

Ch. 5 – From LOLR to an Open Money Supply Model

We develop in this section an economic model explaining the role of open money supply as the first condition for a monetary system to exist and function. The central bank has been properly invested with its own role of unique liquidity provider in the financial markets and of money market manager.

Back to the traditional interpretation of Bagehotian influence on theory and policy making, we search for a good mainstream definition of LOLR, enabling us to further discuss the meaning of this function in orthodox models, and its limit in front of a more complex Bagehotian system of thought.

Our evidence is that, even if it only represents a restricted interpretation of Bagehot's work and philosophy, the same LOLR function has been considered with suspicion inside economic theory. Its "revolutionary" potential to falsify the QT has been thus transformed, and the overriding objective of the lender of last resort has been said to prevent panic-induced declines in the money stock, so that no conflict is produced with the monetary control rules. On this line, by reviewing recent literature modelling panics and financial crises, we can go into the details of the QT misleading requirements to match reality.

Given the orthodox models' featuring of illiquidity and instability, we can propose a model showing Bagehotian principles, as we interpreted them throughout this paper. Our model offers another step in understanding the importance of open money supply for money theory.

1. LOLR in mainstream theory

To discover the role LOLR plays in mainstream monetary policy and theory, we selected two definitions, the first by Robert Kehler¹²² and the second by Stanley Fischer¹²³.

¹²² R. Kehler, "An International Lender of Last Resort, the IMF, and the Federal Reserve", United State Congress, February 1999, in: www.house.gov/jec/.

¹²³ S.Fischer, "On the Need for an International Lender of Last Resort", lecture to the American Economic Association and American Financial Association, New York, Jan, 3, 1999.

Both definitions succeed, under different levels of analysis, to stress and confirm the compatibility of LOLR with the goals of QT. They definitely help mainstream to conceive LOLR in terms of that compatibility, i.e. regardless of the priority for monetary stability, which is implicit in the original concept.

As we saw in the preceding chapters, Bagehot's priority for monetary and credit stability creates a different map of policy instruments and goals than the QT, which organises instead around the goods' price stability goal. LOLR is by far a limited interpretation of Bagehot's work, which calls instead for a serious evaluation of the open money supply concept. Since even the limited interpretation of Bagehot's given through LOLR has been viewed with suspicion, as we argue in the next paragraphs, this measures the gap between the two schools, and also the impossibility to actually treat the monetary stability theme through the lens of orthodoxy.

1- Definition

We present first the LOLR definition by Kehler.

“Relevant, key elements of the domestic Lender of Last Resort (LOLR) function can be succinctly summarized in the form of the following propositions:

- The need for a LOLR arises because of two important institutional characteristics of contemporary monetary systems, namely, fractional reserve banking and government monopoly of legal tender issuance. The first creates a need for a LOLR; the second, the means for satisfying that need. The LOLR is a money-creating backstop or liquidity guarantor, which acts to prevent a panic-induced collapse of the fractional reserve banking system.
- The LOLR has a macroeconomic rather than a microeconomic responsibility. The monetary stabilization duty of the LOLR relates to market-wide (macroeconomic) effects and not to individual bank (microeconomic) effects. The LOLR function pertains to the responsibility of guaranteeing the liquidity of the entire economy but not necessarily the liquidity of particular institutions in the economy. Moreover, the LOLR role is not to prevent all disturbances

to the financial system, but rather to minimize the secondary repercussions of such disturbances. Accordingly, the LOLR is charged with averting contagion, spillover, or domino effects, which might threaten the stability of both the financial system as well as the value of money.

- In no case does the LOLR have a duty to sustain unsound banks. The LOLR should not intervene in the lending decisions of individual financial intermediaries. Poorly managed banks should be allowed to fail, with the LOLR only ensuring such failure does not have important spillover effects. In short, the LOLR must distinguish clearly between promoting monetary stability and protecting the interests of bank owners and management. The former is a macro responsibility and the latter is not.
- The purpose of a LOLR is to prevent credit problems from becoming monetary crises. Although the operation of a LOLR should prevent system-wide runs on banks, large-scale loan call-ins, and collapses of asset prices, loans, and credit, its ultimate purpose is to prevent monetary collapses to promote monetary stability. To accomplish this goal, the LOLR must be able to respond both quickly and massively to a crisis.
- The LOLR function is a short-run stabilization role, which does not conflict with longer-run central bank objectives. Prompt, vigorous LOLR action (activated only during temporary periods of emergency) will allay panic within a very short time and, consequently, well before longer-term goals such as price stability are threatened. As a result, any deviation of general prices from a longer-term target will be small in magnitude and duration. *Price stability and LOLR goals, therefore, are complementary rather than conflicting central bank goals.* Indeed, the pursuit of price stability normally results in the provision of last resort liquidity.
- The LOLR should be transparent. The LOLR's objectives and operations should be fully acknowledged and widely announced to the public before any crisis occurs. Credible assurance of this kind reduces uncertainty about the LOLR's willingness to act, in turn promoting confidence

and thus generating stabilizing expectations that work to avert future panics and lessen the need for LOLR action. To minimize "moral hazard" problems, such advance announcement should indicate that assistance will not be provided to unsound banks but only "to the market" or to solvent, sound banks with good collateral, that are experiencing temporary liquidity problems. In short, advance widespread public notification should leave no doubt that insolvent banks will not be bailed out."

And here the second definition, by Stanley Fischer:

"The lender of last resort role of the central bank is associated with the prevention and mitigation of financial crises. A financial crisis is a typically sudden actual or potential breakdown of an important part of the credit system. Financial crises and panics have been taking place for (...). They are associated with a loss of confidence in the standing of some financial institutions or assets, and because the chain of credit is based on tightly interlinked expectations of the ability of many different debtors to meet payments, can spread rapidly, contagiously, through the financial system, and if unchecked, have significant effects on the behavior of the real economy. In economic theory panics can be modelled as cases of multiple equilibria, possibly dependent on herd behavior.

Surprisingly, there is no accepted definition of the term lender of last resort, and there are also important disagreements about what the lender of last resort should do. I will start with the more traditional Bagehot conception, as summarized and developed by Meltzer¹²⁴.

Meltzer states that

The central bank is called the lender of last resort because it is capable of lending, and to prevent failures of solvent banks must lend, in periods when no other lender is either capable of lending or *willing to lend* in sufficient volume to prevent or end a financial panic.

He lists (...) five main points, the first four derived from Bagehot:

¹²⁴ A. Meltzer, "Financial Failures and Financial Policies", in G.G. Kaufmann and R.C. Kormendi (eds.) "Deregulating Financial Services: Public Policy in Flux", Cambridge, Mass., Ballinger, 1986.

- The central bank is the only lender of last resort in a monetary system such as [that of the United States].
- To prevent illiquid banks from closing, the central bank should lend on any collateral that is marketable in the ordinary course of business when there is no panic. It should not restrict lending to paper eligible for discount at the central bank in normal periods.
- Central bank loans, or advances, should be made in large amounts, on demand, at a rate of interest above the market rate. This discourages borrowing by those who can obtain accommodation in the market.
- The above three principles should be stated in advance and followed in a crisis.
- Insolvent financial institutions should be sold at the market price or liquidated if there are no bids for the firm as an integral unit. The losses should be borne by owners of equity, subordinated debentures, and debt, uninsured depositors, and the deposit insurance corporations, as in any bankruptcy proceeding.

Meltzer's statement for the most part agrees with other formulations, but does not emphasize the view, summarized for instance by Humphrey (1975) and attributed to Thornton, that the overriding objective of the lender of last resort should be to prevent panic-induced declines in the money stock, *and that there is thus no conflict between its monetary control and its duties as lender of last resort*. In some more recent formulations this view has been extended to the precept that

- In the event of a panic, the central bank should provide liquidity to the market, but not to individual institutions."

2- The suspicion towards LOLR

LOLR has been constantly in use since "Lombard Street" was published (1873). Notwithstanding this, few formal models have since then been devoted to the explanation of its meaning and working. One reason to explain this phenomenon is that "[...] many, perhaps most, economists in this field believe that the provision of LOLR (to individual banks) is fundamentally misguided"¹²⁵.

¹²⁵ C.E. Goodhart, H. Huang, (1999), p. 3.

In the orthodox theoretical frame:

- a) money quantity has to be fixed;
- b) global efficiency is measured along the micro-founded theory of market efficiency (market efficiency thesis - MET);
- c) the market is judged to have better knowledge and information on the credit system than the central bank;
- d) linked to c) argument, the central bank is considered as external to the market, a state institution, e.g. most authors speak generally about it as "government". As the central bank is perceived as "government", and not included in the market as a bank - as it actually is -, LOLR interventions are mainly considered as an act of (mis-)government and a State-intrusion;
- e) no relevant credit system's failure problem is recognised, relevant disruptive cases are told to be mainly due to the insolvency of single banks, and often also to the use of monetary policy by the central bank,
- f) (il-)liquidity can be definitely solved inside the private market, through the inter-bank market, without any intervention by the central bank.

Such a context takes the economists' majority to consider moral hazard more important than panic or "financial contagion" as the main issue faced in supplying money.

Even if the aftermath of the "Asian Crisis" produced precious results in terms of awareness about the panic's relevance and of acknowledgement about the use of LOLR by central banks, dealing with this instrument and with Bagehot's work means dealing with one of the less understood and accepted tools in monetary policy. LOLR is perceived by the orthodoxy as disturbing and distorting market rules rather than guaranteeing them.

What LOLR –when interpreted as a part of Bagehot's philosophy–distorts is the orthodox theoretical frame itself. LOLR actually bases on the concept that the risk of panic counts much more than the risk of moral hazard, that liquidity has more relevance than solvency, that the costs of a general disruption of the system are higher than the cash burden arising to the taxpayer from the eventual rescue of a few insolvent institutions. In a word, that monetary instability matters, since it implies the same existence of the system.

The macro-sustainability¹²⁶ content in LOLR as a working-condition of the system contradicts the orthodox micro-efficiency context, and actually implies fundamental changes in the references of the theoretical frame. The reluctance most economists show towards LOLR reflects the difficulty to focus on these implications¹²⁷.

First, LOLR should be understood as an introduction to the autonomous market role of the central bank: the central bank is not just intervening in case of a "market failure", it is the only institution inside the market which can be made functionally involved in and responsible for liquidity. Second, LOLR actually implies the permanent opening of central bank's money supply.

We survey in the following some recent models devoted to explain financial crises. Among them, some are able to show the force of a panic, and the meaning of LOLR as the sole tool facing and stemming the panic. But even those studies, which deepen this matter, cannot reach Bagehot's philosophy – to which all studies more or less explicitly refer –, since they never trespass the theoretical border of an exogenously fixed money supply.

Therefore, their efforts are meant more to convince the economists' community to consider contagion more seriously, and to target those who typically refer to moral hazard as the system's overwhelming problem, than to use the tool, and unveil the new paradigm.

As a logical consequence of this myopia, those authors argue e.g. about a "probability coefficient" for *one* bank¹²⁸ asking for LOLR to be *illiquid* OR *insolvent*, which the central bank should consider before intervening. This way they fail to focus the main problem, namely the impossibility to compare the liquidity (macro) with the solvency (micro) concept, and the necessity to face the problem of liquidity and stability always from a macroeconomic point of view, even when regarding a few banks¹²⁹.

¹²⁶ We call "macro-sustainability" the complementary concept to "micro-efficiency", referring to the whole system.

¹²⁷ LOLR does not represent Bagehot's thinking at best, as we already said, but we shall accept this simplification and abstract from it.

¹²⁸ No liquidity problem can arise from one bank. The (il-)liquidity question can only be approached by analysing the whole banking system, or a relevant part of it.

¹²⁹ Bagehot writes about the danger of refusing only one good paper presented to discount.

Bagehot fully explains that insolvency is an irrelevant by-product while facing the risk of illiquidity. While solvency always includes illiquidity, illiquidity does not always involve insolvency. The accent is on the cause of crises: While orthodoxy is using LOLR "accidentally", Bagehot reveals that open money supply guarantees long term stability on a permanent, structural basis. The central bank's function to lend at request does not only serve to prevent the system's complete and unnecessary destruction in an imminent crash, but principally in order to make the system work on a day-to-day basis. We aim to clearly focus on the system's inherent instability, and to solve it by functionally integrating the central bank's role into the market, looking forward to find or construct a viable theory of contemporary financial markets.

2. Recent models of the dynamic of panics

We will survey recent studies modelling panic. Our methodology will be to consider their key concepts as a reference. Quotations have been sometimes selected also for their influence on the recent literature on the theme.

1- Liquidation costs

Allen and Gale¹³⁰: "One of the special features of the models described above is that the risky asset is completely illiquid. Since it is impossible to liquidate this risky asset, it is available to pay the late consumers who do not choose to early withdrawal. We next analyze what happens if there is an asset market in which the risky asset can be traded. It is shown that this case is very different. Now the banks may be forced to liquidate their illiquid assets in order to meet their deposit liabilities. However, by selling assets during a run, they force down the price and make the crisis worse. Liquidation is self-defeating, in the sense that it transfers value to speculators with negative insurance. In this case, there is an incentive for the central bank to intervene to prevent a collapse of asset prices, but again the problem is not runs *per se* but the unnecessary liquidation they promote."

¹³⁰ Allen, F., Gale, D. 1998, p. 1251.

Most models we surveyed treat illiquidity as a matter, which can be solved inside the market, or by special markets responsible for this role. The Allen and Gale's model evidences the possibility of market failures, and the strongly negative influence of a forced asset liquidation. It also points to the illiquidity cost as a relative cost, even if assuming the cost of liquidation being extremely high. But the absolute cost of a possible destruction of the whole system is not considered, panic destroying the system is not modelled since it is not even conceived. Central bank's intervention is taken for granted, without considering its implications on the model's core assumptions and mechanisms.

The central bank is therefore considered as "government", and it is said to be due to intervene just in case of "incomplete markets" or of lacking "interconnectedness between a failing institution and other (similar) institutions"¹³¹. A market trading illiquid assets is defined, without considering the central bank as a part of that market.

Bagehot explains that the central bank is the missing link inside the market structure, the special ("macroeconomic") market partner searched for, the (only) one able to liquidate illiquid assets.

2- Micro efficiency

As we often signalled, Bagehot's arguments deliberately applied to the best credit market of his time - the London one - being no way underdeveloped or inefficient, even compared to today's systems. It is fundamental to understand that Bagehot's rules are valid under maximum micro-efficiency criteria.

In the model by Huang and Xu¹³², liquidation¹³³ can be only experienced inside financial systems which generate soft-budget constraints (SBC). This model, like most of the models we examine, focuses on micro/structural elements of the credit system. It concludes that a panic occurs only under certain conditions of lack of efficiency and/or non-optimal credit system's structure.

¹³¹ In the same paper.

¹³² Huang, H., Xu, C., 1998.

¹³³ This is the term used in the article.

SBC economies are defined by Huang and Xu as:

- economies where an entrepreneurial project is financed by only one bank;
- where therefore bad projects are not stopped in time;
- information circulates not perfectly (the "lemons" problem);
- inter-bank markets for liquidity are inefficient,

while HBC (hard budget constraint) economies are:

- economies where projects are financed by many banks together;
- bad projects are stopped in time;
- information circulates rightly;
- inter-bank markets are efficient.

Under this view, decentralised banks, characterising the diversified financial systems of HBC economies, reduce contagion and allocate efficiently, to such an extent that no solvent bank ever suffers a run when facing a liquidity shock. No liquidity shock can become a run (no contagion) in a HBC system because of the right flow of information and of the institutional and strategic diversification inside the system's structure.

The difference between solvency and liquidity has not been analysed in its macro-context, and a partial micro-analysis of crises excludes every macro awareness of prevention. By out-defining the occurrence of a crisis in well-developed systems, it excludes the central bank from the model.

The adopted efficiency concept is the recurrent micro-criterion of rational market efficiency theory (MET). Also the arguments used in the model for distinguishing good from bad projects do not consider true macro causes for shifts in the debt schedule, thus being unable to consider macro causes for general credit crises.

3- Prevision and information

In 1983, Diamond and Dybvig¹³⁴ published a model applying to the case of one bank's probability to lose all its deposits. Depositors have been divided between early and late consumers, where early consumers withdraw deposits at period 1, and the others do not withdraw before period 3. The model generates a Pareto-efficient

¹³⁴ Diamond, D., Dybvig, P., 1983, p. 401-419.

market equilibrium, but this does not provide perfect insurance against liquidity shocks, since, as the authors affirm, complete contingent markets do not exist, given the limited observability of the system's status ex-ante.

The hypothesis of perfect prevision is the – unrealistic – element which would permit modelling an inter-bank market able to well-perform under illiquidity, thus defining away both the panic and the central bank's role.

Under realistic hypotheses, even when – like in this model – only one bank is considered, when all its late consumers simultaneously withdraw, borrowing from the inter-bank market becomes impossible and too expensive. In an uncertain world, the role played by the central bank is indispensable.

The solution given by Huang and Xu is, as we saw above, to model an inter-bank market well-performing when information is rightly diffused¹³⁵: "In an HBC economy with symmetric information among bank managers, a bank run happens when a bank faces both technological shocks and liquidity shocks; however, there is no possibility to have a bank run contagion. [...] An HBC economy will not experience bank run contagion simply because with symmetric information among bank managers, the inter-bank lending market will be able to provide liquidity to all illiquid banks that are not hit by technological shocks. As a result, a bank run does not occur to these banks in an HBC economy."

Their stringent hypotheses require for the HBC system to be, for every considered time t , absolutely sure of having stopped all bad projects, absolutely sure that – since banks produce only good projects – depositors will never overreact to whispers. Moreover, the system must be absolutely sure to avoid every external macro-shock, which might eventually be able to change an ex-ante good into an ex-post bad project, to change one solvent liquid bank into a solvent illiquid bank, or even – referring to Bagehot – to change all solvent liquid banks into solvent illiquid banks.

¹³⁵ p.21.

The model by Goodhart and Huang¹³⁶ focuses on contagion and positive estimates the occurrence of "market failures", directly confuting the liberal approach, which would prefer to leave to the market the function of discounting, thereby restricting the central bank's function to general open market operations (OMO)¹³⁷.

On the other hand, the model's solution is based on the hypothesis that the central bank defines, for each liquidity request, an operational probability for the case of illiquidity or insolvency of the requesting bank. We remember Bagehot advises to be rapid in lending, without waiting for analysis of causes, due to the rapidity of contagion.

One interesting feature of the model is that this probability coefficient is considered as not exact, since the authors affirm the impossibility to understand the bank's status ex-ante. This model foresees a cost for the intervention relating to the deriving decision both in the case the central bank acts through LOLR in order to rescue an insolvent bank, and in the case it uses OMO to support an illiquid bank.

A second interesting model feature, the cost for not rescuing from illiquidity (through LOLR) is quadratic, while the cost for rescuing an insolvent bank, i.e. for using LOLR in the case of insolvency, as a burden on the taxpayer, is proved to be linear, therefore much lower than the former. This is due to the macro-consideration of the effects of contagion¹³⁸: "[...] in our view LOLR has been primarily driven by macro, rather than micro, concerns. It is the purpose of this paper to model these."

The authors continue¹³⁹: "Our main claim is that the liberal position is predicated on a certainty equivalent postulate, that is that the central bank is just as confident and knowledgeable about the optimal level of open market operations, high-powered money and aggregate money stock after the onset of bank failures and panic, as it would be if the panic was prevented. We find that, admittedly

¹³⁶ Goodhart, C.A.E., Huang, H., 1999, p. 1-33. H. Huang is the same author of the previously mentioned article on contagion, and surprisingly, he develops in this work the macro context which was precluded in the former article written with Xu.

¹³⁷ As we saw in Ch.1, a Bagehotian policy can be set throughout the whole central bank instrumentarium, the discount window is only one of those tools.

¹³⁸ P. 5.

¹³⁹ Idem.

implicit rather than explicit, position difficult to accept. When failures occur, and people start to panic, their behaviour is likely to become far less predictable. Policy mistakes become more likely."

4- Central bank

Goodhart and Huang do not consider the central bank as part of the market. It is Government, and LOLR is exerted as a governmental action¹⁴⁰: "Although illiquid, rather than insolvent, they were not getting help from the market, so the Bank of England assisted them." Illiquidity is the central bank's responsibility.

Otherwise, the authors provide a description of the role of the central bank - more from the side of historical experience than under a coherent theoretical understanding -, as the institution tending to complete the market with information collection and coordination¹⁴¹, main elements to judge market rationality and completeness: "No one commercial-counterparty can single-handedly assume the credit risk, and there is no incentive for a single commercial bank to take on the time, effort and cost of coordinating the exercise of sorting out the problem. The Bank of England would, we believe, tend to argue that most of its historical LOLR actions have primarily involved the provision of additional information combined with a coordinating role to encourage private sector financial institutions to resolve the problem, primarily by themselves [...], as was also exemplified in the recent case of Long-Term Capital Management."

This argument sketches a frame able to start defining an efficient macro-structure of the financial system, and its functional parts. Our model will show that the central bank plays a unique functional role in the financial market, subsuming the information collection and coordination functions to the broader role which can be defined as "liquidity provision".

Otherwise all the surveyed models, which we selected for their significance, adhere to the orthodox theory frame. The micro-efficiency criteria imposed by the QT oblige most authors to define

¹⁴⁰ p. 4.

¹⁴¹ p. 4.

certain and limited costs for bank failures, since contagion is supposed to have a limited extent in the complete, rational, rightly informed and well-coordinated markets they assume. Equilibrium, whether unique or cyclical, is reachable even during a run - also because normally the case of one single bank is modelled. Contagion has a limited scope, since its costs are mostly valued after having experienced a central bank intervention, criticised even if it rescued the system from panic.

The mainstream theory strives for a micro-foundation of macro phenomena, whereas we search for a macro-foundation of micro¹⁴².

Why does the model by Goodhart and Huang not go further, if it is close to consider an integration of the central bank into the market; if it focuses specifically on macro-elements and recognises the macro-functions of LOLR; if it understands and models the high (social) costs of contagion and liquidation; if it can define moral hazard as an "unpleasant by-product of contagion"¹⁴³? Why does it insist on the need of evaluating a "probability for illiquidity vs. insolvency", while both Bagehot and experience call for a sudden and decided intervention in every case commercial banks ask for money? Why doesn't it consider the event of a complete credit system destruction not even this possibility, if this is the case in absence of a LOLR provision?

The model by Goodhart and Huang finds its limit for being marked with the sign of orthodoxy: the central bank's goal continues to be the optimal exogenous quantity of commercial bank's deposits, the high powered money ratio on total money quantity.

The limit lies in the reference to a fixed amount of money supply. Otherwise, yet there is no alternative theoretical frame able to build a stable system around the element of open money supply.

¹⁴² H. Riese.

¹⁴³ P. 26.

5- Moral hazard

This is the concept, which has been mainly used to criticise LOLR interventions by central banks: commercial banks are said to take excessive risk when they know the central bank will rescue them.

It is interesting that Goodhart and Huang, although considering this concept and specifically modelling its effects in their work, actually reverse the typical meaning of moral hazard. They in fact provide evidence for a cyclical dynamics between commercial banks choosing less risky profiles, and therefore being rescued by the central bank, versus the opposite dynamics of commercial banks tending to choose riskier credit profiles, therefore having to suffer a failure.

6- Overreaction, volatility, panicked actors

Rigobon¹⁴⁴ studies investors' overreaction as a result of a learning problem, where the informational content of signals changes through the business cycles.

Avery and Zemsky¹⁴⁵, Calvo and Mendoza¹⁴⁶, and Chari and Kehoe¹⁴⁷ all study volatility of financial markets as herding behaviour of investors, which has a theoretical foundation by Banerjee¹⁴⁸ and Bikhchandani¹⁴⁹.

Stiglitz¹⁵⁰ and Radelet and Sachs¹⁵¹ study the run of panicked investors on an economy like the run by panicked depositors on a bank.

Can modelling irrational behaviours or different rationality criteria possibly lead to different results? We need a different Market Rationality Theory underpinning the role of a central bank in Bagehot terms.

¹⁴⁴ Rigobon, R., 1998.

¹⁴⁵ Avery, Z., Zemsky, P., 1998, p. 724-748.

¹⁴⁶ Calvo, G., Mendoza, E., 1995.

¹⁴⁷ Chari, V.V., Kehoe, P., 1996.

¹⁴⁸ Banerjee, A., 1992, p. 107.

¹⁴⁹ Bikhchandani, S., Hirshleifer, D., Welch, I., 1992, p. 51.

¹⁵⁰ Stiglitz, J., 1998.

¹⁵¹ Radelet, S., Sachs, J., 1998.

7- Complete markets

Allen and Gale¹⁵² are among the authors who study the phenomenon of market incompleteness as a cause for financial contagion. Other causes they consider are the circulation of incomplete information, the interaction between currency markets and the banking system in times of instability (external macro-shocks).

Their model is based on the assumption of uncertainty between the depositors, which generates a demand for liquidity. The banking system can efficiently intermediate deposits, its situation underlies otherwise a fragility, due to the possibility for the occurrence of a financial contagion of such a measure, that the (interregional) interbank market cannot satisfy the request for liquidity. The modelled (interregional) interbank market is unable to create liquidity, but it is supposed to avoid contagion by joining and coordinating its various (regional) parts.

The authors are keen to offer with the model an as far as possible efficient tool, which in order to be efficient (in the orthodox sense) must also be detailed in its micro-economic structure. But just as all the other micro-solutions, which apply only under very strict or non-realistic conditions -e.g. perfect information, market completeness, perfect ex-ante observability, perfect prevision, one-bank case- even when modelled with extreme care, cannot assure the system's perfect functioning they promise.

Macroeconomic uncertainty, whatever its additional micro-components, must be faced through macro solutions, to support the system against the event of a sudden, unexpected, generalised demand for liquidity. Actually, those models do not aim to increase market efficiency, but to hide an element, which would really complete the market, otherwise under a different theoretical frame. What most authors are trying to avoid is not only the crisis, but primarily central bank intervention, which is assumed to be market external, and to cause an unnecessary (cost) burden to society.

Bagehot's money market management approach clarifies that

- the efficient central bank is part of the market, i.e. only a central bank which is part of the market is efficient, and

¹⁵² Allen F., Gale, D., 1988a.

- an institution assuming this role has to be characterised by the functional features caring for successful central banking, i.e. it has to i) be backed by public authority, since money is a macro-variable and a public good, and ii) provide for liquidity.

A market integrating such an institution can be called complete. Its completeness does not derive from any efficiency measure, which does neither imply completeness nor avoid illiquidity. Its completeness comes from the compensation of the financial markets' imminent instability through a permanently integrated stabilising structure and management method.

8- Coordination problem and policy transparency

Morris and Shin¹⁵³ apply the method of Value at Risk (VaR) analysis to the case of financial turbulence, in particular they apply this methodology to check the effects of an asset price reduction due to reduced trust by the creditors of a borrower in distress, a situation called "coordination failure".

While their innovative methods and results can surely help to better ex-ante value the effective asset's risk, considering the crisis dynamic process during a market turbulence, the authors fear with lucidity the risks of any excessive stretching of their results as a solution of the coordination problem¹⁵⁴: "[...] the current state of the art does not make any explicit provision for coordination failure. By quantifying the impact of coordination failure, it is possible to formulate a framework for credit risk analysis which addresses some of the 'systemic' issues."

Important are their results in terms of evaluation of policy transparency, i.e. improving market's information to mitigate coordination failure: "The effect of improved information on the efficiency of the outcome is ambiguous at best. This raises some important issues in the policy debate. When calling for improved transparency, it is important to be clear as to *how* the improved information will improve the outcome. The mere provision of information is unlikely to mitigate coordination failure. Rather, the institutional backdrop

¹⁵³ Morris, S., Shin, H.S., 1999.

¹⁵⁴ P. 4.

will be important in the way that transparency affects the market outcome. It is perhaps no accident that instances of successful co-ordination by creditors have had a forceful facilitator organising the bailout - such as the New York Fed in the rescue of Long Term Capital Management in 1998, or the U.S. Treasury in the aftermath of the Korean financial crisis of 1997/8. Instances of voluntary co-ordination when there is no such a facilitator are much more difficult to find."

This discussion rises serious doubts about the ability of the market to solve the illiquidity or prevent the panic by itself through improving internal information, or by leaving to the central bank the sole "governmental" role of diffusing information.

9- Fragile financial connections

Lagunoff and Schreft¹⁵⁵ create a model to test the financial fragility degree of an economy, based on the hypothesis that agents forge financial linkages by interrelating portfolios and payment commitments. Two are the possible financial crisis types breaking inside their modelled equilibrium: one is characterised by gradually spreading contagion, the other occurs instantaneously when forward-looking investors preventively shift their wealth into a safe asset in anticipation of the contagion affecting them in the future. The fragility of a system can be judged through the velocity of the breaking of its financial linkages during the crisis.

This model expresses a view, which is near to Bagehot's approach, since the concept of relationship very much relates to that of trust. The modelled economy shows an inherent fragility by pointing on the multiplicity of the financial linkages which agents create during the continuous development of financial systems, thus increasing the credit system's complexity. This explains why a wider developed financial system is more (and not less) fragile than a less developed one, as already pointed out.

The linkage-multiplicity is created through the consideration of a multiplicity of anonymous agents, investors and entrepreneurs relating to finance and executing projects, where both the hypothesis

¹⁵⁵ Lagunoff, R.D., Schreft, S.L., 1998.

of multiple agents and the one of anonymous agents are unusually realistic in the considered frame.

The number of linkages breaking after an external shock, and the velocity and spreading of this breakdown (which finally determines the crisis and panic) defines the degree of fragility in the examined economy. Since the model teaches that the severity of a crisis is randomly determined, any usual ex-post evaluation will not be relevant to draw conclusions about the economy's fragility. The authors try therefore to define criteria for an ex-ante evaluation of the fragility degree¹⁵⁶: "Under the equilibrium strategies, investors remain diversified and linked if the amount of time that has passed does not exceed a state-dependent threshold. That threshold date is the first date at which the economy experiences a crisis caused by individuals simultaneously shifting to the safe asset. The earlier that date is, the more fragile is the economy. That date depends on the features of the environment interacting to determine which portfolio investors prefer. The utility function and degree of risk aversion, the discount factor, the rates of return on the various assets, the riskiness of the assets, the degree of diversification possible, and expectations about other investors' strategies. The use of an ex-ante notion of fragility thus yields an unambiguous measure of fragility."

The evaluation of the literature's contribution to financial crises understanding is well focused¹⁵⁷, the authors explain that this literature is made of

- a) a wide number of models which do not allow for contagion, they explain crises through herd behaviour, asymmetric information or sunspots;
- b) a limited but growing number of models allowing for contagion, but mostly lacking specific financial factors;
- c) few papers (including this one) bridging these literatures, modelling contagious financial crises.

Lagunoff and Schreft's paper further differs from the others in the third group, for modelling i) anonymous agents ii) with foresight, and for offering iii) a clear focus on the "fragility" matter.

¹⁵⁶ p. 3.

¹⁵⁷ p. 4-6.

Considering fragility takes to theme of the breakdown of equilibrium through the crisis. The possibility for an equilibrium to exist and resist in a fragile economy even under foresight, is said to be due to the advantages the investors (commercial banks) achieve through their permanence in the position of "interior investors"¹⁵⁸, i.e. of investors who actively and intensely engage in the credit market. Strong relationships curate fragility.

Comparing with Huang and Xu, Lagunoff and Schreft can model the presence of financial fragility also in an economy where projects are multi-financed, since fragility is supposed and modelled to lie in the linkages themselves, therefore deeply internal to the financial structure of the economy. The authors never pretend to explain the origin of panics through inefficiencies.

The model does not directly consider any Government or central bank intervention. It can therefore model the panic in all its extent, but not its solution. Some conclusions are drawn at this regard. The assumption of limited information and communication lead to market incompleteness. In such an economy, mutual funds can enhance risk-sharing, and a stabilisation gap can be filled by the "Government"¹⁵⁹, i.e. the central bank, playing the lender of last resort: "The Government can serve this role even if it has the same information as private agents about the chain structure and spreading of defaults; all that is necessary is for the government to be known to all agents and able to broadcast announcements. Given such capabilities, if the Government announces after returns are realized at date 0 that it will immediately begin serving as a lender of last resort, it can bring about a Pareto-optimal allocation [...]." As also Bagehot meant, this kind of knowledge is about stabilising markets, not about efficient information on credit failures.

Further relevant issues are raised when considering the case for the government selling insurance against investment losses from contagious defaults¹⁶⁰: "Economies with an insurance equilibrium should be less fragile than those without because the insurance essentially allows complete diversification: it connects each investor to the government, and through the government to all other investors in the economy. The insurance, of course, is just a type of tax-

¹⁵⁸ See p. 23 ff.

¹⁵⁹ P.39.

¹⁶⁰ ibidem.

transfer scheme that brings about a Pareto-superior outcome. Solving for an insurance equilibrium remains the subject of future research." In other words, in order to be efficient, the insurance must regard a policy intervention, comparable to the LOLR also in terms of cost burden for the citizens, and must be exercised by an actor (like the central bank) invested with a macroeconomic (i.e. coordination) role.

This kind of equilibrium is not to be confused with a solution to the immanent market instability. The authors do not give political advice about rules and tools for central banking, nor about the role of central banks as the sole liquidity providers.

Conclusions

By recognising their relevance, still we cannot find a model of panic comparable to Bagehot's work, i.e. reaching a true macro-framing of the crisis theme. The study by Lagunoff and Schreft can be appreciated for deepening the fragility matter, especially with reference to the orthodox hypothesis of coincidence between market efficiency and market liquidity. Otherwise it doesn't include a macroeconomic solution.

Hereafter we present our own attempt, certainly only a first step into this complex matter, to build a model of an internally unstable financial market, whose instability is due to the dependence from the most "sure" asset, the means of payment.

The model embodies an open money supply and an interest rate policy able to "complete" and stabilise the credit market.

3. A model inspired by Bagehot

1- General assumptions and features

Structure assumptions:

- be a macro model when considering contagion, i.e. confronting with (credit) markets' incompleteness and imperfection at the

macro level, even if perfect efficiency at the micro level is hypothesised;

- deal primarily with financial factors: in our case the model represents a simplified financial system, optimised for efficiency and hierarchy, consisting of a money and a credit market;
- integrate the central bank into the market, i.e. focus on the market function of this peculiar bank;

theory/ policy assumptions:

- substitute LOLR with a functional and stable intervention of the central bank as the only liquidity provider in the market: the integration of the central bank (money market) exerts (credit) market macro-completeness and stability;
- open money supply to the requests of money demand, as the fundamental manoeuvre to provide stability;

assumptions regarding the environment:

- credit/financial system is considered best developed, efficient and solvent; perfectly in line with Bagehot's Lombard Street we hypothesise the highest market development, extension, solvency and performance;
- involved actors, i.e. commercial banks and depositors, are assumed to show foresight, to be anonymous, to form a multiplicity and to be competitive, to further assure efficiency conditions;
- nonetheless the credit market is characterised by limited information and communication; it is inherently unstable (with the central bank's role as liquidity provider as a stabilisor).

Fundamental differences with orthodox models/the Bagehotian is a macro-model because:

- its efficiency and behaviour are judged under macro-criteria: general need for liquidity under uncertainty; banking system's reactions and needs representing the whole system, also when only "one bank" is involved; contagion and agents' overreaction under foresight; efficient financial interaction and role distinction between entrepreneurs, banks and central bank (where e.g. the central bank lends only to commercial banks and never to individuals);
- it presents a stable integration of the central bank into the markets, in terms of role definition and autonomy;

- it focuses on the inherent and absolute financial fragility. This fragility, arising from the existence of an unstable demand for the unique means of payment, creates a peculiar form of demand-pushed scarcity, which is solved (Bagehot's solution) through a) the stable integration of the central bank in the market applying b) the money market management adequate to monetary stability, c) stability being the only monetary policy goal;
- it shows the absolute costs of illiquidity, i.e. the medium or even long-term destruction of credit markets and therefore of the monetary economy;
- it opens money supply.

2- The model

Money market:

1) money demand $M^d = M^d (+ I, + (Cr^d - Cr^s), - i_{CB},)$

2) money supply $M^s = \mathbf{M}$

Credit market:

3) liquidity preference $I = (I, + (M^d - M^s), - i_{CB},)$

4) credit supply $Cr^s = Cr^s (- I, + i_{CB}, + Cr^*)$

5) credit demand $Cr^d = Cr^d (+ I, - i_{CB}, + Cr^*)$

6) total credit quantity $Cr^d = Cr^s = Cr^*$

7) $Cr^* = Cr^* (v \times (\mathbf{M} + Z))$

8) $v = v (-I)$

Estates:

9) money possessed by privates deposited in banks $Z = Z (- I, \mathbf{b})$

Existence and stability condition:

10) Money supply equals money demand $M^s = \mathbf{M} = M^d$

(Secondary stability and) Equilibrium condition:

11) Interest rate paid on the money market equals the liquidity preference and the interest rate expressed on the credit market
 $i_{CB} = I = i_{CR} - \mathbf{a}$

Frame:

12) Income: $Y = Y (+ Cr^*)$

LEGENDA:

- exogenous variables are **bold**; i_{CB} and \mathbf{M} depend from policy, a part of I , called \mathbf{I} (I bold) is exogenous;¹⁶¹
- the sign of the variable's influence is indicated with + or - right before the variable itself.

The model is partial, it considers only the financial market. Equation 11) defines the considered conceptual frame, therefore it is not included in the solution.

Nine are the endogenous variables considered (M^d , M^s , i_{CR} , Cr^d , Cr^s , Cr^* , Z , I , v), and nine (1) to 9)) the relevant equations, since the 10th is a specification of the 2nd and cares for the system's existence (under Bagehot rules), and the 11th is the equilibrium condition. The two exogenous variables (i_{CB} , M) represent the central bank's tools. The quantity of Money supply M , is exogenous and subject to the central bank's decision, unless the central bank accepts its role as a market participant and issues at the banking system's demand, as expressed in Eq. 9). A part of the "liquidity preference" or "premium" I , which expresses the most genuine "trust" element, is a given parameter in the model, defined on a pure psychological ground. v is a multiplying factor of credit, expressing also the liquidation price of credit on the market.

The "virtuous dynamics" foreseen by the model is the following:

I rises $\rightarrow \rightarrow Z$ sinks (hoarded), Cr^s sinks, v sinks, M^d rises $\rightarrow M^s$
 $+ i_{CB}$ (money market management) $\rightarrow M^d$ stabilises $\rightarrow \rightarrow I$ stabilises \rightarrow
 Z rises (hoarded money back to zero), Cr^s rises

¹⁶¹ S. below in this paragraph

The model's environment

The directly considered actors are:

- the central bank, i.e. the liquidity provider;
- the commercial banking system, i.e. the credit intermediaries and money distributors;
- the private money-stock owners, i.e. a simplification for the saving class;
- the entrepreneurs' class, i.e. the investors.

Only a very peculiar form of deposit has been conceived in the model, otherwise creating no relevant difference in commercial banks' role as the institutional intermediaries between the central bank, the saving class and the enterprises.

The central bank is the system's net creditor, it emits the legal tender, money. It is the sole institution which, given its institutional and market responsibility, is able to emit paper notes as the only universally accepted means of payment. Means of payment signifies the priority, it means that no risk is considered superior to the one to lose the own money.

The credit market is made up of commercial banks and private estate or asset or wealth owners. Credit lets income originate, private families (estate owners) hold it in form of money, or deposit it at commercial banks, thus letting it flow back to entrepreneurs in form of credit. Money-stock owners accept to deposit their money into the vaults of commercial banks, e.g. in order to avoid theft. In change they don't receive any remuneration in form of interest rate payment, but they sign a contract assuring the prompt refunding of their deposited money on demand, and receive a cheque book, which they can use for the exchange on the market for goods.

Considering the stock of money held by estate owners allows us to simplify the market for deposits. This eventually reduces the multiplication (v) of credit on the money base, and the consequent risk for the wealth owners, but doesn't change the realism of the model. Since it is the intrinsic instability of credit which is to be investigated, - should the adopted simplification increase the structural stability, the notwithstanding incidence of panic would reinforce the model's validity.

Commercial banks are in charge with a double role:

- borrow money from the central bank, given their institutional role, and bring it into circulation, and
- dispose of money for supplying credit.

The whole money demand arising inside the economy has to pass through commercial banks. Risk and term transformation are also carried on by commercial banks, so that they cannot be reduced to the role of branches of the central bank. The money stock flows into the credit market, where commercial banks operate with an interest rate. This rate is determined by the supply and demand curves on the credit market, and is influenced by the central bank rate as well.

Private wealth owners have no access to the central bank. Their financial wealth goes into commercial banks' vaults or is hoarded.

The entrepreneurs-class is for simplicity represented only through the credit demand curve, and do not coincide with the estate owner class, thus allowing to represent a (very) simplified vision of the distinction between a saving and an investing class.

3 - Main features of the model

The model's dynamic dramatically changes given the existence of a limit to the availability of money.

Under validity of equation 10), the in the economy already existing money "stock" (Z), not to be confused with the money newly issued in the considered period (M), will be completely lent by the wealth owners when the interest rate set by the central bank equals the liquidity premium.

The liquidity premium is not an interest rate or a price; it represents money demand dynamics and the dynamics of trust. Therefore the liquidity premium will first be determined by the satisfaction of money demand through the supply, and only secondarily through the adjustment of the money market interest rate. The weight and hierarchy of the two monetary policy variables have been evidenced through Eq.7).

The classical portfolio calculation based on the interest rate structure applies only if a continuous exercise of the function of liquidity provision by the central bank is assured. If not, rates are irrelevant.

With l (liquidity preference) and v (credit multiplier) the main elements of the system's instability are expressed, i.e. the priority of money, the risk intrinsic in trust-based credit, linked to the positive multiplication of credit on the money base and to the negative spiral of liquidation prices due to the imperfection of the credit market, together with the impossibility for commercial banking to independently issue money.

4- The money market

The model begins with the demand for money, originating in the credit market. The general demand in the system is collected "via" the commercial banks' intermediation.

Money supply is per se exogenously defined, being set by policy decision, it can therefore a) be fixed at a given (ie varying in percent of income or similar) quantity of money; or b) vary in amount, to satisfy the banking system's demand. Also the leading interest rate on this market is fixed exogenously by the central bank.

Liquidity preference cannot be directly measured. Therefore the central bank issues money until money demand has been stabilised, and raises its interest rate according to the amount of money it issues.

5- The credit market

Equation 3)

Liquidity preference (Equation 3)) belongs, just like in Keynes' work, to the implicit calculation by the lenders, who perceive the risk of lending their money possessions on the credit market. It expresses the trust element guiding every private actor's decision to hoard money or to lend it. The effects of this decision, which takes place on the credit market, are directly felt on the money market, and induce a change in money demand.

Equation 9) describes as an endogenous variable the money amount which private wealth owners decide to make available on the market, depending on their trust. The choice is between “depositing” the whole money stock or hoarding it all, and it depends on the perception of the risk to receive money back from banks. The “other” advantages of holding the money in bank’s vaults has been defined through the exogenous variable **b**. It must not surprise if private money owner deposit it without remuneration, this hypothesis is absolutely realistic, since the risk of panic is not evaluated unless the central bank refuses to issue.

Liquidity preference is the element containing the potential to induce a panic: it consists of two parts, directly linked to each other, the first is an exogenous, psychologically driven “trust” element. The second eventually arise through unsatisfied money demand, i.e. under the hypothesis that Eq. 10) doesn’t apply.

Liquidity preference (negatively) affects also (Eq. 8)) the credit multiplier v , since a sinking liquidity preference raises the trust for new credit. V exemplifies, in the opposite case of rising liquidity preference and money demand, the fall in credit liquidation prices when credits have to be suddenly sold on the market to pay back depositors.

Money is the sole means of payment, thus portfolio-calculation is based primarily on the availability of money on the market, which determines the same market’s existence, and only secondarily on the height of interest rates on the market, involving considerations regarding the system’s equilibrium. Even if money is lent on demand, since credit grows above the money base ($M+Z$), when liquidity preference rises the risk of not receiving back the own money possession increases. The risk comes from the reduced value of the credit assets in case of a sudden liquidation of credit. When money demand increases and the central bank does not compensate it, the credit market is compelled to liquidate its investments, and their prices will fall¹⁶². The fear of the wealth owners not to get back their money provokes the rise in money demand and the panic.

¹⁶² We give with v a measure of this factor.

Equation 7)

Our representation of the production and reproduction of value in the credit markets aims to signal its monetary roots, especially when the use of money disappears from the routine, as it happens in well-developed monetary systems.

Equation 7) represents the credit market budget edge; it can be considered together with Equation 3) the core of the model. While it resembles the usual monetary base equation, it expresses instead that the credit market is built on money, which cannot be independently created by commercial banks. It makes us understand how a stop in the central bank's money supply destroys the credit market.

The wealth owners suffer a risk in entrusting their money to the banks. When they perceive that there is a reduction in the availability of money, they will retire all their funds from the market, and hoard their money, which is the sole recognised means of payment in the system. They cannot be made responsible for macroeconomic foresight and support.

It is the central bank, through its money issue and interest rate which must favour credit market stabilisation and the feeding of money into the banking system, thus also securing the optimal allocation of resources and the connection of the Savings and Investment variables. Therefore Equation 10) closes the system and Equation 11) provides for the monetary budget constraint.

Equations 4) to 8)

Credit demand arises from entrepreneurs willing to fund their projects. The supply comes from the banks, and it is fed through private money supply (by the wealth owners) plus money issued by the central bank. Both sources of funds are debt forms, the central bank requires an interest rate, the private suppliers require a re-funding at demand. To understand financial fragility and the market behaviour in case of illiquidity the credit market curves are modelled to depend on "liquidity preference" (Eq. 4 and 5). Given money priority, the liquidity preference has been modelled in order

to move rapidly in occurrence of a shock, multiplying the mistrust effect of an eventual unsatisfied money demand, shifting both curves on the credit market, and annulling the credit supply curve.

The model only shows positive values, when money demand on the market is satisfied: the modelled economy completely breaks down under a liquidity crisis and no private money (Z) is provided in case the market feels that money is limited in quantity. In particular the effect of a shock on the liquidity preference acts positively (plus sign) on the demand for credit (Eq. 5), raising it without limit, and negatively (minus sign) on credit supply (Eq. 4), reducing it to zero. This is what we understand under fragility of the system.

Equation 6), credit market equilibrium, applies only when the money market satisfies money demand, as we discussed in Ch. 3. This is the case since the market's equilibrium is influenced by liquidity preference, which makes the two curves diverge in case of false money management, thus moving also the other components causing panic (v).

Equation 8) is a multiplier, an exponential factor acting on credit; it reflects the trust level in the system and the value of credit. It indicates the factor of growth of commercial credit, and – when it falls – the loss of value suffered by a sudden liquidation of credit assets, in case the central bank doesn't fulfil its role, lending freely.

As we saw in Equation 7), when liquidity preference rises and money demand is not satisfied, the private money (deposit) supply to the banking system is not made available any more. Without open money supply by the central bank, the credit market would lose all its funds. It cannot exist anymore, since the supply curve disappears, impeding every kind of transaction and even the formation of a price.

6- Income definition

Equation 12) expresses the global income in a monetary economy as depending on credit. This helps to understand the real effects of a financial crash on a monetary economy, and that the width and

depth of the credit pyramid is responsible for the level of development.

7- Existence and equilibrium conditions

Equation 10) has been defined as the "existence condition" of the system, while Equation 11) states the equilibrium condition. This is the case, because Equation 11) will not apply, if Equation 10) does not exist: there is no model without Equation 10).

Existence and equilibrium of a monetary system are in the hands of monetary policy, and no interest rate policy is effective if money demand is not satisfied.

The relation to the Bagehotian rules is a direct one:

- a) open money supply, filling the permanent but variable gap between the demand and the supply for credit;
- b) central bank's ability to fix adequately its price for newly issued money, thus correctly influencing the rates on the credit market.

In equation 11), the exogenous variable **a** expresses the intermediation costs (including risk and term-transformation) held by commercial banks, justifying the difference between the rates on the money market and on the credit market.

8- The dynamics of the model

The model has been built to demonstrate the disrupting effects of rigidities in a monetary system, i.e. in a system characterised by liquidity preference.

It stresses the concept that the credit system cannot exist without money because of its inability to realise the nominal prices of credit during a sudden liquidation, and that this risk, if due to illiquidity, i.e. to a reduction of trust in the system, has to be compensated through monetary policy. The central bank's role is to complete the market, by playing a macro-systemic role. The priority on the risk of money-disappearance comes from the means of payment function of money.

The essential hurdles to stability come when an unforeseen demand for money arises and the central bank is put under pressure with the request for legal tender. The origin of a crisis is exogenous to the money market, a bank run due to insolvency is a usual cause. Modelling the origin of a crisis through its most reliable index, liquidity preference and money demand increase, helps to understand its high probability to happen without the right central banking. A non-routine rise in liquidity demand is not a rare phenomenon, it becomes a crisis when money demand is not satisfied, and we normally don't see its effects because central banking does usually apply the right money management.

Any uncertainty about the further availability of money from the central bank causes a further rise in liquidity preference. The possibility to be refunded for the money entrusted to the banks without suffering losses gets more remote, since the credit system has to liquidate its investments, and prices fall rapidly. Wealth owners will not be ready anymore to hold their money in commercial banks' vaults, and withdraw it.

The central bank can choose between three possible options: a) stopping the supply of money; b) issuing the demanded money at an unvaried money market interest rate; or c) satisfying the risen demand for money at an interest rate, which it sets adequately high.

Under the first hypothesis the credit market has to suddenly liquidate investments, which causes a fall in their values, and the fear of wealth owners not to be able to get their money back. The deposits will be demanded by the owners, commercial banks go bankrupt, the credit market disappears. Credit interest rates rise without limit. Money disappears, so that the system experiences the status of "money disappearance in instability".

The system goes bankrupt, and from the bankrupt-status rapidly into the barter-economy status, which does not represent in this sense any alternative equilibrium status, but - on the contrary - surely the complete collapse of every modern economic and financial system. The described scenario will rarely become true, since most central banks hold the money supply open.

Under the second hypothesis, i.e. when the central bank satisfies money demand but doesn't appropriately rise the cost of money, the liquidity preference shows a disequilibrium value, higher than the equilibrium value. Since the price set by the central bank is lower than the liquidity preference, commercial banks will continue borrowing money. Under disequilibrium, their portfolio calculation will be wrong, and funds will be incorrectly allocated. Price inflation can arise. Different from the banking-school hypothesis, inflation would arise also if money would be issued against sound credit bills. Different from the currency school hypothesis, inflation wouldn't arise because of the open money supply.

Liquidity preference will rise, and a devaluation of money will be experienced. But anyway the monetary economy would continue existing, thus explaining the priority of the money stability goal (open money supply) over the price stability goal (fixed money supply).

Under the third hypothesis, money demand and liquidity preference will stop increasing. The credit system is not obliged to liquidate its investments, the fear of the wealth owning depositors to lose their possessions will be defeated, central bank money repairs the damage done by the rise of liquidity preference. The open discount window, or whichever other money market tool a central bank prefers to apply in order to fully satisfy money demand, will influence the rate of liquidity preference (expressed by wealth owners and commercial banks), stopping its ascent. The higher central bank interest rate, at which the demand for money is satisfied, contributes to stabilisation.

As soon as private money is lent again on the credit market, the extraordinary demand for money decreases and flows out of the credit market back to the central bank. At this stage also the central bank's interest rate can be lowered, following the decrease of liquidity preference due to regained and rising trust on the credit market.

9- Concluding remarks

What we learned about the credit system is that central bank intervention is not misguided when its role focuses on instability, rather than on moral hazard. The target of the central bank's intervention is the banking system. Runs are caused by its immanent illiquidity and not by micro-inefficiency. The false focus on micro-efficiency creates the danger of an out-definition of financial panics and extraordinary demand in well-developed financial markets. No credit market is able to finance a general status of illiquidity, no inter-bank market can rescue the credit market. The credit market as a whole depends on the central bank's function for its liquidity.

Since the central bank permanently manages the money market, thus acting under every aspect as a market player, we do not distinguish between "market" and "government" but between a "credit" and a "money" market. The two markets together form the "financial market", which as a whole includes both the public and the private component of finance, and can be called complete.

Our model stresses the priority of liquidity preference, which characterises money as the sole means of payment and which is guaranteed by the correct procedure of liquidity provision. Given the money function in a monetary economy, the role of the money market manager is the fundamental element guaranteeing stability. Its institutional vest can change, as e.g. the confrontation with other authors¹⁶³ shows. The central bank of the western historical experience, being a bank and emitting money as a public good, and being moreover invested with the role of money market manager, seems to be best suited to reach the stability needed in monetary economies.

¹⁶³ Glen Donaldson in Ch. 3.