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MACROECONOMICS AFTER THE CRISIS
Bringing Finance Back In

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Abstract

The conventional DSGE models used by Central banks have miserably failed in dealing with the emergence, maturing and ways out of the present crisis. Such an irrelevance dates back to the earliest formalizations of the message of *General Theory*. Modern macroeconomists have neglected the micro-macro gap associated with composition effects – the paradox of thrift – and the impact of expectations formed on the financial markets upon production, employment and investment. In reaction to the multiple anomalies revealed by the crisis, DSGE models now try to formalize the banking system, liquidity constraints, the impact of monetary policy upon risk-taking, the influence of the stock market and so on. Nevertheless, most of them suffer from two main shortcomings: implicitly financial markets should be efficient and heterogeneity is not really taken into account. These lacunae open a large opportunity to alternative strategies based upon a better incorporation of the political economy of financial crises. In order to explain the major stylized facts that emerge from the history of financial crises they should also incorporate some of the robust transmission mechanisms between finance and the real economy detected by existing econometric studies. Multiple heterogeneous agents based models can deal with the interactions between various financial entities and they define macro regularities as emerging properties of a series of selection and learning mechanisms. Modeling financial networks, extending stock market models to the entire financial system and economy, formalizing the learning and then the oblivion process of past crises by financial entities and regulators define three other promising research programs. Finally, given the specificity of the present crisis, largely generated by the accumulation of powerful but risk financial innovations, an historical and institutional macro-model could formalize contemporary finance led regimes.

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Synopsis

The 2007-2008 crisis has clearly shown the dangerous dichotomy between DSGE models without finance and the pricing of complex financial products without any concern for their macroeconomic permissive conditions, such as a permanent access to liquidity along a stable growth regime. Consequently a new generation of DSGE research now tries to incorporate some features of modern finance, takes into account the heterogeneity of households and/or investors and formalizes how the Central Bank may affect risk taking by banks and firms and how its balance sheet may help in overcoming the limits of a “quantitative easing” when nominal interest rates reach the zero floor.

These developments are welcome compared with the simplistic and unrealistic seminal DSGE models that are not up to the challenges pointed out by the so-called “subprime” crisis. They continue to be a drastic over simplification of the complex interactions between financial innovations and changing firms governance modes, income rising inequality and access to credit, the financialization of the US economy and the rise of Asia, especially China, as a world manufacturing center. Many alternative modeling can be imagined but they should share some common basic hypotheses.

1. Cycles and crises are largely *endogenous* and not uniquely the outcome various exogenous shocks, affecting mainly the real economy.
2. The *heterogeneity* of agents is crucial both in the genesis of financial bubbles and the explanation of the concentration of risks that makes so dramatic and costly the major economic crises.
3. The financial and the real sectors have to be dealt *symmetrically*: a bunch of financial innovations – subprime plus securitization – may exert as much macroeconomic impact as the so-called ICT revolution.

The *art of modeling* is then to try to detect what are the relevant interactions and mechanisms that explain the succession of booms and crises. There is a still more difficult question: how to diagnose in real historical time the conversion of a typical and mild “business cycle” into a major crisis and possible long lasting depression? This article proposes a possible method in the direction of this (impossible?) ideal.

1. The *long history of financial crises* exhibits a list of stylized facts that macroeconomists should explain: recurrence of bubbles as consequences of uncertainty, existence of typical patterns linking credit, asset pricing and economic activity, swing from the illusion of liquid financial markets to the chase for the only absolutely liquid asset: central bank money.

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2. The *2007-2008 crisis* share these features but it displays other ones quite specific indeed: financial innovations have overcome technological advances, credit has fuelled speculation within the shadow banking system and converted American poorest households into Ponzi speculator.
3. The neo-Walrasian foundations of DSGE literature is unable to deal with the specificity of financial assets, that never converge towards their fundamental value. It is thus crucial to revisit the *political economists* who have tackled with the macroeconomics consequences of a monetary and financialized economy: Marx, Wicksell, Fisher, Keynes, Minsky, still provide useful insights to be embedded into modern formalizations.
4. How do these theoretical frameworks, both old but updated from forgotten or neglected economists and new and triggered by the irruption of the present crisis, cope with the stylized facts extracted from the history of financial crisis? The proposal is here to begin with a *qualitative assessment* of ability of any model to mimic the basic pattern observed. Econometric tests and calibration should come second and try to minimize the ad hoc “technical hypotheses” that frequently hide the intrinsic inability of a static equilibrium model to reproduce dynamic patterns. The autocorrelation of extraordinary large productivity shocks is for instance a common trick used to hide the basic inadequacy of a DSGE model without sufficiently rich mechanisms linking finance and real economic activity.
5. Given the limits of a top-down deductive approach typical of most macro-modeling, it might be fruitful to have a *bottom-up strategy* whereby agents only master their local environment. Nevertheless, their interactions deliver possible macro-regularities, as emerging property of a complex multi heterogeneous agent dynamic model with selection and learning. The contrast is striking between two conventional strategies concerning the formalization of stock market bubbles. On one side, only external and real shocks do affect the valuation of firms that are supposed to converge quickly to their fundamental value, with only a transitory impact upon the medium-long term trajectory. On the other side, a multiplicity of agents with contrasted objectives, access to information and different time horizons, interact via the formation of the market price in such a way that bubbles may endogenously emerge and burst out. The horizontal interactions between these agents are crucial in order to generate the typical pattern derived in the history of financial crises.
6. There is then a need for micro-foundations, alternative to those provided by full rationality and complete information hypotheses. It is proposed to survey briefly the large bulk of statistical and *econometric studies* that have detected quite *robust mechanisms linking finance and real activity*: procyclicality of risk taking, generality of credit rationing, paralyzing impact of uncertainty as opposed to risk, progressive oblivion of previous crises, role of incentives on risk taking, importance of collateral in credit decisions and propagation of financial panics. This could define a criteria in order to discriminate among the various new theories about individual behavior: bounded rationality, animal spirits or framing effects put forward by experimental economics. If the related models have to remain tractable and relatively easy to master, a parsimonious choice of these mechanisms should be preferred to a complete and black box model. According to their theoretical a priori, various economists may elaborate quite different models in order to explain the same stylized facts.
7. According to a final proposal, macroeconomists should take seriously the advances in institutional analysis. If the set composed of organizations, institutions and even the constitution change, then incentives and constraints governing the individual behaviors do

evolve: it is another expression of the Lucas critique. Nevertheless there is a positive side of the coin: a careful analysis of the core institutions of contemporary economies should help in detecting the key actors, their logic, their instruments and strategic interactions. It could be a useful device in order to select among alternative modeling of the behavior of the Central Bank, investment and commercial entities, firms and households with different social and economic insertion and status. For instance, the Keynesian Central Banker has been replaced by the conservative one and a synthesis of their objectives is given by the famous Taylor rules. In the era of intense and general financialization, the Central Banker is also in charge of global financial stability. It is especially clear looking at the strategy of the Central Banks after the collapse of Lehman Brothers. In turn, banks rely heavily on their stock market valuation and not only upon interest rate in order to make their credit decisions to firms, households,...and other financial entities such as the shadow banking system that has played such a key role in the genesis and unfolding of the crisis.

Finally, this paper proposes three specific areas for future investigations.

- a) With the emergence of larger and larger financial actors and the concentration of risks and/or their diffusion via collateral and counterparty transactions, the tools of *network analysis* should be more frequently mobilized in order to formalize the interdependency within the financial system, detect what are the weakest actors and systematically test the resilience of the economy to the bankruptcy of such a “to big to fail” actor.
- b) The more advanced bottom-up modeling – from the interaction of heterogeneous agents to the emergence of meso or macro regularities – concerns the stock market, with incidentally a large variety of behavioral hypotheses: noise traders against fundamentalists, fundamentalists against chartists, contrarians against fundamentalists or even the extension of models borrowed to statistical physics. Given the *hierarchical domination of stock market* and its high frequency quotations, macroeconomists should try to derive its impact upon commercial banks, then their credit decisions to the firms and households and so on. Therefore, by construction, the impact of finance should be giving a chance to monitor real economic activity and thus explain one of the major stylized facts of the last decade: the leading role of stock market in macroeconomic evolutions.
- c) Explaining the long term *recurrence of financial crises* could be a last area for a quite different modeling. At the level of the banking system, detailed statistical investigations show that after a bankruptcy, the expected probability of default is first very high and overestimated. As times elapses this subjective probability continuously declines. After 5 or 6 years, individuals and organizations have totally forgotten this possibility of bankruptcy. Thus they take largely underestimated and growing risks by excess leverage. The brutal reversal of the situation is thus endogenous and new cycle might begin, with new actors and new instruments. Nearly everybody is convinced that “This time it is different”. At the societal level, the same process of learning how to control finance is progressively forgotten. After two or three decades, authorities are convinced by powerful financiers that regulations are inefficient constraints. The deregulation is initially quite favorable since it removes the credit constraints, but the recurrence of more and more severe bubbles usually ends up into a major structural crisis. It could be interesting to formalize these two levels and two times scale learning and lapse of memory within an extended overlapping generation with heterogeneous actors.

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I. INTRODUCTION

As times elapses since September 2008, the costs, the severity and the uncertainty about the way out of the present crisis are clearly recognized by every analyst and observer. The reference to the Great Depression becomes more and more frequent, since the macroeconomic patterns observed do not fit with the post WWII typical business cycles. This is a matter of concern not only for policy makers but also for financial economists as well as macroeconomists. According to the modeling of risk by the formers, a financial crash of this amplitude was supposed to happen with an infinitesimal probability. The macroeconomic basic model elaborated by Central Banks used to analyze the impact of interest rate policy directly upon the real economy without any intermediation via the financial system. After a few years of benign neglect by economists, the pressure of policy makers as well as informed public opinion, the profession has now to recognize that “Something may well have gone wrong”.

One official now dares to state “I believe that during the last financial crisis, macroeconomists (and I include myself among them) failed the country, and indeed the world. In September 2008, central bankers were in desperate need of a playbook that offered a systematic plan of attack to deal with fast-evolving circumstances. Macroeconomists should have been able to provide that playbook. It could not. Of course, from a longer view, macroeconomists let policymakers down much earlier, because they did not provide policymakers with rules to avoid the circumstances that led to the global financial meltdown” (Kocherlatoka, 2010). This article proposes to substantiate this hypothesis and to show that the present poor performance of macro-theory dates back to the foundation of this discipline as distinct from microeconomic analysis (figure 1).

-- Insert Figure1-

The General Theory was proposing three breakthroughs: the need and possibility to analyze *economic aggregates*, the concept of *involuntary employment* as distinct from any labor market friction and the crucial role of *financial markets* in the emergence of the conventions that shape firms of expectations facing *radical uncertainty*. The reluctance of John Maynard Keynes about modeling has lead to a canonical formalization of his too complex and diverse ideas by John Hicks: the *IS/LM* model has focused upon a new mechanism of transmission of monetary policy to economic activity but it has bypassed Keynes’ rich and fundamental analysis of finance and especially of the stock market. When the relevance of this model is challenged by the surge of inflation and

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then stagflation, the monetarist backlash is only the first step in the rehabilitation of microeconomics as the only starting point for any macro-analysis.

The forward looking strategy of agents is enhanced by the *Real Business Cycle* (RBC) but it is associated with a quite paradoxical conception of the Walrasian message: a representative agent knows the deterministic part of the national economy that is fully adjusting only via price variations. Then the long term equilibrium for the relative prices is only transitorily affected by shocks concerning the money supply. The worm is already in the fruit: the representative agent hypothesis is a "coup de force" against one of the major findings of General Equilibrium Theory and money is again a pure veil. Therefore finance is inessential since it only adjusts preferences with technical possibilities without any proper role for intermediation. Basically recessions, even the Great Depression, are the efficient reactions to an adverse and very large productivity shock. Furthermore State interventions can only delay necessary adjustments and private agents fully understand the consequence of the inter-temporal budgetary constraint of the State: they will not spend more if their taxes are reduced today because they know that they will have to tomorrow. Farewell to Keynes: the economy is self regulating and thus "Governments are the problem not the solution".

The only counterattack by opponents to this statement was to bring back an hypothesis put forward by disequilibrium theory but that had been defeated by market fundamentalism: the inertia in wage due to overlapping negotiations and oligopolistic price formation may give some room for an impact of budgetary policy on real activity. This new synthesis embedded into various variants of Dynamic Stochastic General Equilibrium (DSGE) models has been adopted by most Central Banks. This framework, very flexible since calibration has frequently replaced econometric estimation, has given them a sense of unprecedented scientific foundations for their action. Their neglect of the recurring bubbles that have been more and more intense is the direct consequence of this vision according which the Central bank has a direct dialogue with firms and households in order to convince them that inflation, measured by a consumer price index, is under control. No matter if a shadow banking system is pushing the price of assets by an explosion of leverage effects and thus feeds an unsustainable economic boom. Actually, within canonical DSGE models, implicitly the financial markets are informationally efficient and they redistribute the risks all over the world to the agents more able to bear them.

If one agrees with this brief retrospective, the present epoch is featuring *two inter-related crises*: the financialization of most modern economies, now in trouble, has not been accompanied by an equivalent alertness of macroeconomists about the impact of these structural changes. The public authorities have until now prevented the repetition of the Great Depression but they navigate on uncharted waters. A huge research agenda is now opening for macroeconomists. It is time to reconcile macro-modeling with the teachings of the history of financial crises and this requires taking a symmetric account of the real and financial components of contemporary economies.

There is a huge gap between the rusticity of the DSGE models used by the economists of the Central Banks and the multiplicity of mechanisms that triggered the present crisis, its unfolding and diffusion from one market to another, from the US to the rest of the world : conceptually this should give a premium to a complex system approach (§ II). A second strategy is to point out the logical weaknesses and irrelevance of the founding blocks of most if not all DSGE models. Correcting them and adopting more satisfactory starting points open a large variety of research programs. Is the crisis a definite nudge in favor of a bottom up approach or will the old paradigm be flexible enough to deal with a fully fledged formalization of the financial system and its links with the real economy (§ III)? May be one of the most significant U-turn in

macroeconomic theorizing would be to restore a kind of dialectic between theorizing and detecting some typical dynamic patterns: some seem to repeat themselves since the 18th century, some others are quite specific to the subprime crisis. How do the various research programs fare concerning possible explanations of these stylized facts? Which of them could be taken as foundations of behaviors at the individual level and which others should be the outcome of the model at the macro level (§ IV)? Another source of rejuvenation of macro-theory might well be to revisit the institutions and contributions of the founding fathers of macroeconomics (§ V).

Could one trust the results of models where extreme and unlikely values for parameters finally mimic some, but not all, macro economic evolutions or should calibration be completed and as far as possible replaced by rigorous econometric tests? The proposal is here to upgrade the status of empirical research on the mechanisms that govern the finance-real economy mechanisms and to challenge the frequent symbolic domination of theoreticians (§ VI)? This is an invitation to economists to be more reflexive in their daily practice. The fundamentally deductive, if not axiomatic, method inherited from General Equilibrium Theory has been adopted by RBC and DSGE models, but with far less rigor. It has shown its limits in removing from theorizing quite crucial and robust mechanisms linking finance and real economy. It is more and more difficult to maintain that a simple and single model can capture the multiplicity of the links exhibited within more and more complex financial instruments. Another methodological choice relates to the degree of adequacy of the modeling: is the objective to build a generic workhorse valid for successive bubbles or is the ambition to enlighten the specificity of the subprime crisis (§ VII)? Finally among this entire continent of pluralism of possible representations of a given complex economy, in the name of the classical/Keynesian tradition this article selects three potentially interesting modeling strategies (§ VIII). A short conclusion puts into perspective these various proposals that share a common inspiration: *macroeconomists have to take seriously finance and its contemporary transformations.*

II. A QUITE COMPLEX CRISIS AGAINST SIMPLISTIC MODELS AND AD HOC HYPOTHESES AND IDEOLOGIES

As time elapses since the panic associated to Lehman Brothers bankruptcy, quite all economists recognize that numerous mechanisms played a role in generating the crisis but they may disagree upon their relative importance. Ironically, the profession has shifted from the belief in the self regulation of market financialized economies to the emphasis upon many imperfections, frictions and perverse incentives that were bound to lead to a major crisis.

Some point out the *domestic factors* that shaped the American bubble: “Excess liquidity, income polarization, conflicts between financial and productive capital, lack of appropriate regulation, asymmetric information, principal-agent dilemmas and bounded rationality” (Palma, 2009). Others think that the novelty of the present period lies largely in *the opening of the American economy*: “Global imbalances have had an important causal role not at the international level, in the form of currency recycling, but at the domestic level, in the form of credit recycling to the agents spending more than their income, who are the other end of the external deficit. The breakdown occurred in the credit recycling mechanism” (Wade, 2009). By contrast other analysts are impressed by the leading impulse of financial innovation: “Innovation created important financial products so complex and opaque they could not be priced correctly; they therefore lost liquidity when the boom ended (...).Regulators allowed giant banks to measure their own risk and set their own capital requirements. Given perverse incentives, this inevitably led to excessive risk taking (...). Heavy reliance on complex financial products in a tightly integrated global financial system created channels of contagion that raised systemic risk” (Crotty, 2009).

But another tradition stresses the primacy of *technological factors* that are the underlying cause of the internet mania and real estate bubble: “Such major boom and burst episodes are endogenous to the way market economy evolves and assimilates successive technological revolutions” (Perez, 2009). The causality from real to financial causes and from domestic to international factors is thus inversed. A possible reconciliation would be to design a very general analysis and ultimately accept to *model a complex system* in which these diverse mechanisms may generate a rich dynamic with contrasted time scales: from the microsecond of some financial transactions to quarter century long technological and organizational changes.

The *cognitive components* are also present in many analyses. From a Keynesian perspective:” The nature and conditions of social reality are such that the forms of mathematical deductivist reasoning favored by modern economists are almost entirely inadequate as tools of insightful social analysis” (Lawson, 2009). More technically, a specialist points out the danger of importing the tools of physics in economics: “By reflecting on the similarities and differences between economic phenomena and those of other scientific disciplines such as psychology and physics, we conclude that logic goes awry when we forget that human behavior is not nearly as stable and predictable as physical phenomena” (Lo and Mueller, 2010). And actually the performative power of modern quantitative financial theory (MacKenzie, 2003; 2008) is not a minor curiosity or addendum to the realistic interpretations of the contemporary crises.

The message of this too short survey is that modeling is probably *an art and not only a technique*. How to isolate the key mechanisms that are shaping the evolution of a rather complex system? Where to close it without losing relevance? Just adding the hypotheses previously mentioned would lead to a quite original model, far away from the specialization of contemporary research (figure 2).

--Insert Figure 2 --

There is a sharp contrast with the quite restrictive approach of RBC and DSGE modeling: a *representative* firm and a household are optimizing their behavior by using the same tools as the *professional economist*, including the last tools of dynamic control theory, within a set of *stable and known* mechanisms. The *closed economy* is only affected by *exogenous shocks* produced elsewhere or by the unexpected move of the Central Bank, given that *money is neutral* in the medium-long term.

III. FROM THE INTRINSIC WEAKNESSES OF DSGE MODELS TO THE OPENING OF NEW RESEARCH AGENDA

The brief survey of the history of macroeconomic theory has already pointed out how weak, counter intuitive and paradoxical were the founding hypotheses of contemporary research. Ironically, the multiplicity of horizontal relations among actors differently specialized has been replaced by the equivalent of a Robinson Crusoe optimizing its work and investment over an a long term horizon. It is not surprising if finance and banking are so difficult to insert into these models since the adjustment of saving and investment is made by the same individual! Adopting the Milton Friedman’s “as if” hypothesis would be acceptable only if the conclusions derived from the related model adequately fit the typical macroeconomic patterns observed in long run history and contemporary period as well. It is far from being the case.

III.1 – The DSGE models failed the test of the present crisis

Since the early stage of RBC and then DSGE models, clever calibrations have been unable to reproduce the dynamical pattern of contemporary cycles. This has been the main incentive for constantly refining the techniques and for looking for adjunct hypothesis in order to bring more relevance to the simulation exercise. When Lehman Brothers went bankrupt, this was a real surprise for most central bankers who had adopted the idea that they now had a scientific tool for conducting their interventions. The drama is precisely that in such models a depression can only occur when the economy is affected by a major external negative shock. The unfolding of the subsequent crisis has therefore been screening their relevance and in most case it has invalidated the founding hypothesis of modern macroeconomic analysis (table 1).

- The convenient hypothesis of a *representative agent* becomes problematic when one observes the knock-on effects of the failure of a large entity over the whole financial system. The extreme interdependency in terms of assets and liabilities has been crucial. This brings back the need to formalize the linkages between heterogeneous agents. Let us imagine that the initial estimate of the losses in the real estate credit, around 700 billions dollars, could have been distributed evenly among identical agents, the crisis would have been easily absorbed. By contrast the unequal indebtedness of commercial banks and investment bank, of poor and rich households is a key ingredient in the unfolding of the financial collapse.
- Rationality is presented as a common sense hypothesis: agents behave at the best their interest, don't they? The problem with the *full rationality principle* is that, in most contemporary models, it is associated with complete information: not only do households know the functioning of the markets they transact upon recurrently but they have also the competence of a professional economist since their knowledge is extended macro issues such as the impact of monetary policy upon inflation or public finance upon employment. Basically the auctioneer of Walras has been replaced very learned agents who have overwhelming competence to solve the coordination problems a market economy is facing. This is a quite strange starting point for any realistic macroeconomics theorizing.
- Implicitly at least, markets are the only institutional arrangement in charge of coordinating agents. In the modern formalization of Walras, an intertemporal equilibrium of a decentralized economy may exist, but one of the conditions is quite stringent: all contingent future markets are open. Mathematical economists have shown that if these markets are missing, an intertemporal equilibrium might not exist, equilibria might be multiple and in any case the related state has not any chance to be a Pareto optimum (Newberry, 1989). The very absence of financial markets in most DSGE model is implicitly assuming their smooth and efficient role in resource allocation. Other researchers suggest that creating few future markets may exacerbate the pathology of the economy: there is no guarantee of a progressive convergence towards an efficient equilibrium when the number of future market is increasing but not complete (Artus, 1990; Li and Barkley, 2001; Brock and *al.*, 2006).
- The *rational expectation hypothesis* (REH) is not a mere extension of the domain of rationality, since it is dealing with the issue of time and intertemporal strategies. In a sense, it is a solution for overcoming the absence of a complete set of future markets. The RBC and DSGE theoreticians imagine that the individuals are Bayesian statisticians that constantly re-estimate the pet model of the theoretician. Finally, this common knowledge hypothesis is the clever device put into the brain of economic actors that solves the issue of uncertainty, typical of any capitalist economy: only stochastic shocks affect the long term equilibrium of the economy. Again, the main interest of macro is dissolved by the fact that micro and macro behavior do coincide.

====Insert Table 1 – From the failures of DSGE models to new research agenda====

- But then, how to explain business cycles if fundamentally the economy is always converging towards a long term equilibria? The trick is to imagine that *exogenous shocks* recurrently move this equilibrium. These shocks are identified by the residual of the econometric estimate of a long term relation: they might well measure the imperfection and inadequacy of the basic model. A second problem relates to the fact that exogenous productivity shocks in DSGE models actually are the endogenous consequence of a productivity cycle generated within a Keynesian simple model by the variability of productive capacity utilization, itself moved by the evolution of effective demand. How to imagine that the depressions are efficient because they are triggered by the decrease of productivity associated to the fact that engineers and entrepreneurs have brutally forgotten some highly efficient techniques and organizational forms? A third and more technical problem relates to the fact that business cycles are mainly explained by a postulated auto-correlation of shocks, a quite tautological explanation indeed.
- The *financial sector* in its complexity is the grand absent of most DSGE first generation models and this is quite detrimental to the intelligibility of the present crisis. Ironically, the central bank is the only actor common to all these models but it impacts directly upon firms and households without any intermediation via banks or financial markets. Some models do introduce the embryo of a banking system, but they don't deal with investment banks and it is very rare to take into account the evolution of the stock market both as the outcome and the possible determinant of monetary policy. One understands the disarray of the most prestigious central bankers: ideologically they were convinced about the efficiency of self organized financial markets and the macroeconomists had convinced them that the last development of their science was confirming this belief.
- Afraid by the brutality and severity of the crisis, public authorities had to react without any support from a commonly accepted macro theory. The years 2007-2010 have experienced the equivalent of a Copernician revolution in the *conception of economic policy*. All the principles put forward by DSGE have been violated. Firstly, the rapid decline of interest rate has not been sufficient to engineer a quick recovery: macroeconomists have rediscovered the liquidity trap and the risk of deflation that have been pointed out by Irving Fisher but totally forgotten by contemporary economists until the Japanese lost decade. Secondly, the Central Bank has been compelled to monetize non performing loans and toxic derivatives, at odds with the monetarist orthodoxy of the conservative central banker. It was not at all orthodox but it prevented the repetition of the Great Depression of the interwar period. Thirdly, when monetary policy is unable to convince banks to grant credit to the real economy, public spending is the ultimate tool for putting a floor against a possible cumulative depression. When the financial system is disorganized, and if wage and price cannot adapt rapidly, conventional Keynesian tools regain efficiency.

The challenge is quite daunting: is it possible to reconstruct a macro theory and models that could help to overcome the present crisis in real time? Unfortunately the answer is probably negative.

III.2 – Generalizing the seminal DSGE model: as many avenues as weakness

The discrepancy between the established model and the genesis, maturation and bursting out of the crisis was so wide that *nolens volens* macroeconomists have felt obliged to reconsider more or less drastically their favorite hypotheses. Some major stylized facts have permeated the ivory

tower of theoreticians and macroeconomists. In a sense, the new approach recognizes that “*banks and finance matter*”. Some (rare) precursors had anticipated this move (table 2).

- First recognition: *bank credit* is one of the main transmission mechanisms of monetary policy. The adjustment of saving and investment is not a matter of household intertemporal optimization but the very business of commercial and investment banks. Consequently, a financial shock may move cyclically consumption and investment and the freezing of the financial system may annihilate the effectiveness of any monetary policy. Farewell to the helicopter dropping banknotes directly upon the real economy and this is a good news for the tenants of endogenous money creation.
- It is important to model simultaneously *financial flows and stocks* because the dividing line between resilience and crisis is to be detected in the balance sheet of non financial and financial actors. During bubbles, hidden unbalances are piling up because the excess of credit is supposed to be justified by higher future returns of capital. When the boom ends, the issue of liquidity and solvency is a matter of balance sheet structure. Consequently, whereas the real economy could *a priori* adapt via price flexibility, in the financial sector the issue is about balance sheet restructuring. It is why it takes so long to recover from a major financial crisis. These elements were absent from DSGE models but more and more modelers address this issue and this may explain why the capitalization of banks is a discriminating factor between fragile and resilient economies.
- It is time to incorporate into standard macroeconomic models all the advances in *imperfect and asymmetric information*. In the credit relations, the asymmetry between the lenders and the borrowers introduce opportunistic behaviors that might make more probable the default of the credit; the possible bankruptcy of the firms can then trigger that of the imprudent bank. Logically, the banks charge a higher interest than the Central Bank not only because they optimize their profits but also because they have to take account the risk of default of borrower. Actually, financial spreads over different firms, credits, sovereign debts are a key macroeconomic variable that should be added to the modernized variants of IS-LM model. For instance, in the present crisis, the various spreads are shaping quite contrasted macroeconomic trajectories for Germany or Greece, Brazil or Turkey. Consequently, the monetary policy and prudential regulation are entitled to try to correct the adverse impact of contemporary financial markets.
- The *heterogeneity of financial entities and non financial firms* is crucial in the analysis of the links between finance and the real economy. Thus one may understand the knock-on effect of the failure of one large entity such as Lehman Brothers or AIG, whereas the conventional representative agent does not capture these domino effects that are so important in the unfolding of any crisis. At the extreme, one single financial entity may trigger the collapse of the entire financial system: the Northern Rock bankruptcy is a good example. This unexpected and dramatic quasi collapse seems to have triggered quite innovative approaches by Bank of England macroeconomists, for instance in terms of financial network structure and resilience.

====Insert Table 2 – Recent extensions of GSGE models: at least “Banks matter”=====

- It is crucial to model accurately the *access to liquidity* for financial entities. The rise of direct finance and the multiplicity of new financial instruments had generated the illusion that the contemporary financial markets were providing a liquidity equivalent to that of Central Bank money. Consequently, the prudential regulations were mainly concerned by capital ratios and

not so much liquidity. Facing a brutal rise in risk premium, and the related collapse of credit and stock markets, all actors are desperately looking for liquidity that was so abundant just before the crisis but that is now so scarce. In the heyday of financialization, commercial banks were supposed to be an archaism bound to disappear because they would be replaced by the permanent innovation associated to direct finance. With the present crisis, it is clear that banks are de facto managing the public good related to the payment system, a definite competitive advantage with respect to investment banks. Macroeconomists as well as Quants absolutely need to deal with liquidity constraints.

- *Monetary policy and prudential regulations are complementary* in risk management. This is a new channel in the formalization of the mechanisms linking finance and the real economy. If regulation is absent, or too weak, agents may interpret the low interest rate of the Central Bank as an evidence of the absence of major risk. Consequently, the transmission of monetary policy should ideally take into account the nature and stringency of financial regulations. A new generation of models begins to explore this complementarity that is actually very important in order to assess the relevance of various plans of reorganization of the national and international financial systems.

III.3 – Extension of the DSGE workhorse...or a premium to new paradigms?

One may conclude that the intellectual crisis of macro theory is finally minor since DSGE is so flexible that it will easily implement all the previous breakthroughs into a new new synthesis. Other factors seem to push in the same direction. Firstly, macroeconomists and econometricians have so heavily invested in the specific technical tools required by the DSGE models, that the related sunk costs will be an incentive for only amending marginally this research program. Secondly, the relations of macroeconomists with other sub-disciplines such as institutional and experimental economics or the history of financial crisis, make difficult the full incorporation of their advances into mainstream analysis. Last but not least, the conversion of Central Banks to the financial markets efficiency hypothesis used to coincide with the vision of the world of the financial community. Consequently, the funding of DSGE type modeling has become the norm and the institutional organization of the macroeconomic community is an important factor in its ability to adopt any new paradigm. “*Business as usual*” may thus be a tempting strategy for macroeconomists.

Nevertheless, the very origin of this research program makes very difficult the full incorporation of all the hypotheses previously mentioned. Firstly, the Walrasian general equilibrium model continues to be the benchmark and any existing economic system is suffering from welfare losses with respect to this ideal. Unfortunately, this mythical vision is far away from the configuration of contemporary capitalisms. Basically one should compare imperfect financial systems among themselves and not assess them by comparison within a fully transparent system that would only react to preferences and technologies. Secondly, the issue of aggregation remains unsolved and the micro / macro gap put forward by Keynes and subsequent innovative economists is not recognized as the key reason for the failure of DSGE in diagnosing and preventing the present crisis. Thirdly, price variations are supposed to be the unique adjustment mechanism whereas the advance in institutional analysis shows that organizations, laws, conventions, collective agreements are other complementary mechanisms that contribute to macroeconomic dynamics.

The rest of this paper is devoted to the exploration of various new possible paradigms. It is built upon the premise that such a dramatic crisis cannot be associated with only minor adjustments of the existing *doxa* since various “unorthodox” past researches have already provided the founding blocks of such alternatives.

IV. ALL RESEARCH PROGRAMS HAVE TO COPE WITH MAJOR AND ROBUST STYLIZED FACTS

The main criticism addressed to contemporary macro modeling is thus to have focused upon a deductive if not totally axiomatic approach at the cost of empirical and political relevance. The starting point of alternative programs should therefore be to privilege the compliance of any model with respect to the teachings of the long run history of financial crises.

IV.1 – Dynamic patterns observed in long run history

It is possible to suggest seven stylized facts, of unequal importance for macro-modeling.

- The most fundamental teaching is that *financial crises are a recurring phenomenon* and not the exception since the existence of credit. This is the converging conclusion of all the available research (Kindleberger, 1978; Garber, 1990; Reinhart and Rogoff, 2009). Every financial instrument is concerned: bank credit, stock market, exchange rate, real estate, public debt default (figure 3).
- Financial markets deal with *uncertainty* and not only risk. This is the reason why bubbles may emerge since it is initially very difficult to assess the viability of any given project. Basically, the radical uncertainty about innovation and the complexity of strategic interactions play a major role in the origin of recurring crises.

==== Insert here Figure 3 – The recurrence of bubbles and financial crises: a synthetic index====

- All the crises exhibit significant and sometimes *large costs* in term of loss in production, employment, and standards of living, erosion of competences, destruction of capital and finally increased public spending (table 3). Some of them are easy to overcome and do look like a typical business cycle generated by minor financial unbalances, but others are threatening the *structural stability* of the financial system and even the viability of the existing socioeconomic regime. Let us call *minor* the first type, *major* the second.
- The dividing line between minor or major financial crises is defined by the *resilience or the fragility of the banking system*. The Great Depression in the US was exacerbated by the collapse of the banking sector whereas the subprime crisis, until now, has only generated a great recession since the public authorities have been quite active in rescuing the commercial banks as well as the shadow banking system.

===== Insert here Table 3 – The costs of financial crises 1981-2002=====

Three other stylized facts can be added to this list.

- There is a strong contrast between the actors on the financial markets and external observers about the assessment of the probability of a bubble when they see a surge in the price of some real or financial asset. The first ones are induced to think that some radical innovation has actually affected the *fundamental value* of a specific asset, whereas the second usually express their doubts about the viability of a typical *speculative bubble*: the private rate of return of some agents does not cope with the social rate of return and only risky leverage effects may explain the observed dynamic.

- There is not a single cause to bubbles since generally they result from a seemingly *rather coherent configuration* associating a type of innovation, incentives concerning the remuneration of financial entities, a light touch regulatory system and finally a permissive monetary policy. The stronger complementarities of these various components are, the more severe the following financial crisis is.
- All financial crises manifest a brusque reversal from a very *abundant liquidity* on most financial assets – due to the intensity of speculation – to a desperate search for the only absolutely liquid assets: *central bank money*. This stylized fact has definite consequences in terms of the modeling of financial crisis...and the pricing of derivative products as well.

Any relevant model has therefore to deal explicitly with banks, credit, stock market and money and should be rich enough to entitle the emergence of bubbles and their bursting out.

IV.2 – The special challenges revealed by the 2007-2008 crisis.

The present crisis is not an exception from these seven stylized facts but it exhibits some genuine other characteristics that might be still more difficult to embed into a general macro-model.

- A clear novelty relates to the fact that *the pace and the variety of financial innovations* have overcome the advance in product and process innovations in the real economy sector. An unprecedented cluster of finally complementary new financial instruments had generated the hope that very leverage effects were no more implying a major risk taking. Pure financial innovations would thus have drastically improved the tradeoff between returns and risks. Furthermore, some financial economists had been advocating that any productive, social organizational problems could and should be overcome by the adequate derivative instrument (Shiller, 2003).
- A second specificity is associated to the diffusion of the belief that *direct finance was far superior to financial intermediation by banks*. The financial markets were so deep and active that financial assets were supposed to be as liquid as money and the regulatory agencies built their prudential norms upon this quite optimistic hypothesis. Consequently, in order to capture the mood of the financial actors during the 90s and 2000s, it would be logically necessary to develop models that incorporate stock markets as well as bank credit and central bank money.
- The dynamism of financial innovations has triggered a rapid growth of *shadow banks* that have been managing a growing share of total transactions and assets. Since these entities had no obligation to divulgate the relevant information about their financial structure, regulators, Ministers of finance and Central Bankers were victim of a quite dangerous lack of information. More fundamentally, the risk assessment was delegated at the level of each individual entity, the formation of price of most sophisticated products has been derived from ad hoc models that have been proved *ex-post* quite erroneous in their assessment of risk. Thus, ideally, a model of the present crisis should deal with the activity of shadow banks and their very specific pricing methods.

In other words, the clustering of the innovations associated to the strategy of “originate and then redistribute”, i.e. securitization, seems to have had a direct responsibility in the genesis of the present crisis. Of course, the explosion of credit, especially in the direction of the financial system itself, might be analyzed as a direct consequence of these innovations (figure 4).

===== Inset here Figure 4 – The novelty of the 2007-2008 crisis: an endogenous bubble generated with the financial system=====

V. A SYSTEMATIC ASSESSMENT OF PAST, CURRENT AND EMERGING RESEARCH PROGRAMS

It is time to try to overcome two of the major limits of contemporary macroeconomic theorizing. On the one hand, RBC and DSGE models have come back to a pre-Keynesian approach whereby the macro variables are simply the expression of microeconomic theory applied to a representative agent. On the other hand, modern macroeconomists have shown a strange propensity to build deductive reasoning starting from erroneous and misleading hypotheses. These two shortcomings are an invitation to go back to the tradition of political economy in order to find alternative mechanisms concerning the interaction between finance and the real economy. Simultaneously the Karl Popper's methodology of fabrication should be respected: economists should reject all the models that clearly do not fit with the statistical and econometric evidence.

V.1 – The neglected insights of past political economists

If one distinguishes between a vision, a theory and some founding fathers of macroeconomic analysis: the derived models, it might be enlightening to briefly review the contributions of most of them have been forgotten by contemporary theoreticians (table 4).

- *Marx* is a good starting point since it is among the first analysts who have pointed out the specificity of capitalist social relations upon *economic dynamics*. In the socioeconomic regime based upon competition among firms and asymmetric capital-labor relations, accumulation is the driving force for macroeconomic evolutions. The business cycle becomes the norm and periodic crises are the expression of the unbalanced nature of accumulation. This should have definite consequences for macro-modeling: all formalizations should deal with dynamic patterns, they should necessarily embed the recurrence of endogenous cycles and crises that are not only caused by external shocks. The conflicting interests between workers and capitalists in the short run but their complementary role in the medium-long term may generate *endogenous cycles* (Goodwin, 1967). *Non linear dynamic models* could be a powerful alternative to RBC/DSGE approaches.
- *Keynes* still provides insights that have been neglected by the new Keynesians that only distinguish themselves from neoclassical by adopting the hypothesis of nominal rigidity in wages and prices formation. By contrast, the hypothesis that the *expectations on financial markets* have a direct impact upon the decisions of production, employment and investment has not been formalized. Of course, it is a difficult task: the price of financial assets does not necessarily converge towards their fundamental values, since they are the consequence of the equivalent of a beauty contest game. The financial convention that will emerge is not only the consequence of preferences and technologies but also the expression of collective beliefs. Such a framework is especially useful to understand the successive contemporary bubbles: the so-called Internet convention has been replaced by the real estate convention. This mechanism can partially be formalized within a two periods model where the expected output of the second period generates externalities for employment, capacity utilization or investment in RD in the first period. Pessimist expectations imply a stable-low employment equilibrium and it is a possible formalization of involuntary unemployment (Weil, 1989).

====Insert here Table 4 – Back to the political economy of financial crises=====

- *Minsky* is prolonging the message of the *General Theory* in the direction of a financially generated business cycle. The productive firms use credit in order to speed up their rate of investment. In the early beginning of a boom, they adopt modest leverage effects but with the maturing of the expansion, their balance sheet becomes more and more risky until it enters into a zone of financial fragility. The boom is bound to have an end, since a speculative strategy has progressively replaced prudent hedging. The reversal is largely endogenous even if provoked by a bad news affecting one or another firm. This process has rarely been modeled but it should be interesting to build upon previous attempts (Taylor, O’Connell, 1985). In a sense, the financial accelerator model delivers similar cyclical patterns but starts from information asymmetries and the consequences of possible bankruptcy on interest rate formation (Bernanke & *al.*, 1999).
- *Wicksell* is the ancestor of this model since he was among the first to point out that the very existence of financial intermediation via credit makes possible a *divergence* between the economic rate *return of productive capital* and the *nominal monetary interest rate*. It is a rupture with respect to the hypothesis of a permanent adjustment of these two rates. Since their determinants and timings are different, a cumulative boom might take place when the interest rate is low and conversely, a long depression could be triggered by a real interest rate far higher than the economic profit rate. Back in the 70s, some macroeconomists have been building such simple models in order to capture the accelerating inflation that took place at the end of the Golden Age. In the 2000s, this mechanism should be applied to the repetitive bubbles that have been generated, paradoxically, by the victory over inflation.
- *Irving Fisher* is also interesting to revisit. Contemporary economists persist to formalize the smooth shift of an equilibrium in response to the evolution of key real variables, such as productivity. They forget that in recessions and still more during depressions, the general *search for liquidity* constrains indebted agents to distress sales of some financial assets that were supposed to be sufficiently liquid during the boom. Therefore, the decline in assets and product prices is not necessarily re-equilibrating the previous unbalances. In a sense, such a model gives a convincing explanation of the differences between a mild recession and a *deflationary cumulative depression*. This nominal rigidity becomes as important as price rigidities and some contemporary macroeconomists have actually generalized the basic DSGE model in this direction (Lawrence & *al.*, 2007). It is thus possible to explain why nearly two years after the massive support to banks, in the US the credit to the real economy is still declining.

The list of suggestive hypotheses could be extended (see, table 4, *supra*). Let us mention briefly that a fully-fledged formalization of *Schumpeter’s* long cycles is still lacking, whereby the access to credit is a permissive condition for the conversion of innovations into profitable production. Such a research program might be stimulated by the observation of the present crisis (Nomaler & *al.*, 2010). Similarly, *Frank Knight* is important since he stressed the difference between risk and uncertainty, a point that has been superbly neglected by the Quants. Fortunately some macroeconomists begin to take seriously the paralyzing role of radical uncertainty (Bloom, 2009). Finally, *Hayek* was pointing out the crucial role of price in information diffusion and resource allocation, much more than their role in delivering a Pareto optimum. In modern finance-led economies, quite all the prices of sophisticated derivatives have been invented via rather dubious statistical models: they were not any more market prices, since the buyers were unable to compute their own estimates of the prices. The sanction has been a drastic over accumulation and speculation in the financial sector. Therefore the current crisis might be interpreted as the

vigorous revenge of market mechanisms against “model to market” or “myth to market” pricing of complex financial instruments. This could be an opportunity to rejuvenate a research program in disequilibrium theory, applied to finance (Benassy, 1982).

V.2 – Emerging paradigms: do they cope with the major stylized facts?

Among past and present macroeconomic theorizing, what are potentially the more relevant? Ideally, if economics were the equivalent of physics, the same general model could be used in order to explain the seven stylized facts previously mentioned. Unfortunately, economies are so complex that each strategy of modeling has a specific domain of relevance (table 5).

- Each major financial crisis has induced a specific modeling that takes into account the precise instruments and assets that have been the support of speculation: default of sovereign public debt in Latin-America in the 80s (first generation models), exchange rate crisis in Europe in the 90s (second generation models), balance of payment and banking crises of Asian countries in 1997 (third generation models). The relative novelty of the subprime crisis is now triggering the activity of macroeconomists in order to formalize the *specific web of incentives, regulations, analytical models and monetary policy* that led to the present crisis. According to this methodology, the profession would need a fourth generation model of financial crises (Krugman, 1979; 1999; 2002,...).
- Nevertheless, all financial markets share common properties and patterns that are difficult to formalize within the conventional rational expectations models. Basically, financial crises emerge out of the inability of markets to correctly aggregate individual risks and still more to draw a dividing line between *risk* – that can be assessed according to an estimate of frequency distributions observed in the past – and *uncertainty* that calls for a subjective evaluation given the novelty of the financial instrument and economic configuration. In such a context, the methods according which the agents form their representations place a determinant role. For instance in the stock market, when the degree of uncertainty increases, agents will think that other agents have a better information than themselves and that it is incorporated into the market prices. This behavior is sufficient to remove the peak of the frequency distribution away from the fundamental value towards a bear and a bull position. When agents loose any confidence in their own evaluation of assets, the market should oscillate from naïve optimism to extreme pessimism (Orléan, 1989). This is an argument in favor of a multi agent model with rational mimetism. Statistical physicists have developed quite interesting dynamic models where the *interactions among agents*, reacting to stochastic shocks, may generate first a bubble and then a brutal collapse, the date of which is nearly impossible to forecast (Sornette, 2003).

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 =====insert here Table 5 – Various research programs facing the major stylized facts
 revealed by the present crisis=====

- There is a third strategy in order to explain simultaneously a financial boom and its burst. The recent literature privileges complex interactions among heterogeneous agents, but an older literature had explored the consequence of *non linear dynamic models*. They are interesting since they generate complex dynamic patterns while playing with a small number of aggregate relations. The prototype already mentioned, the Goodwin 1967’s model simply uses the non linearity of the impact of unemployment on income distribution and this allows to generate limit cycles. *Mutatis mutandis*, equivalent non linearities may exist in various relations that link finance to real economic activity. This was first explored in the formalization of Hyman Minsky’s vision of a financially unstable economy (Taylor, O’Connell, 1985). Inspired by a different set of hypothesis, the financial accelerator models do use the same methodology,

but their complexity makes difficult to prove the existence of a limit cycle and therefore simulations are required in order to assess the property of the model (Bernake & al., 1999). The same modeling strategy could be used again and extended to the new financial instruments such as ABS, CDS,... that have had such a role in the maturing and severity of the present crisis.

- *A new generation of disequilibrium models* is welcome since rationing has become quite evident as a cause of a stable low economic activity. Not only unemployment is involuntary and not at all a shift of preferences in the direction of more leisure, but the commercial banks do restrict their credit supply since, in spite of very low nominal interest rate, their risk appreciation has brutally increased, probably much more than the underlying structural risk. Unemployed workers especially suffer from such a self exacerbating credit rationing (Challe, Ragot, 2010). Similarly, firms might be profitable again – for example in the US, productivity has accelerated since 2009, whereas real wage has been kept stagnant – but their production is limited by the level of effective demand. One may recognize the ingredient of a typical disequilibrium model, but the novelty would be to develop the various rationings mechanisms typical of the financial sector. A special case is when every agent prefers liquid assets to long term irreversible investment, for instance in RD (Amendola, Gaffard, 1988).

Many options are open but it seems *a priori* difficult to converge towards a simple model that would cope with all the seven stylized facts. Looking for robust elementary mechanisms might be an adequate strategy in order to select among these various avenues.

VI. THE FINANCIAL-REAL ECONOMY TRANSMISSION MECHANISMS: WHAT DO EMPIRICAL STUDIES SUGGEST?

The history of financial crises, simple descriptive statistics and some econometric studies suggest at least three of such mechanisms.

VI.1 – Risk taking varies pro-cyclically

In good times, agents underestimate the underlying future risks and therefore they ask for and easily obtain credit in anticipation of future profits and on the basis of various collaterals the price of which is climbing up. By contrast, as soon as the macroeconomic situation is reversed, a brutal reappraisal of risk takes place, and it sometimes paralyzes financial markets and stops credit flows. The procyclicality of risk taking has been observed in any previous speculative bubble and whatever the financial instrument that is carrying the explosion of transactions: public debt, stocks, real estate, foreign currencies. It is impressive to note that nearly the same timing is observed in any case (Davis, 1992).

This is observed in the contemporary economies, especially where financial liberalization has been pushed forward during several decades. The consequence is a strong synchronism between credit impulse and demand growth. This does not necessarily means the existence of a single direction causality from finance to demand and output, since the reverse mechanism also plays a role in the genesis and propagation of over optimistic expectations (figure 5).

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Insert here Figure 5 – US Private Demand Growth and the Credit impulse
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VI.2 – The yield curve and its impact upon bank credit supply

This is a second link between finance and activity that has frequently been used by private investors and central bankers since the 80s (Estrella, Hardouvelis, 1991). Normally, as soon as agents try to use a past regularity to get some extra profits, the conjunction of their strategies tends to destroy this regularity. This is precisely that has been happening with financial innovations and their impact upon the stability of demand of money. Paradoxically, the contemporary period confirms the role of the slope of the yield curve in the decision of consumption and investment (figure 6).

A macro financial VAR model for the US economy confirms the permanence of this effect and detects some of the transmission mechanisms: the lagged term spread augments the net interest margin of banks; this causes an increase in financial assets that themselves are anticipating GDP growth. Consequently, the behavior of banks is crucial in the transmission of monetary policy, the more so, the more liberalized the financial system is (table 6). But then, at least two interest rates, one short term, one long term, have to be introduced in order to capture this transmission mechanism.

====Insert here: Figure 6 – Forecasted probability of recession based on the slope of the yield curve 4 quarters earlier

And Table 6 – A macro financial intermediary VAR, US 1990 Q3 – 2008 Q3=====

VI.3 – Stock market and wealth effects

The third link between finance and the real economy has become more and more important along with the surge of direct finance and the rapid growth of financial wealth as expressed on the stock market. Public firms quoted on the Wall Street stock market have to optimize their balance sheet between the extension of real capital and financial portfolio management. Many econometric studies have analyzed the impact of stock market upon investment decisions by using the Tobin q ratio and they got mitigated results. Nevertheless a close relation seems to prevail between the share of productive investment over GDP and the stock market valuation related to GDP (figure 7). During the 80s, the debt of the firm was not correlated with the evolution of the stock market. But from 1994 to 2007, the fluctuations of the credit to firms have been larger than their stock market valuation (figure 8).

====Insert here figure 7 and figure 8=====

It can be argued that the transmission from the stock market to bank credit and conversely from credit to stock market speculation increases the probability of entering into a zone of financial fragility (Boyer, Dehove, Plihon, 2004). Consequently, a realistic appraisal of financial stability should consider not a single financial asset but a whole spectrum: when their evolutions are uncorrelated, there are few chances that a transitory and local speculation might generate a macroeconomic financial crisis. On the contrary, when the speculation spreads from one asset to another the situation becomes quite dangerous. On the one hand, the pricing of derivatives becomes erroneous because it overestimates the diversification of the portfolio. On the other hand, the segmented regulatory agencies might not perceive the emerging systemic risks.

An equivalent explosive process may take place concerning the households. In the US for instance, the stock market is an important contribution to their total wealth given the organization of pension funds. When the stock market rises, the households can easily get a credit to buy a house because they are considered to be richer and richer. Thus the stock market wealth effect may drastically affect the consumption and investment of household. The result is

another procyclicality of stock market and credit (figure 9). The spillover effects can also concern credit cards, credit to university students and so on. The stock market has thus a significant impact in the allocation of resources, the level of economic activity, and the transmission mechanisms of monetary policy: a very low product market inflation can go along with fast inflation of real estate and financial assets. In particular, the abundant subprime credit is correlated with the explosion of the price of real estate, after a lag its collapse triggers a rapid downward adjustment of prices (figure 10).

=====*Insert Figure 9 and Figure 10*=====

VI.4 – Some confirmations by the econometric literature

The unfolding of the crisis after Lehman Brothers collapse has triggered in new wave of empirical research, where the impulse of finance has a determinant role. Firstly, the relaxation of the solvability constraints for subprime mortgage has effectively removed one of the constraints upon the consumption of the less privilege households: in the past, the above average spread paid by them had a disciplinary effect (Besley, 2008). Similarly, when banks have revised their assessment of risk, the constrained firms have actually experienced larger cuts in high tech investment, employment and production (Murillo *et al.*, 2010).

Secondly, the radical uncertainty that prevailed between October 2008 and March 2009 has put forward how different a negative shock is with respect to a large variance of the same variable. The logical reaction of firms is to postpone their decisions until they may again form reasonable expectations about their environment (Bloom, 2009). When the law reorganizing the American financial system was voted by the Congress on June 2010, some CEOs and experts have pointed out that the uncertainty about the effective implementation of a very complex law put a brake to the recovery: it is too early to check the magnitude of such an effect. The vagaries of the dollar exchange rate are another example of financial uncertainty that may make the restructuring of the US productive system quite difficult. Thirdly, the variability of risk aversion along the cycle is again manifest when one observes the international flows of capital in the direction of successful emerging economies such as Brazil. Alas it is much more difficult to test econometrically such a link (table 7). One of the problems is precisely that the relations between financial and real shocks are two sided.

=====*Insert here Table 7 – What do we know about some key mechanisms relating finance and real economy? A brief review of some empirical studies*=====

VII. THREE DIFFERENT METHODOLOGICAL STRATEGIES

Building macroeconomic models that would take into account finance is not only matter of new econometric techniques and data sets, however important they might be. Clearly, if financial entities keep private any information about their net position on various markets, regulatory agencies will unable to detect any coming systemic crisis. But modelling is also an epistemological and methodological issue. The last decade has experienced the triumph and then intellectual collapse of the conventional way of doing macroeconomics. Other approaches are possible.

VII.1 – Charm and misery of the axiomatic approach

The DSGE approach is not without merits. It starts from a very general neo-Walrasian vision, it has attracted a lot of researchers and generated cumulateness in dealing with the impact of

monetary policy and finally, the calibration and stimulation techniques have made possible the exploration of many variants of the same core model (figure 11). But the other face of the coin is quite preoccupying indeed.

- Firstly, it is rather paradoxical to start from a *general equilibrium model* in which none of the stylized facts under review can be present since it assumes full employment, money neutrality in the medium-long run, convergence toward a long term equilibrium. Therefore the absence of any cycle and still more of any speculative bubble is not a surprise since money is the unique financial instruments.
- Therefore, only *imperfections* can explain the existence of cycles and bubbles. Should these imperfections be removed, all the contemporary problems should vanish. But then, how to explain the recurrence of financial crises since the 17th century, even in epochs when nominal prices were highly flexible? More fundamentally, it is misleading to consider that financial markets suffer from the same imperfection as the product or labor markets. The existence of asymmetric information is common but the originality of finance is to deal with expectations about the intertemporal flow of return of a given asset. Risk and uncertainty prevent the formation of one stable long term equilibrium in the absence of a complete set of future markets.
- Frequently, the technical constraints associated to any analytical formalization imply a selection of the related hypotheses according to the *principle of tractability* and ability to compute a reduced form. This is at odds with the choice of hypothesis according to their empirical relevance. One could accuse mainstream macroeconomics to prefer aesthetic to empirical relevance (Krugman, 2009), whereas here the fidelity to Walrasian principles and technical tractability are the main explanations of the complete failure of the DSGE model in anticipating or diagnosing the present crisis.
- Finally, *calibration and simulation* are more frequent than econometric estimates and falsification of successive models. The name of the game seems to prove that the model is rich enough to reproduce some stylized facts, with ad hoc stochastic hypothesis, however unlikely are the parameters required to mimic historical series. This rebuttal of the celebrated Karl Popper's falsification principle might well be crucial in explaining the progressive autonomization of the DSGE research program with respect to real world economies.

=====insert here Figure 11 – The deductive / Axiomatic Approach=====

VII.2 – A revival of the Classical / Keynes methodology

There is thus room for an alternative conception of the role of theory and modeling (Colander, 2009a; 2010b). Since economic interactions are multifaceted and more and more complex along with the deepening of the division of labor and organizational and institutional innovations, economists might build a *multiplicity of models* supposed to be representative of the same economy. The *theoretical background*, the *specialization* in some techniques or sub-disciplines, the *institutional position* of the economists, and finally her/his *ideological preferences* open to a large variety of macroeconomic modeling (figure 12).

- The aim of the model might be typically academic and concern the tentative explanation of *one or several stylized facts*. Ideally, the same model should explain the maximum of them, but the parsimony principle is quite difficult to comply with in economics. A second source of

modeling is related to *problem solving*. For instance, how should the Central Bank adapt its monetary policy in response to a new wave of productive or financial innovations?

- The macroeconomist is entitled to select among the *many mechanisms* linking finance to the real economy, the ones he considers as the more important and robust. Given the fragility of econometric tests, the community of macroeconomists may propose a whole spectrum of models.
- Nevertheless, for a given line of macro modeling, the econometric tests should be taken seriously in the Popper's sense. A model that fails after several thousands variants and estimates should be *rejected*. Some of its technical or economic hypotheses should be *changed* and a new cycle of modeling, testing and simulations should be undertaken. The pursuit of such a rigorous strategy could deliver, in the medium-long run, a *better adequacy* between macro-models and observed macroeconomic patterns.

===Figure 12 – An eclectic / Ad hoc method: classical / Keynesian in the Colander's sense===

VII.3 – Institutionally and historically grounded macro-economics

But there is a third way between the culture of a single canonical model and the belief “that every thing goes”, i.e. an endless list of equally valid and likely models. It is built upon the rebuttal of the Milton Friedman's “as if” hypothesis: no matter how unrealistic are the hypotheses, this does not matter provided they deliver interesting and likely results. In between these two extreme strategies, the founding hypotheses of macro-modeling can be justified by the careful observation of the core institutions that shape individual and collective behaviors. This is the central message of the New Institutional Economics (North, 1990; Aoki, 2002). The rules of the game associated with the prevailing constitutional order, institutions and organizations define simultaneously constraints and incentives that shape economic behaviors. Macroeconomics is not an exception. The likelihood of the fit of the prediction of the theory with the observations is enhanced when the economist is deducing logical consequences out of an adequate abstraction of really existing institutions. For instance, when credit money is endogenously created by banks, if an oligopolistic competition prevails among them, if wages are determined by a series of overlapping negotiations and if a free mobility of international capital is moving the exchange rate, no doubt that the financial and macroeconomic cycles will have a specific pattern.

This approach of macroeconomic modeling has been developed by Régulation Theory in order to understand the breaking down of macroeconomic regularities at the end of the 60s (Boyer, Saillard, 2001). Five core institutional forms are shaping short run adjustment as well as the growth regime: the form of competition, the configuration of labor market institutions, the organization of the monetary and financial systems, the style of interventions of the State into the domestic economy and finally the mode of insertion of any national economy into the international relations (figure 13). For each precise configuration of these institutional forms, prices, wages, interest rate, exchange rate exhibit definite regularities. A coherent mode of regulation may or may not exist but in any case the continuous slow transformations of these institutional forms generally lead, after 2 or 3 decades, to a major crisis during which the structural stability of the regulation mode is vanishing.

=====Insert here Figure 13 – An institutionally grounded macro modeling: A given configuration of a capitalist economy=====

VII.4 – Towards an institutional macro-theory of finance: A first step

The recent advances of this theory have pointed out that the coherence of a macro regime does not derive from chance and/or from a miraculous mix of *ex ante* independent institutional forms but from their co-evolution, complementarity or from the hierarchical domination of one of them. Since the mid-80s, the dynamism of finance has progressively transformed the whole economic system, especially in countries such as the US and the UK that play a determinant role in international financial intermediation. Nowadays, there is an emerging consensus among macroeconomists about this dominance of finance. Let us mention some empirical evidences.

- Until the mid-80s, credit was increasing nearly at the same rate for each entity: non-financial firms, households, investment banks. But with the rise of pension funds, financial liberalization and the multiplicity of financial innovations, the explosion of credit that took place afterwards has mainly be directed towards security broker dealers (figure 14). Conventional wisdom tells that the households have been the center of this structural change. Nevertheless, the empirical evidence shows that in the US the access to credit has been a compensating mechanism to the slow growth of household wealth (figure 15) and income (see section II, supra). By contrast, the financiers themselves, the so-called shadow banking system, have been the main beneficiary of the credit boom: by a continuous rise of leverage effects they have been expanding their total assets at an unprecedented rate (figure 16). The financial fragility affected neither the non financial firms nor the majority of households but the financial system itself. Thus, any relevant model of the present crisis should explicitly deal with a quite detailed description of financial flows.

=====Insert here Figures 14 – 15 – 16=====

- The related changes are not only quantitative – the continuous rise of the financial wealth / GDP ratio – since they were essentially qualitative. In the 50s, the mortgage credit market was quite simple indeed: the deposits of some households were financing the mortgage of other households who were buying houses (figure 17). Since the 80s, a myriad of financial intermediaries has permanently grown: this specialization has expressed an unprecedented labor division with multiple interdependencies: the asset of one entity is the liability of another one (figure 18). A neo-Schumpeterian approach would stress that financial innovations have been much more dynamic that technological and organizational innovations in the productive system (Boyer, 2008).

=====Insert here Figures 17 and figure 18=====

- If one adopts Régulation Theory method, these qualitative and quantitative transformations are strong hints about the progressive domination of the financial system over quite all other institutional forms (Boyer, 2000; 2010b). The diffusion of shareholder value implies that the stock market is governing the investment and production strategies of firms. Consequently, labor management has to deliver a rather stable RoE, the welfare, especially the pension funds, rely more and more upon high rate of returns. Last but not least, the Central Banker continuously interacts with the financial community and shapes their expectations. The evolution of the real economy is the consequence of these financial impulses and this is a novelty of the contemporary period (figure 19). This is probably why many VAR models incorporating finance show that financial shocks have been crucial in the genesis of the present crisis (Lawrence & al., 2007; De Fiore & al., 2009).

====Insert here Figure 19 – The consequences of the hierarchical position of finance on contemporary macroeconomics=====

- The understanding of the present crisis may of course build upon the general mechanisms put forward to analyze the previous crises (see section IV). Nevertheless, the contemporary regime is so specific that one may have to design a special model in response to this idiosyncratic regime. Productive investment is not only responding to variations in demand but to the gap between the economic profit rate and the financial rate of returns. Consumers take into account their financial and real estate wealth when they decide about their consumption and investment. The Central bank observes the financial markets, and consequently the monetary policy changes accordingly the short term interest rate and the access to liquidity. The tax base itself becomes sensitive to the evolution of capital gains, however modest might be their taxation. Thus, a finance-led capitalism should display a genuine macroeconomic modeling (figure 20).

====Insert here figure 20 – The channels of finance to real economy in the era of finance led capitalism=====

VIII. THREE OTHER RESEARCH PROGRAMS IN MACROECONOMICS

This is not the only research program suggested by the present crisis. Let us mention briefly three of them.

VIII.1 – Formalizing the resilience and crisis of financial networks

The collapse of Lehman Brothers and AIG has shown that some financial entities were so big and so interconnected that their bankruptcy might be sufficient to provoke the melting down of the entire American, if not the world, financial system. This cannot be analyzed in terms of nice supply and demand curves for financial assets. Instead, financial stability becomes a matter of network resilience and this general hypothesis is now recognized by experts in quantitative finance (Cont, 2009) and Central bankers (Haldane, 2009a).

Some pioneering works already show the relevance of this approach (Gai, Kapadia, 2010). Implicitly models that adopt a representative agent hypothesis for the banking system exclude a very important source of crisis: the collapse of one important bank even if the absence of any external macroeconomic shock. By contrast, really existing financial systems exhibit quite specific distributions in size of banks and number of connections with other entities. The configuration of nodes, assets and liabilities may now become a discriminating factor in the dividing line between resilience and systemic fragility (figure 21). Simulations of a simple system suggest that the influence of connectivity is strongly non-linear: very fragmented systems and at the opposite highly connected ones are the more resilient. On the contrary, moderately connected systems might be the more sensitive to contagion and financial breaking down (figure 22). What is the most convenient policy in order to counteract these tendencies? Again simulations suggest that the capital reserve ratios might be an efficient instrument (figure 23).

====Insert Here figures 21 – 22 – 23=====

Such formalization requires the transparency of financial transactions at a high level of disaggregation, and it is far from evident in the light touch regulation regimes, typical of pre-crisis institutional configurations. Had any public authority any precise information about the central role of AIG in CDS related to mortgage derivatives?

VIII.2 – Mixing stock a market bubbles model with a formalization of banks and the real economy

The neo-Walrasian tradition continues to consider that any financial asset should quickly converge towards its fundamental value. Consequently, it is very difficult to generate stock market bubbles within a typical rational choice model, and this is very detrimental to the understanding of the present crisis. Furthermore, within an historical and institutional grounded macroeconomic analysis, the stock market was, and probably still is, the more fundamental market in contemporary finance-led capitalism. It is thus crucial to depart from conventional macroeconomics. Why not to start from multi agents based models that endogenously generate speculative booms and their bursting out? Experts in statistical physics (Sornette, 2003; Bouchaud, 2008) and some financial economists have proposed such models but they are only partial since they do not deal with the impact of macroeconomic evolutions upon stock market and conversely, the consequence of stock market upon macroeconomic dynamics.

Thus, a possible modeling strategy would be the following. In a first step, develop the simplest possible formalization of the stock market with a distinction between productive firms, commercial banks and investment banks. Within a shareholder value economy, the credit strategy of commercial banks significantly responds to the signals of the stock market. Similarly, on the side of demand of credit by productive firms, their quotation on the stock market is an important factor. Last but not least, the financial portfolio of households is sensitive to the evolution of the stock market and individual decisions concerning consumption and housing react to perceived total wealth.

A priori, this integration of real economic activity into a large financial model could provide a quite complex but interesting approach to contemporary macroeconomic dynamics.

VIII.3 – Learning and then oblivion at the micro and institutional level

Explaining the long term *recurrence of financial crises* could be a last area for a quite different modeling. At the level of the banking system, detailed statistical investigations show that after a bankruptcy, the expected probability of default is first very high and overestimated. As times elapses this subjective probability continuously declines. After 5 or 6 years, individuals and organizations have totally forgotten this possibility of bankruptcy. Thus they take largely underestimated and growing risks by excess leverage. The brutal reversal of the situation is thus endogenous and new cycle might begin, with new actors and new instruments. Nearly everybody is convinced that “This time it is different”.

At the societal level, the same process of learning how to control finance is progressively forgotten. After two or three decades, authorities are convinced by powerful financiers that regulations are inefficient constraints. The deregulation is initially quite favorable since it removes the credit constraints, but the recurrence of more and more severe bubbles usually ends up into a major structural crisis. It could be interesting to formalize these two levels and two times scale learning and lapse of memory within an extended overlapping generation of heterogeneous actors.

IX. CONCLUSION

After this rather extensive but far from exhaustive survey, what are the perspectives for macroeconomic theorizing and modeling after the crisis? It might be useful to sum up some of the basic findings and proposals for future investigations.

- C1 – The long term history of financial crisis, as well as the present one, display *stylized facts* and *specific features* that *cannot be derived* from the simulations generated by the numerous Dynamic Stochastic General Equilibrium (DSGE) models, even the most innovative and recent ones. Firstly, the financial cycles and bubbles are essentially *endogenous* and not at all the consequence of big and correlated productivity shocks. Secondly, a cluster of far reaching innovations has extended the zone of *financial fragility*, especially in the US and the UK, two of the most advanced finance led capitalisms. Thirdly, the inefficiency of monetary policy when the viability of the banking system is uncertain, points out the need for a detailed analysis of the *incentives and interactions* between various financial entities, including the shadow banking system. Fourthly, a *confidence shock* about the resilience of the financial system may have specific and quite important impact upon economic activity.
- C2 – On top of these recurring patterns, the so-called subprime crisis has exhibited rather *specific new features*. It is now clear that the impulse of the September 2008 collapse took place inside the financial system itself: the excess of credit was devoted to the financing of the (speculative) activity of the shadow banking system. A complementary set of perverse incentives has initiated and then propagated a quite unstable model based upon the principle: “originate and redistribute”. Not only risk has been shifted far away from the informed agents, but each stage in the elaboration of derivatives has been spoiling if not hiding the core information about the real solvency of initial credit holders. The long chain between the initial mortgage credit and the final holder of the risk is an evidence for an unprecedented deepening of the division of labor among commercial banks, money market funds, security firms, ABS originator companies, rating agencies, pension funds, insurance companies, and so on.... Logically, any relevant model should adopt a sufficiently detailed description of the financial system because it is not at all functioning as a simple appendix of the real economy.
- C3 – The DSGE program has been quite stimulated by all the anomalies and puzzles evidenced by the genesis and unfolding of the present crisis. Econometricians have extended the real economy shocks to others affecting demand, the financial system and risk aversion: they have shown that they have exerted a significant impact on activity. The efficiency of monetary policy has been shown to depend crucially upon the degree of implementation of prudential regulation. This complementarity hypothesis challenges the previous conception of a totally autonomous monetary policy. It also stresses that one of the origins of the crisis is related to the surge of an uncontrolled and largely under scrutinized shadow banking system. Other researchers have taken into account the impact of a possible bankruptcy upon credit supply by commercial banks. It turns out that the related spread has a clear impact on economic activity on top of the normal transmission mechanisms via interest rate. Nevertheless, the neo-Walrasian theoretical inspiration of all these models is still limiting the amplitude of this aggiornamento: basically, the productivity shocks continue to be the primary mover of the real economy

and ideally, finance should be a mere transmission mechanism. Furthermore, the convergence of assets prices towards their fundamental value continues to prevent the full understanding of financial markets functioning, the recurrence of bubbles and their impact upon production and employment (table 8).

=====Insert here Table 8 =====

The bulk of the present article has then be devoted to the presentation of various alternatives to DSGE, via an extension of *evolutionary and institutionalist modeling*.

- C4 – In retrospect, it is quite surprising that the Lucas’ critique of the IS-LM Keynesian model has rejuvenated the Walrasian tradition in macroeconomic theorizing, at the very moment when the researchers in General Equilibrium Theory (GET) recognized their inability to introduce rigorously the existence of money, the restrictive conditions warranting a dynamic process converging towards an equilibrium and the incapacity of micro foundations to generate a well behaved aggregate demand function. Still more paradoxically, the many pathologies generated by the absence of complete future contingent markets should have prevented to naïvely extend the Walrasian static model into a formalization of the intertemporal optimization of a representative agent. Therefore *a first strategy* aims at revisiting *the political economy of economic and financial crises* and collecting the various mechanisms and hints successively proposed by Marx, Wicksell, Fisher, Knight, Schumpeter, Keynes, Hayek and Minsky. For instance, some of the Minsky’s ideas have been captured by the financial accelerator model, but some fruitful intuitions by Wicksell and Fisher still wait for their modern formalizers. All of them share the hypothesis that the relevant model should be dynamic and concern stocks and not only flows. Furthermore, a precise *definition of economic and financial crises* should be given for each of the selected theorizing: freezing of financial transactions, explosion of bankruptcies of financial and non financial firms, brutal and large crash of the stock market. Such concepts should be carefully distinguished from the downward phase of a normal business cycle.
- C5 – During the last two decades, the econometric research has made definite breakthroughs in the formalization of dynamic stochastic process governing developed, as well as developing, economies. *A second strategy* is then to survey this enormous literature and to explicit the more *robust mechanisms linking the financial system and the real economy*. Let us mention some of them: *pro-cyclical risk taking*, the importance of *credit rationing* for poor households and small-medium size firms, the determinant role of *stock market* valuation within a finance-led regime and finally the dramatic impact of *radical uncertainty* when unprecedented shocks cannot be assessed by business by usual risk evaluation methods. Any relevant model should incorporate several or at least one of these features in order to possibly reproduce the pattern of *recurring financial bubbles*.
- C6 – *A third strategy* builds upon the vast research program about *institutional economics* and its possible synergy with *evolutionary approaches*. One of the major advances of the former deals with the consequences of institutional hierarchy: a specific institutional form does permeate the organization of others and is influencing their transformations. Many analysts from quite distinctive theoretical and ideological orientations do converge towards a common characterization of contemporary capitalism, especially in the US and the UK. Their economic regime would be finance led, as opposed to the previous Fordist growth pattern in the US or export led models in many Asian countries. According to this approach, the macroeconomic regularities cannot be explained without a full recognition

of the domination of finance in quite all the sphere of social and economic activity at least in the US and UK. The CEOs look at the stock market and international finance when they decide production, investment, R&D, strategy and so on. Households take into account their real estate and financial wealth when they make their decisions about consumption, saving and real estate investment. In their credit decision, banks consider simultaneously their stock market valuation and the nature of the collateral provided by borrowers. Last but not least, the Central banker, on top of the inflation – employment dilemma, has now the task to try to prevent financial instability and provide liquidity when a systemic financial crisis threatens the very existence of a payment system and monetary economy. Such a research program has two important consequences. Firstly, each actor follows a fragmented and *institutional context dependent rationality* and therefore macro-dynamics might well be the unintended consequences of the complex interactions of these quite diverse behaviors and embedded rationalities. Macro-modeling should therefore be bottom-up, while taking into account the institutional architecture of the economy. Secondly, if the major institutional forms change, the precise quantitative regularities observed at the macro level finally evolve along with these structural changes.

C7 – This article finally proposes a quite specific agenda for future research.

- In order to challenge the temptation of most conventional economic theorizing to make finance a simple appendix of the real economy, it could be enlightening to start from the headquarters of contemporary economies, i.e. the *stock market and its bubbles*. It could then be deduced the strategy of the commercial and investment banks, the demand of credit for firms and households. Finally, the objectives of the Central bank and the degree of freedom of budgetary and tax policy are also financially constrained.
- A quasi Copernician revolution would replace the idealization of supply and demand on potentially transparent financial markets by the modeling of financial actors via a typical *network analysis*. Then, given the concentration / distribution of assets and liabilities, the formalization of possible domino effects could try to diagnose the dividing line between *resilient* economic and financial systems and *unstable and crisis prone* economies.
- Why do *bubbles recurrently emerge, mature and burst* over nearly three centuries? Should not fully rational actors learn from this history and change their behavior in order to prevent the repetition of such dramatic episodes? A possible explanation is that financiers, non financial firms, households and governments undergo a learning process when crisis burst out and they actually change their behaviors, organizations and institutions in the immediate aftermath of the crisis. Nevertheless, they progressively forget that they may go bankrupt because they become confident that they opened a new epoch, where past regularities are no more valid. They then take risks they are unaware of, until they generate another major crisis that calls for the return to a more realistic appraisal of risk. The contemporary actors usually forget the lessons learnt by their ancestors and a new long term cycle might begin. A stimulating research agenda would be to formalize such a process by a close interaction between the macro level of banks management and the global one, where rules of the game are elaborated, changed and reformed.

The Great Depression of the 30s has triggered a vigorous and multifaceted aggiornamento of economic theorizing. In spite of a stronger institutional path dependency of academia, one may hope that this should be also the case for the 2010's.

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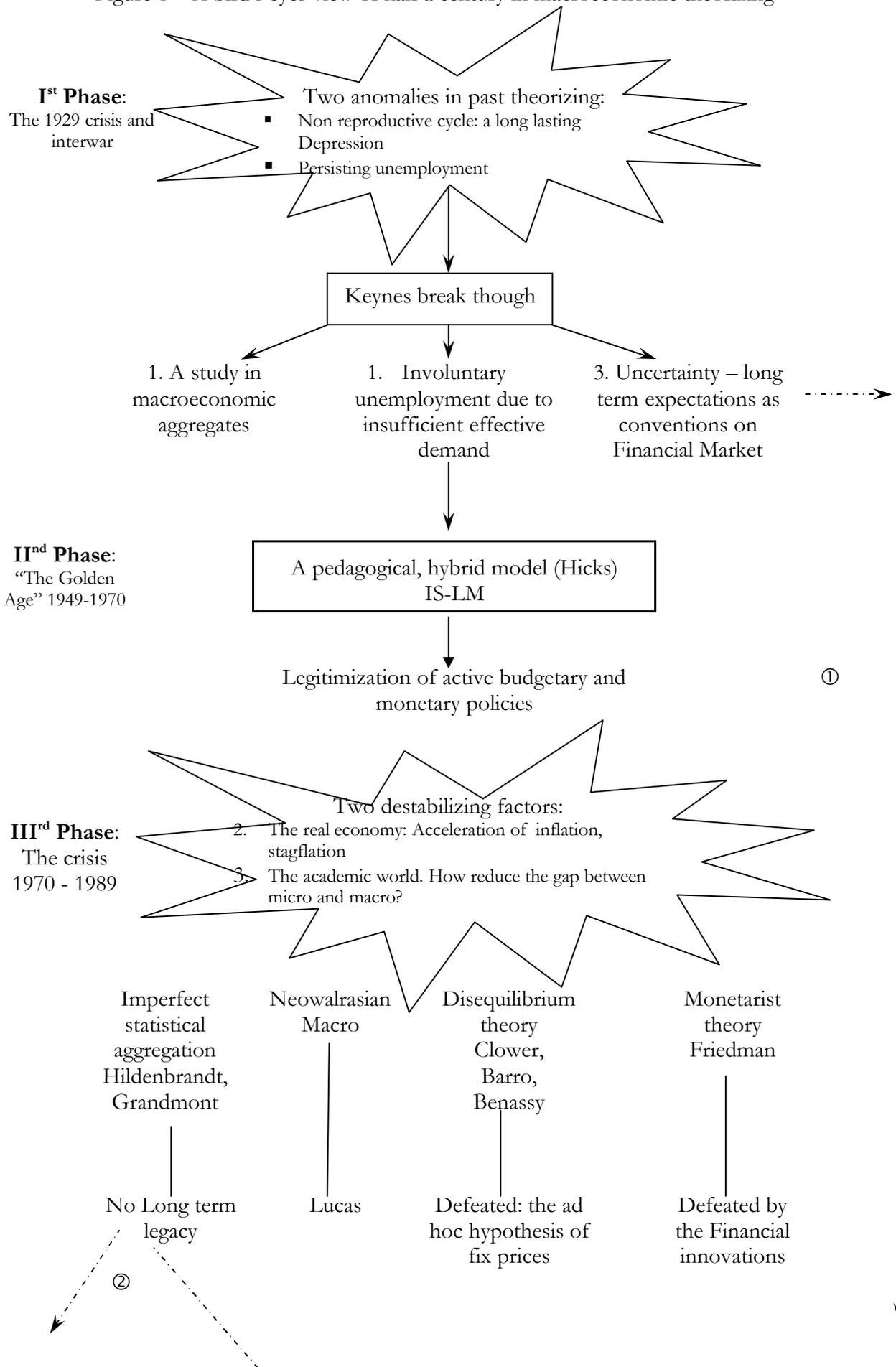
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Figure 1 – A bird’s eyes view of half a century in macroeconomic theorizing



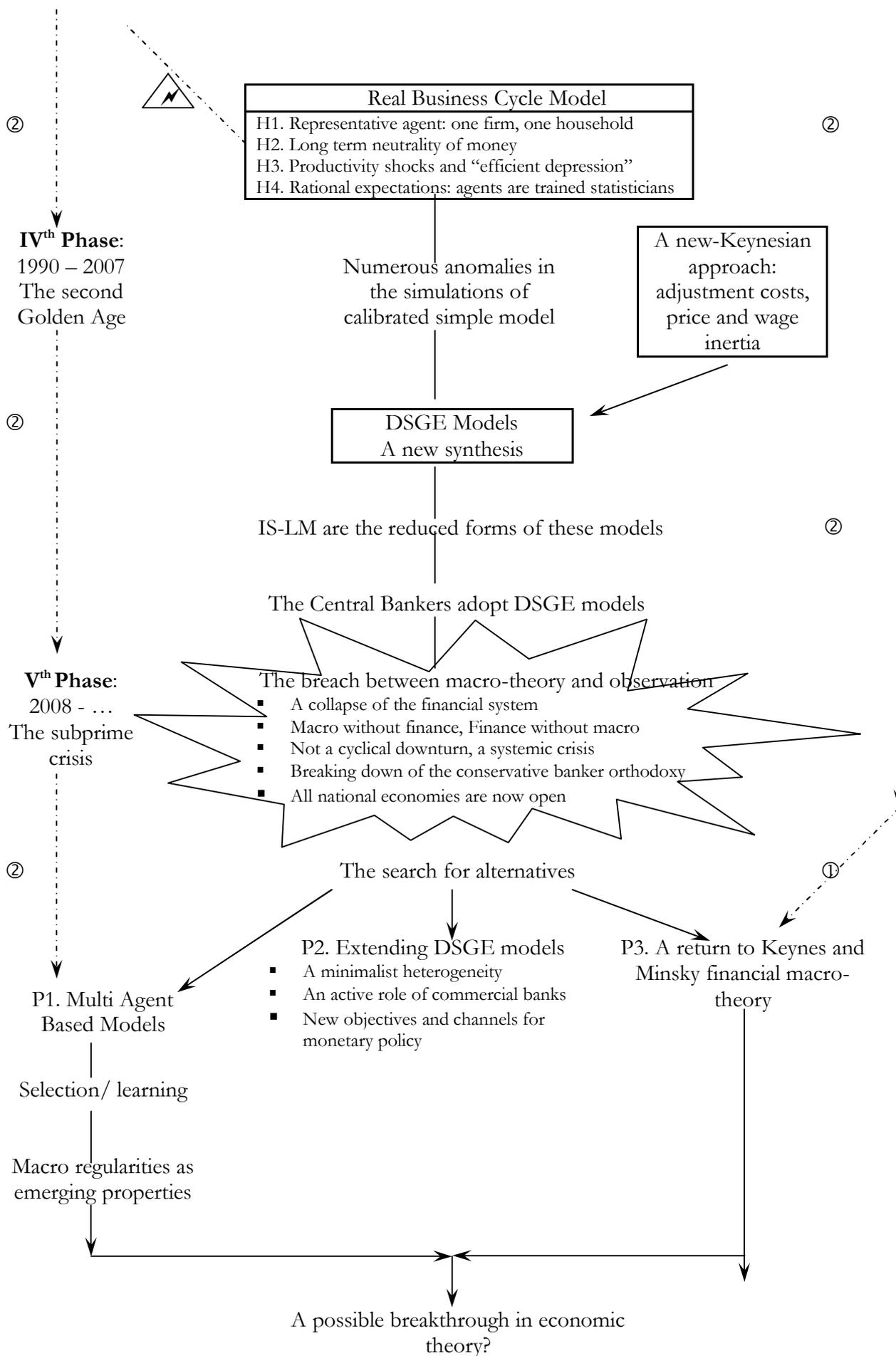
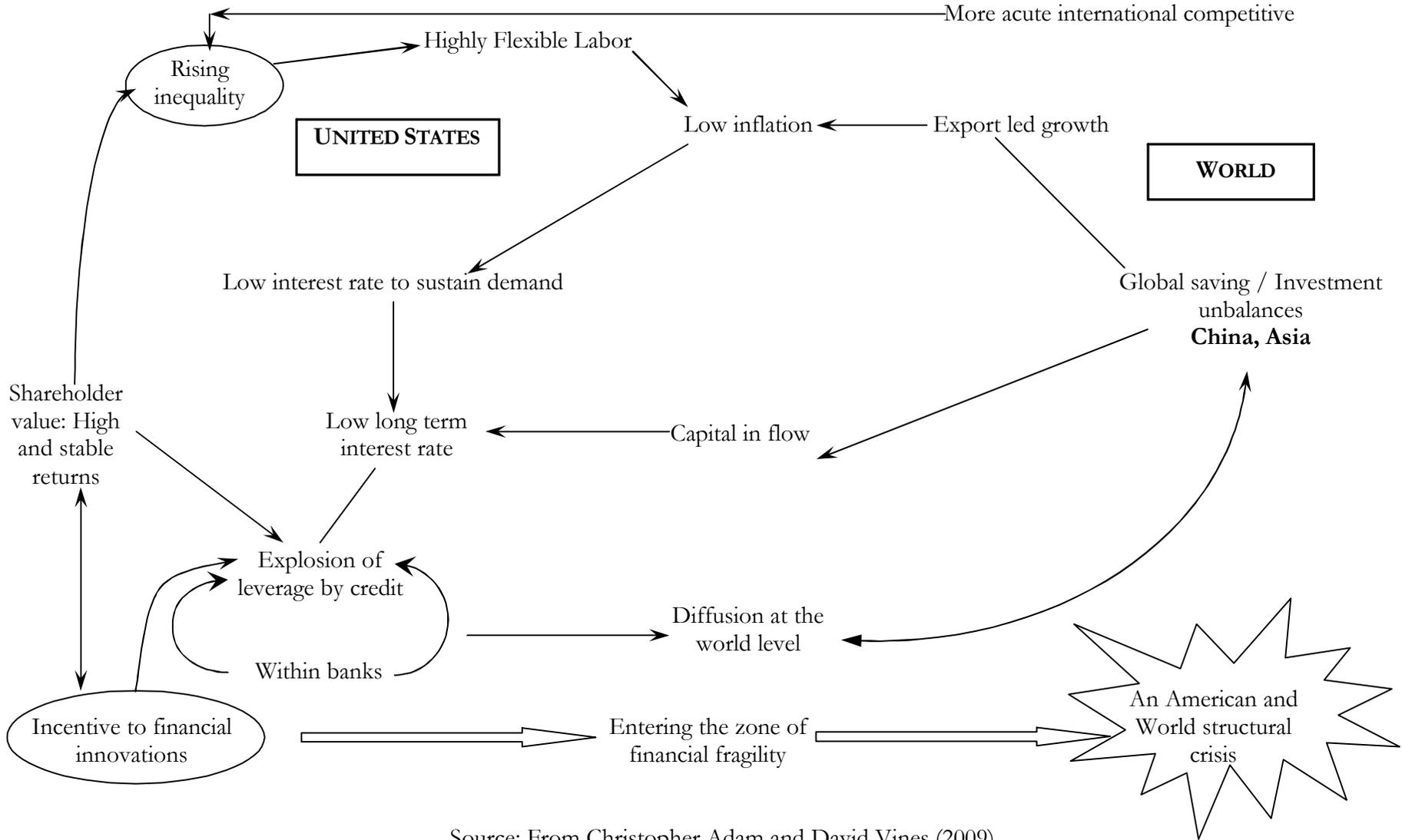


Figure 2 – The complexity of the present crisis: finance, inequalities, international interdependence ..



Source: From Christopher Adam and David Vines (2009)

Table 1 – From the failures of DSGE models to new research agenda

DOMAIN	DSGE'S HYPOTHESIS	ALTERNATIVE
Agents	A representative agent	A1. Heterogeneous agents with different preferences, information, strategies → Multi agent based models
Rationality	Full substantive rationality with perfect information	A2. Limited / bounded rationality → Animal Spirits
Markets	Perfect with complete flexibility of prices, wage...	A3. Stickiness of prices, slow adjustments → New Keynesian DSGE
	(Implicitly) Complete future and spot markets	A4. Incomplete future markets imply Pareto inefficiency and possibly perverse dynamic → Overlapping generation models
Expectations	Rational about future market clearing prices	A5. Impossibility of rational expectations facing uncertainty - Experimental economies - Bayesian approach
Nature of shocks		
. Domain	Mainly productivity and real shocks	A6. Existence of demand and monetary and financial shocks → Extended Keynesian DSGE
. Stochastic distribution	White noise	A7. Auto correlation of shocks is required in order to generate cycles → Keynesian employment cycle explains endogenous productivity moves
Finance	Only one or two financial assets External shocks in risk aversion, preference for the future	A8. Financial theory of high-frequency asset trading and corporate portfolio management: a complex dynamics is possible → Models of self-fulfilling beliefs: endogenous bubbles
Economic policy		
. Taxation and budget	Public interventions are undesirable. Ricardian equivalence	(A3) Effectiveness of some public policy if sticky prices
- Monetary	Neutrality of money in the long run	A8. If no insurance for workers and credit rationing, money feeds back into aggregate economic outcome - New generation of DSGE models
- Financial regulation	No fully-fledged financial system	

Table 2 – Recent extensions of GSGE models: at last “Banks matter”

New hypothesis / Extension	Author (example)	Contribution to the understanding of crises
A representative <i>bank</i> uses household savings to borrow to entrepreneurs	Lawrence, Motto, and Rostagno (2007)	<p>The Bank propagates monetary shocks</p> <ul style="list-style-type: none"> ▪ The Fisher debt-deflation channel has a significant role in the impact of financial accelerator ▪ A <i>financial shock</i> moves consumption and investment procyclically
<ul style="list-style-type: none"> ▪ The <i>balance sheet of banks</i> affects the propagation of shocks ▪ Shocks associated with the distress of financial markets 	Césaire Meh and Kevin Moran (2008)	Well capitalized banks help the resilience of economies facing adverse shocks
Asymmetric information and difficult risk assessment lead banks to charge a spread over risk free rates	Fiorella De Fiore, Oreste Tristano (2009)	<ul style="list-style-type: none"> ▪ The spread affects the level of activity and is endogenous ▪ Monetary policy can correct adverse impacts of financial markets imperfections
<ul style="list-style-type: none"> ▪ Agent heterogeneity of households and banks, liquidity, endogenous default ▪ Cash in advance constraints 	Goodhart, Osorio, Tsomocos (2009)	<ul style="list-style-type: none"> ▪ Heterogeneity is essential for the welfare effects of shocks ▪ Interest determined the credit and money markets
Banks provide liquidity to firms and households select projects and use leverage	Ignazio Angeloni, And Ester Faia (2009)	<ul style="list-style-type: none"> ▪ Transmission of shocks essentially via banks ▪ Optimal policy mixes anti-cyclical capital ratios and a monetary policy “learning-against-the-wind”
Monetary policy affects risk taking by financial intermediary, for a given regulatory system	Simon Dubecq, Benoît Mojon, Xavier Ragot (2010)	Underestimation of risk and high leverage due to regulatory arbitrage in the US 2000-2007
Role of balance sheet as an instrument of Monetary Policy	Vasco Cindria, Michael Woodford (2010)	Targeted asset purchases by the Central Bank improve welfare when the zero interest rate is reached but “quantitative easing” is inefficient

Figure 3 – The recurrence of bubbles and financial crises: a synthetic index

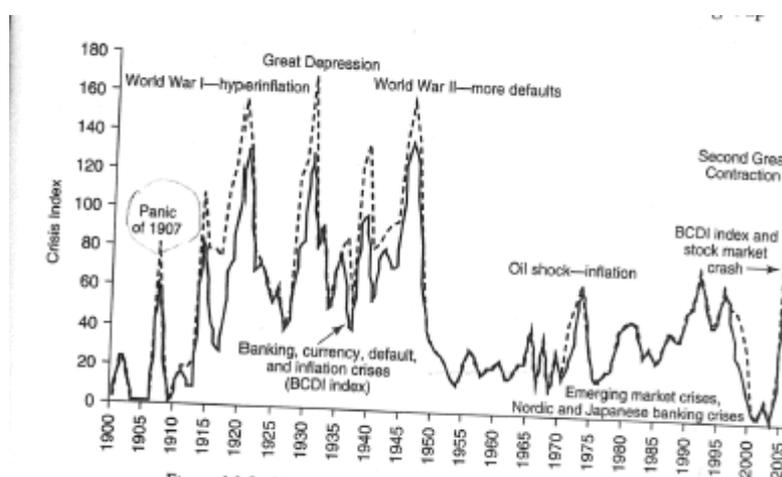


Figure 16.2. Varieties of crises, 1900-2005

Source : C. M. Reinhart and K.S. Rogoff (2009), p. 253

Table 3 – The costs of financial crises 1981-2002

	Bursting out of the crisis	Share of non performing loans	Fiscal costs / GDP	Cumulated loss of production	Decline of production after the bursting out
Argentina	2001	20,1	9,6	42,7	- 10,9
Chile	1981	35,6	42,9	92,4	- 13,6
China	1998	20,0	18,0	36,8	+ 7,6
Korea	1997	35,0	31,2	50,1	- 6,9
Finland	1991	13,0	12,8	59,1	- 6,2
Hungary	1991	23,0	10,0	na	- 11,9
Indonesia	1997	32,5	56,8	67,9	- 13,1
Japan	1997	35,0	24,0	17,6	- 2,0
Mexico	1994	18,9	19,3	4,2	- 6,2
Norway	1991	16,4	2,7	0,0	+ 2,8
Poland	1992	24,0	3,5	na	+ 2,0
Romania	1990	30,0	0,6		- 12,9
Russia	1998	40,0	6,0	0,0	- 5,3
Sweden	1991	13,0	3,6	0,0	+ 0,7
Thailand	1997	33,0	43,8	97,7	- 10,5
Turkey	2000	27,6	32,0	5,4	- 5,7
Uruguay	2002	36,3	20,0	28,8	- 11,0

Source : Lue Laeven et Fabian Valencia, IMF, WP/08/224

Figure 4 – The novelty of the 2007-2008 crisis: an endogenous bubble generated with the financial system

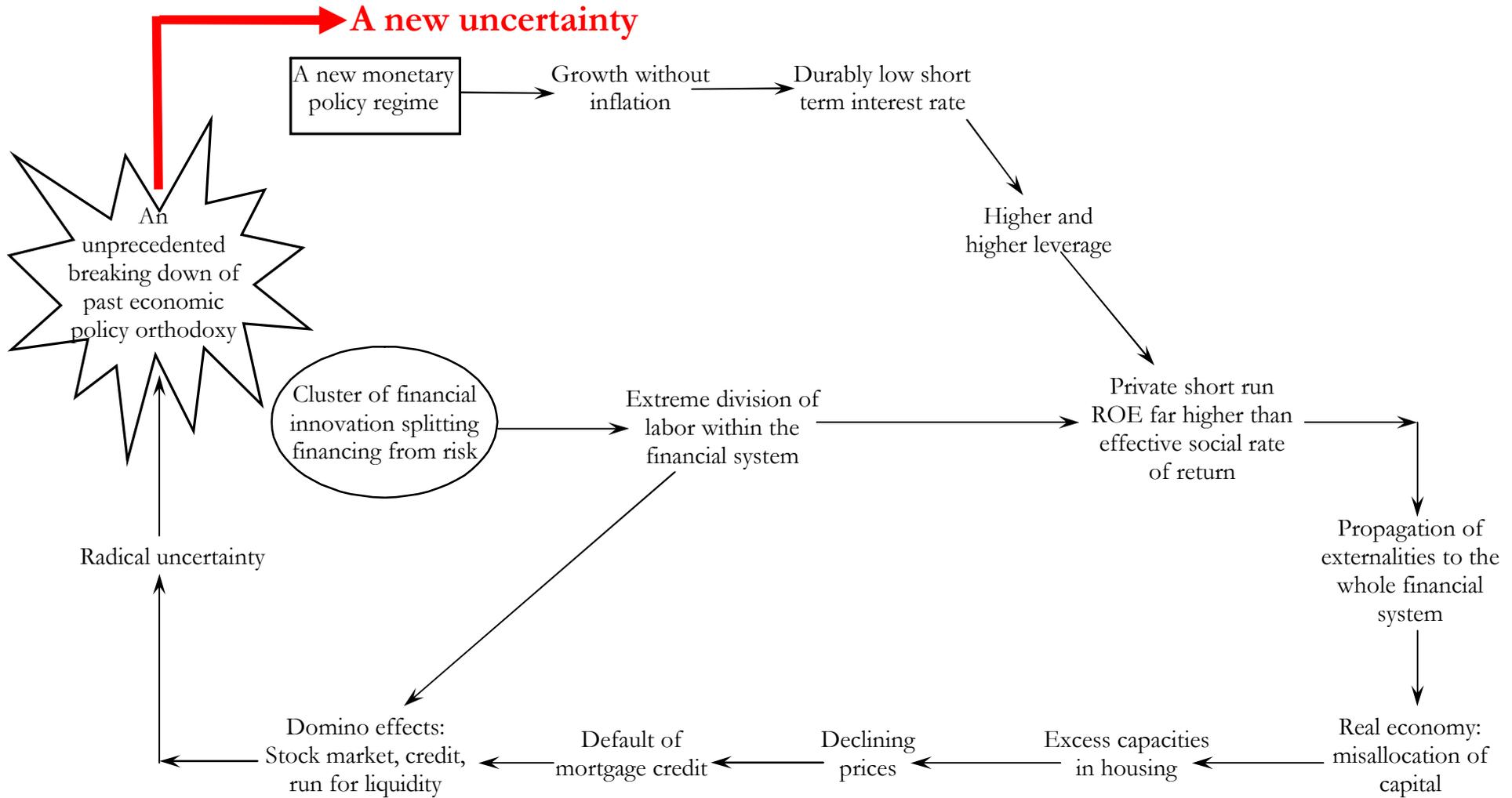


Table 4 – Back to the political economy of financial crises

Authors	Core hypotheses	Nature of crises	Possible interpretations of the present crisis
1. MARX	<ul style="list-style-type: none"> The capitalist mode of production implies a specific dynamics that of capital accumulation 	<ul style="list-style-type: none"> They are integral part of the accumulation process Transformation towards finance capital and diffusion at the World level 	<ul style="list-style-type: none"> Basically an endogenous crisis The expression of the domination of financial capital The American crisis diffuses internationally
2. KEYNES	<ul style="list-style-type: none"> Expectations govern firms decisions on investment, production and employment Intrinsic difficulty to compute the fundamental value of an asset 	<ul style="list-style-type: none"> Unemployment as a self fulfilling pessimistic prophecy Clear limit of monetary policy facing a systemic financial crisis 	<ul style="list-style-type: none"> Stability of a high involuntary unemployment even if wage are flexible Facing a risk of depression, public budget is more efficient than monetary policy
3. MINSKY	<ul style="list-style-type: none"> Endogeneity of credit booms in the emergence of speculative bubble and over accumulation 	<ul style="list-style-type: none"> Crises happen when hedging is overcome by speculation and Ponzi finance 	<ul style="list-style-type: none"> Key role of credit to financial institutions and poor households Reemergence of Ponzi type frauds
4. WICKSELL	<ul style="list-style-type: none"> The gap between monetary interest rate and the rate of return of capital sets into motion macroeconomic dynamics 	<ul style="list-style-type: none"> They are the outcome of a low monetary interest rate 	<ul style="list-style-type: none"> The victory over inflation by the conservative Central banker leads to a permanently too low short term interest rate
5. SCHUMPETER	<ul style="list-style-type: none"> Productive and organizational innovations periodically re-launch accumulation Innovators require access to credit 	<ul style="list-style-type: none"> The turning point from the boom to the recession is endogenous The downward adjustment may generate a long lasting depression 	<ul style="list-style-type: none"> The speed of financial innovations has triggered a boom, followed by a brutal adjustment
6. FISHER	<ul style="list-style-type: none"> The downward phase of the cycle does not necessarily prepare the recovery 	<ul style="list-style-type: none"> The deflation increases the real cost of debt repayment and thus be propagating depression 	<ul style="list-style-type: none"> After September 2008, general fear about a repetition of the lost Japanese decade: stagnation and deflation
7. KNIGHT	<ul style="list-style-type: none"> Profit is the remuneration of risk taking 	<ul style="list-style-type: none"> The complete generalization of risk taking and creating unfolds a radical uncertainty at the systemic level 	<ul style="list-style-type: none"> What was initially conceived as hedging against risk finally triggers a speculative bubble that ends-up into a systemic crisis
8. HAYEK	<ul style="list-style-type: none"> The price system is diffusing the relevant information for actors, but does not necessarily allocate efficiency resources 	<ul style="list-style-type: none"> With modern finance, “mark to model” and perverse incentives in the financial system, prices are losing their informational content 	<ul style="list-style-type: none"> The erroneous pricing of many derivatives generates a speculative bubble, a misallocation of credit and competence, hence a systemic crisis

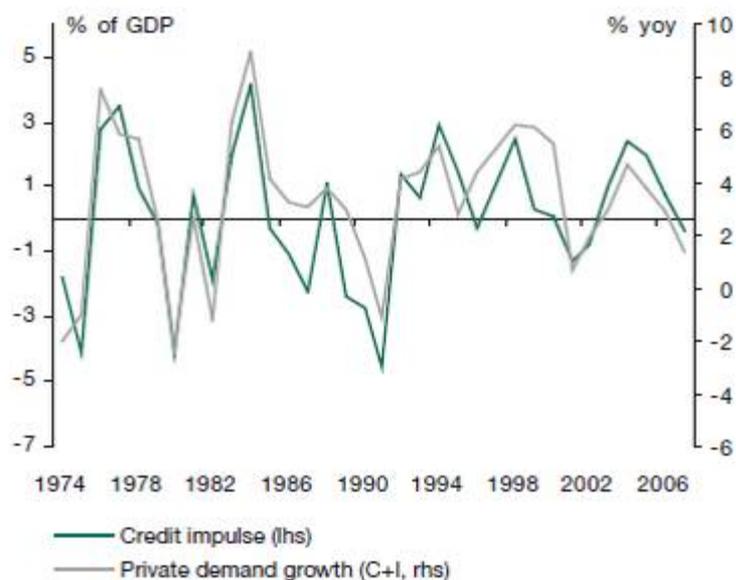
Table 5 – Various research programs facing the major stylized facts revealed by the present crisis

STYLIZED FACTS	POSSIBLE EXPLANATORY MECHANISM/MODEL	EXAMPLE OF MODEL	AUTHOR
SF1 – Recurrence of bubbles	<ul style="list-style-type: none"> ▪ Informational asymmetry among heterogeneous traders ▪ Non linear dynamic models 	Financial accelerator	<p>Didier Sornette (2003)</p> <p>Lance Taylor and O'Connell (1985) B. Bernanke, M. Gertler and S. Gilchrist (1999)</p>
SF2 – Financial markets deal with uncertainty, not only risk	<ul style="list-style-type: none"> ▪ Inefficient aggregation of risk appraisal on liquid markets 	Rational mimetism explain bull and bear periods	André Orléan (1989)
SF3 – Some major bubbles can be detected in real time	<ul style="list-style-type: none"> ▪ Cumulative discrepancy between private and social rates of return 	<ul style="list-style-type: none"> ▪ Impossibility to explain market price by the computation of fundamental value ▪ Excessive leverage effects only compatible with a Ponzi strategy 	<p>Robert Shiller (2000)</p> <p>Harry Markopolos (2005)</p>
SF4 – Speculative bubbles display- a definite configuration of innovations, incentives, regulations and monetary policy	<ul style="list-style-type: none"> ▪ Spillover from one asset to another until the entering into a zone of financial fragility ▪ Unequal information between professionals and private investors 	<ul style="list-style-type: none"> ▪ Models of twin crises, several successive generations ▪ Asymmetric information models 	<p>Paul Krugman (1979; 1999)</p> <p>Joseph Stiglitz, Bruce Greenwald (2003)</p>
SF5 – Financial crises are costly in terms of growth, social costs and public budget	<ul style="list-style-type: none"> ▪ The brutal adjustments of risk appreciation triggers a run for liquidity and a credit stop 	<ul style="list-style-type: none"> ▪ Models of credit rationing to households and firms 	Edouard Challe, Xavier Ragot (2010a; 2010b)
SF6 – Money is the only absolutely liquid assets	<ul style="list-style-type: none"> ▪ Contagion effects from one distressed financial market to another 	<ul style="list-style-type: none"> ▪ Keynesian models of liquidity trap in the presence of radical uncertainty 	Mario Amendola Jean-Louis Gaffard (1988)
SF7 – The resilience of commercial banks is crucial in the ways out of the crisis	<ul style="list-style-type: none"> ▪ Bankrupted or quasi bankrupted banks restructure their balance sheet, reduce credit hence a pluriannual period of slow growth 	<ul style="list-style-type: none"> ▪ Models of financial networks ▪ Lost Japanese decade models 	<p>Anton Brender (1982)</p> <p>Bank of England (2010)</p> <p>K. Kobayashi and M. Inaba (2002)</p>

SOME STYLIZED FACTS ABOUT THE FINANCE-REAL ECONOMY NEXUS

THE PROCYCLICITY OF CREDIT AND ECONOMIC ACTIVITY

Figure 5 – US Private Demand Growth and the Credit impulse



Sources: BEA, Federal Reserve, Deutsche Bank.

Source: Biggs Michael and Thomas Mayer (2010), "The output Gap Conundrum", *Intereconomics*, n°1, p. 14.

THE YIELD CURVE AND FUTURE ECONOMIC ACTIVITY

Figure 6 – Forecasted probability of recession based on the slope of the yield curve 4 quarters earlier

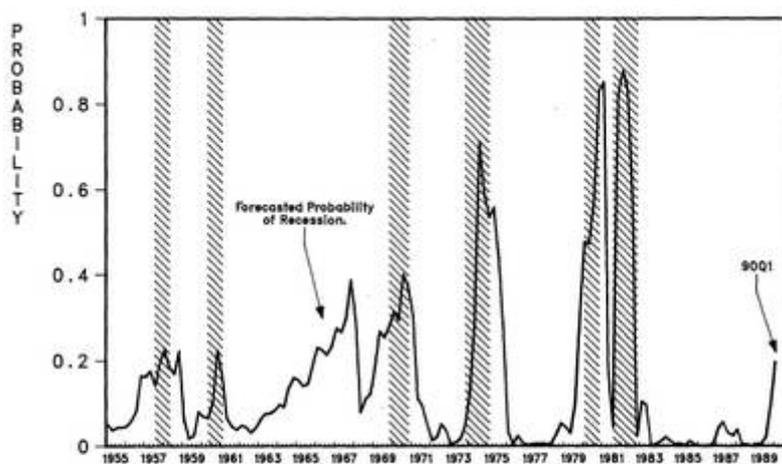


Figure 2. Forecasted probability of recession for current quarter based on the slope of the yield curve 4 quarters earlier. The shaded areas denote current NBER-dated recessions. The forecasted probability of recession denotes the within-sample fit of a probit model, estimated over the quarterly sample period from 1956:1 through 1988:4, in which the dependent variable is a binary variable denoting the current presence or absence of an NBER-dated recession, and the only explanatory variable is the slope of the yield curve observed 4 quarters earlier. The slope of the yield curve is the difference between the 10-year Treasury bond rate and the 3-month Treasury bill rate. Both rates are quarterly averages of annualized bond equivalent yields.

Source: Estrella Arturo and Gikas A. Hardouvelis (1991), "The Term Structure as a Predictor of Real Economic Activity", *The Journal of Finance*, vol. XLVI, n° 8, June, p. 565.

THE RELATED MECHANISMS: IMPACT UPON THE SHADOW BANKS CREDIT SUPPLY VIA PROFITABILITY

Table 6 – A macro financial intermediary VAR, US 1990 Q3 – 2008 Q3

	GDP Growth	Term Spread	Net Interest Margin	Asset Growth	Short Rate	VIX Change
GDP Growth (lag)	0.106	-0.329***	-0.026	0.911*	0.411***	1.933*
Term Spread (lag)	0.041	0.958***	0.038*	-0.729**	0.029	-1.173
Net Interest Margin (lag)	0.241	-0.302	0.804***	1.822*	0.241	1.451
Asset growth (lag)	0.112***	0.012	0.002	-0.066	0.058**	-0.742**
Short Rate (lag)	-0.032	-0.019	0.015	-0.093	0.965***	0.199
VIX Change (lag)	-0.002	0.004	0.002	0.037	-0.015*	-0.442***
Constant	0.024	1.620*	0.598**	-3.028	-1.540**	-4.197
Observations	73	73	73	73	73	73

*** p<0.01, ** p<0.05, * p<0.1

Source: Adrian Tobias, Estrella Arturo, and Hyun Song Shin (2010), Monetary Cycles, Financial Cycles, and the Business Cycle, Staff Report n° 421, Federal Reserve Bank of New York, January, p. 7.

SOME EVIDENCES ABOUT THE IMPACT OF FINANCIAL WEALTH

Figure 7 – U.S. stock market and productive investment (% of GDP)

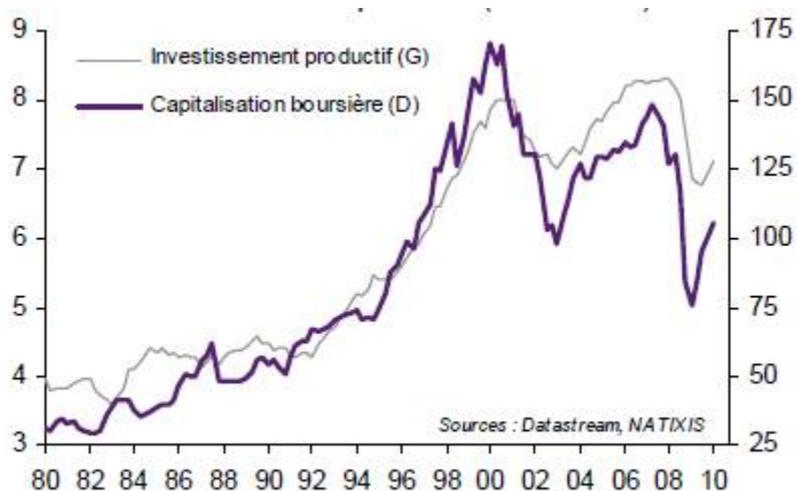
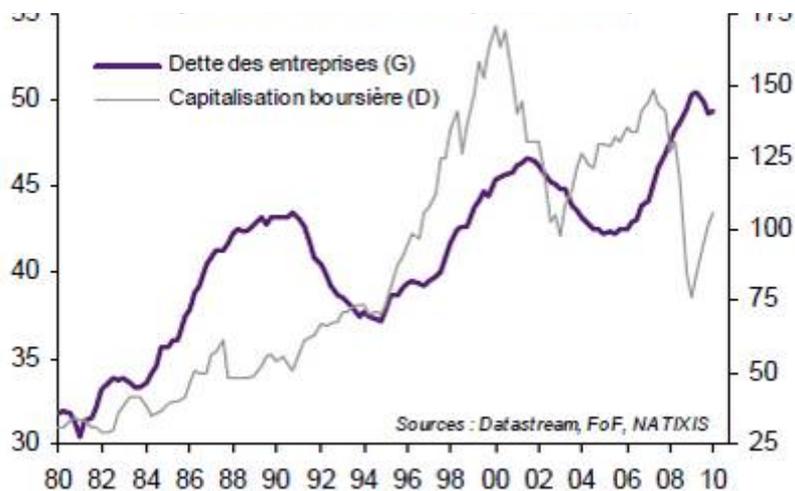


Figure 8 – U.S. Firms debt and stock market valuation (% of GDP)



Source : Artus Patrick (2010), "Y a-t-il déstabilisation des économies par l'effet de la richesse boursière et immobilière sur l'activité réelle?", *Flash Economie*, n° 389, 4 août, p. 4.

Figure 9 – U.S.: total debt and financial and real estate wealth of household (% of real disposable income)

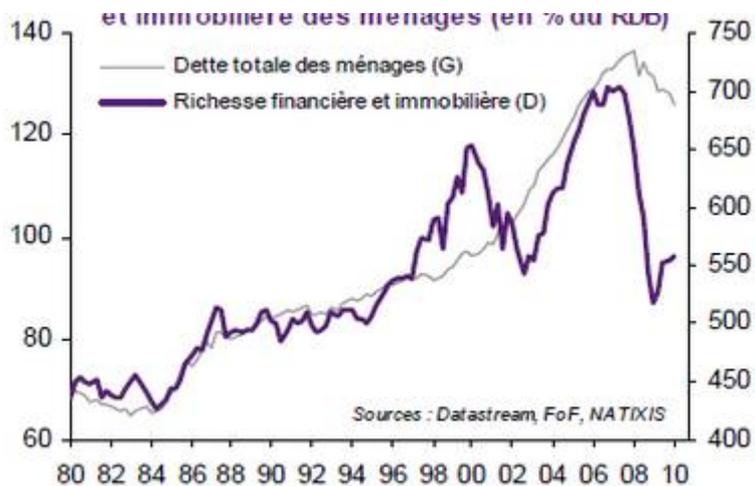
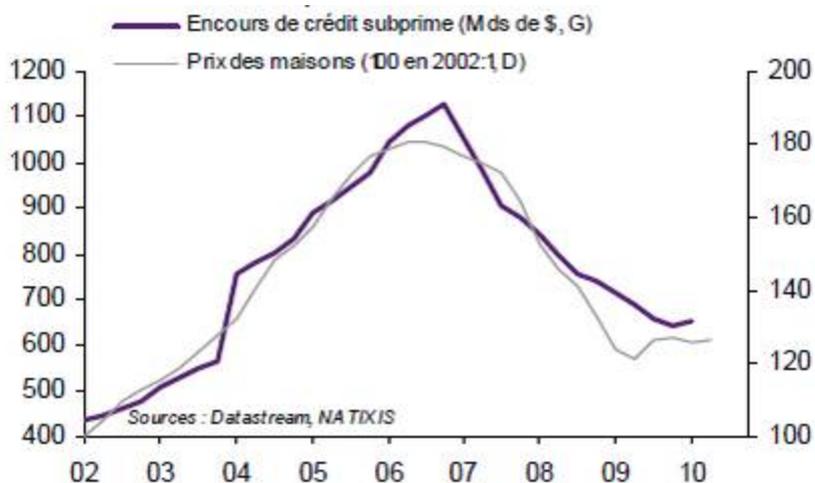


Figure 10 – U.S.: Total subprime credit (billion dollars) and housing prices (100 = 2002.1)



Source : Artus Patrick (2010), "Y a-t-il déstabilisation des économies par l'effet de la richesse boursière et immobilière sur l'activité réelle?", *Flash Economie*, n° 389, 4 août, p. 5 et 6.

Table 7 – What do we know about some key mechanisms relating finance and real economy? A brief review of some empirical studies

COMPONENT / MECHANISMS	AUTHOR	NATURE OF THE RELATION
Household consumption (UK)	Timothy Besley (2008)	A measure of the “above average spread” borrowers has a negative and significant impact upon consumption
▪ GDP, employment (US)	Niang Abdou-Aziz, Diagne Abdoulaye and Pichery Marie-Claude (2010)	1. Common shocks affecting employment and housing markets and those affecting financial market
▪ GDP, employment (US and EU)	Gros Daniel and Cinzia Alcidi (2010)	▪ Role of the anti-cyclical patterns of risk aversion
	Michael Biggs and Thomas Mayer (2010)	▪ The credit has an impact upon production, investment, consumption ▪ Correlation between credit impulse and US private demand
▪ Yield curve and GDP predictor (US)	Estrella Arturo and Gikas A. Hardouvelis (1991)	▪ If the FED wants to use this relation it may vanish...contingency of aggregate relations between finance and activity
(UK)	Chadha Jagjit and Sean Holly (2010)	▪ Output and inflation are negatively correlated the 2 and 5 years yield spread
▪ GDP, consumption	Complement Niang, Diagne and Pichery (2010)	2. Financial markets adjust very quickly to the evolution of the real economy
Wealth Effect		
▪ Real estate	Artus Patrick (2010)	1. Since 1991’s, a strong correlation between wealth and growth in the US,UK, EU
▪ Stock market		2. Growing impact stock market valuation over firms decisions, especially on investment
		3. Stock market valuation is an early index for firms’ debt
		4. Household wealth is an early index
Pro cyclical risk taking , credit and asset bubbles	Davis (1992)	Whatever the financial instrument, there is a definite pattern for speculative bubbles
	Artus Patrick (2010)	It was the case for the subprime bubble
Generality of financial constraints On firms (US, Europe, Asia)	Campello Murillo, Graham John R. and Campbell R. Harvey (2010)	After 2008, constrained firms have a different behavior: deeper cuts in tech spending, employment and investment
	Previously Kaplan, Zingales (1997)	Constrained firms invest less, grow less and save less cash
Impact of monetary policy upon housing market (US and EU)	Musso Alberto, Neri Stefano and Livio Stracca (2010)	Larger reaction in the US than in the EU: domestic structure of demand and production matter
Uncertainty shocks produce a definite macro-dynamics	Bloom Nicholas (2009)	The major, generally exogenous, shocks (Cuban miracle crisis,... 9/11 attacks) produce a rapid drop and rebound in aggregate output and employment
The interconnection between sovereign debt risk and private financial risks	Fasten Erik R. and Eloise Orseau (2010)	The Lehman Brothers collapse has shown the strength of two spillovers: ▪ From private finance to public debt ▪ From one to another national sovereign debt

THREE STRATEGIES IN MACRO MODELING OF FINANCE AND ITS IMPACT UPON THE REAL ECONOMY

Figure 11 – The deductive / Axiomatic Approach

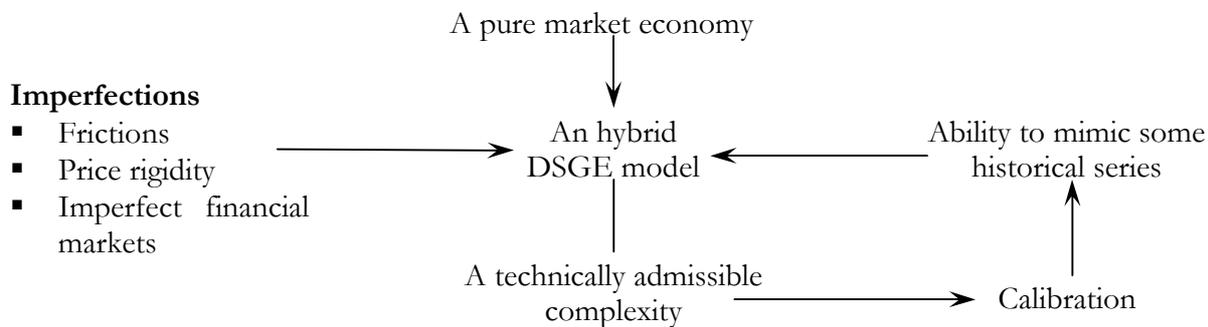


Figure 12 – An eclectic / Ad hoc method: classical / Keynesian in the Colander’s sense

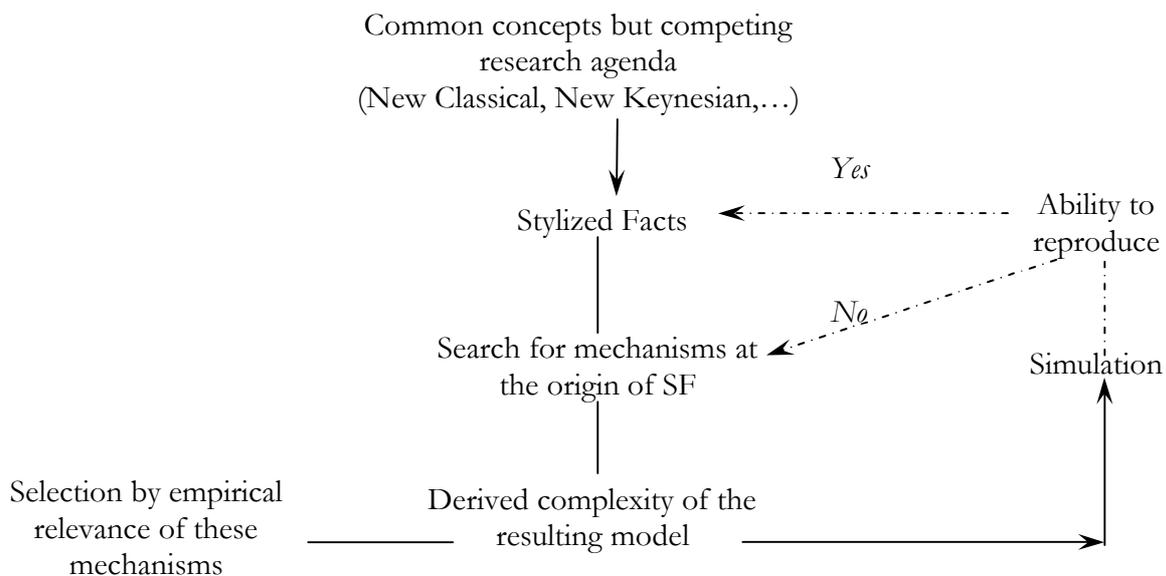
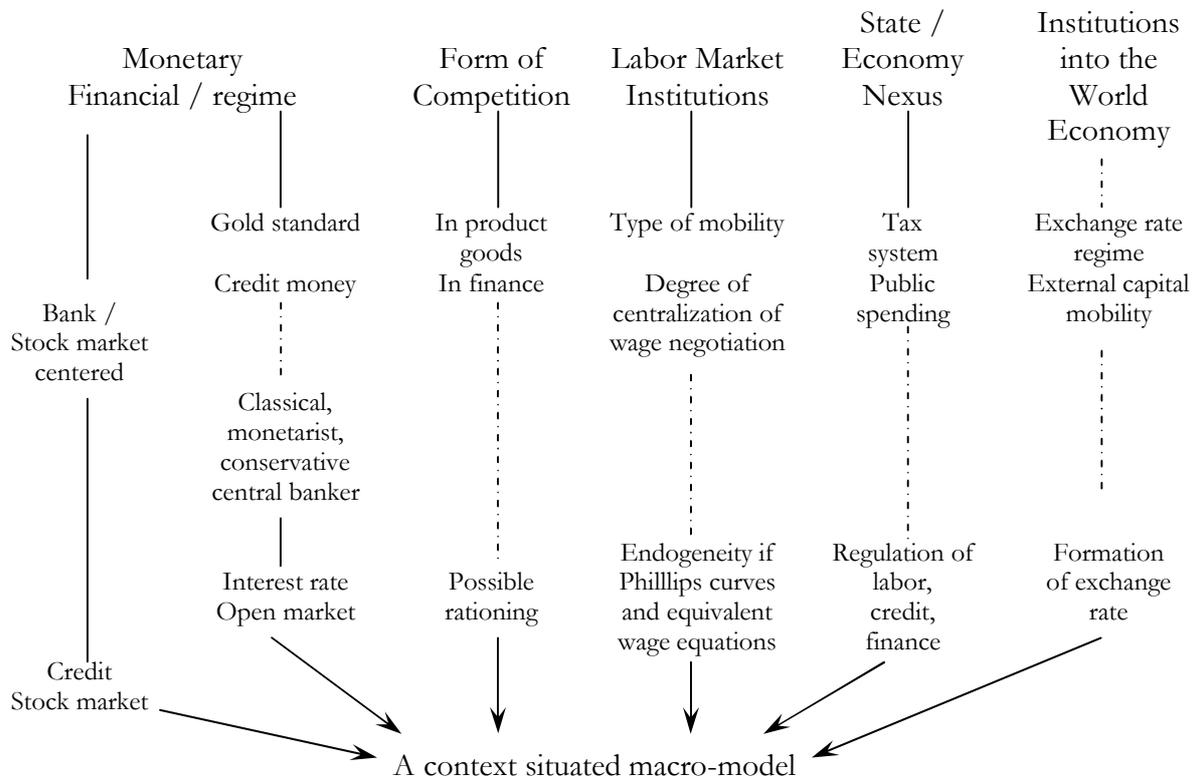


Figure 13 – An institutionally grounded macro modeling: A given configuration of a capitalist economy



THREE EVIDENCES ABOUT AN INTERNALLY GENERATED FINANCIAL CRISIS

Figure 14 – Growth of Assets of Four Sectors in the United States (March 1954 = 1) (Log scale)
(source: Federal Reserve, Flow of Funds, 1954-2009)

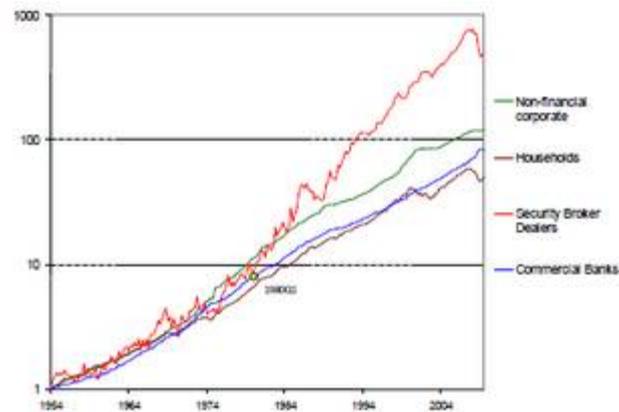


Figure 15 – Household Sector Leverage and Total Assets (Source: U.S. Flow of Funds, Federal Reserve, 1963-2007)

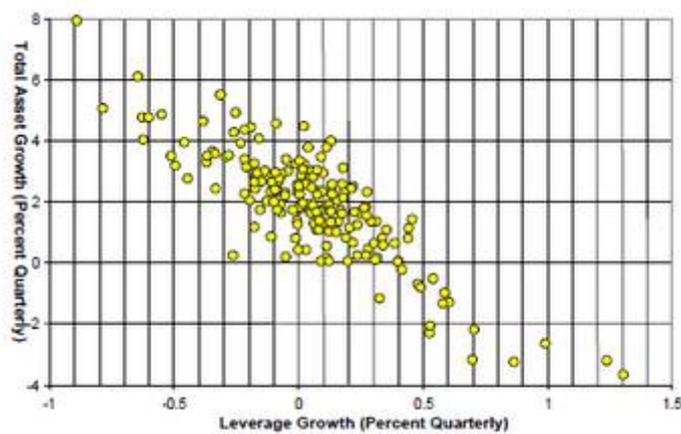
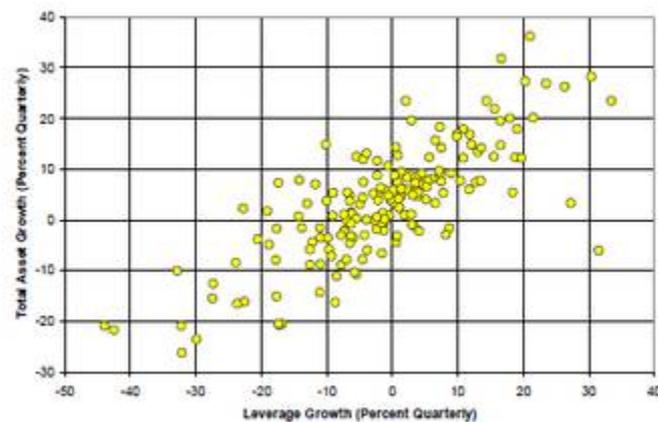


Figure 16 – Broker Dealer Sector Leverage and Total Assets (Source: U.S. Flow of Funds, Federal Reserve, 1963-2007)



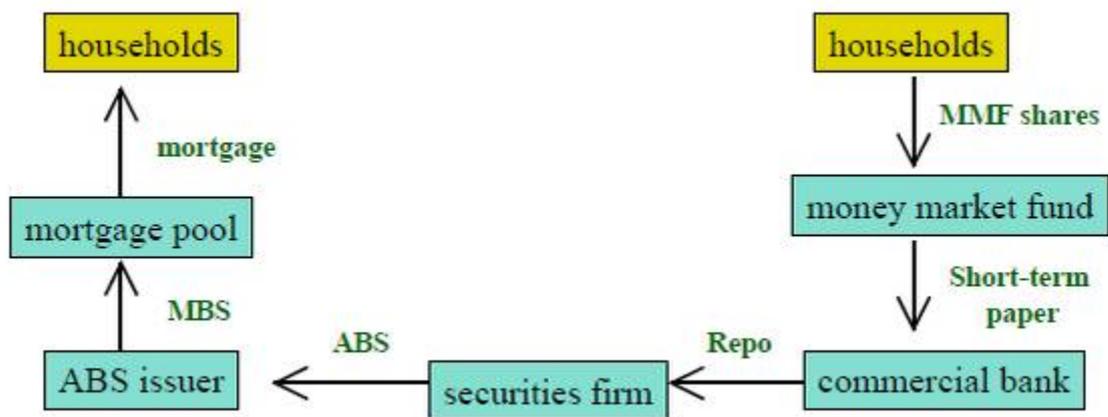
Source: Tobias Adrian, and Hyun Song Shin (2010), The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-2008, Staff Report n° 439, Federal Reserve Bank of New York, March-April, p. 6-10 et 11.

THE CONSEQUENCES OF AN EXTREME DIVISION OF TASK AMONG FINANCIAL ENTITIES

Figure 17 – Short Intermediation Chain



Figure 18 – Long Intermediation Chain



Source: Tobias Adrian, and Hyun Song Shin (2010), The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-2008, Staff Report n° 439, Federal Reserve Bank of New York, March-April, p. 2 et 4.

Figure 19 – The consequences of the hierarchical position of finance on contemporary macroeconomics

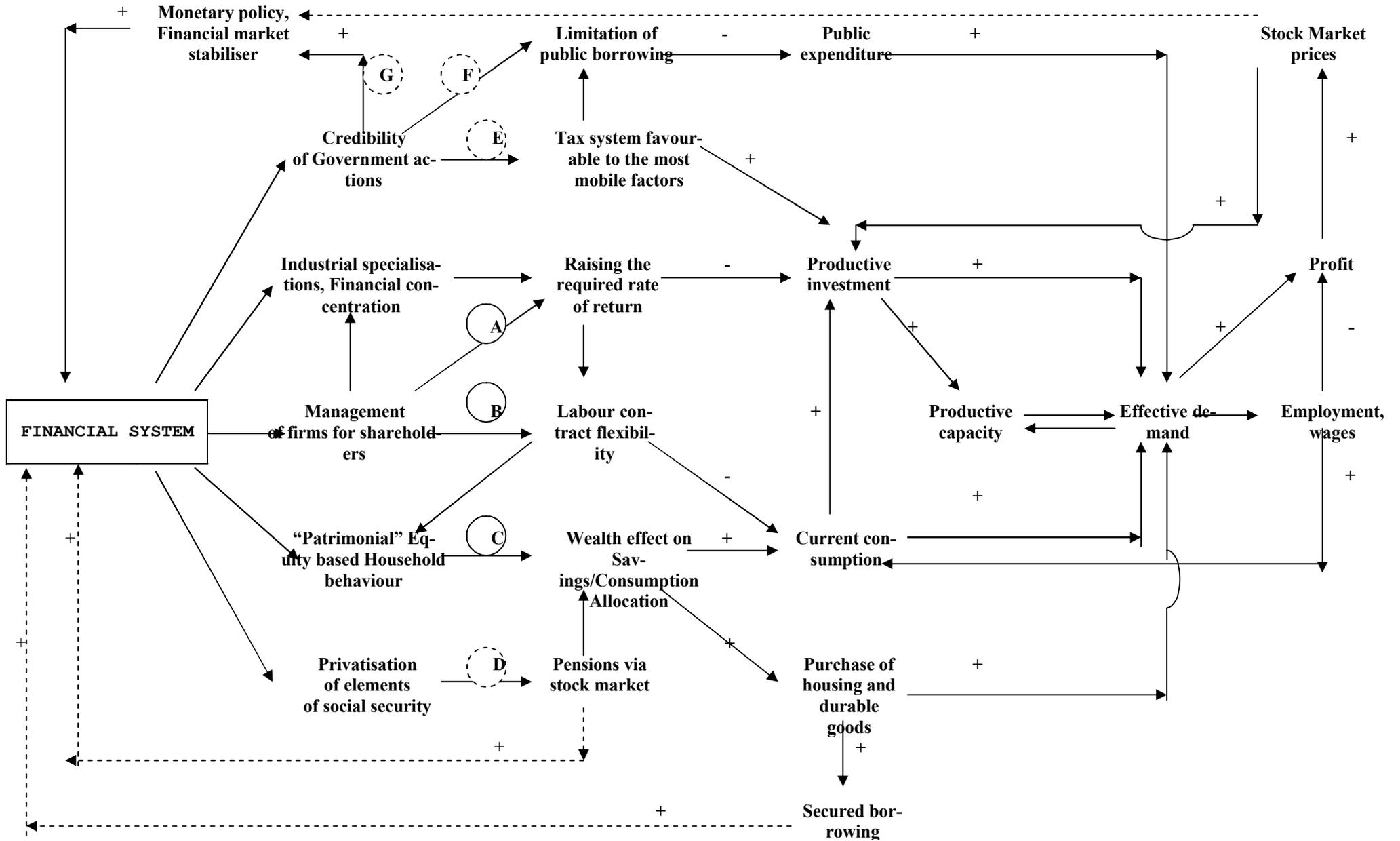
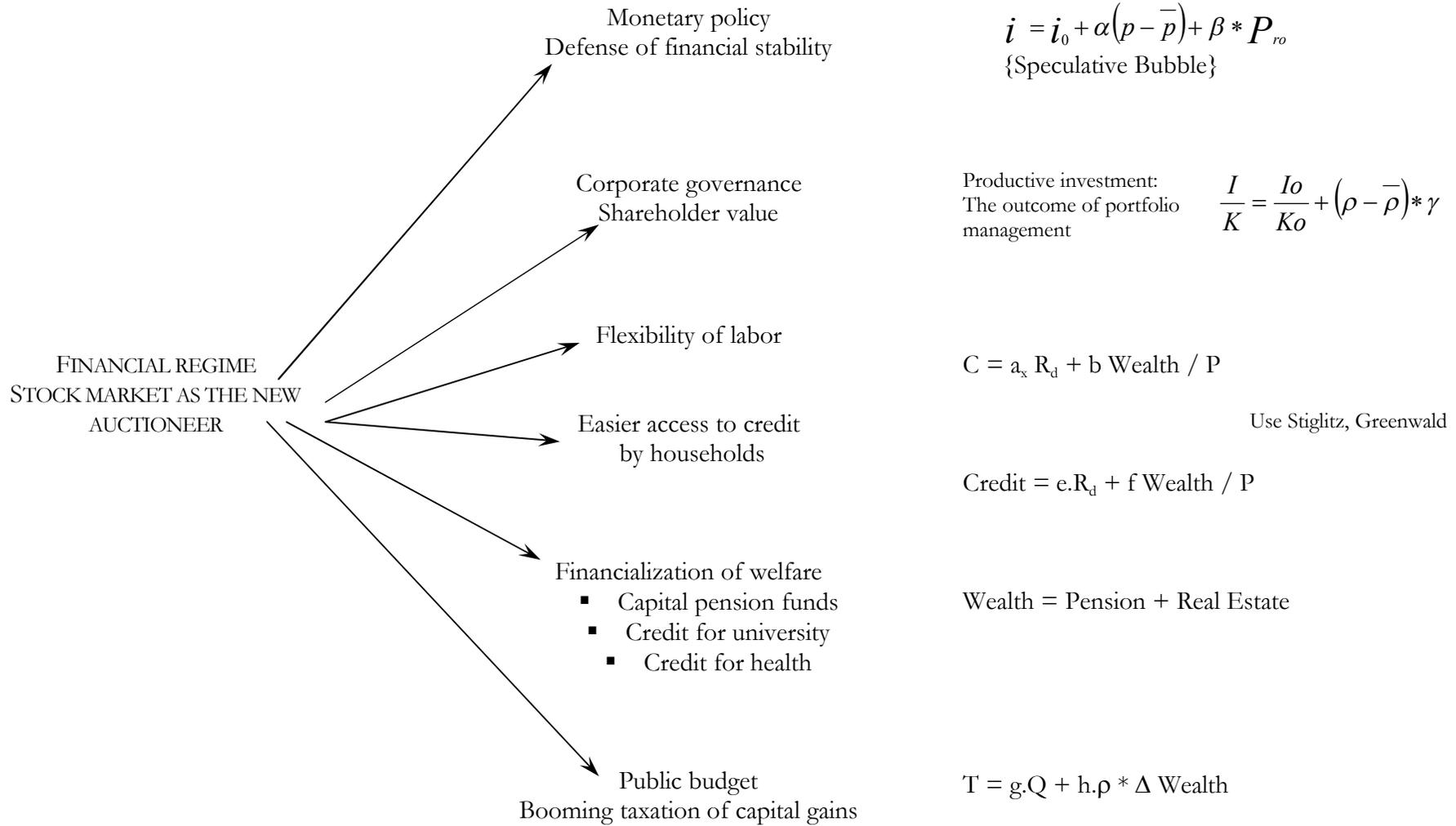


Figure 20 – The Channels of finance to real economy in the era of finance led capitalism



AN EXAMPLE OF FORMALIZATION OF FINANCIAL NETWORKS

Figure 21 – The financial system as a network of assets and liabilities

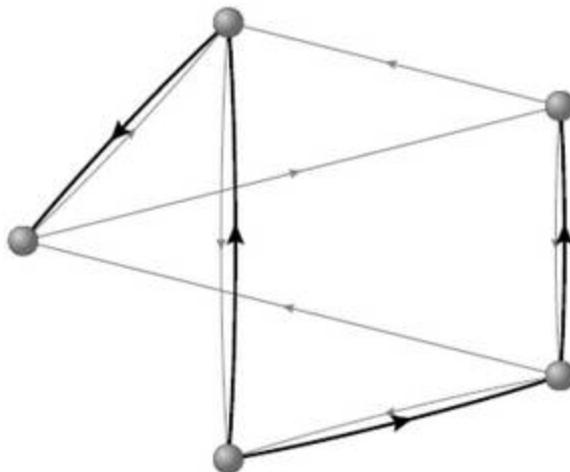


Figure 22 – The non linear impact of connectivity upon the default of banks

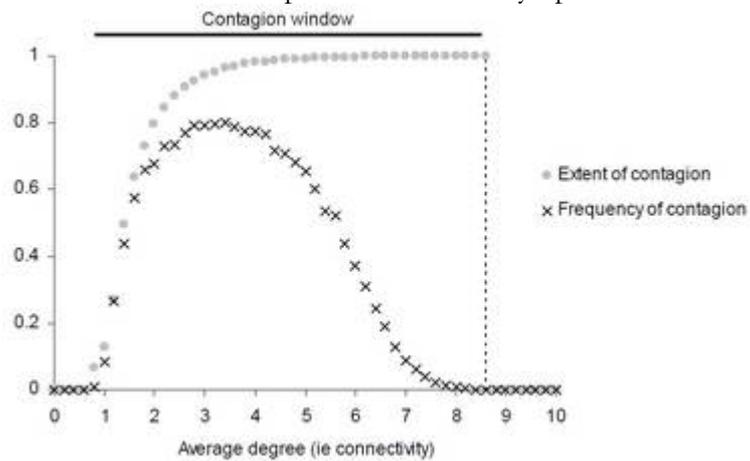
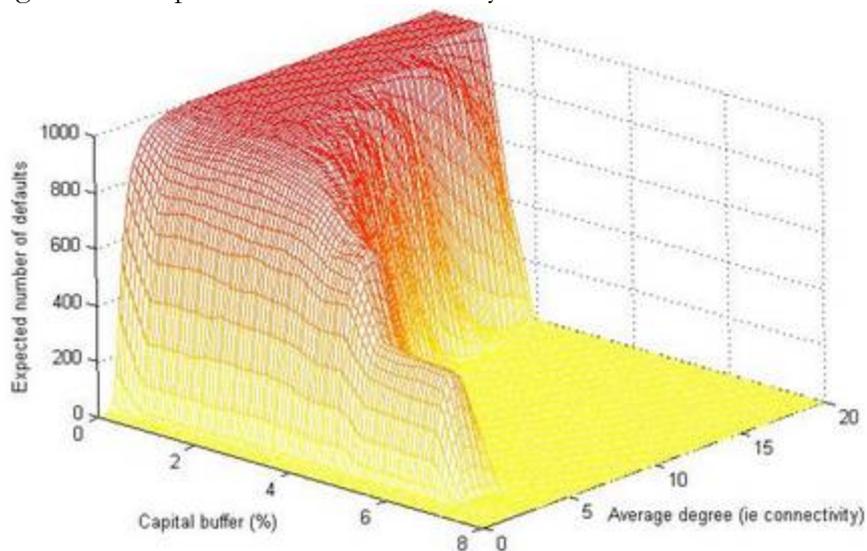


Figure 23 – Capital buffers of banks may counteract the risk of default



Source: Gai Prasanna, and Sujit Kapadia (2010), p. 11, 22, 24.

Table 8 – A bird eyes view of the arguments of this article

DSGE core hypotheses	Relevance with respect to a capitalist economy	Compatibility with the patterns revealed by the present crisis	Alternative hypotheses and macroeconomic analyses
1. A representative agent; a quasi social planner	Oxymoron: exchanges take place among heterogeneous agents	The quite unequal burden of the crisis explains its severity	R1 – Multi agent based models
2. Substantive rationality	Unrealistic cognitive competence. At odds with decentralized behavior on a limited set of transactions	The very inventors of complex derivatives were unconscious of their properties (strong non linearity, concentration of risks)	R2 – Bounded rationality (Simon) R3 – Animal spirits, as an alternative economic psychology (Akerlof and Shiller) R3 – Institutionalized situated rationality (institutionalists)
3. Rational expectations	Incompatible with <ul style="list-style-type: none"> ▪ The unintended outcomes of competition among heterogeneous agents ▪ Recurring innovations make it impossible 	Quite no actor (the Central banker, the Hedge Funds, regulators,...) had the correct representation of a finance led regime	R4 – Experimental economies: behavior facing uncertainty R5 – Bayesian learning and selection / imitation
4. Only exogenous shocks affect a static stable equilibrium	Cycles, boom and bursts, crises are a permanent feature since the industrial revolution	A succession of bubbles (Internet, subprime) ends up into a major crisis	R6 – Generalizing Minsky's model R7 – Extending the financial accelerator model

MACROECONOMICS AFTER THE CRISIS

Bringing Finance Back In

Robert BOYER

ABSTRACT

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