

How Financial Innovation Might Cancel Out Bank Regulation Along
Financial Cycles.

A Keynes's State of Confidence Interpretation.

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How Financial Innovation Might Cancel Out Bank Regulation Along Financial Cycles. A Keynes's State of Confidence Interpretation.

Abstract:

The question posed in this paper is how financial innovation may render conventional bank regulation ineffective. It is argued that the root cause as well as the essence of financial innovation is the predominance of trust in the financial markets, as it is confidence in the financial markets which makes the acceptance of financial innovation possible. In particular, mutual trust in the interbank market depends on the degree of confidence by which expectations are held, which, in turn, affects the relevant risk premia. Consequently, bank regulation may fail to accomplish its stabilization purpose if it cannot *check overconfidence* in the upswing or inspire and *redress lack of confidence* in the downturn.

Keywords: Financial Innovation, Bank Regulation, State of Confidence, Financial Cycles.

JEL classifications: G28, G01

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1. Introduction

Kindleberger (1978) inspired by Minsky (1972) gave a typology of financial crises founded on a psychological standpoint (Toporowski, 2005, p. 138) identifying five successive phases: “displacement”, “euphoria”, “mania”, “distress” and “panic”. Behind the descriptive typology of the Minsky-Kindleberger model lies Keynes’s (1921[2004], 1936[1973], 1937) perception of our world as one plagued by fundamental ignorance of the future, where the effect of expectations depends more on the degree of confidence by which they are held, given established conventions, rather than on objective knowledge of the probability distributions. This holds true not just for those assuming borrowers’ risk but for banking firms as well. In the above Minsky-Kindleberger framework, banks extend credit or cut on lending depending on their expectations of future economic prospects and the confidence with which they hold these expectations. In fact, they do more than that: they provide credit *to each other* and make use of innovative products in order to exploit profit opportunities and/or, as this paper argues, to circumvent costly regulations. Fisher (1933) has argued that overconfidence cannot explain cyclical events unless coupled with overindebtedness. Yet, to reverse the conditionality, overindebtedness of firms may itself be explained by overconfidence in the banking system, which in turn makes credit expansion sustaining the boom possible. In fact, Minsky (1972) has explained, the process of changing beliefs and confidence in both the demand and the supply end of the credit market, at the same time when euphoric expectations, aided by financial innovation, overcome the effect of rising interest rates.

The present paper poses the question of how financial innovation can render conventional bank regulation ineffective, by focusing on the issue of confidence and mutual trust in the interbank market. A model of the interbank market based on banks' liquidity preference, given a Minsky-Kindleberger financial cycles background, is the analytical framework employed. The paper argues that the essence of financial innovation lies in the prevalence of mutual trust in the market, as it is the latter which makes the acceptance of the former possible. This will be the case regardless of the various forms of financial innovation and the complexity of instruments used in different historical circumstances. As far as the banking industry is concerned, the solidity of mutual trust in the interbank market will depend on the degree of confidence by which expectations are held, which in turn affects the relevant risk premia. Consequently, bank regulation of whatever sort will be doomed to failure if it cannot check overconfidence in the upswing or inspire and redress the lack of confidence in the downturn. Therefore, the design of bank regulation should be flexible and thus amenable to revision according to the phase of the financial cycle that the economy is going through.

2. The missing link between financial innovation and regulation evasion.

The regulatory loopholes that made possible the burst of the 2007 crisis spurred a debate on causes and proposals for prevention of the same disease. Calomiris (2009) argues that financial managers took on excessive risk due to a regulatory environment that encouraged them to underestimate risk. It was

government policy that gave incentives for distorted risk assessment. Similarly, Demirgüç-Kunt & Servén (2010) insist that the crisis does not represent simply a failure of free markets but rather ‘the reaction of market participants to distorted incentives’. Then Carvajal *et al.* (2009) urge a reform of regulations towards requirements consistent with a set of incentives in favor of systemic stability. ‘Macroprudential regulation’ focusing on systemic risks (Bernanke (2009)) should be more intense in booms, when increasing leverage and maturity mismatch increase systemic risks, and more lax in downturns (Mohan (2009)). Other proposals include ‘contingent capital’ arrangements, contracted by banks in the upswing, when capital is cheap, to be infused into the system in the downturn (Rajan (2009)). As a policy response, Basel III partly validated this discussion by its provisions for conservation and countercyclical capital buffers, non-risk-based leverage ratios and Liquidity Coverage and Net Stable Funding Ratios (BCBR (2010a,b)).

The arguments expounded thus far fail to recognize Minsky’s warning that stability enhancing regulation can only emerge from a theory which explicitly acknowledges financial markets’ inherent instability (Kregel (2010a)). Crotty (2009) suggests that high ratings assigned to banks’ assets by credit rating agencies entailed lower levels of capital adequacy requirements than the Basle Accords, higher leverage ratios, greater profits for banks and larger bonuses for managers. Wray (2009), recalling Minsky, stresses the gradual increase of the financial system’s fragility from the 70s onwards, characterizing its current stage as that of “money manager capitalism”, where eroded perceptions of risk trigger the pursuit of capital gains with highly levered money. Removal of New Deal regulations paved the way to this stage. Thus came the restoration of the pre-1929 predominance of ‘speculation over enterprise’, as Keynes (1936[1973], p.158) may have put it.

Tymoigne (2009 a,b) sets the above in the context of the transformation in the financial structure of the economy, from hedge to Ponzi financing, sustained by all market participants: bankers, rating agencies, homebuyers, institutional investors and the government. As a financial innovation, securitization coupled with a lax regulatory environment, caused an increase in systemic risk and a threat to financial stability. Tymoigne (2010) proposes measures for the detection of Ponzi financial structures and the regulation of destabilizing innovation, such as restricting or prohibiting innovation related to Ponzi finance and encouraging innovation promoting hedge financing. Financial innovation, in the sense of creation of new products and practices to handle risks, is due to efforts to maintain bank profitability. Such efforts, as the history of US financial system regulation reveals, may be followed by the *de facto* undermining of a given regulatory framework by banking competition (Kregel (2009,2010b)). Then evasion of reserve and capital requirements for financial institutions is at the centre of such innovative practices (Wray (2009)).

All the above arguments point to the inevitable links among bank regulation, financial innovation and the current financial crisis. Yet, despite the identification of regulatory shortcomings or even the need for a radically different approach to financial regulation, is left unaddressed the critical question: which is the *crucial* factor that makes financial innovation as such a potential source of regulatory evasion? The specific focus of this paper attempts to relate financial innovation to the existence of mutual trust and confidence in the *interbank market*; as the latter has arguably played a central role in the spread of the current crisis (Kregel (2010b)). If this focus illuminates the crucial mechanism then prescriptions of regulatory authorities should take into account measures to curb overconfidence in the boom and redress confidence in the downturn as a necessary ingredient of their regulatory

arsenal. The following sections build a model of the interbank market satisfying these conditions.

3. Banks' liquidity preference and financial innovation

The link between liquidity preference in the form of precautionary demand for money and the confidence with which expectations are held (Keynes, 1930[1971], 1936[1973], 1937) is given in Carvalho (1999, 2009), Dequech (1999, 2005) and Runde (2003). Specifically, Keynes (1936[1973], p. 240 and 1937) establish the relationship between liquidity preference and the degree of confidence since 'The possession of actual money lulls our disquietude; and the premium which we require to make us part with money is the measure of the degree of our disquietude'. In this context, banks' liquidity preference might be a portfolio decision related both to banks' ability to pay off debts (deposits) on demand and to their perception of future economic prospects. The first is a Minskian interpretation but the latter comes directly from Keynes (1930[1971]) where he describes the attempt of banks to establish a trade-off in their balance sheets between profitability and liquidity (Carvalho, 1999; Bibow, 2009 p. 107-108) as they '... feel that a speculative movement or a trade boom may be reaching a dangerous phase...' and '... try to move, so far as they can, into a more liquid position' (Keynes (1930[1971]), p. 59-60).

This section builds on these ideas to present a model of banks' liquidity preference that relates the notions of the state of confidence and trust prevailing in the interbank market with financial innovation. Financial innovation is defined in the literature as the development of new financial instruments to manage risk and cope with various types of market "imperfections", including taxes, regulation, information

asymmetries, transaction costs and moral hazard (Tufano, 2002; Jenkinson, Penalver & Vause, 2008). The paper will focus on the ability of financial innovation to make risk sharing acceptable by the various contracting parties and its repercussions for bank regulation. The purpose of the ensuing analysis is to show how trust and confidence in the interbank market might be an indicator of financial innovation with the above characteristics.

Assume a monetary economy¹ with $m < n$ banks which extend loans to n firms and hence create deposits in the context of a fractional reserve system. Based on Freixas and Rochet (1997), Studart (1995), Matthews & Thompson (2005), a Monti-Klein model of the banking firm in imperfect competitive conditions (Cournot oligopolies) takes the following form. Bank j balance sheet is $\mathcal{L}_j + R_j \pm T_j = D_j + E_j$. The Assets' side is comprised of loans² \mathcal{L}_j , required reserves R_j and excess reserves in the form of holdings of liquid assets T_j . The latter indicate the net position of bank j in the interbank market and can be positive or negative depending on whether the bank is a net lender or net borrower in the interbank market for reserves. If bank j is a net lender then $T_j = D_j + E_j - \mathcal{L}_j - R_j > 0$, (short term securities as an asset). If the bank is a net borrower then $-T_j = D_j + E_j - \mathcal{L}_j - R_j < 0$, (short-term securities as a liability). The Liabilities' side is comprised of deposits D_j and the market value of equity capital E_j . The maximization problem is solved for every bank at the beginning of period t in terms of expected values of the variables for loans, deposits, short-term securities, equity capital and marginal costs at the end of the period, for prices

¹ Since this is a monetary economy all variables and rates of return referred in the text are nominal.

² "Loans" is a portmanteau term that may include both non-marketable and marketable assets

determined at the beginning of the period. Bank j maximizes the profits it expects to receive at the end of the period as given by ³:

$$\max_{\mathcal{L}_j} \Pi_j = l(\mathcal{L})\mathcal{L}_j - d(D)D_j \pm r_T T_j - r_E E_j - C_j(\mathcal{L}_j) \quad (1)^4$$

where l is the loan rate, d is the deposit rate, r_T is the interbank rate and r_E is the market cost of equity capital. The variable C is the operating cost which depends on the volume of loans extended – assuming negligible operating cost of keeping deposits – and the institutional conditions in the financial markets which determine the cost of loan contracts.

Define $k = \frac{R_j}{D_j}$ as the required reserves ratio, $\tau_j = \frac{T_j}{D_j}$ as the liquid assets' ratio and $e_j = \frac{E_j}{\mathcal{L}_j}$ as the capital/asset ratio. The required reserves ratio and the capital/asset ratio are directly influenced by the existing regulatory framework of the financial system. On the other hand, the liquid assets ratio is related to a behavioural relationship that gives rise to a liquidity preference function for banks.

The pivotal market of this model is the interbank market. The net position in the interbank market for every bank j is the difference $T_j = T_{jA} - T_{jL}$, where T_{jA} denotes liquid assets and T_{jL} liabilities in the form of short-term securities. We assume that there are different motives for holding liquid assets and liabilities. Demand for liquidity by a bank that borrows from the interbank market has the

³ I drop the time subscript for simplicity.

⁴ I assume for simplicity that a change in the amount of deposits accepted by each bank D_j will not affect the market deposit rate so that each bank acts as price taker in the market for deposits. In addition, deviating from the classical representation of the Cournot model, I treat loan supply by each bank as a function of loan supplies of all other banks such that $\mathcal{L} = \mathcal{L}_j(\mathcal{L}_{k \neq j}) + \sum_{k \neq j} \mathcal{L}_k^*(\mathcal{L}_{j \neq k})$ for $k = 1, \dots, m$ and $j \in [1, \dots, m]$. Then expressing all variables in terms of loans and maximizing with respect to them we have $\max_{\mathcal{L}_j} \Pi_j = l(\mathcal{L})\mathcal{L}_j - d(D) \left(\frac{1-e_j}{1-k \pm \tau_j} \right) \mathcal{L}_j \pm r_T \tau_j \left(\frac{1-e_j}{1-k \pm \tau_j} \right) \mathcal{L}_j - r_E e_j \mathcal{L}_j - C_j(\mathcal{L}_j)$.

meaning of a demand for cash reserves in exchange for short-term securities supplied by these banks, the latter entering as liabilities in their balance sheets. The rationale for this trade is to supplement their liquid reserves in order to pay out possible deposits withdrawals given defaults expected in the current period. In this way, the volume of their loans remains unaffected by the increase in defaults, given a replenished equity capital⁵. On the other hand, demand for liquid assets has the meaning of obtaining securities as assets substituting loans and shortening the maturity of a bank's portfolio, by supplying extra liquidity to net borrowers in the interbank market. The justification for this operation is to guard against future defaults expected for the next period but not currently affecting bank's liquidity position. Banks as lenders will provide such liquidity to other banks as borrowers at a price equal to the interbank rate.

Assume that the preference for liquid liabilities (issuing of short-term securities as liabilities) as expressed by the liquid assets ratio is proportional to the current period's expected default rate⁶ α_{jt} with $0 \leq \alpha_{jt} \leq 1$ for every bank j i.e.

$$\tau_{jLt} = (1 - k_t)\alpha_{jt} \quad (2)$$

$(1 - k_t)$ being the proportionality factor. Multiplying (2) by the amount of deposits we obtain $T_{jLt} = (1 - k_t)\alpha_{jt}D_{jt}$ namely, the funds borrowed on the interbank market should be at such a level that they could repay, if needed, the proportion of deposits that corresponds to loan losses and which is not covered by required reserves. A rising

⁵ As explained below, banks are assumed to replenish equity capital which has covered defaulted loans in order to maintain a target capital/assets ratio.

⁶ If "loans" include both marketable and non-marketable assets then $\alpha_{jt} > 0$ expresses both the expected default rate and the expected rate of depreciation of marketable assets. Possible asset appreciation would have the opposite sign and might counterbalance the effect of the default rate. I ignore this case in order to keep the model simple and focus on the less favorable situation for banks.

α_{jt} corresponds to rising demand for current liquidity or rising supply of short-term securities in the interbank market. On the other hand, the preference for liquid assets τ_{jAt} depends on the present value of future (next period's) expected demand for liquidity, as expressed by the expected default rate for period $t + 1$ given the (assumed unchanged by regulation) required reserves ratio:

$$\tau_{jAt} = \frac{\tau_{jLt+1}}{1 + r_T} = \frac{(1 - k_t)E[\alpha_{jt+1}]}{1 + r_T} \quad (3)$$

Thus, depending on whether $T_{jA} > T_{jL}$ or $T_{jA} < T_{jL}$ some banks end up as net lenders and others as net borrowers in the interbank market. Hence, we assume that bank j becomes a net lender in the interbank market if:

$$\begin{aligned} \tau_{jt} = \tau_{jAt} - \tau_{jLt} > 0 &\Rightarrow \\ \Rightarrow \frac{(1 - k_t)E[\alpha_{jt+1}]}{1 + r_T} - (1 - k_t)\alpha_{jt} > 0 &\Rightarrow \\ \Rightarrow E[\alpha_{jt+1}] > (1 + r_T)\alpha_{jt} &\quad (4) \end{aligned}$$

that is, if defaults in the next period are expected to exceed the future value of current defaults, or the amount of liquidity needed in the future is expected to increase above current demands for liquidity. In this case, a bank that wants to insure itself against future liquidity problems will become a net lender in the market so as to both shorten

the maturity of its portfolio and obtain cash at interest in the next period when these funds would be mostly needed. On the other hand, a bank h is a net borrower in the interbank market when:

$$\begin{aligned}
 -\tau_{ht} &= \tau_{hAt} - \tau_{hLt} < 0 \Rightarrow \\
 &\Rightarrow \frac{E[\alpha_{ht+1}]}{1 + r_T} < \alpha_{ht}
 \end{aligned}
 \tag{5}$$

which means that the present value of next period's expected defaults is less than current defaults, so that the bank becomes a net borrower to insure itself from current unexpected withdrawals of deposits up to the level of current loan defaults. Hence, we can discern two types of banks: net lenders of type j where $j \in (1, m')$ and net borrowers of type h where $h \in (m' + 1, m)$.

In order to derive equilibrium in the interbank market we need to take into account not just banks' net positions but rather their gross supply and demand for liquidity. Since aggregate borrowing of liquidity of the magnitude $\sum_{k=1}^m T_{Lkt}$ should be satisfied by aggregate liquidity supply $\sum_{k=1}^m T_{Akt}$, then in equilibrium and using (2) and (3) we obtain:

$$\sum_{k=1}^m T_{Akt} = \sum_{k=1}^m T_{Lkt} \Rightarrow$$

$$\Rightarrow \frac{\sum_{k=1}^m (1 - k_t) E[\alpha_{kt+1}] D_{kt}}{1 + r_T} = \sum_{k=1}^m (1 - k_t) \alpha_{kt} D_{kt} \Rightarrow$$

$$\Rightarrow \frac{\sum_{k=1}^m E[\alpha_{kt+1}] D_{kt}}{\sum_{k=1}^m \alpha_{kt} D_{kt}} = 1 + r_T$$

(6)

Equation (6) indicates that the equilibrium interbank rate depends on the relationship between future and current liquidity needs in the market as these are expressed by the interaction of liquidity preferences of lenders and borrowers. Thus, the higher future liquidity needs are expected to be, given current levels, then in equilibrium the higher will be the interbank rate demanded by lenders and paid by borrowers. Hence, if $\sum_{k=1}^m T_{Akt} < \sum_{k=1}^m T_{Lkt}$ or future liquidity needs fall short of current ones, this is an indication of *optimism* and leads to a lower interbank rate in equilibrium. The opposite happens when $\sum_{k=1}^m T_{Akt} > \sum_{k=1}^m T_{Lkt}$ as a rising ratio of future expected over current default rates signifies a rise in *pessimism* and leads to a higher interbank rate in equilibrium.

In order to establish an upper bound for the interbank rate we need to introduce the notions of *trust* and *financial innovation*. To do this we decompose the interbank rate:

$$r_T = r_B (1 + \bar{\lambda}_{kt}) \quad (7)$$

In (7) r_B is the risk-free Treasury Bill rate and $\bar{\lambda}_{kt}, k \in [1, \dots, m]$ with $0 \leq \lambda_{kt} \leq \lambda_{up}$ is an *average*, across banks, factor of *degree of confidence* with which they hold their expectations of economic prospects. Thus, if the level of the interbank rate

indicates the liquidity premium of money in the interbank market, then fluctuations in the latter correspond to fluctuations in the degree of confidence with which probabilistic estimates are made, in the sense of Keynes (1936[1973], p.240). Independently of banks' final positions as net lenders or net borrowers, they all participate in the market as both lenders and borrowers and, hence, they all contribute by their individual risk assessment to the average degree of confidence factor. This factor acts as a mark-up or risk premium on the risk-free interest rate taking values above or equal to zero. An extreme value of the average degree of confidence factor $\bar{\lambda}_{kt} = 0$ indicates a high degree of confidence on expectations held, or alternatively a high level of *trust* prevailing in the interbank market, such that the interbank rate becomes equal to the risk-free interest rate. Conversely, a value of $\bar{\lambda}_{kt} > 0$ is an indication of low confidence and *distrust*, which raises the interbank rate above the risk-free rate. Then a rising interbank rate or a rising risk premium in the interbank market corresponds in equilibrium to higher expected default rates in the next period (for given current default rates) or the prevalence of pessimism.

$$\frac{\sum_{k=1}^m E[\alpha_{kt+1}]D_{kt}}{\sum_{k=1}^m \alpha_{kt} D_{kt}} = [1 + r_B(1 + \bar{\lambda}_{kt})] \quad (8)$$

Finally, in terms of (8) an extremely high $\bar{\lambda}_{kt} = \bar{\lambda}_{up} > 0$ indicates a break of trust in the market since expected default rates conditioned by current deposit levels $E[\alpha_{kt+1}]D_{kt}$ are in aggregate so high that it is doubtful whether future liquidity demands could be serviced, the market facing a liquidity crunch⁷.

⁷ For a specific value of this upper bound see footnote 13.

Now, since equilibrium in the interbank market is attained as the outcome of transfer of liquidity between periods, *a high degree of trust and confidence which lowers the cost of interbank lending is an indication of financial innovation*. This is because this transfer of liquidity between periods t and $t + 1$, takes the form of exchange of risk between profit maximizing net lenders and net borrowers in the market. The risk of deposit withdrawals incurred by net borrowers in period t is transferred to net lenders who undertake it at a price denoted by the level of the interbank rate. A low level of r_T is thus an *indication* of financial innovation, namely of newly constructed financial instruments that make this transaction possible. But no such technical instrument or form of security can represent financial innovation if it is not based on the mutual benefit and trust of the two parties of the transaction. Thus, trust and confidence in the market are positively correlated with financial innovation which makes the exchange of risks possible at low cost⁸.

The default on loans rate as the major risk factor that banks face in this model should also affect the price of the other source of funds that is of interest from a regulatory perspective: equity capital. Assume, as in Heid (2007), that banks do not lose the interest on defaulted loans because this is paid before firms default. In addition, since the principal of defaulted loans (write-offs) is covered by equity capital, assume that banks aiming at maintaining a target capital/assets ratio e_j will resort to the capital market to raise equity capital at the market cost r_{Ej} . Hence, the expected market value of equity at the end of period t implicit in (1) is equal to

⁸ The model is able to incorporate the effect of financial innovations such as Credit Default Swaps or other insurance-like products. This would require two things: 1) An additional argument in the operating cost $C_j(\cdot)$ of banks representing the incurred cost of insurance. The latter would depend positively on the expected default rates as these are perceived by the insurer. 2) An additional market, the insurance market, where the relevant premia are determined. However, the argument of this paper remains valid since a mere risk transfer from the interbank to the insurance market cannot reduce fundamental uncertainty and the degree of confidence prevailing in the insurance market might affect the cost of insurance in a similar way as the one described in the text for the cost of interbank funds.

$E_{jt} = E_{jt-1} + \Pi_{jt-1} - \alpha_{jt}\mathcal{L}_{jt} + \Delta E_{jt}(r_{Ej})$ where $\alpha_{jt}\mathcal{L}_{jt}$ is the expected level of write-offs and Π_{jt-1} are retained earnings from the previous period. Thus, the cost of write-offs is transformed into a cost of raising equity capital from the market. The higher the return on equity r_{Ej} required by the market, the higher profits must be to sustain this increased cost for a given amount of write-offs. Denote by r_{Ejt} the cost of equity capital of bank j at time t . Define the variable $r_{E(nd)}$ as a benchmark cost of equity capital of a banking firm with zero defaults $\alpha_{(nd)} = 0$, current and expected. Then, for a risk factor λ_{jt} pertaining to bank j at time t , we can write:

$$r_{Ejt} = r_{E(nd)}(1 + \lambda_{jt}) \Rightarrow$$

$$r_{Ejt} = r_{E(nd)} \left[1 + \left(\frac{\alpha_{jt-1}}{\alpha_{jt-2}} \right) \bar{\lambda}_{kt} \right] \quad (9)$$

Equation (9) says that the cost of equity capital for bank j is a mark-up above the cost of equity of a benchmark bank without defaulted loans. The mark-up factor is the risk factor of bank λ_{jt} . Although only bank managers are aware of the true λ_{jt} that makes up, along with the risk factors of other banks, the average degree of confidence factor of the banking sector $\bar{\lambda}_{kt}$, we assume that equity market participants can obtain a proxy of it as $\lambda_{jt} = \left(\frac{\alpha_{jt-1}}{\alpha_{jt-2}} \right) \bar{\lambda}_{kt}$. In this sense, expectations about the state of the economy derived by the level of $\bar{\lambda}_{kt}$, which is closely related to the conditions in the interbank market, and expectations about the individual situation at which each bank is placed, as given by the ratio of previous periods default rates $\left(\frac{\alpha_{jt-1}}{\alpha_{jt-2}} \right)$, affect the cost of capital for each bank. Accordingly, by thus allowing default rates to affect the cost

of equity capital may act as a market disciplining device. However, a reasonable objection to that is that euphoria which inflates asset prices emerges *because* market discipline in the above sense cannot function effectively, either because uninformed investors cannot have even the proxy knowledge of past default ratios for each bank or because informed professional institutional investors simply disregard the signals given by these ratios and charge unjustifiably low risk premiums.

4. The interbank market along the financial cycle

In this section, the analysis of the interbank market presented above is used to explain the possibility of regulation evasion *through* financial innovation, with a Minsky-Kindleberger financial cycles model as background⁹.

Different liquidity preferences in this model, as expressed by net lenders and net borrowers, indicate differing market shares in the credit market. The attempt of a net borrower bank h to maintain its level of extended loans despite expected defaults by supporting its liquid reserves with funds borrowed on the interbank market will be successful only if another bank (or banks) j decides to decrease its own market share as it substitutes bank's h short-term securities for loans at a price¹⁰. This implies a necessary change in liquid assets ratios for each bank. Define $s_{k\mathcal{L}} = \frac{\mathcal{L}_k}{\mathcal{L}}$ the share of bank $k = j, h$ on total loans extended by the banking sector \mathcal{L} . Define also the

⁹ Minsky-Kindleberger financial cycles model as described in Kindleberger (1978), based on Minsky (1972).

¹⁰ This process of banking competition for shares in the loan market is not in conflict with the modern banking practice of securitization since, for the latter to come into existence, loan origination is necessary.

elasticity of market demand for loans $\varepsilon_{\mathcal{L}} = \mathcal{L}'(l) \frac{l(\mathcal{L})}{\mathcal{L}} < 0$. Then by the first order conditions derived by (1) we obtain the expressions F_{NL} for net lender banks and F_{NB} for net borrower ones:

$$F_{NL} = \frac{l(\mathcal{L}) - [d(D) - r_T \tau_j] \left(\frac{1 - e_j}{1 - k - \tau_j} \right) - r_E e_j - \frac{\partial C_j(\mathcal{L}_j)}{\partial \mathcal{L}_j}}{l(\mathcal{L})} - \frac{s_{j\mathcal{L}} \left(1 + \sum_{k \neq j} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_j} \right)}{|\varepsilon_{\mathcal{L}}|} = 0 \quad (10a)$$

$$F_{NB} = \frac{l(\mathcal{L}) - [d(D) + r_T \tau_h] \left(\frac{1 - e_h}{1 - k + \tau_h} \right) - r_E e_h - \frac{\partial C_h(\mathcal{L}_h)}{\partial \mathcal{L}_h}}{l(\mathcal{L})} - \frac{s_{h\mathcal{L}} \left(1 + \sum_{k \neq h} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_h} \right)}{|\varepsilon_{\mathcal{L}}|} = 0 \quad (10b)$$

Changing liquid assets' ratios imply for the respective market shares $\frac{d(s_{j\mathcal{L}})}{d(\tau_j)} < 0$ and

$\frac{d(s_{h\mathcal{L}})}{d(\tau_h)} > 0$ if the inequality (11) holds true¹¹:

$$r_T < \frac{d(D)}{1-k} \quad (11)$$

Note that inequality (11) means that the unit cost of funds in the interbank market should be less than the corresponding cost of funds in the market for deposits adjusted by the required reserves ratio if a change in market shares is to be attained through a change in liquid assets' ratios. To explain this, multiply both sides by the amount of deposits which correspond to defaulted loans $a_h D_h$ for bank h and rearrange to obtain

¹¹ See Mathematical Appendix.

$r_T(1 - k)a_h D_h < d(D)a_h D_h$ or $r_T T_h < d(D)a_h D_h$. This means that for this market to function, the net borrower bank should face a cost of interbank funds (to cover possible deposits withdrawals) lower than their cost in the deposit market¹². This gives a meaningful upper bound for the interbank rate in the sense that a rate above that level $r_T > \frac{d(D)}{1-k}$ would indicate the end of trading in the interbank market¹³.

Now suppose that the economy is placed at the rising phase of the cycle. At this point optimism prevails, which means that the rate at which current liquidity needs are traded for future ones is close to the risk-free rate. If current default rates are at a level which is considered to be normal for the conditions that prevail in the economy then optimism means that it is not expected that these rates will change significantly in the future. Hence, the rate at which funds are loaned is just the one corresponding to the time value of money without any risk premium. This has its repercussions in both (8) and (9), affecting both the level of the interbank rate and the cost of equity capital for each bank h . Indeed, if banks' average risk factor $\bar{\lambda}_{kt}$ is close to zero, then the interbank rate is close to the risk free rate *and* the cost of equity capital for each bank h is close to the benchmark cost of equity capital without defaults $r_{E(nd)}$, the mark-up depending only on agents' expectations described by the ratio of defaults for each bank $\left(\frac{\alpha_{ht-1}}{\alpha_{ht-2}}\right)$. If default rates are indeed considered normal then this ratio would be low contributing to a low cost of equity capital for this bank and hence, a low cost of restoring capital after write-offs.

¹² Note that the amounts of funds that are effectively comparable are $(1 - k)a_h D_h$ on the side of the interbank borrowing as opposed to $a_h D_h$ on the side of deposit market since borrowing from the interbank market is reserve free while borrowing from the deposit market is burdened by a percentage of $(1 - k)$ in required reserves.

¹³ Note that this upper bound reflects the case where market shares are left unaffected by liquidity positions since $\frac{d(s_{jL})}{d(\tau_j)} = \frac{d(s_{hL})}{d(\tau_h)} = 0 \Rightarrow r_T = \frac{d(D)}{1-k}$.

Hence, a low interbank rate makes it possible for net borrowers to increase their market share despite current default rates that could provoke a liquidity problem to the bank if $\alpha_{ht} > k_{ht}$ and would demand premature liquidation of loans to cover possible deposit withdrawals. Trade in the interbank market enables the net borrower bank to circumvent the constraint on its loan activity placed by the reserves requirement ratio. Hence, optimism of net lenders in the interbank market at the beginning of the financial cycle validates optimism of net borrowers in the credit market and makes it possible for the latter to maintain their loan activity despite defaults. This kind of risk sharing between the two types of banks is an indication of financial innovation in the form of new instruments or techniques that permit this optimism to manifest itself.

If financial innovation through such exchange of risks between periods and liquidity needs continues to be validated by euphoria in the market, an increase in current default rates will not significantly affect future expected default rates and the risk premium will remain low. Nevertheless, as the boom in investment demand goes on, either a tight monetary policy by the central bank or a demand for credit that rises at a higher rate than its supply, will exert an upward pressure on interest rates (Minsky (1980b)). Such rise in loan rates facing firms could lead to present value reversals for those with the weaker financial structures (Minsky (1980a)). The longer the time Ponzi financing practices have been exercised, the higher their compounding and volume effect on the fragility of the financial structure of the economy (Tymoigne (2011)). This implies that current default rates for every period will increase as the economy moves up the cycle. After some point in time, spreading of present value reversals among firms-borrowers of banks will lead to a reassessment of risk premia in the interbank market, exerting upward pressure *in both* the interbank

rate and the cost of equity capital. At the top of the cycle, as $\bar{\lambda}_{kt} = \bar{\lambda}_{up}$ the high cost of both interbank funds and equity capital will come to express the prevalence of pessimism in the economy.

The interbank rate will reach its maximum level at $r_T = \frac{d(D)}{1-k}$. Beyond this point the interbank market ceases to operate. Trust has been broken as the risk premium $\bar{\lambda}_{kt}$ is very high and confidence is very low. Financial innovation, which gave the opportunity to banks to circumvent reserve requirement regulations and obtain equity capital at low cost, is no longer validated by optimism and, hence, is no longer operational. In this model, risk assessment in the capital market requires the proper functioning of the interbank market. If the latter is unable to operate properly then raising capital from the capital market will become more difficult, at least at reasonable cost. Then the compound effect of deposits withdrawals and write-offs eating on equity capital would lead to both liquidity asphyxia and capital inadequacy for net borrowers. The only alternative source of borrowed funds is the deposit market but this would require a rise in the deposit rate and, hence, a further rise in the loan rate leading to a vicious circle. On the other hand, it is doubtful whether depositors would increase their bank deposits in the first place and not run on them, plagued by what Kindleberger called “panic”. Deposit insurance will only be a partial solution, if it is not followed by policies that will revive confidence on expectations held by banks for future economic prospects. Restoring lending activity is at the heart of the problem.

At this point, the “Big Government-Big Bank” mix (Minsky (1982)) could operate so as to prevent both bank panic and economic downturn. The Central Bank could accommodate the demand for funds by net borrowers by discounting banks’ short term securities at a rate close to but below $\frac{d(D)}{1-k}$. Such an operation would restore

the liquidity position of net borrowers and permit them to revitalize their loan activity, Central Bank intervention having the same effect as the original functioning of the interbank market. More important is the expectation that government intervention at this point of the cycle might restore trust as the basic precondition for the re-functioning of the interbank market and the proper functioning of the deposit market. On the other hand, since we are at that part of the cycle that is characterized by falling profits, bankruptcies, increasing default rates and pessimism and extreme skepticism prevails, we have a situation where there is both unsatisfied demand for liquidity by net borrowers *and* shortening of investment horizons by both borrowers and lenders. In this case, the monetary authority can sell newly issued government securities to net lenders at the risk-free rate r_B to cover their unsatisfied demand after the closure of the interbank market. In this way it satisfies their need to shorten the maturity of their portfolio and at the same time collects funds that could be partly channeled to net borrower banks and partly used by the government for public spending to sustain economic activity. The government undertakes the task of implementing the maturity transformation that the private sector cannot realize on its own and thus support investment even though banks' horizons become shorter and their unwillingness to lend aggravates the crisis. Note that the proposal is that the government borrows from net lender banks at the risk-free rate but lends net borrower banks at a higher rate close to $\frac{d(D)}{1-k}$. This might have two consequences: Firstly, the government obtains a risk premium by net borrowers which is close to the market risk premium thus lessening the burden of tax-payers from the rescue of banks. Secondly, since it pays out only the risk-free rate to net lenders for their holdings of government securities, it provides an incentive for net lenders to again enter the interbank market and seek a

higher rate of return including a risk premium, given that the operation of the market has now been normalized after the rescue of net borrowers by the government.

Although it is wise to rescue a solvent but illiquid bank, it is always a dilemma whether to save an insolvent bank, even as their identification might be a difficult task. If $(1 - \alpha_{kt})\mathcal{L}_{kt}$ is the proportion of healthy loans in the portfolio, a bank is solvent if the market value of the liquidation of all its assets is just enough to cover its debt liabilities:

$$(1 - \alpha_{kt})\mathcal{L}_{kt} + R_{kt} \pm T_{kt} = D_{kt} \Rightarrow$$

$$\Rightarrow \alpha_{kt} = e_{kt}$$

(12)

Given the above relationship, conventional wisdom indicates that regulation in the form of capital adequacy requirements would establish such a minimum rule in order to change the incentive structure towards more stability of the financial system. Then the problem for the regulatory authority is to set a minimum e_{min} below which capital/assets ratios should not fall in the upswing. Such a minimum capital requirement might depend on risk weighted assets, the latter defined either by the regulatory authority or internally, as in Basel II. However, the model presented above indicates that even if banks operate close to this minimum e_{min} in the upswing, regulation evasion is still possible if the cost of equity capital is low enough.¹⁴ We have seen that this cost depends on the level of the risk premium that reflects the degree of confidence on expectations held $\bar{\lambda}_{kt}$. A low cost of equity capital in the

¹⁴ Note that the mathematics behind inequality (11) imply that the capital/assets ratio remains unaffected, say at the regulatory minimum level, as market shares change.

upswing might delay the effect that capital adequacy requirements might have on the behavior of net borrowers¹⁵. On the other hand, when confidence on probabilistic expectations changes, rising risk premia become an impediment for easy access to the market and this renders the maintenance of the e_{min} capital/assets ratio more costly if profits' maximization is the bank's aim. Hence, raising capital adequacy ratios using capital buffers or even building up countercyclical capital reserves, as proposed in Basel III, might not be enough if measures targeting overconfidence in booms are also not taken on board.

5. Conclusion: Regulation in a state of confidence-dominated interbank market

The “Minsky-Kindleberger” financial cycles framework has been widely used in the literature for explaining financial crises. What this paper argued is that it may be the appropriate framework for deriving bank regulatory policies as well, if coupled with a – inspired by Keynes (1930[1971], 1936[1973], 1937) – state of confidence-dominated perception of financial innovation and banks' liquidity preference. In this context, bank regulation, along with its traditional tasks, should aim at controlling financial innovation in the interbank market and affect confidence depending on the phase of the financial cycle the economy is placed at.

We have seen in the previous section how optimism in the upswing of the cycle validates financial innovation in the interbank market which makes the exchange of risk between net lenders and net borrowers possible. This innovation,

¹⁵ If risk weights are computed internally as in Basel II using models whose estimates of probability of default depend on the phase of the cycle then this would be an additional route by which capital requirements become ineffective to restrain overoptimism in the market.

based on mutual trust of financial institutions which lowers risk premia, renders the required reserves regulation ineffective and delays the effect of capital adequacy requirements for the part of the market identified as net borrowers, as it permits them to continue their loan operation at least at the same levels as before despite current defaults. If a given reserve requirement/capital adequacy requirement constitutes a certain structure of incentives imposed on each bank, to maintain liquid reserves and take care of its solvency position through the magnitude and quality of its loan activity, then mutual trust of banking institutions might circumvent this regulation. On the other hand, when this trust is broken at the beginning of the crisis, it may be too late for this regulation to play its role. Financial innovation in its various forms may accommodate the increase in the proportion of speculative and Ponzi financial structures in the economy. The economy has benefited by the extended loan activity of banking institutions at the cost of increased fragility of the financial system.

The paper argued that the degree of confidence or risk premium factor which could affect both the interbank rate and the cost of equity capital may be the crucial variable in the regulation-innovation nexus. Consequently, government intervention both in the upswing and the downturn should aim at affecting this factor. Higher capital adequacy ratios, liquidity and leverage ratios, as proposed in Basel III, might not be enough if measures targeting overconfidence in booms are not taken into account. The results of this paper provide support to the view that reserve and capital requirements in the rising phase of the cycle should be accompanied by policies which would encourage hedge financing, in the spirit of Minsky's (1986) agenda for financial reform.

However, as this paper argued, financial innovation might depend on the degree of confidence on expectations held which, in turn, are reflected in the

workings of the interbank market. Then, policies that discourage speculative and Ponzi finance should aim at keeping overconfidence under check. To put it differently, if overconfidence of the suppliers of credit makes possible the acceptance of speculative and Ponzi financial structures (Minsky (1972)) then constraints on certain business practices and banks' asset structures should target the fluctuations in the state of confidence either at the boom or at the trough. It is in this context of a "regulation of confidence" point of view that bank examination by the central bank using financial fragility indices (Tymoigne (2011)), along with the use of its discount policy to favor hedge financing, may restrain the tendency towards destabilizing bank practices.

Similarly, in the downturn, capital adequacy requirements or reserve requirements should not act as an impediment to credit extension. In this phase of the cycle, regulation should be more relaxed so as to allow the loan rate to fall and economic activity to be revived thus contributing to lower default rates and restoring confidence. Accommodation during the crisis might retain default rates at moderate levels and stop the deterioration of confidence or even improve it after some point given increased involvement of the government in the investment process and the revitalization of the interbank market.

Mathematical Appendix

For a net lender bank j we have:

$$\frac{d(s_{jL})}{d(\tau_j)} = -\frac{\frac{\partial F_{NL}}{\partial \tau_j}}{\frac{\partial F_{NL}}{\partial s_{jL}}} = \frac{[r_T(1-k) - d(D)](1-e_j)|\varepsilon_L|}{(1-k-\tau_j)^2 l(\mathcal{L}) \left(1 + \sum_{k \neq j} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_j}\right)}$$

While for a net borrower bank h :

$$\frac{d(s_{hL})}{d(\tau_h)} = -\frac{\frac{\partial F_{NB}}{\partial \tau_h}}{\frac{\partial F_{NB}}{\partial s_{hL}}} = \frac{[d(D) - r_T(1-k)](1-e_h)|\varepsilon_L|}{(1-k+\tau_h)^2 l(\mathcal{L}) \left(1 + \sum_{k \neq h} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_h}\right)}$$

1. The term $\left(1 + \sum_{k \neq j} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_j}\right)$ is positive either for a positive sum of partial derivatives (indicating a rise (fall) in loan supply by banks $k \neq j$ as a reaction to a rise (fall) of loans by bank j) or for a sum of partial derivatives which ends up negative provided that its absolute value $\left|\sum_{k \neq j} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_j}\right|$ is less than one. The latter means that the response of banks $k \neq j$ to a rise (fall) of loans by bank j would be a fall (rise) in their loan supply in the aggregate but less than proportional to it. The same reasoning holds for the term $\left(1 + \sum_{k \neq h} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_h}\right)$. Hence, both denominators

$$(1-k-\tau_j)^2 l(\mathcal{L}) \left(1 + \sum_{k \neq j} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_j}\right) \text{ and } (1-k+\tau_h)^2 l(\mathcal{L}) \left(1 + \sum_{k \neq h} \frac{\partial \mathcal{L}_k}{\partial \mathcal{L}_h}\right)$$

are positive.

2. The products $(1 - e_j)|\varepsilon_{\mathcal{L}}|$ and $(1 - e_h)|\varepsilon_{\mathcal{L}}|$ are positive since the terms $(1 - e_j)$ and $(1 - e_h)$ are positive given that $1 - e_k > 0 \Rightarrow e_k < 1 \Rightarrow E_k < \mathcal{L}_k$ for $k = j, h$ namely, part of the loans for both types of banks is funded by deposits.

3. Hence, $\frac{d(s_{j\mathcal{L}})}{d(\tau_j)} < 0$ and $\frac{d(s_{h\mathcal{L}})}{d(\tau_h)} > 0$ hold for $d(D) - r_T(1 - k) > 0 \Rightarrow r_T < \frac{d(D)}{1-k}$

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