Instability and Crisis in Financial Complex Systems

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“...our economic leadership does not seem to be aware that the normal functioning of our economy leads to financial trauma and crisis, inflation, currency depreciations, unemployment, and poverty in the midst of what could be virtually universal affluence- in short, that financially complex capitalism is inherently flawed”

(H.P. Minsky, 1986)
→ One of the most puzzling aspects of the recent crisis was indeed just how it was *unpredicted* by the *economic leadership* both in academic and inside the international institutions (→ Queen Elisabeth 2\textsuperscript{nd} speech at London School of Economics)

→ Post-Keynesian economists (cf. Kregel, 2007; Chick, 2008; Dow, 2008; Wray, 2008 and 2009; Lawson, 2009; Davidson, 2009;) have very frankly denounced the inadequacy of the *mainstream’s cycles* models in explaining the *origins, nature and effects* of financial crisis
As well-known, traditional approaches in economics and finance have indeed been based on the proposition of the so-called \textit{Efficient Markets Hypothesis} (EMH) developed at the University of Chicago since ‘70s.

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According to this theoretical approach financial market are \textit{efficient}, and instability and crisis may happen only as temporary \textit{shock} since markets are always \textit{self-regulating} and \textit{self-stabilizing}.
As a consequence New Classical Macroeconomics (NCM), as leading macroeconomic approach, has put (real!) *exogenous shocks* at the centre of the analysis of the cycle and of the instability of developed capitalist systems.

Standard views in economics, up to date, seem to ignore that current capitalistic economies are characterized by *complex* and more and more *sophisticated* financial systems driven by the fundamental activity of *money-managers* (cf. Whalen, 2001, 2005; Wray, 2009).
In this paper I try to contrast EMH with the *Financial Instability Hypothesis* (FIH) held by Hyman Minsky (1977, 1982, 1986) taking into account the *dynamic complexity* of financial markets and the role of fundamental *uncertainty* and *organic interdependence*.

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This approach may provide analytical tools to explain crisis through processes *endogenous* to contemporary economics.
→ *Complex dynamics* provide an independent source of *fundamental uncertainty* and this one, as discuss by Keynes himself (1936, 1937), can lead to *speculative bubbles* in assets markets and to *over-reactions* both in *lender’s* and *borrower’s* attitude toward risk

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The relevance of *complex dynamics* has been particularly stressed by Barkley Rosser (2004; 2005). This author considers indeed the analysis of *complexity* a strong foundation for Keynesian models and results.
As I shall try to argue a *financially complex* capitalism, according to the FIH, is indeed inherently flawed:
in absence of adequate economic policy, *booms* and *busts* phenomena in financial markets fuelled by *credit booms* and *busts*, may generate *endogenous* instability and *systemic* crisis like the one occurred recently.
The paper is structured thus:

Par. (1) overviews and moves critical assessments of the EMH;
Par. (2) is concerned with financial markets as complex dynamic systems;
Par. (3) shows how complexity and fundamental uncertainty may provide the analytical tools to explain current crisis through endogenous processes;
Par. (4) stresses the relevance of organic interdependence to analyse both the national and international effects.
EMH approach have stressed the relevance of different types of efficiency of the financial markets:

a) \textit{fundamental-valuation efficiency}

b) \textit{information-arbitrage efficiency}

c) \textit{full-insurance efficiency}

d) \textit{functional efficiency}
a) fundamental-valuation efficiency states that investors are perfectly rational, from which it follows that market are efficient in the sense that all the usable information about fundamentals is discounted into the current prices (i.e. net present value of firm’s future cash flows)

b) information-arbitrage efficiency states that speculative profits, via technical trading or others means, are not obtainable (i.e. an average investor cannot hope to consistently “beat the market”!)
If there are some investors that are not rational, their trades are random and, being uncorrelated, they cancel out each other.

Even in the presence of correlated trading strategies, EMH stressed that the activity of rational arbitrageurs may perfectly eliminate their irrational influences on prices.

Bubbles and crashes cannot occur (i.e. “the information that might lead to them would indeed be discounted into the price instantaneously”!).
c) **full-insurance efficiency** states that financial markets as a whole are **efficient** if it is possible to **insure** the delivery of goods and services under a complete set of “**state of nature**” (i.e. environment à la Arrow-Debreu (A-D))

Ex. - *mortgage contracts*- according to EMH, these markets are efficient if the **probabilistic risk** of the debtors to be unable to meet all future cash outflows linked to contractual debt obligations can be known with **actuarial** certainty (on this point see Davidson, 2009)

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EMH
d) Concerning with *Functional efficiency*, EMH stress that it is concerned with various activities assured by the financial system that is:

- to mobilize *saving*; to allow for the *diversification* and *sharing* of risk; to enhance *orderly financial* markets for *liquid* and *illiquid* assets;
- to *produce* and *disseminate* information; to promote *corporate governance*; and finally to facilitate *investments* and *innovation*. 
EMH is unable to provide guidelines for how to deal with financial crisis both *domestically* and/or *globally*. Such crises are not possible! (cf. Davidson (2009))

*Efficient markets* would indeed never permit neither *over-borrowing* (i.e. households and firms spending an amount that so exceeds their income or cash-flows that the debt cannot be serviced) nor *over-lending* (i.e. by banks and other financial institutions)

→ in EMH, NO SPECULATIVE AND PONZI’S FINANCIAL UNITS!
This argument was become even stronger in the recent decades since a vast risk management and pricing system has evolved.

In recent years to evaluate and manage the risks, investment bankers in Wall Street based indeed on statistical probability the analysis of historical data to predict the future.
EMH stressed that permitting computer to organize the market may reduce significantly the variance and therefore increase the probability of a more well organized, insurable and orderly market than before.

(cf. Davidson, 2009)
EMH is founded on A-D-type analytical context in which the hypothesis of *complete markets*, *perfect information* and the idea that *risk* can be always *perfectly shared* or *insured*, seem at most applicable to an *ideal world* rather than to real economy.
In this sense EMH is based on a *simplistic* approach since it assumes or seems to ignore the actual processes that unfold within and beyond *economic* and *financial complex systems* (cf. Rosser, 1999; Foster, 2005).
By contrast Keynes was very well aware of these aspects since his work as an economist was essentially an attempt to cope with the complexity of economic system and with the organic interdependence of the variables, founded on a conception of economics as science of social complexity.

→ The most important loci of economic complexity in the GT are the analysis of the long-term expectations and that of the business cycle
→ As to conventions Keynes stressed the relevance of them for economic behaviour particularly in his 1937 article on the QJE (cf. Marchionatti, 2009).
When Keynes wrote the GT the *leading actors* were the *stock market investors* and they found their actions and decisions from *conventions*.

The essence of *conventions* lies “in assuming that the *existent state* of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change” (cf. 1937, p. 158) and:

“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” (cf. 1937, p. 115).
In financial markets the evaluations of the investment opportunities depend on the “judgement of the rest of the world” or on the attempt “to conform with the behaviour of the majority or the average” (Keynes, 1937, p. 114). Instead economic activity is fundamentally guided by conventional judgement.
These factors determine people’s *state of confidence* and therefore the magnitude of investment.

Keynes consider the meaning of the state of confidence as twofold (see here p. 45):

a) the *state of confidence of the speculators or speculative investors*

b) the *state of confidence of the lending institutions, i.e. “the state of credit”*
The fluctuations of the state of confidence is what make the business cycle a “highly complex” phenomenon. Expectations and investment cannot indeed be modelled by using probabilistic relationships, the study of instability and crisis are therefore beyond the domain of probabilistic inference as assumed by EMH!

Put in more plain English, under conditions of fundamental uncertainty the behaviour of economic agents is so complex that a formal probabilistic treatment of expectations is not feasible.
In complex economic systems the predictability that is so successful for hard sciences does not work, and theories claiming predictability and computability have misled policy makers and continue to do so.

(cf. quotation of Taylor-Shipley in Davidson, 2009, p. 11).
There are indeed serious *epistemological* problem associated with *complex economic* systems which imply that there exist serious *bounds on the rationality* (cf. Dequech, 2001; Rosser, 2001; Marchionatti, 1999) of economic agents assumed by EMH models.

These bounds take many forms, inability to understand the *internal relations* of a system, but particularly the inability to understand the *interactions of agents*, especially when these agents are thinking about how each other are thinking about each others’ thinking.
This can lead, indeed, to *group dynamics* as analyzed by Keynes for the well-known *“beauty contest”* (see here p.44) where each party tries to guess the *average state of expectations* of the other parties; i.e. participants in financial markets tend to be more interested at the *average level of “sentiment”* in the market than in the relation of prices to the *“fundamentals”*!
Whenever forming expectations means predicting an aggregate outcome that is formed in part from others’ expectations, expectations formation can become self-referential.

The problem of logically forming expectations that becomes ill-defined, and rational deduction finds itself with no bottom ground to stand upon.

The indeterminacy of expectation-formation is by no means a rarity or anomaly within the real economy. On the contrary, it pervades all of economics and, as pointed out above, for Keynes’s “beauty contest”, particularly the financial markets.
When different people have different views about each other’s expectations the results can indeed be dynamically complex. The fact that the result of one’s decision depends on the decisions taken by the others gives rise to a special character to interdependence↓

Interdependence in itself is not a source of fundamental uncertainty, since it may merely generate complexity in a constant, or predictability changing environment. One have to consider organic interdependence, where the whole may be more than the sum of its parts. “Organic interdependence create fundamental uncertainty in the sense that expectations must be about other people’s expectations and this spreads fundamental uncertainty” (cf. Dequech, 2001, p. 919).
The reality of *complex dynamics* undermines the classical view on two grounds (cf. Rosser, 2005, p. 6):

→ 1\textsuperscript{st} the presence of *complex endogenous dynamics* means that the economy is not necessarily *self-stabilizing* or *optimal* and *efficient*

→ 2\textsuperscript{nd} that such dynamics *undermine* the assumptions of *rational expectations*

Foster (2005; p. 877) discerned different order of *complexity*.

*Forth-order complex systems (the so-called interactive knowledge case)* is particular relevant to study financial markets’ behaviour:

“....Such systems come into being when mental models interact with each other. My imagination can still mould reality, but knowledge that this is so leads others to imagine what my imaginings might be”.
Such complexity present many threats since can lead to speculative dynamics:

→ in the presence of positive feedback (a given trader is made better off if everybody else is trading on his information) or positive information spillovers aggregate beliefs cease to bear a relationship to realistic possibilities

(This is in sharp contrast with most information-based asset pricing models. In these models the information spillovers is indeed negative: a given trader is made better off if nobody else is trading on his information)

→ if it is the case, severe structural discontinuity can be the result:

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booms phases characterized by a bull market in the securities market fuelled by an over-lending and over-borrowing process in the credit market are followed by a bear markets, a credit crunches and the risks of crashes/downturns

(cf. Minsky’s FIH)

THE COMPLEXITY OF FINANCIAL MARKETS
→ In this case, \textit{efficiency} is not reached because not only capital is not allocated according to results of the entity, but also this strategy lead to \textit{financial bubbles} followed by a market \textit{crashes}, when other holders realise that their assets value is starting to \textit{decrease}.

→ A \textit{complex financial} system is \textit{inherently} flawed: i.e. \textit{booms} and \textit{busts} are the result of the \textit{internal dynamics} of the financial markets.
This theoretical approach may now be considered trying to explain several aspects of the current sub-prime crisis.

→ One of the most important aspect of the USA economy in ‘80s and ‘90s was the increasing role of institutional investors-money managers.

→ Financial markets in USA were indeed not driven primarily by masses of individual investors or even by a few huge professional stock-market investors (as stressed by Keynes in the GT), the leaders being money-managers (MM).
As well known, *money managed funds* includes not only *pension* and *mutual funds*, but also *venture capital funds*, *private equity funds* and of course *hedge funds*.

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The consolidation of market power in the hand of MM has been driven by a huge process of *financial liberalization, deregulation* and *reduce supervision* that has characterized the financial economic policy in USA for near *thirty* years. These policies had special relevance for two important aspects: *securitization* and *globalization* (Cf. Wray, 2008)
These *structural changes* in the system generate a *systemic* problem that results from the incorrect notions of EMH approach and that stress that financial markets can *properly assess risk*, *hedge* and *shift* risk to those best able to bear it, and will always *discipline* decisions making.

→ Since similar models were *widely* used, the models themselves drive *financial sophisticated* and *complex financial markets.*

*Mimicry behaviours* was founded on *complex dynamics* and *fundamental uncertainty* in *globalized* financial markets.

→ *Over-lending* (by institutional investors, banks and other financial institutions) and *over-borrowing* (by households and firms) processes in the *credit market* and the *boom* phase in the *value of real estate* and in the *stock market.*
Even though from the microeconomic perspective no financial institution alone is sufficient to generate a lending boom, this may come about as a consequence of the action by lenders who, in a context of fundamental uncertainty founded in the complexity of financial markets “hunt in herds”.

In other words, investment money managers and financial institutions adapted their behaviour regarding the granting of loans to that of the others because in this way they had less to lose in terms of their reputation (cf. Keynes, 1936, p. 158; 1937; Azariadis, 1981)
This herding happens every time the operators act by conventions and by observing the behaviour of the others. Given that people’s decisions are influenced by their beliefs and that decisions constitute “signals” for others, the improvement (or deterioration) in the “state of confidence” can spread with more or less speed to the whole system.

An improvement in the “state of credit” induced by herd behaviour increases the value of capital goods and real assets (REAL ESTATE) but this, in turn, has positive effect on the credit constraints with pro-cyclical effects.
In USA the process described above began around the year 2000, after the “dot.com” bubble burst; real estate seemed the only safe bet to many Americans, especially since interest rates were unusually low and liquidity was plentiful.

When the aforementioned elements are mixed together the tendency was toward an increasing in the so-called “Ponzi’s financial units” and then to an increasing of the overall financial fragility: i.e by lending institutions, by households and by purchasers of mortgage-backed securities.
The process described, essentially hinges on the complexity of the financial system. Since banks and other institution’s financial structure became particularly fragile, the risk of a credit crunch and of systemic financial crisis increased.

A deterioration in the “state of credit” (i.e. an increase in lender’s risk) push for a reversal in tendency: this lead to a drop in employment and in the production financed by loans.
As the credit available to the private sectors was rationed or the conditions on which they could get access to credit became more onerous, households and firms were forced to liquidate their financial assets, or even sold their real estates in order to meet their obligations.

However during the credit crunch the sale of capital goods and real assets triggered a collapse in the price of these assets and so provoked a drop in the patrimonial value of collateral itself (NO orderly financial markets as in EMH)

In such a case the firms and households are said to be in financial distress
The credit crunch also negatively influenced the stock market, the market of real estate and therefore reduced the aggregate consumption and the aggregate investment, further aggravating the drop in income and employment.

A deterioration in the “state of credit” therefore reduced the levels of income and employment not only directly, but also indirectly because of the process of deflation on the prices of assets which may be set off with effects on the real variables that, as we have seen, was the opposite of those which characterized the boom.
The first bank failures (i.e. Lehman Brothers on September 15th 2008) caused the foreign investors to lose confidence and raised the possibility of bank panic.

This was interpreted indeed as a sign that the entire financial system was in danger, and so many believed that it was time to ask for the loans to be repaid, thereby triggering a self-fulfilling systemic crisis.

herd behaviour plays a key and reverse role with respect to boom.

This caused a big drop in loans and, through the multiplier, of deposits, thus driving other banks to insolvency and then to bankruptcy by others institutions → aggravating the negative impact on the real variables.
According to FIH in a complex financial system one is not to be surprised by observing the huge wave of defaults by homeowners, highly leveraged mortgage-backed lenders, and holders of mortgage backed securities.

This was partly due to panic, but it was also partly due to the recognition of the fact that precarious borrowing had woven its way into the entire system- indeed into the global financial system- and nobody really knew where the greatest dangers were (cf. Wray, 2008).

According to this analysis global financial crisis phenomena originated, once again, in a situation of complex dynamics and organic interdependence, making it possible to explain the effect of contagion and propagation.
Quoting Keynes’s “beauty contest” (1936, p. 156):

“...professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole: so that each competitor has to pick, not those faces which he himself find prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view. It is not a case of choosing those which, to the best of one’s judgement, are really the prettiest, 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. And there are some, I believe, who practise the fourth, fifth and higher degrees".
Keynes consider the meaning of the state of confidence as twofold:

“So far we have had chiefly in mind the state of confidence of the speculator or speculative investor himself and may have seemed to be tacitly assuming that, if he himself is satisfied with the prospects, he has unlimited command over money at the market rate of interest. This is not of course the case. Thus we must also take account of the other facet of the state of confidence, namely, the confidence of the lending institutions towards those who seek to borrow from them, sometimes described as the state of credit. A collapse in the prices of equities, which has led disastrous reactions on the marginal efficiency of capital, may have been due to the weakening either of speculative confidence or of the state of credit. But whereas the weakening of either is enough to cause a collapse, recovery requires the revival of both. For whilst the weakening of credit is sufficient to bring about a collapse, its strengthening, though a necessary condition of recovery, is not a sufficient condition.”

(1936, p.158)
See Keynes, 1936, p. 144-145

“... two types of risk affect the volume of investment which have not commonly been distinguished but which is important to distinguish. The first is the entrepreneur’s or **borrower’s risk** and arises out of doubts in his own mind as to the probability of his actually earning the prospective yield for which he hopes. If a man is venturing his own money, this is the only risk which is relevant.

But where a system of borrowing and lending exists, by which I mean the granting of loans with margin of real or personal security, a second type of risk is relevant which we may call the **lender’s risk**. This may be due either to moral hazard, i.e. voluntary default or other mean of escape, possibly lawful, from the fulfilment of the obligation, or to the possible insufficiency of margin of security, i.e. involuntary default due to the disappointment of expectation.”

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during a boom the popular estimation of the magnitude of **both these risks**, both borrower’s risk and lender’s risk, is apt to become unusually and **imprudently low**.