Banking Strategy and Credit Expansion: a Post Keynesian Approach

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Resumo: Este texto visa trazer à luz relações entre bancos individuais e a indústria bancária durante períodos de expansão do crédito. Argumentamos que a estrutura patrimonial de um banco individual é apenas parcialmente determinada por suas decisões, sendo influenciada pelas decisões de outros bancos com respeito às suas estruturas patrimoniais. Essas relações são evidenciadas pela desagregação de variáveis que compõem um multiplicador monetário e abrem uma possibilidade de integrar níveis micro e macroeconômicos presentes em uma análise keynesiana sobre o sistema bancário.

Abstract: This paper aims at clarifying the relationship between individual-bank and banking industry behavior in credit expansion. We argue that the balance sheet structure of an individual bank is only partially determined by its management decision, as it is also determined by the balance sheets positions of other banks. This relationship is explicitly showed by a desegregation of variables that enters into a simple money multiplier and opens a way to integrate the micro and macro levels that makes part of a Keynesian bank system analysis.

1 Introduction

What determines the limits to the asset growth of an individual bank through the business cycle? Is there any connection between the strategy of an individual bank and whole banking system? What are the macroeconomic effects of the bank behavior? How does banking strategy affect business-cycle outcomes?

In order to answer these questions, this paper aims at:

- Clarifying and extending a remark by Keynes in his Treatise on Money, concerning the relationship between individual-bank and banking industry behavior in credit expansion.
- A clearer understanding of the impact of bank behavior on business cycle dynamics by focusing on banks' strategic incentives in different credit-expansion environments.
- A better understanding of how micro and macro levels can be integrated within one model of bank behavior, to see how banking strategy affects business-cycle outcomes, and vice versa. The key 'micro' dimension introduced here is banks' decisions concerning risk-bearing and prospective profits, through their loan-market decisions.

This paper argues that the bank's balance sheet is only partially determined by management decision, being determined partly by the balance sheets positions of other banks, as first stressed by Keynes (1960)[1]. This relationship can be explicitly showed by a desegregation

[1] As is well known, The Treatise of Money was originally published in 1930.

of variables that enters into a simple money multiplier and opens a way to integrate the micro and macro levels that makes part of a Keynesian bank system analysis.

Furthermore, the paper also intends to contribute for understanding the impact of bank behavior on business cycle dynamics, and how banking strategy affects business-cycle outcomes.

2 Keynes and Post Keynesian ideas about banking: what remains undone?

One of the most interesting and fertile field of analysis opened by Keynes and the Post Keynesian economists is the study of the relations between banks and the economic activity. From the Treatise on Money (TM) to the General Theory (GT) and to the controversy with Robertson and Ohlin, after the publication of GT, Keynes pointed out the key importance of the bank system to support the investment. Following Keynes, under a Post Keynesian approach, Minsky (1982, 1986) developed his financial fragility hypothesis (FFH). His work is a seminal contribution to the study of relation between bank system and the trend to financial fragility that characterizes economic units during the upturn of a business cycle and the occurrence of crisis as an endogenous result of the own economic dynamic. In fact, the recent research about financial crisis that emerges from different theoretical perspectives uses freely the term financial fragility as a key concept.

The perception that banks are special firms, that run fundamental and non-substitutable functions, induct studies about bank behavior. Therefore, the introduction of banks in macroeconomic models introduced the need to connect micro and macroeconomic analysis. But this connection in general does not explore differences between individual banks. It deals with a representative bank.

One exception is the studies on financial fragility. These studies seek to analysis the impact of some highly exposed banks on the fragility of banking system and, as result, on the systemic risk. The main subject here is the impact of an isolated bankruptcy on the rest of banks, that is, the contagious-effect. A vast literature is concerned with this subject and most part of it is concentrated into the negative externality that a bankruptcy causes to the bank system as a whole into an asymmetric informational environment.

Keynes' ideas about banking

Keynes never wrote an extended tract on banking. Nonetheless, his works over the years are littered with occasional comments and analyses of banks' behavior. And one of his later papers contains the comment (1937) that banks hold the key position in the shift of the economic system from a lower to a higher level of economic activity (see Keynes, 1973).

This point had not been developed much in the GT, which had used a comparative static and descriptive approach. The GT presented a schema for understanding the extent of economic activity at any point in time, but with little attention to the dynamics of movement through time. So discussions of financial issues focus on the liquidity role of money in the context of uncertainty about the future and about investment prospects.

What Keynes meant by this relatively cryptic comment is perhaps revealed in a passage in the *Treatise on Money*, where he writes about banks' financing of investment activity.

There, Keynes wrote that the volume of reserves of a bank will depend, to a great extent, on the growth rate of loans of the other banks, that is, on their finance polic(ies). Consequently, an individual bank cannot grow much faster than other banks, unless it increases its market share on total deposits of banking sector; for if it adopts a rapid growth strategy this will strength other banks' lending capacity by providing them with more available funds (free reserves), due to this bank's aggressive policies (which will, at the same time, reduce the reserves of this aggressive bank). As Keynes (1960, p. 26-7) stated:

> *There can be no doubt that, in the most convenient use of language, all deposits are 'created' by the bank holding them. It is certainly not the case that the banks are limited to that depositors should come on their own initiative bringing cash or cheques. But it is equally clear that the rate at which an individual bank creates deposits on its own initiative is subject to certain rules and limitations;- it must keep step with the other banks and cannot raise its own deposits relatively to the total deposits out of proportion to its quota of the banking business of the country. Finally, the 'pace' common to all the member banks is governed by the aggregate of their reserve resources.*

This analytical point finds an echo in Keynes' famous comment that 'bankers would rather hang together than hang separately.'

These interrelated points are, in any case, made well before the GT was written, and in any case Keynes' post-GT comment about the key role of banks in determining the level of economic activity do not refer back explicitly to these ideas.

Post Keynesian ideas about banking

The problem of banking behavior and its impact on economic outcomes has received substantial attention among Post Keynesian economists. Two lines of thought have predominated. One concerns the role of banks and of financial intermediaries generally in business cycles. These ideas were developed principally by Minsky (1982), Wray (1990) and Kregel (1997).

According to the first approach, business cycle influences, and is strongly influenced, by the agents' perception of risks, in a context of non-probabilistic uncertainty. As a result, business cycle is inducted by the way that current data influence the state of confidence of bank and non-bank firms in their foresights about expected returns of the investment projects. In a monetary economy, the foresight of the future, even if it is done with the agents' best efforts, is not a sufficient condition to have any degree of certainty about the best decision according to the agents' preferences. Under uncertainty, the search for new information to complete the data necessary will not provide more certainty to the agents' forecasts, since in most cases it simply do not exist.

Banks under uncertainty environment seek to base their behavior in conventions evaluating the history between the bank and the customer and also following strategies that are being adopted by the average behavior of the (other) banks. This means that if the banking system as a whole is expanding credit, it is expected that an individual bank will do the same. Under uncertainty, this is the more safe way to adopt a competitive strategy, since it can guarantee both the bank market-share and the institution reputation. Banks have an important and contradictory role in the business cycle since their behavior is able to amplify

the economic growth during the upturn of a cycle but during the crisis it can amplify the downturn, due to the increase of their liquidity preference[2].

A second line of thought involves banks' role in the literature on money endogeneity[3]. In this literature, banks are regarded as accommodative of the demand for credit by the non-financial corporate and household sectors. If banks have the capacity to expand their credit supply infinitely, especially due to central bank policy, then their key role comes down to being a reliable transmission mechanism for other sectors' pursuit of consumption and investment spending.

If banks instead sometimes face liquidity shocks and adverse conditions in their borrowing markets, then a different interpretation of banks' role emerges, one in which banks may face the same kind of liquidity pressures as other economic units (this is a key point in Dymski, 1988) and hence the state of the interbank and borrowed-funds markets is crucial in the extent of expansion. This debate on the proper characterization of banks – as either reliable transmission mechanisms or as units sometimes constrained by liquidity risk – has not exhausted the theoretical problems.

For under either interpretation, bank behavior has the effect of widening cyclical swings. In the upturn, banks' accommodative behavior – their willingness to make loans that increase other units' leverage, combined with their relative unconcern about liquidity risk – is a factor that increases cyclical volatility. Bankers react to the optimistic views on the viability of the firms' debt structure, that are typical of a period of euphoria, increasing their loans in order to respond to the demand for credit of firms. In the downturn, quite the opposite[4].

In particular, it has paid little attention to the problem of banks' strategies and of how banking-system dynamics can work to amplify business cycle dynamics. Minsky's model and the work of Moore and others focus on representative banks. The notion of diverse behaviors among banks is not introduced, nor the implications of strategic diversity for the link between micro and macro processes.

3 Is bank's balance sheet a (exclusively) strategic decision of an individual bank?

In this section we argue that the balance sheet structure of an individual bank is only partially determined by its management decision, as it is also determined by the balance sheets positions of other banks, as first stressed by Keynes (1960). This relationship can be explicitly showed by a desegregation of variables that enters into a simple money multiplier and opens a way to integrate the micro and macro levels that makes part of a Post Keynesian banking system analysis. This relation is suggested by what we call 'Money Multiplier Approach' (MMA).

3.1 The Money Multiplier Approach (MMA)

The MMA shows how an initial increase in the monetary base can generate a bigger increase in the amount of means of payment defined narrowly (M1 = cash + demand

[2] See more, in this connection, section 4.
[3] See in this connection, among others, Moore (1988), Wray (1990) and Lavoie (1992) .
[4] See more on this in the section 4.

deposits). The variables of money multiplier expresses the fact that the volume of money is dependent of the fraction of deposits to M1 that public will to hold and the fraction of reserves to loans that banks desire.

Therefore, conventionally, the money multiplier is defined as $\zeta = 1/(1-D(1-R))$, and consequently, $\Delta M1 = \zeta \Delta B$, where:

B = monetary base (cash + reserves);

D = demand deposits/M1;

R = reserves/demand deposits

From the point of view of a representative bank, assuming only cash and loans as assets and only deposits and net worth as liabilities, the impact of the money multiplier is summarized below:

Table 1. Representative bank balance sheet

Δ Assets	**Δ Liabilities**
Cash: $R\ D\ \zeta\ \Delta B$	Deposits: $D\ \zeta\ \Delta B$
Loans: $(1 - R)\ D\ \zeta\ \Delta B$	Net Worth: $\Delta\ NW = 0$

The key point here is to highlight another process that occurs together with the money expansion by the operation of the bank system. The behavioral coefficients inside the money multiplier – that are D and R - not only determine the amount of the increase in M1 from an initial increase in monetary base (B), but they also settle the dimensions of each item of the balance sheet of a representative bank. For example, the amount of cash that a representative bank or the bank system holds is a function of D and R.

It is worth noting that the conventional view about the money multiplier, that suggests some automatism in the way that money is created, implicitly admits that the structure of the bank system's balance sheet changes during the process of growing of M1. This can happen due to an increase in the monetary base or by a change in the behavioral coefficient. This is especially true if the increase of money occurred instantaneously or more quickly than the growing of the net worth of a bank. As the bank system begins to loan, their assets as a whole starts to grow. Further, as the net worth is stable in the short run, the bank leverage will grow as a result of the process of money multiplier. Indeed, it is reasonable to accept that net worth will remain stable in the short run as the financial results of credit operations – such as net interest revenues – will only occur sometime later. In other words, only in the future they will have impacts on the bank profits.

3.2 The Desegregated Bank Multiplier: the case of different bank strategy

The former section showed how an increase in the monetary base or a change in the behavioral coefficients can change the characteristics of the balance sheets of the banks. In this section, it will be pointed out another possibility. It will be suggested that *banks in a*

competitive environment can adopt different strategies in order to explore profitable prospects. So, it will be admitted that each bank can change its fraction reserve/deposits. Furthermore, it will be accepted that each bank has different capacity to obtain deposits.

Each bank establishes the fraction reserve/deposits[5] as a result, initially, of its strategy – if more or less aggressive. Supposing that net worth is constant, the reduction in this fraction when R decreases for a specific bank implies a bigger leverage and a growing liquidity risk. As banks reduce their reserves (R), the multiplier process begins to run, amplifying total deposits. Thus, as demand deposits grow both total liabilities and total assets increase. And, more importantly, as loans are $(1 - R)\ D\ \zeta\ \Delta B$, since ζ and $(1 - R)$ grew, loans become bigger than before. So, the individual bank reduces its capacity to support any adverse shocks and, at the same time, it has greater probability to have liquidity troubles than before.

The capacity to obtain deposits is one factor that express the market power of the bank; it is a function of the branch network, marketing policy, loan interest rates policy and so on.

So, the variables that express the strategies of each individual bank are:

Ri – reserve policy of bank "i"

Γi - deposits attraction of bank "i" (fraction of total deposits D).

Note that $\Sigma\ \Gamma i = 1$, that is derived from the fact that each bank will absorb Γi of total deposits. Each Γi is considered as a constant.

The multiplier (ζ) does not change with the introduction of these variables. For example, let us suppose an increase in the monetary base. Each bank will receive $\Gamma_i\ D\ \Delta B$ deposits, as a result of ΔB. The total deposits will be $D\ \Delta B\ \Sigma\Gamma_i$ (or D ΔB, as $\Sigma\ \Gamma_i = 1$) in the first round of the multiplier. The next step will include new loans $(1 – Ri)\ \Gamma_i\ D\ \Delta B$ for each bank. And the total amount of loans will be $D\ \Delta B\ \Sigma(1 – R_i\ \Gamma_i)$. So, new deposits, $\Gamma_i\ D^2 \Delta B\ \Sigma (1 – R_i)$, will be done in bank "i", and so on.

In equilibrium, or at the end of the multiplier process, the multiplier[6] will be $\mathbf{M} = 1/[1- D((\Sigma\ (1-R_i))\Gamma_i)$, a desegregated version of conventional aggregate multiplier, $\zeta = 1/[1- D\ (1-R))]$. The main feature of the desegregated version is that it highlights the fact that the general reserve fraction is an average of the reserve fraction established by each bank firm, considering each marginal deposit attraction Γ_i.

One of the consequences of this approach is that it makes clear the point stressed by Keynes (1930), that is the balance sheet of each bank is affected by the strategies adopted by the other ones. The table below shows the balance sheet of bank "i" at the end of the multiplier process.

[5] We are considering as bank reserves not only primary reserves (cash) but also secondary reserves, that is other liquid assets that can be convertible rapidly in cash with no significant losses. See for a more precise definition of liquidity, Davidson (1992).

[6] The formula of $\mathbf{M}$ is the result of $(1 + D\ (1 – \mathbf{\Sigma}\ R_i\ \Gamma_i) + D^2\ (1 – \mathbf{\Sigma}\ R_i\ \Gamma_i)^2 + ... + D^n\ (1 – \mathbf{\Sigma}\ R_i\ \Gamma_i)^n)$, that is $1/\ 1 - D\ (1 – \mathbf{\Sigma}\ R_i\ \Gamma_i)$.

Table 2. Balance sheet of bank "i" at the end of the multiplier process

Assets	Liabilities
Cash: $R_i\ \Gamma_i\ D\ \Delta B\ \Sigma D^z\ (1 - (\Sigma\ R_i\ \Gamma_i))^z$, or $R_i\ \Gamma_i\ D\ \Delta B\ \mathbf{M}$	Deposits: $\Gamma_i\ D\ \Delta B\ \Sigma D^z\ (1 - (\Sigma\ R_i\ \Gamma_i))^z$, or $\Gamma_i\ D\ \Delta B\ \mathbf{M}$
Loans: $(1 - R_i)\ \Gamma_i\ D\ \Delta B\ \Sigma D^z\ (1 - (\Sigma\ R_i\ \Gamma_i))^z$, or $(1 - R_i)\ \Gamma_i\ D\ \Delta B\ \mathbf{M}$	Net Worth: $\Delta\ NW_i$

The balance sheet of bank "i" will be a function of public preference for deposits (D), deposit attraction of bank "i" (Γ_i), and a result of the other banks reserve/deposit fraction.

3.3 A simulation of a change in the bank behavior

It is commonplace in the Post Keynesian's studies on bank behavior to deal with banks that change their portfolios in search of perceived profit opportunities. In this approach, banks are characterized as active firms[7]. They can lend before they receive deposits, as they decide to accommodate the demand for credit. Later, banks seek to obtain reserves, if needed, to meet their financial commitments[8]. Thus, at least during some period of time, banks deal with imbalances between reserves and deposits. But, what are the limits for this kind of action?

In order to illustrate the consequences of this behavior, we suppose that a bank "k" increase its loans in an amount **E**. We also suppose that other banks do not change their R_i. So, part of the loans will be deposited in each bank, in an amount $D\ \Gamma i\ \mathbf{M}\ \mathbf{E}$. At the end of the multiplier process, the bank "k" will have a balance sheet as described below:

Table 3. Bank "k" balance sheet

Assets	Liabilities
Cash: $R_k\ D\ \Gamma_k\ \mathbf{M}\ (\mathbf{E}) - \mathbf{E}$	Deposits: $D\ \Gamma_k\ \mathbf{M}\ (\mathbf{E})$
Loans: $(1 - R_k)\ D\ \Gamma_k\ \mathbf{M}\ (\mathbf{E}) + \mathbf{E}$	NW_k

[7] Minsky (1994, p. 156), for instance, states: "In contrast to the orthodox quantity theory of money, the financial instability hypothesis takes banking seriously as a profit-seeking activity. Banks seek profits by financing activity; like all entrepreneurs in a capitalist economy, bankers are aware that innovation assures profits. Thus using the term generically for all intermediaries in finance (whether they be brokers or dealers), bankers are merchants of debt who strive to innovate in the assets they acquire and the liabilities they market".

In order to loan, bank "k" looses to other banks an amount of reserves **E.** For the banking system as a whole, it causes an expansion in the monetary base at the expenses of the bank "k". From this point, the reserves of bank "k" begin to grow proportionately to the increase of money that it caused. At the end of the process, the reserve variation will be (R_k D Γ_k - 1) **E**. As $0 < R_i < 1$, $0 < D < 1$ e $0 < \Gamma_k < 1$, the term between brackets will be negative, but bigger than - 1. This means that if bank "k" expands their loans while the other banks do not the same, it will loose reserves to the remaining ones, but less than the total amount it first lent.

Conversely, the other banks gained reserves that bank "k" lost. Supposing that the remaining banks do not change their $R_{i's}$ and that $\Gamma_{i's}$ is constant, their financial structures still change due to the growth in their leverage. As Table 4 shows, bank "i" loans will raise by the effect of the increase in bank "k" loans (E). And, as it is supposed that NW_i does not change, both leverage of loans and leverage of assets will grow.

Table 4. Bank "i" balance sheet

Assets	Liabilities
Cash: R_i D Γ_i **M** (ΔB + **E**)	Deposits: D Γ_i **M** (ΔB + **E**) + D_i
Loans: (1 – R_i) D Γ_i **M** (ΔB + **E**)	NW_i

3.4 Financial fragility and the interaction between banks' balance sheets

As Minsky (1982) pointed out, financial fragility can be understood as a measure of the resistance of the bank system to shocks. So, it can be suggested some balance sheet indicators of bank susceptibility to a specific shock. These indicators should combine two dimensions: (i) the losses that a bank can have with a shock; (ii) the absorption of losses originated from shocks. In this connection, it will be defined two indicators that are somehow connected to the findings of this paper. The first is an index of liquidity, which establishes a ratio between reserves plus securities to deposits. The second is an index of solvency, that is the bank leverage.

The index of liquidity shows how much money a bank has to cover promptly withdrawals from public or another banks during the checks clearing. The formula that will be used is:

V_1 = (reserves + securities)/deposits

The leverage, indirectly, shows how losses could be covered by bank net worth. If a bank has a high leverage, given the value of Ri, it has higher probability to have problems with bad loans, given the proportion of bad loans to total loans.

V_2 = loans / net worth

[8] The degree of compulsory requirements depends on the institutional environment of each specific context. See, in this connection, Keynes (1930) and Goodhart (1979).

We introduce now the accounts in absolute value terms in the bank balance sheet and no more only a variation of each account as it was seen before. Thus, the bank balance sheet has the following structure:

Table 5. Representative bank balance sheet

Assets	Liabilities
Cash (C)	Deposits (D)
Securities (T)	Interbank and borrowed funds (AFL)
Loans (E)	Net worth (NW)

In the table that follows (Table 6), the two indexes (V_1 e V_2) are showed for two banks – "i" and "k" - two stylized banks with different expansion strategies that represent here the whole banking system. This table shows an exercise of comparative static. It puts together the banks in three points of time: (1) before the initial expansion of monetary base; (2) after the expansion of monetary base; and (3) after the bank "k", autonomously, increase its loans in an amount **E**. In this way, the indexes are presented in Table 6 as follows:

Table 6. Bank fragility indexes of bank "i" and bank "k"

	Moments					
Fragility Index	**(1)**		**(2)**		**(3)**	
	Bank i	Bank k	Bank i	Bank k	Bank i	Bank k
$\mathbf{V_1}$	$(C_i + T_i)/D_i$	$(C_k+T_k)/D_k$	$[Ri\ D\ \Gamma i\ \mathbf{M}\ \Delta B + (C_i + T_i)]/(Di + D\ \Gamma i\ \mathbf{M}\ \Delta B)$	$[R_k\ D\ \Gamma_k\ \mathbf{M}\ \Delta B + (C_k + T_k)]/[Dk + D\ \Gamma_k \mathbf{M}\ \Delta B]$	$[R_i\ D\ \Gamma_i\ \mathbf{M}(\Delta B + \underline{\mathbf{E}}) + C_i + T_i]/\ [D_i + D\ \Gamma_i\ \mathbf{M}\ (\Delta B + \underline{\mathbf{E}})\ ]$	$[R_k\ D\ \Gamma k\ \mathbf{M}\ (\Delta B + \underline{\mathbf{E}}) - \underline{\mathbf{E}} + C_k + T_k]/\ [D_i + D\ \Gamma_k \mathbf{M}\ (\Delta B + \underline{\mathbf{E}})\ ]$
$\mathbf{V_2}$	E_i/NW_k	E_k/NW_k	$[(1 - Ri)\ D\ \Gamma i\ \mathbf{M}\Delta B + E_i]/\ NW_k$	$[(1 - R_k)\ D\ \Gamma_k\ \mathbf{M}\ \Delta B + E_k]\ /\ NW_k$	$[(1 - R_i)\ D\ \Gamma_i\ \mathbf{M}\ (\Delta B + \underline{\mathbf{E}}) + E_i]\ /\ NW_i$	$[(1 - R_i)\ D\ \Gamma k\ \mathbf{M}\ (\ \Delta B + \underline{\mathbf{E}}\ ) + \underline{\mathbf{E}}\ + E_k]\ /\ NW_k$

The *first moment* is an image of the behavior adopted by each bank. The V_1 and V2 of banks "i" e "k" are not showed as an explicit function of another bank influence, as they do not consider the effects of expansion of monetary base nor the change in bank strategies. This first moment is the start point of our exercise.

The *second moment* shows exactly how the expansion of monetary base can modify the liquidity and leverage of both banks. Here, it is supposed that securities (T) and net worth (NW) do not change. On the other hand, the expansion of loans obeys to R and Γ of each bank. So, the changes in V_1 depend on the magnitude T as part of total liquid assets (C +

T). In the case of V_2, as assets grow and net worth (NW) remains constant[9], the risk of insolvency increases, as the index of leverage shows.

In the *third moment*, a new fact is introduced. It is simulated that bank "k" increases more its exposition than bank "i", as a result in once and for all growth in loans **E** of bank "k". Consequently, bank "k" has got *lower* V_1 and *higher* V_2 than the rest of the bank system, represented here by bank "i". In other words, both liquidity and solvency risk of bank "k" increase. Note, however, that although bank "i" was more conservative than bank "k", it became more leveraged than before, in spite of its passive strategy of credit expansion.

One can conclude from this analysis that:

(1) *The bank system balance sheet is affected by the multiplier expansion of money, since its net worth does not change in the same way as monetary base does*. So, conventional multiplier supposes, implicitly, that banks want or accepted to be more fragile during the monetary expansion as the risks of liquidity and insolvency increase.

(2) *The balance sheet of the individual bank and the risks that each bank faces depend partially from other banks decisions related to their portfolio*. This result does not depend on the effect of the bank refinancing policy on the outstanding default level (bad loans to total loans), but from the own process of money creation.

(3) *If banks present different rhythm of expansion of loans,* coeteris paribus*, the more aggressive one will lose reserves to the others, and at the same time it will present higher liquidity and insolvency risks.* In other words, it will be more financially fragile than the other banks, what can put some limit in its loans growth strategy.

3.5 A numerical simulation of a change in the credit strategy of bank "k"

The approach developed in the former section can be exemplified with a simulation. Let us consider a bank system with only two groups of banks, denominated as bank "i" and bank "k". Both of them have initially the same figures in their balance sheets (see Table 7).

Table 7. Bank "k" and bank "i"'s balance sheet

Reserves	333.33	Demand Deposits	666.7
Cash	200.00		
Securities	133.33		
Loans	333.33	Net Worth	100.0
Fixed Assets	100.00		
Total Assets	766.67	Total Liabilities	766.67

Bank "k" and "i"'s financial policy		Macroeconomic parameters	
reserve-to-deposit ratio	0.5	cash/M1	0.2
deposit absorption of each bank	0.5	Monetary Base	1000
		DD/M1	0.8

[9] We maintain the assumption that net worth does not change in the short run.

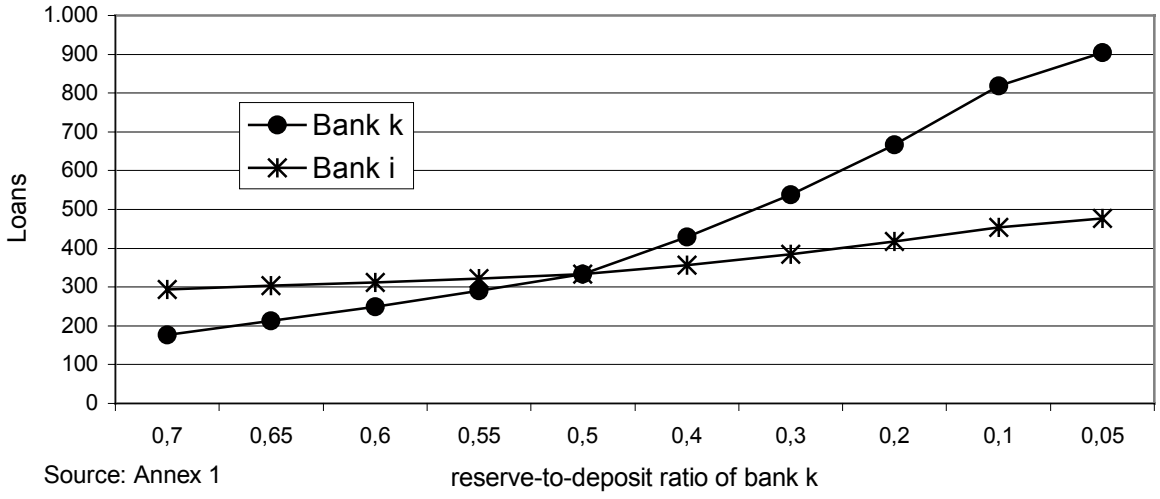
The simulation assumes that the deposit absorption of the two groups of banks are autonomously determined and equal to 0.5. It means that each bank shares each new $1 deposit created or destroyed in the banking system.

The two groups of banks are supposed to have their financial policy summarized in their reserve ratio (reserve-to-deposit). The reserve ratios are equal to 0.5 at the starting point of the simulation[10]. The reserve ratio is the sum of required reserve ratio (0.3 of demand deposits), in cash, with voluntary ratio (0.2 of demand deposits), held as securities. It is assumed that since a bank has more reserves than the amount of required reserves it will drive the further reserves to the purchase of securities. In the case that a bank has less reserves than the amount of required reserves it will sell securities.

Thus, focusing on loans, loans leverage, assets and reserves, *the simulation shows how the two groups of banks and the whole bank system will behave if bank "k" changes its financial policy, that is, its reserve-to-deposit ratio while bank "i" maintain all the time the same reserve ratio* (0.5). The basic idea is that bank "k" changes its reserve ratio according to its credit policy. As bank "k" seeks to increase its loans it reduces its reserves. Furthermore, the simulation assumes the following macroeconomic parameters, according to some given public preference: cash/M1= 0.2 and DD/M1 = 0.8.

Figure 1 shows what happen with banks loans if bank "k" shifts its reserve ratio. If the reserve ratio increases (running to the right side of Figure 1), the loans of the two group of banks will grow, as a result of the increased money multiplier. However, loans of bank "k" will grow faster than loans of bank "i", increasing its loans market share. Conversely, if bank "k" reduces the reserve ratio (the left side of the figure), the loans of the two banks will decrease. However the loans of bank "k" will diminish more than bank "i" ones.

Figure 1. Loans of banks k and i for different reserve-to-deposit ratios of bank k



Source: Annex 1

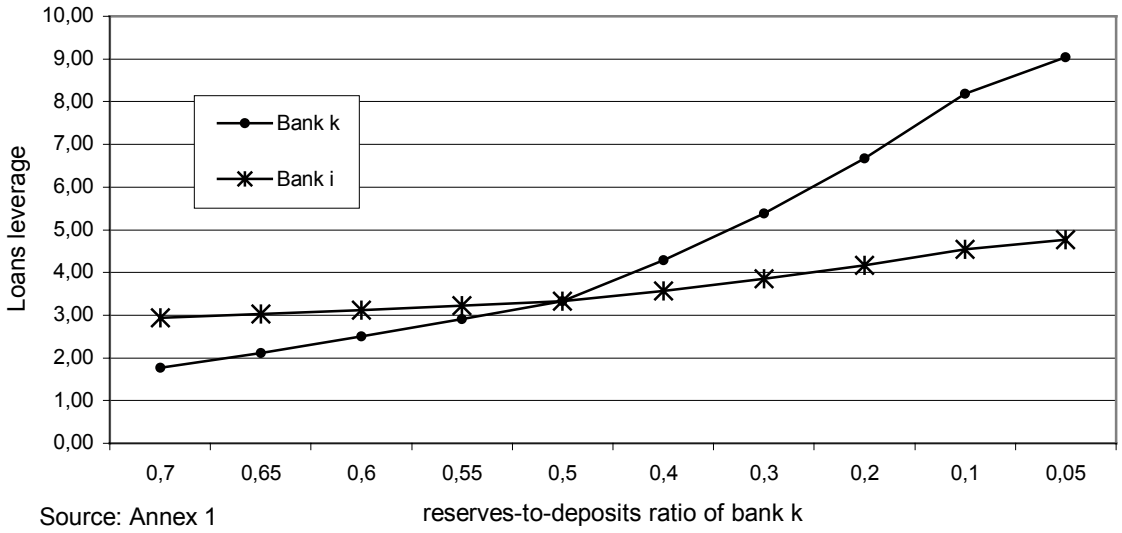
[10] The whole data are in Annex 1.

This first result points out the fact that even the financial policy of the bank "i" does not change, its loans will grow. Of course, there are other possibilities that are not explored in this simulation. One may suppose, for example, that bank "i" could maintain the volume of loans constant. In this case, the reserve ratio of bank "i" would increase, and its assets would grow as the bank would increase the volume of securities in its portfolio.

As banks net worth are supposed to be constant in the short run, the exposure of the banks to credit risk will change together with the behavior of their loans, as it can be viewed in the Figure 2. As bank "k" increases its reserve-to-deposit ratio (the right side of the figure), loans leverage of both banks will grow. However, bank "k" leverage increases more than bank "i" ones.

Conversely, if we consider the reduction of the reserve ratio of bank "k", the leverage of both banks will decrease together, but the leverage of bank "k" will reduce more than the leverage of bank "i". In other words, although both banks increase their insolvency risk (V2) when bank "k" decreases its reserve ratio, insolvency risk is bigger to bank "k" than to bank "i".

Figure 2. Leverage of loans (loans/net worth) for different reserve-to-deposit ratios of bank k



Source: Annex 1

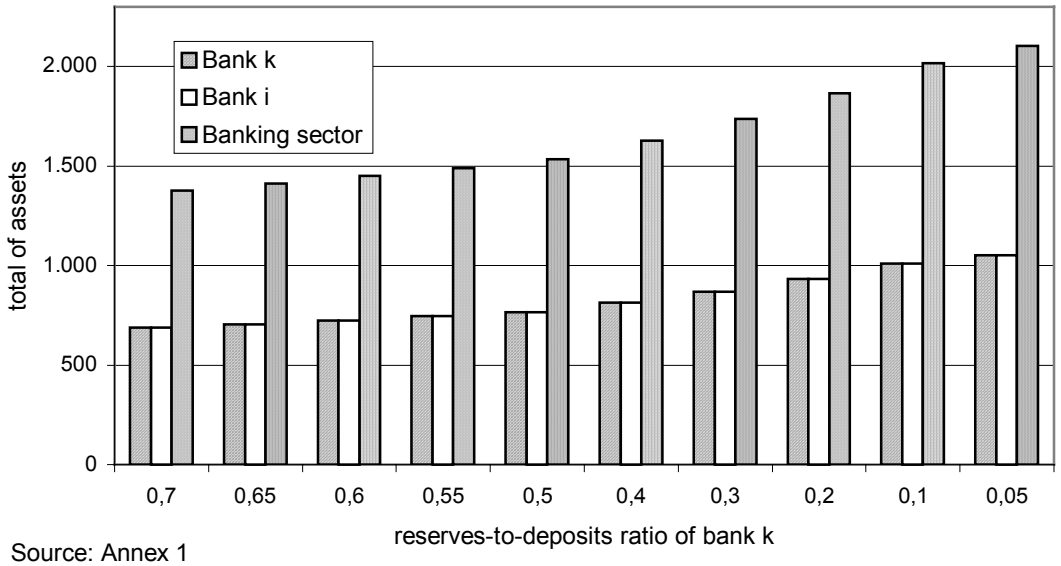
Another consequence of the shifts in the reserve ratio of bank "k" is a change in the total assets of banking sector: as reserve ratio of bank "k" decreases the assets of both banks increases in the same rhythm, due to the increase in the volume of loans (Figure 3). This occurs because this simulation assumes that both banks have the same deposit absorption[11]. The current exercise shows that the total assets of banking sector changes when there is a change in the finance policy of a bank. Even if the bank - in our example, bank "i" -

[11] It must be considered that the deposit absorption of bank "k" and bank "i" can change in the long run. If the degree of deposit absorption are different between them the banking assets growth of each bank also vary in different pace.

maintains the same reserve ratio, it will experiment an increase in its assets. This is a expected result of the simple multiplier model.

Bank "i" does not need to expand or reduce its loans as an automatic response to the expansion or reduction of bank "k" loans. Let us suppose that bank "i" maintain constant the volume of its loans. It means that it is increasing its reserve-to-deposit ratio, weakening the monetary multiplier effect. But it also means that bank "i" will experiment an increase in its assets (as its volume of reserves increase in the same amount), due to the bank "k" loans expansion.

Figure 3. Banking assets of bank k and i for different reserve-to-deposit ratios of bank k

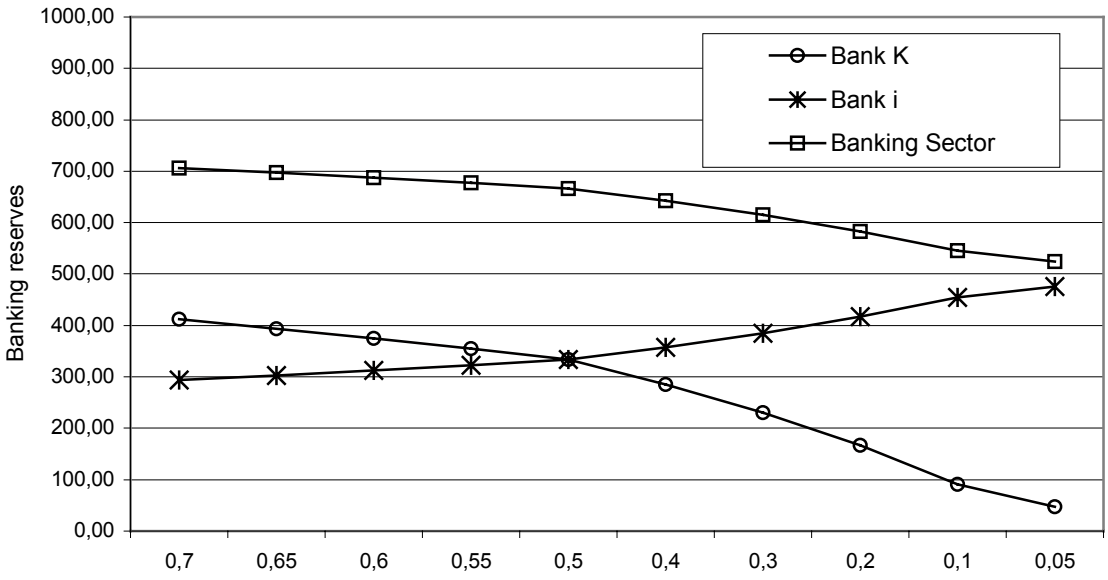


Source: Annex 1

The increase (or reduction) of bank "k" reserve ratio causes a transference of reserves between banks. If bank "k" reserve ratio diminishes as a result of the increasing of loans, the reserves into the banking system go to the public and to bank "i" that had not change (or have reduced) its reserve ratio. This situation must push the bank "k" to borrow money in the reserve market from Central Bank and from another banks, probably from the more conservative ones. In this case, bank "k" will have to sell the securities if its portfolio (and/or to issue new securities) in order to obtain new reserves.

So, the reduction in reserve ratio increases the exposure to liquidity risk of the banking system as there is more demand deposits, and increases the liquidity risk of the bank that is more aggressive (bank "k"), as it lost its reserves *pari passu* to the increasing in their loans (Figure 4). Alternatively, if bank "k" reserve ratio increases, the reserves into the banking system are absorbed by bank "k" from the public and the bank "i" (that did not change its reserve ratio), and its exposure to liquidity risk diminishes.

Figure 4. Banking reserves of bank k and i for differents reserve-to-deposit ratios of bank k

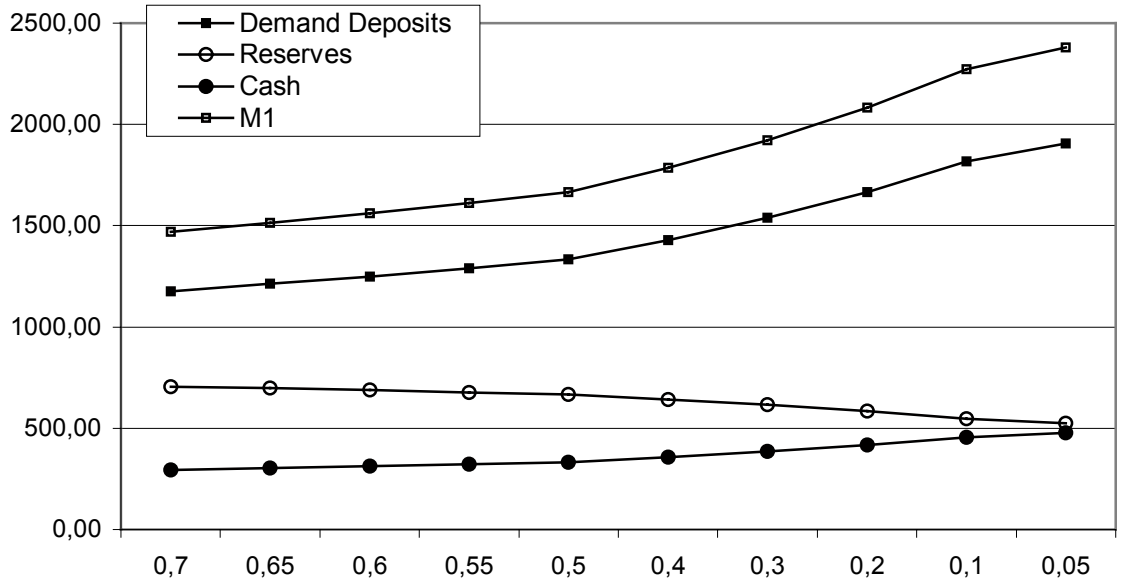


Source: Annex 1

The previous paragraph has a important consequence to the determination of the banking system liquidity risk. According to the monetary multiplier, the expansion of the average reserve ratio diminishes M1. So, if the public preference, cash/M1, is maintained constant, the public demand for cash also declines. The reserves of the banking system as a whole increase as well. This situation guarantees a natural defense to bank running. Alternatively, the reduction of the reserve ratio increases M1. So, if the cash/M1 is maintained constant, the public demand for cash increases (Figure 5). As a result, banking system – as a whole - will be more exposed to liquidity risk, *ceteris paribus*.

In sum, this simulation highlights the fact that banks balance sheet is barely a result of individual choice. The behavior of the set of banks is a essential element in the determination of the size and composition of the banking balance sheets.

Figure 5. Monetary Aggregates



4 Banking strategy and the business cycle: some stylized facts

In this section, we discuss the impact of bank behavior on business cycle dynamics by focusing on the relationship between individual bank and banking sector behavior in different credit-expansion environments. For this purpose we explore the analytical structure developed in the former section during four phases of the business cycle: stagnation, upturn, downturn and crisis.

According to the financial fragility hypothesis (Minsky, 1982, 1986), the dynamic of the economic growth conduct firms to become increasingly indebted to expand their investment. In this connection, cyclical fluctuations result from the way that firms finance their portfolio so that macroeconomic financial fragility increases in the upturn due to the rise in the quantity of speculative units. The decision to invest, to choose assets, runs hand-in-hand with the choice of the means of financing. Both decisions, taken together, define the extent of the economy's vulnerability to adverse changes in the economic situation. An economy will be – macroeconomically – more or less fragile according to the preponderance of hedge or speculative units. As Dymski and Pollin (1992, p.40) state: "Minsky argues that there is an inherent tendency for capitalist financial structures to move from states of robustness to fragility over time. This is due to the shift in expectations that occurs over the course of a business cycle, and the way this shift is transmitted through the financial system".

Business cycle would be inducted by the way that current data, besides the agents' expectations concerning the future, influence the state of expectations of bank and non-bank firms in their foresights about expected returns of the investment projects. As we have already stressed, banks have an important and contradictory role in the business cycle since

their behavior is able to amplify the economic growth during the upturn of a cycle, as a result of banks' accommodative behavior during the upturn; however, it can also amplify the downturn, due to the increase of their liquidity preference as the banks' expectations about the future become pessimistic during this phase of the business cycle[12].

Stagnation

At the through the business cycle, when the state of confidence is particularly impregnated by the uncertainty about future, the current information is dominated by bankruptcies of indebtedness firms and banks as such as borrowers still deal with very delayed contractual payments. Realized profits and profit expectations are still low. The indebtedness is viewed as extremely riskier as the degree of uncertainty perceived by the economic agents is still very high. Since agents' expectations are deteriorated, due to their low state of confidence in the next future, *the aggregate demand for credit is low*. Healthy firms tend to adopt a hedge posture, that is the safety margins between profits and financial commitments are sufficient to ensure that, in all future periods, profits will exceed interest expense and amortization payments (here, expected gross revenue affords some margin over debt payment commitments)[13].

Under these conditions, what would happen in the case that the growth rate of loans of an individual bank increases faster than the average growth rate of the other banks? In this phase of the business cycle, the individual bank (bank "k" according to section 3 analysis) - that increases its loans faster than the others (represented by bank "i"), without a respective change in its market share of deposits, measured by Γ_i - would loose reserves. As a result the risk of liquidity (V1) of the individual bank would increase. On the other hand, as bank leverage increases due to the expansion of loans of bank "k", its insolvency risk (V2) tends to increase as well. In this case, it would not be possible to maintain for a longer term an aggressive finance policy as the demand for credit is low. Therefore, only for a very short period the bank could find borrowers that would accept its credit offer, even though they decrease their loans interest rate and squeeze the spread of their credit operations. Furthermore, the credit risk would tend to grow in the case of the maintenance of an aggressive finance policy by an individual bank, as the firms would not be able to generate the enough profits to meet their financial commitments, due to the stagnation state of the economy. Under these conditions, the convention instructs the banks to be cautions, that is they should adopt a more conservative strategy; as a result, they compose their portfolio with the predominance of short term and/or more liquid assets. High liquidity preference prevails in the banking strategy.

Upturn

[12] The liquidity preference approach explains the balance sheet strategy, rather than choices of individual liabilities, according to the perception of risks and profit opportunities by banks: "For a give state of expectations, bank's liquidity preference will determine the desired profile of the assets they purchase and their prices, that is, the rate of returns each type of asset must offer to compensate for their degree of iliquidity". (Carvalho, 1999, p. 132)

[13] For a hedge unit the margin of safety is positive for any probably increase in the rate of interest once it is completely hedged in relation to its future commitments cash flow.

The beginning of the boom depends crucially on the shifts in the state of expectations of the agents, that is the sharing expectations of non-banks and banks on the better future prospects of the economy. As the agent's state of confidence improves, the overall perception of risks tends to decline. More profits and growing utilization of production capacity stimulate new investments As a result, *the demand for credit tends to increase*. Firms tend to adopt speculative posture, that is they maintain smaller margins of safety than hedge units, as they speculate that financial costs will not increase to the point where their plans become unworkable. Here, in general, expected gross capital income obtained in initial periods are insufficient to pay off the first debt amortization in full; but the expectation is that in subsequent years agents will obtain a revenue surplus sufficient to offset the initial situation of deficit. In the case of the banks, the improvement in their state of expectations implies a shift in their liquidity preference, that is translated in a change in their behavior from a more defensive posture to a less conservative one. As a result, banks tend to adopt a more accommodative posture in terms of credit supply. Bankers react to the optimistic views on the viability of the firms' debt structure, that are typical of a period of euphoria, increasing their loans in order to respond to the demand for credit of firms. The bank search for bigger profits in the upturn of the business cycle can induce them to adopt a more speculative posture: a banker will seek to get bigger monetary returns accepting longer-term and/or riskier assets and at the same time, trying to reduce the rate that they remunerate the deposits, offering safety promises and other special guarantees to their customers.

In this context, what would happen in the case that the growth rate of loans of an individual bank increases faster than the average growth rate of the other banks? In this case, as the level of reserves tends to decline, the risk of liquidity of the individual bank (bank "k") increases. Bank "k" would be able to sustain an aggressive finance policy only at the risk of an increasing raise in the liquidity risk (V1) and insolvency risk (V2), that would cause a raise in its financial fragility. Furthermore, as we have seen in the former section, even the rest of the banking sector (bank "i") becomes more fragile (but less than bank "k"), once its leverage increases due to the credit expansion. Under these conditions, the convention instructs the banks adopt the following convention: *individual bank tends to follow the average growth rate of loans of the whole banking sector.* This means that if the banking system as a whole is expanding credit, it is expected that an individual bank will expand in the same direction. Under uncertainty, this is the more safe way to adopt a bank's expansion strategy, since it can guarantee both the bank market share and the institution reputation. It is precisely here that Keynes' famous comment suits well: "bankers would rather hang together than hand separately".

Downturn

The collapse of asset values that occurs during the downturn because of position-making problems of units engaged in speculative and Ponzi finance leads to a collapse of investment. Such a collapse will lead to a shortfall in the profit flows generated by capital assets, which in turn makes the fulfillment of business financial commitments more difficult, if not impossible. A lot of 'good payers' becomes 'bad borrowers'. In particular, when profits fall, some hedge and speculative units become Ponzi units, as the cash flows

to validate even initially hedge-financing arrangements will not be forthcoming[14]. The flows of expected yields are reduced as financial institutions expect a decrease in their loans returns. As the firms' profits are declining and their financial commitments are increasing, the enterprises' margins of safety decrease abruptly. In this context, the risks of the banks borrowers are reevaluated by banks and, in general, they are raised. As the perceived risks grow and are incorporated in the risk premium, bigger interest rates increase the cost of firms' refinancing, exactly at the moment they are mostly needed. Banking system as a whole seeks to recover its loans, refusing to rollover most part of the firms debts. Therefore, the growth of bad loan figures indicates to banks to ration credit. Consequently, at a macroeconomic level, bad loans increase quickly.

Therefore, banks tend to react to a shock that starts a cyclical downturn changing their expectations about the future once their state of confidence deteriorates quickly. Financial institutions manifest their greater liquidity preference conducting their portfolio to less profitable but more liquid assets; consequently, credit supply tends to decline. Thus, banks are likely to reduce the average term of their assets and to adopt a more liquid position throughout the maintenance of surplus reserves and/or the purchase of assets with high liquidity, such as government securities. Under these conditions, the overall decrease in the amount of loans will result in losses of deposits for all banks. For this reason, liquidity risk of the banking sector does not increase, unless the depositors run against the banks deposits. The individual bank (bank "k") that has more stable asset target than other banks as a whole (bank "i"), and which is slower to change, will take on a disproportionate share of bad loans and the adjustment problems associated with coming out of the downturn. It will face problems related to the liquidity risk (V1), to its reserves decline, and to problems related to the credit risk, due to the increase in the volume of bad loans. This is a further reason to explain the logic that support Keynes' statement that 'bankers would rather hang together than hang separately.' As a consequence, *as all banks tend to contract their credit supply, the volume of bad loans increases causing deterioration in the quality of their credit portfolio*. As a result, the risk of credit of the banking sector increases as a whole.

Crisis

Shocks on an economy can be originated by central bank action to constrain inflation pressures – adopting a more tight monetary policy - that results from the economic growth during the upturn. The crisis depends on the occurrence of shocks that an market economy cannot absorb. Thus it depends on bigger or lesser are the firm's margins of safety in that moment in comparison with magnitude of a shock. As the ratio of speculative and Ponzi finance units increases in the total financial structure of an economy, the economy becomes increasingly sensitive to interest rates shocks on their outstanding debt. If the financial structure degenerates, the economy tends to follow a debt deflation trend, that can causes a recession: the decrease in the prices of capital assets (compared to the cost of the investment) and the general collapse in the financial assets can result in a declining spiral among investment, profits and prices of assets.

[14] *Ponzi* units may be considered an extreme case of units with a speculative financial attitude. In the immediate future, their gross capital income is not sufficient even to cover the value of outstanding interest payments, making it necessary for them to take out additional loans so that the unit can meet its financial commitments. Their indebtedness grows even when interest rates do not rise.

In this context, the institutional environment that support a sustainable economic activity needs some counter-cyclical economic policy that can attenuate the downturn. Whether a fully-fledged financial crisis takes place, if a non-absorbable shock occurs, depends upon the efficacy of central bank lender of last resort behavior, and whether gross profit flows are sustained by an increase in the government deficit. Indeed, Minsky (1982, 1986) states that two major institutional devices can play a stabilization role in the economy: the Big Government and the role of central bank as lender-of-least-resort.

The first one normally interferes directly and indirectly into the aggregate demand by the expansion of government spending, transfers and tax reduction. As this kind of intervention support some aggregate demand level, there is a flow of yield that could be used to pay financial commitments, reducing the credit risk.

The second one stabilizes the prices of assets as the central bank operates like a lender-of-least-resort that increases the volume and scope of eligible assets that it can buy from the banks and also the volume of financial assistance to banks. This device can be able to impede a debt deflation process, limiting the liquidity risk and market risk that banks face. The action of the central bank to provide the necessary liquidity for banking system is essential since such action can be determinant to mitigate a possible financial crisis. Central bank, as a lender-of-last-resort, has an important role to avoid the spread of a panic that can result from the break of the payment system.

The desegregated multiplier model suggests another way to understand how the central bank works: it establishes a macroeconomic condition that allows the recessive adjustment of bank system without (or with less) banks' bankruptcies. Central bank can operate like the bank "k" during the downturn, i.e., it expands loans when the bank system as a whole (bank "i") reduce its loans growth rhythm. In this connection, central bank amplifies the volume of its loans (liquidity assistance), increases its purchase of securities (open market and rediscount operations) and inject reserves in the rest of the banking system. Therefore, as a result of central bank expansive policy, banks can have more liquid balance sheets, shifting more liquid assets for loans – as bank "i" does – without generating a bank crisis.

As Minsky pointed out, the recessive adjustment can negatively impact on the economy and the whole bank system. The central bank action just allows that banks do balance sheet adjustment without more critical macroeconomic effects. However, from the microeconomic point of view, this balance sheet adjustment result, in general, in low banking profitability, as the relative share of liquid and less profitable assets in the total assets reduces. Thus, the action of central bank when successful puts the bank system in a 'stand by', with a lower opportunity cost, just waiting a signal of better prospects on the economic environment to expand its loans again.

5 Conclusion

This paper aimed at clarifying the relationship between individual-bank and banking industry behavior in credit expansion. We argued that the balance sheet structure of an individual bank is only partially determined by its management decision, as it is also determined by the balance sheets positions of other banks. Indeed, according to our analysis, if banks present different rhythm of expansion of loans, *coeteris paribus*, the more aggressive one will lose reserves to the others, and at the same time it will present higher

liquidity and insolvency risks. This relationship was explicitly showed by a desegregation of variables that enters into a simple money multiplier and opens a way to integrate the micro and macro levels that makes part of a Keynesian bank system analysis.

The paper also focused on the role of banking in the business cycle. In this regard, it showed that banks have an important and contradictory role in the business cycle since their behavior is able to amplify the economic growth during the upturn of a cycle, as a result of banks' accommodative behavior during the upturn; however, it can also amplify the downturn, due to the increase of their liquidity preference as the banks' expectations about the future become pessimistic during this phase of the business cycle.

Further research are necessary in order to develop the analytical framework described in this paper and they have to address the following questions: Do they apply principally to the situation of banks in an earlier time – that is, when banks and their customers had few strategic options and a small range of feasible investment and savings opportunities? Are these comments still relevant for our era, in which large and small banks behave differently in their aggressiveness, in their loan-making, in their use of securitization and fee-based activity, and so on – that is, in an era in which banking strategies are diverse?

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Annex 1. Changes in some banking variables (bank k and i) for different reserve-to-deposit ratios

	Assets			Reserves		Loans		Loans/Net worth		Assets/Net worth	
Reserve-to-deposit ratios of bank k	Bank k	Bank i	Banking sector	Bank k	Bank i	Bank k	Bank i	Bank k	Bank i	Bank k	Bank i
0,70	688,24	688,24	1376,47	481,76	344,12	106,47	244,12	1,06	2,44	6,88	6,88
0,65	706,06	706,06	1412,12	458,94	353,03	147,12	253,03	1,47	2,53	7,06	7,06
0,60	725,00	725,00	1450,00	435,00	362,50	190,00	262,50	1,90	2,63	7,25	7,25
0,55	745,16	745,16	1490,32	409,84	372,58	235,32	272,58	2,35	2,73	7,45	7,45
0,50	766,67	766,67	1533,33	383,33	383,33	283,33	283,33	2,83	2,83	7,67	7,67
0,40	814,29	814,29	1628,57	325,71	407,14	388,57	307,14	3,89	3,07	8,14	8,14
0,30	869,23	869,23	1738,46	260,77	434,62	508,46	334,62	5,08	3,35	8,69	8,69
0,20	933,33	933,33	1866,67	186,67	466,67	646,67	366,67	6,47	3,67	9,33	9,33
0,10	1009,09	1009,09	2018,18	100,91	504,55	808,18	404,55	8,08	4,05	10,09	10,09
0,05	1052,38	1052,38	2104,76	52,62	526,19	899,76	426,19	9,00	4,26	10,52	10,52

Source: Authors' calculation based on Table 2.