

Balzarotti, Verónica; Anastasi, Alejandra

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Web Page: www.bcra.gov.ar

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**Regulatory Solutions to Bank Loans Pro-Cyclicality
Is the cure worse than the illness?**

Verónica Balzarotti¹ and Alejandra Anastasi²

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Economic Research Department
Banco Central de la República Argentina

¹ Principal Manager - Economic Research Department – vbalarotti@bcra.gov.ar

² Principal Analyst - Economic Research Department – aanastasi@bcra.gov.ar

Abstract

The impact of the business cycle on banks' internally generated cash flow³ is an important driver in the pro-cyclical dynamics of the traditional banking business and yet the issue has been understated in the discussion on counter-cyclical regulations. Considerable attention has been given to the need to lessen capital scarcity during the downturns and to the discrepancy between accounting rules and regulation standpoints. In contrast, the importance of incentives arising from this type of regulations has received little attention.

We develop an exercise of a representative bank to illustrate the dynamic effects of some counter-cyclical regulatory schemes, with a special focus on the impact on cash flows. We show that while a counter-cyclical provisioning scheme changes the temporal impact of the cycle on accounting earnings, it may still stress cyclicality. Alternative counter-cyclical regulatory schemes such as time-varying capital and liquidity requirements are also assessed with a focus on the above mentioned impact on cash flows and other potential drawbacks associated with the interplay among accounting rules, signaling and incentives to "manage the balance sheet".

³ Flow of funds from assets, as opposed to funds raised from depositors and other creditors.

1. Motivation

There is a two-way link between credit and the real economy that reinforces the business cycle. Taking into account that banks provide a large part of the money supply –sight deposits– and most of the financial credit of the economy (specially in some countries), and that they also play an essential role in the transmission of monetary policy⁴, the link between credit and activity is also intuitively quite clear. The issue has been extensively studied, especially as regards bank credit and financial crises. Such studies have applied different perspectives and the various formulations have been criticized and reformulated by many authors. In one extreme, crises are explained as market failures and the result of asymmetric information or agency problems, and thus should be corrected with policies and regulations. In the other, policies and regulations are held accountable for inducing economic agents to make wrong decisions, prompting errors in the valuation of financial assets in general and of credit in particular and eventually leading to crises.

Despite their discrepancies, all these efforts concur in the search for solutions tending to smooth out expansions and contractions or to weaken the cycle-reinforcing links between the credit market (specially the regulated market) and the real economy. There is also considerable consensus among experts as to the existence of overoptimistic upswings that lead to financial crises. In this case, crisis postponement or smoothing does not suffice because crises are, to some extent, a correction in the allocation of resources after an unsustainable credit boom. Accordingly, the objective must be rather to attack the origin of the excessive boom.

In this paper, we adopt the widespread view that it is desirable to find counter-cyclical mechanisms, defined as those aimed to smooth out fluctuations in credit volume and interest rates, without formally testing such a premise.

The discussion is extremely relevant in less-developed countries, where episodes of marked macroeconomic and financial volatility have been frequent and their welfare costs have been particularly high; instability seems to be simultaneously a cause and a consequence of the lack of development. In turn, the financial turmoil experienced by developed countries in recent times has stimulated the discussion and the efforts to find policies to limit the severity of the cycles and the likelihood of a crisis. As a result, there is now abundant literature on this topic regarding both monetary policy and financial regulation. There is a higher and longer-standing set of papers on the former, i.e. studies about the relationship among monetary policy, credit conditions and the real economy⁵. In comparative terms, only lately have we seen a more vigorous debate on the role of prudential banking policies to mitigate the link between the cycle and the credit market⁶. This debate also comes as an extension to the recent introduction of regulations based on time-varying risk measures (Basel II), since they could eventually increase pro-cyclicality⁷.

Typically, capital is pointed out as the main restriction on bank loan granting during contractions within the literature referring to prudential issues. As the increase in loan

⁴ Bernanke and Gertler, 1995.

⁵ See, for example, Kashyap, Stein et al., 1993.

⁶ G-20 leaders discussed recommendations in March 2009. See G-20 2009.

⁷ Gordy and Howells, 2004.

losses starts to be reflected in banks' income statements, capital levels decline. Given the high leverage in the banking business and the existence of minimum capital requirements, these losses lead banks to reduce their assets or opt for lower-risk assets in their portfolio which entail lower capital requirements, unless there is capital in excess a priori –over the regulatory minimum and over the bank target. On top of this, economic downturns usually bring a drop in the value of securities and an increase in the measures of risk used to determine capital. Some studies on monetary issues also stress the fact that, monetary expansionary measures will attain a growth in loans and deposits only if banks' capital levels can support a higher asset level⁸. Consequently, many have proposed regulatory changes aimed to lessen the impact of the downturns on income statements and capital.

The set of regulatory changes under analysis could be classified according to their mechanisms: (i) promoting asset valuation methodologies that admit that some assets may become illiquid⁹; (ii) reducing the pro-cyclical incentives of private compensation schemes by, for example, deferring the payment of bonuses until the profits to which they relate have been effectively realized, or establishing reversal clauses; (iii) improving the quality of capital, and (iv) encouraging the use of through-the-cycle risk measures, for example, aiming at redistributing the impact of the cycle on the financial statements by means of counter-cyclical provisions.

In this paper we have picked the proposals of the fourth group and we will analyze them from a dynamic standpoint. As the dichotomy between the accounting and prudential standpoints has been frequently raised, our goal is to address the financial and incentive perspectives regarding counter-cyclical regulation. We aim to underline that the potential impact of some of these regulations on risk perception (as a result of signaling problems prevailing in the banking sector) and on credit and liquidity management decisions (through pricing and incentives) may eventually outweigh the benefits.

Additionally, there seems to be a misunderstanding as to the equivalence between some counter-cyclical regulation schemes and insurance. When a proposal advocates for the building up of accounting reserves during booms, through the early recognition of losses to avoid their reporting in the busts, such inter-temporal distribution of book entries does not equal insurance because it fails to provide compensatory funds when the event occurs, as insurance would. Said distribution will affect accounting and/or regulatory ratios but will not prevent nor compensate a fall in collections due to a higher default rate.

To illustrate these ideas, we have performed an exercise of a representative bank whose core business is the primary intermediation of resources. The bank is subject to a minimum capital regulation and a minimum liquidity ratio and faces a credit demand and a deposit supply, which are not infinitely elastic. We have considered a cyclical credit default rate and analyzed the behavior of the main variables (items of the balance sheet, interest rates, dividend payment, etc.) under the different counter-cyclical regulatory schemes. The exercise uses approximate calibrations based on Argentine figures; therefore, results should be taken as illustrative of the signs and magnitudes of the responses rather than as a conclusive assessment of what would happen in all cases. With

⁸ Bliss and Kaufman, 2003.

⁹ In this sense, some regulators are trying to establish regulations related to the liquid asset levels that a bank should keep. In this respect, an important point to consider is the definition of liquid asset.

this caveat, the exercise is useful to focus on some features of the dynamics of banks' business and the ways in which some effects are transmitted.

We proceed to describe the regulatory proposal that seems to have received most support, i.e. counter-cyclical provisions, and discuss the different uses of this instrument and the problems it might create. Later on, within the framework of the exercise, we will illustrate the impact of said regulation and of other alternative regulations on credit pricing, as well as their impact on liquidity management. Lastly, we will focus on the potential biases and incentives to "manipulate the balance sheet" that permeate the different schemes.

2. Accounting standards, prudential regulation and provisions

The current regulatory discussion goes beyond prudential regulation of liquidity and solvency and extends to accounting standards, especially those concerning the valuation of balance sheet items. Accountants and bank regulators/supervisors have different priorities regarding the data they want to get from a firm¹⁰. The former argue that financial statements must include all the information that might impact the decisions made by users, i.e. investors, creditors, depositors and employees, in addition to other concerned individuals and entities. The information must depict the institution's financial situation and its performance in the accounting period or business year. Certain criteria are applied to determine the values and timing of the items to be reported, which are based, in turn, on general accepted accounting principles, including, among others, that information must allow the comparison between the revenues and the expenses of the period, the application of accrual basis accounting and the assumption that the entity is a going concern.

Supervisors, in turn, are interested in assessing an entity's risk profile and usually make analyses under liquidation scenarios¹¹. On some occasions, this difference in perspective has led to a decoupling between prudential standards and accounting standards. Two points are worth highlighting: in any case, information should be sufficiently clear and consistent and be good for comparisons among banks and over time. Second, investors and other data users cannot compel the institutions to provide additional information while regulators in fact can and do it, so that it is not so crucial for the latter that the financial statements meet their needs.

Although this is a long-standing difference in approach, a number of episodes of market turmoil and financial scandals have revitalized the discussion about the methodologies to book and value assets and liabilities, especially new financial instruments. It is a major source of concern, for example, to realize that the complexity and sophistication of the financial activity since the 90s has been due in part to the creation of financial instruments and structures whose purpose has been to exploit –with different degrees of lawfulness– the benefits generated by booking criteria. Such developments should have made clear by now that incentive mechanisms have turned accounting information into a highly relevant factor for managers' decision making.

¹⁰ The fiscal standpoint adds yet another source of different demands on the same data.

¹¹ Clearly, this is not the view of the accounting profession. For example, the Bank of Spain's Circular Letter 4/2004 on Public and Confidential Financial Information Standards and Financial Statements Models states that "the application of accounting standards is not intended to determine net worth value for the purpose of its total or partial transmission nor the resulting amount in case of liquidation".

With this background, international regulators have moved towards the strengthening and modernization of information systems in several ways. One is assets valuation according to their fair value¹², which results in more market discipline and transparency but whose downside is a tendency to increase pro-cyclicality. This is due to the fact that, when market prices are used –or estimated- for asset valuation, it is assumed that markets are efficient, i.e. no adjustment is made for the eventual overvaluation resulting from bubbles or the undervaluation caused by recessions. The problem is significant because a high proportion of financial assets held by the banks are valued according to these criteria.

2.1. Loan Loss Provisions as a value adjustment and as a prudential instrument

In the case of loans, they are usually recorded at historical cost, and it is provisioning which should bring the accounting value closer to the fair value. If the amount provisioned is equivalent to the expected loss, then the net accounting value will equal the fair value. In this sense, it has potentially the same pros and cons as the fair valuation of securities¹³.

Loan Loss Provisions (LLP) are also thought of, from a prudential point of view, as a loss-absorption instrument that should cover expected losses from default. This means that the same instrument should achieve at least two goals (valuation adjustment and shock absorption), with the resulting complexity. Moreover, while the fair value is an economic concept and the measure of expected losses is statistical, provisions follow a methodology defined by accounting standards and based on accounting principles.

A basic accounting principle prescribes that financial statements must be backed by objective evidence. Accordingly, a loan is "performing" unless there are verifiable events or information indicating that the terms of the contract will not be fulfilled¹⁴. Potential future losses are not a current liability according to accounting standards, thus, they are not recognized through provisioning. This makes provisions backward-looking and pro-cyclical, as they increase during economic downturns, when credit quality deterioration becomes evident¹⁵.

As regards the prudential point of view, regulators/supervisors differentiate between the expected losses of a portfolio and the unexpected losses. Specialists in this field agree that the former must be covered with provisions and the latter with capital. While the distinction comes in handy to establish a regulation, in practice the difference is not so unequivocal from the prudential point of view (both instruments absorb losses) but rather a

¹² This methodology implies valuating assets and liabilities at the value at which they could be sold. This means using the market price for regular traded securities (which comply with certain liquidity, depth, etc. requirements) and estimating the value for the remaining financial assets. Fair value estimation depends on the model used for this purpose, its assumptions and the criterion applied by experts, thus losing part of the transparency driven by this methodology.

¹³ While we acknowledge the importance of securities valuation, in this paper, we will focus on the links between provisions and pro-cyclicality, i.e. loan valuation.

¹⁴ The International Accounting Standard (IAS) #39 establishes that financial assets and liabilities must be booked as per their residual value except when there is "objective" evidence of deterioration.

¹⁵ Mention should be made of the distinction between specific and general provisions (which are established as a fixed percentage of credits or assets to cover latent losses still unidentified). While the former are made against a specific credit, the latter are made against the portfolio and are less backward looking. But the importance of general provisions in this respect is minor as they tend to be a small proportion of the overall amount provisioned and are limited by the regulations (in general, they cannot be deducted from taxes and only a percentage is admitted as capital within the Basel II framework).

matter of timing: when provisions are set aside, capital is affected, if later on the loss exceeds the provisioned amount, it will affect capital again, whereas if later on the loss is small, then part of the provision will be recovered. From this standpoint, provisions are advanced capital.

Lastly, let's mention the "finance point of view" on the role of interest margins to absorb losses. This is an important element for the conclusions of this paper which has not called enough attention from the prudential regulation and related literature. This lack of consideration contrasts with the industry view, as expressed by one institution: "banks consider expected losses to be a cost of doing business and set product margins to both compensate for expected losses and earn a favorable return on capital"¹⁶. Finance literature on credit pricing shares this view since it maintains that lending rates are set as a function of expected losses and risk. It follows that interest margins are a first line of defense against losses.

3. Counter-cyclical (or "dynamic") provisioning

The core idea of the counter-cyclical provisioning methodology is to decouple prudential oriented LLP from those arising from accounting standards, so that LLP become stable at a level representing the long-term expected loss, instead of reflecting the losses incurred period after period. When the amount of booked provisions exceeds incurred losses (in the expansion), an accounting reserve is built up, which is drawn down in the contraction when incurred losses exceed the booked loss for the period. The purpose is to smooth out the impact on the bank's results by temporally redistributing LLP booking, to avoid pro-cyclical effects.

Many authors, including several regulators, have argued in favor of counter-cyclical provisioning, by explaining that most bad loans are granted during booms. A strong economic context that helps banks to increase their profits also encourages them to ease their credit standards and take on higher risks. During economic busts, some of these bad loans become evident. Then, requiring banks to increase their LLP during expansions would mean nothing but forcing them to admit that they are probably granting bad loans which will come to light in the downturn¹⁷.

Spain is a country with an interesting experience in this sense¹⁸. In 1999 the Bank of Spain introduced a specific regulation to deal with credit risk volatility resulting from the business cycle, arguing that the standards on minimum capital requirements (if internal models are not used) do not make accurate and robust quantifications of the bank risk in general and credit risk in particular¹⁹.

¹⁶ Bank of America, 2003.

¹⁷ See, for example, the comments by the President of the New York FRB William J. McDonough, quoted by Cope (1999).

¹⁸ Portugal and Australia also have a compulsory system of anti-cyclical provision-making, while in other European countries this scheme is optional (for example, tax incentives are provided). In Latin America, Colombia and Uruguay have introduced similar standards. The Bank of Portugal established in 2002 a *Fundo de Cobertura Estatística*, which acts similarly to the Spanish case. Also, the debate on dynamic provisioning is gaining importance in other European countries. See, for example, The Turner Review: A regulatory response to the global banking crisis, March 2009, FSA.

¹⁹ Economic Bulletin, January 2000, Bank of Spain.

Counter-cyclical provisioning entails several implementation challenges. First, it assumes, among other things, that a bank or the regulator is able to differentiate between macroeconomic conditions and idiosyncratic drivers of the expected default level. Second, it can face a considerable political resistance; consequently, it should be supported by clear rules and formulated with the involvement of the monetary authority. The existence of clear standards tends to avoid the difficulties stemming from the need to declare the current time of the cycle and, therefore, signaling problems. Finally, the articulation of this methodology with other sets of standards in every country is also a challenge.

3.1. Potential undesired outcomes from counter-cyclical provisioning

In our opinion, this proposal presents three potential problems associated with the subject of pro-cyclicality, in addition to the above-mentioned implementation challenges.

3.1.1. Signaling problems

A relevant part of the debate, which has been overlooked in our opinion, lies in analyzing how a counter-cyclical regulation might affect the information released to the market.

A bank's funding cost depends on the returns required ex-ante by shareholders, depositors and other creditors. The required rate of return is affected by the bank's performance, solvency and liquidity indicators. If these indicators are altered by the prudential regulation and as long as the economic agents cannot accurately discern its effects, then the funding cost will be affected.

A relevant precedent for the counter-cyclical provision regulation is the voluntary smoothing of earnings, which has been studied with interesting, though not yet conclusive, results. It has been proved that financial institutions can, and to some extent do, manage the signals on their private information and that this discretion is used to smooth out earnings by phasing out the booking of LLP. This behavior is counter-cyclical: there is an inverse relation between provision booking and the default rate, and a direct relation between such provisions and the fiscal year results (loan losses are booked when results are positive). This behavior may be due to managers' targets and their compensation and/or the fulfillment of the institution's goals for the period, and to tax rules which often encourage result smoothing²⁰.

The studies describe positive and negative aspects for this behavior. Among the positive, banks will be less likely to be subject to a sizably depletion of their capital in some fiscal years. This leads to a perception of lower risk and reduces the return required by risk-averse creditors and shareholders, though restricting the information on the true volatility of results. The downside is precisely this damage to transparency and to market discipline, among other things because it makes firms' comparison more difficult and discourages investors from acquiring information. Information accuracy about the fiscal year performance deteriorates, as well as that of the portfolio's fair value.

²⁰ See Cavallo and Majnoni (2001), and Bikker and Metzmakers (2003). Ahmed and Takeda (1999) state that provisioning management is not a response to result smoothing but to capital management.

Some studies²¹ show that the market knows that discretion is applied by banks and thus interpret higher LLP as an indication of next positive results, i.e., as a positive signal. On the other hand, countries in which results can be smoothed out more easily have higher risk profile banks and less market discipline. In other studies, the evidence seems to support that the market interprets higher provisions as a signal of a lower quality portfolio, instead of more prudence or anticipation of good results²².

The above-mentioned studies have analyzed risk perception with reference to voluntary counter-cyclical provisioning. The question arises as to whether the interpretation would change if smoothing provisions became compulsory. If a regulatory counter-cyclical provision is implemented in the same way as traditional provisions, then greater signaling problems might arise. In short, the new regulation poses a two-fold challenge to the user of the information (including the supervisor): (i) understanding the breakdown between observed losses and regulatory losses and (ii) assessing if, and to what extent, the bank is hiding, deferring or advancing the booking of losses, both in terms of the regulation and of the real losses of the fiscal year.

3.1.2. Pricing problems

The impact of a counter-cyclical regulation on earnings booking may affect the bank's loan pricing. Valuation models and professional consensus agree in that loan pricing consists in setting a lending interest rate that cover expected loan default losses, return on equity²³, funding costs and overhead expenses²⁴. That is, the interest rate spread is forward looking. If the regulation introduces a wedge between future incurred losses and future booked losses, the question arises as to which is the relevant expected default loss. If it is the one reported in the books (which is likely the case if the bank's targets and managers' compensation are tied to accounting ratios and figures), the spread charged to lending rates will tend to be less volatile with counter-cyclical provisioning. Lower spread variability would in principle convey a lower volatility in terms of credit granted.

However, a more stable spread would stress pro-cyclicality in the portfolio's internally generated cash flow. In the absence of counter-cyclical provisions, spreads are raised when an increase in default rates is foreseen and this tends to offset the drop in collections during economic busts. A more stable spread would imply even less money coming in during bad times and lead to an additional effort by the bank to get external funding resources. Then, during contractions, the increase in funding costs would be exacerbated and the desired counter-cyclical effect could potentially be reverted²⁵. This interrelation is illustrated later on in the exercise.

²¹ See, for example, Wall and Koch, 2000.

²² Bushman and Williams, 2007.

²³ Assuming that the capital required will cover the unexpected losses.

²⁴ There may be cross-subsidies between products for the same debtor; in this case, the analytical unit is no longer the credit but the relationship with the customer. Under some circumstances, other considerations may prevail, such as setting low interest rates to win market share, but then this will usually be temporary.

²⁵ In this analysis, the key factor is that the bank's internal source of funds is affected and must seek external financing, which is more expensive. This cost difference is what Bernanke (2007) and other authors call "external financing premium", regarding corporates. There is an analogy between the analysis made here and the bank-lending channel of the monetary policy since this channel operates because such premium exists, rather than due to an absolute restriction in the funding available to banks which, in turn, reflects in the cost and availability of funds to bank customers.

3.1.3. Regulatory arbitrage problems

Another potential set of problems is related to regulatory arbitrage. Counter-cyclical rules would change the reporting of economic performance in the books of regulated entities, creating an asymmetry with unregulated entities that could adversely affect the efficient allocation of resources, within a jurisdiction or even across jurisdictions. The benefits obtained by the banking activity would not be comparable to those gained in other financial activities and the former would be deemed as less volatile than it really is, due to the regulation.

The above mentioned bias on pricing introduces a wedge between the loan “market value” and the bank’s book value; as a result, loan transfers between regulated and non-regulated entities might generate short-term accounting profits, encouraging “balance sheet manipulation” and the creation of new financial institutions or instruments not covered by the regulation.

3.2. Time-varying minimum capital requirements

Considering the above-mentioned signaling problems stemming from a counter-cyclical provisioning rule, a counter-cyclical capital requirement appears as a natural alternative. Such a requirement would not create off-balance reserves. However, it would not be free from interpretation problems: the higher capital could still be interpreted either as reflecting higher risk or as a stronger position to face eventual losses. One advantage to this alternative is that it does not distort the booking of fiscal year results, although Return on Equity (ROE) and other ratios on capital would be affected. In addition, capital is a more efficient resource than provisions since it has a wider spectrum of use as it can offset losses generated by other parts of the business.

To a certain extent, banks may already be keeping counter-cyclical capital. Most banks hold more capital than required; according to Rochet²⁶, this discrepancy between “economic” capital and regulatory capital is a result of market discipline. Since this excess capital has acted, according to the author, as a buffer (allowing to hold a reasonable credit volume during a contraction), the question arises as to whether it is better to require such additional amounts of capital by means of a regulation²⁷.

One of the problems behind this solution is that it might be much easier to increase capital requirements during an economic expansion than to reduce them during contractions, since this decision could be wrongly interpreted by the market (generally speaking, it poses the same signaling and coordination challenges as a counter-cyclical provision). If resorting to Pillar 2 to require additional capital, the supervisor would be using the discretion granted by this Pillar, i.e. the supervisor would not be applying a published and automatic rule. Although this empowerment aims at strengthening the role of supervisors and is at the heart itself of Pillar 2, it could be problematic and generate some resistance. An alternative proposal would consist in adjusting the capital ratio by means of an automatic formula, according to macroprudential factors (eg leverage, maturity mismatches and loan and

²⁶ See Rochet, 2008.

²⁷ Borio et al. (2001) suggest that supervisors should make adjustments to the instruments available according to their perception of the financial system risk levels.

securities portfolios growth), increasing the requirement when the bank's systemic risk is higher and vice versa.

Another issue regarding such a change to capital requirements is that, since cycles are not identical among countries, the notion of a minimum standard capital level would be lost. Finally, there may be important drawbacks related to cash flows if dividend payments are not regulated together with such a capital buffer, but we save this issue for the moment and will come back to it within the context of the exercise.

3.3. Time-varying liquidity ratios

This alternative has not got much support among the proposals under discussion. Several factors explain the lack of debate on the role of liquidity regulation to mitigate cycle effects. Noticeably, the first factor is related to the traditional understanding, especially in advanced economies, that a capital shortage is the main cause behind credit tightening.

Secondly, another major factor has been the specificity needed to implement a liquidity evaluation framework for each jurisdiction and each entity, though the overall principles may have a general nature. The definition itself of a liquid asset is hard to establish with both accuracy and universality. Lastly, there has been an underreckoning of the dependence of the banking business on the capacity to internally generate liquidity and how this capacity is linked to the cycle, an issue we will underline within the exercise.

4. Exercise

4.1. Model

We develop a simulation exercise on the business of a representative bank. The goal is to show the behavior of the institution throughout an economic cycle under different regulation schemes which aim at smoothing out cycle effects on the banking activity, especially on credit levels.

The calibration of the main parameters has taken into account the information of the Argentine banking system (see Annex 1), but only as reference, as it is difficult to identify a true business "cycle" throughout recent Argentine history.

Representative bank, credit demand and deposit supply: The representative bank operates in an environment of certainty. It has three asset classes: loans (identical among them), fixed assets and risk-free liquid assets. Its funding comes from deposits and capital.

Since it is a representative entity, the bank faces a credit demand curve depending on the interest rate charged on loans. The stock of loans L moves according to the following equation:

$$\ln(L_t) - \ln(L_{t-1}) = w [\ln(1 + r_t^l - r_t^b) - \ln(1 + r_{t-1}^l - r_t^b)]$$

Where r_t^l is the interest rate charged on such loans in the period t , r_t^b is a benchmark rate and w is the loan demand elasticity to changes in spreads.

The bank grants two-year bullet loans and charges a fixed interest rate on them; there are yearly interest payments.

The bank faces a supply of deposits which is a function of the risk assessment made by depositors. The rate required on deposits includes a spread above the benchmark rate. Such a spread depends on some liquidity and solvency indicators of the bank (in addition to a constant component of 0.5%). Spread determination is also influenced by changes in deposits in a non-linear fashion: the rate increase required to raise one additional peso worth of deposits is lower in the economic expansion than in the contraction. In turn, the benchmark rate fluctuates around 5%, according to the business cycle phase. Formally,

$$r_t^d = 0.005 + r^b + \sum_i \varepsilon^i \text{ind}_t^i + \eta \Delta D_t \text{ cycle}$$

Where r_t^d is the rate on deposits and ε^i represents the different sensibilities applied on ind^i indicators, corresponding to:

- the difference between the observed capitalization ratio and the target ratio;
- the difference between the observed liquidity ratio and the target ratio;
- the difference between the observed ROE and the target ROE;
- the phase of the business cycle, and
- the verification that the bank has had to raise capital at the previous year to avoid regulatory breaches.

Since the cycle indicator is defined as a variable whose value increases when the economic activity deteriorates, the first three sensibilities are negative and the last two are positive.

The last term ($\eta \Delta D_t \text{ cycle}$) represents the effort required in terms of rate to modify deposit funding in each period. η is an elasticity, ΔD_t is the change in deposits and cycle indicates the phase of the business cycle.

Capital and liquidity requirements and balance sheet composition: The accounting identity of the balance sheet is as follows:

$$(L_t - AP_{t-1}) + F + B_t = K_{t-1} + D_t$$

F represents Fixed Assets, assumed as constant. B_t stands for risk-free liquid assets, which are remunerated at a constant rate. AP_{t-1} is the stock of provisions at the end of the previous period and K is the Net Worth value (Tier 1 capital).

Loans have a 100% risk weight (they are homogenous in terms of default risk; in addition, for the sake of simplicity, there are no monitoring cost), liquid assets are risk-free (assimilable to reserves at the central bank) and their risk weight is 0%, while Fixed Assets have 100% weight.

Tier 1 capital is determined by the bank's Net Worth. It is affected by results, dividend distribution and stock issuance. Tier 2 capital is only possible in this exercise under schemes where (partial) capitalization of anti-cyclical reserves is admitted. Capital regulations require that total capital (sum of Tier 1 and admitted Tier 2) be higher or equal to a percentage of risk-weighted assets. Therefore:

$$\theta [(L_t - AP_{t-1}) + F] \leq K_{t-1} + APC_{t-1}$$

Where θ is the minimum capital ratio and APC is the Anti-cyclical Provision allowed as Tier 2 capital (when it exists and is admitted).

It is worth mentioning that, though the Anti-cyclical Provision (AP) can be allowed (up to a certain limit) as Tier 2 capital for regulatory purposes, it is in fact an off-balance reserve in accounting terms.

There is a liquidity requirement expressed as a percentage λ of deposits, which demands a minimum of liquid assets B , in such a way that:

$$\lambda D_t \leq B_t$$

Cash flow: The following expressions describe the sources and uses of the bank's cash flow, allowing for new loan (NL) granting:

$$NL_{t+1} = NIM_t + L_{t-1} (1-d_{t-1}) (1-d_t) + (B_t - B_{t+1}) + (D_{t+1} - D_t) - Y_t;$$

$$NIM_t = L_t (1-d_t) r_t^l + L_{t-1} (1-d_{t-1}) (1-d_t) r_{t-1}^l - r_t^d D_t + r^{rf} B_t;$$

Bank's available funds at the end of each year to grant new loans are obtained from the Net Interest Margin NIM_t , collections from amortizing loans (ie, those originated at the beginning of the previous year net of the proportion that defaulted this year and the year before $L_{t-1} (1-d_{t-1}) (1-d_t)$), the reverse of the change in the amount of liquid assets ($B_t - B_{t+1}$) and the change in deposits ($D_{t+1} - D_t$), minus dividend payment Y_t . In turn, NIM includes collections from interest payments on this year loans, once defaulted loans have been discounted and applying the interest rate determined at the beginning of the year $L_t (1-d_t) r_t^l$, the same on the loans granted the year before $L_{t-1} (1-d_{t-1}) (1-d_t) r_{t-1}^l$, interest paid on deposits $r_t^d D_t$, and interest collected on liquid assets $r^{rf} B_t$.

The default rate fluctuates with the cycle. LLP (under a "simplified" version of current regulations) are obtained by multiplying the outstanding loans times the default rate of the period. As there is perfect foresight, at the beginning of each period the bank builds a provision according to the expected rate and given that this rate coincides with the observed rate, the whole provision will have been used at the end of the period, leading to a zero balance. When there is anti-cyclical provisioning, the LLP results from multiplying the current amount of loans by a constant rate, set by the regulation. Observed loan losses will be higher or lower than this provision. When they are lower, there will be a non-zero AP (reserve) balance at the end of the period, which can be used to calculate an amount of loans net of provisions. When loan losses are higher than the provision determined by the regulatory coefficient and there is an AP balance, this balance is drawn down.

The overall result for the period comes from adding the NIM and the amount of LLP imputed during the period, whether derived or not from an anti-cyclical scheme. If, under an anti-cyclical scheme, the provision balance were used up without completely offsetting loan losses, then this extra loss would affect results.

Pricing: At the end of each period, the bank determines the amount of new loans to be originated, taking into account funding restrictions, the accounting identity and the regulatory requirements. The elasticity of credit demand establishes a limit regarding the interest rate and the amount of new loans. The bank makes sure that the lending rate is enough to cover the expected funding rate for the current year and the next one (because the loans have a 2-year maturity), loan losses due to default and the required ROE on capital (in the exercise, expectations are always fulfilled due to perfect foresight).

It is possible to calculate a pricing formula explaining the level at which the bank sets the lending rate according to its objectives (see Annex 2). There is only one rate for all loans granted in a period, and it is fixed for two years, until maturity.

When LLP do not result from the expected loss due to default but from the application of an anti-cyclical regulation, then the bank will consider this accounting loss level at the time of setting the lending interest rate.

Distribution of dividends: The bank pays dividends in cash at the end of each period so as to comply with the desired capital ratio for the next period. This means that it has to simultaneously define the levels expected for the different aggregates and earnings breakdown. In some periods, the bank may need to raise capital. It always gets the capital it wishes, without modifying the required ROE, but faces an increase in the cost of deposits when it has to place shares in order to comply with the regulations.

Liquidity management: The bank manages the balance between fund inflows and outflows by deciding simultaneously, at the end of each period, the variables under its control, i.e. changes in aggregates –new loans, liabilities, capital and placements in liquid assets– and the corresponding interest rates. It always gets the funds required, though sometimes at a higher interest rate.

Capital and liquidity requirements as binding restrictions: The composition of the balance sheet and interest rates at the beginning of the exercise are as follows:

Balance Sheet				Interest Rates	
B Liquid assets	13,7	D Deposits	91,1	r^l Lending	13,5%
L Loans	67,6	K Net Worth	7,6	r^d Deposit	4,5%
F Fixed assets	17,5			r^f Benchmark	5,0%
Total	98,8	Total	98,8		

The target capital ratio is constant at 9% (a regulatory 8% minimum ratio plus a voluntary excess) and the minimum liquidity ratio is 15%. With a 3.7% constant default rate, the representative bank described in the table above gets a 15% ROE, complies with liquidity and capital requirements and shows stable aggregate items in the balance sheet and rates. With cyclical default rates, the bank also gets a 15% ROE but on average over time. Both the items in the balance sheet and the rates show levels fluctuating around those described above.

Since ROE results from the pricing mechanism applied by the representative bank to loans, one could wonder about other “equilibrium points” where the entity could keep liquidity and/or capital ratios above the minimum ones. These would lead to higher lending interest rates and lower credit supply, but the target ROE would still be achieved. However, in such

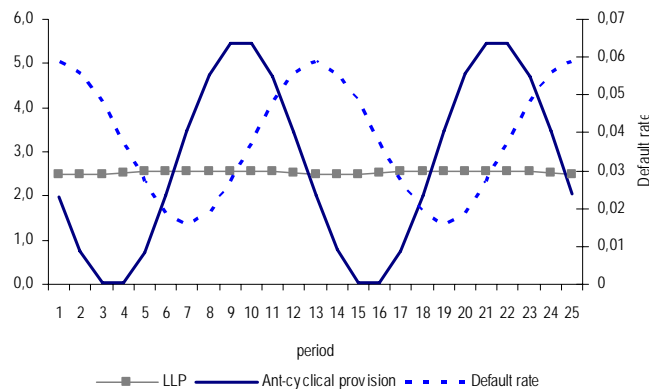
situations, each individual bank would have incentives to differentiate from the others, by using less capital and/or fewer liquid assets and getting a higher ROE (assuming that each individual entity does not significantly impact the market interest rates it faces). This is so because resorting to capital is more expensive than funding with deposits, and keeping liquid assets is less profitable than granting loans. Consequently, the equilibrium is to be found in the point where all entities operate in strict compliance with both required ratios.

4.2. Regulatory schemes

The exercise was solved for different regulatory proposals so as to show the different evolution of the significant variables and analyze the extent of success in attaining the objective, i.e. smoothing the business cycle impact on the entity's performance and the amelioration of other related problems.

Anti-cyclical provision: Under this scheme the bank establishes the LLP rate at the average level of the default rate through the cycle. The bank must keep this provisioning level regardless of the expected default rate for the following periods. In this way, LLP booking only varies following the changes in credit volume, since the recorded relative loss remains constant. In the periods when the real default rate is lower than the “booking” rate, i.e. when there is an excess provisioning, this excess turns into the AP reserve. Instead, if there is a provisioning deficit in the period, the resources accumulated in such account are used to offset the higher real loss (see Figure 4.2.1).

Figure 4.2.1: Provisions build up and use of the anti-cyclical reserve



Two exercises were performed: (i) the off-balance sheet reserve is not allowed for regulatory capital, and (ii) it is admitted as Tier 2 capital up to 50% of Tier 1 capital.

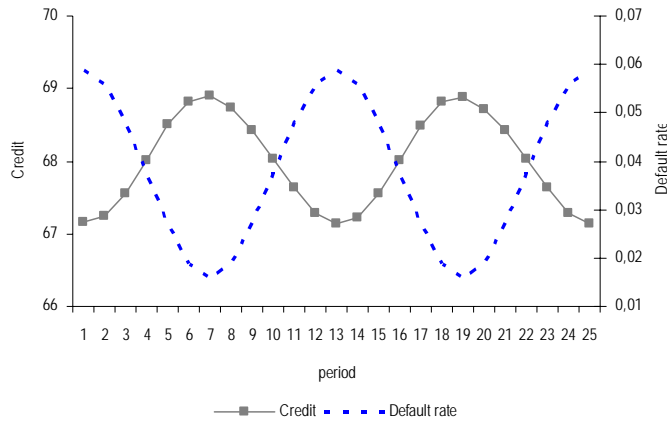
Capital regulation: This exercise entails a time-varying capital requirement which increases in economic expansions and decreases in economic contractions. The amounts by which the capital goes up and down are similar to the changes in the anti-cyclical reserve balance under the AP scheme.

Liquidity regulation: The liquid assets ratio varies with the cycle. In the expansion, the bank must accumulate liquid assets above the λ ratio (by an amount similar to the anti-cyclical reserve balance under the AP scheme) or below it, during the contraction.

4.3. Basic, “current” scheme: without anti-cyclical regulation - resolution

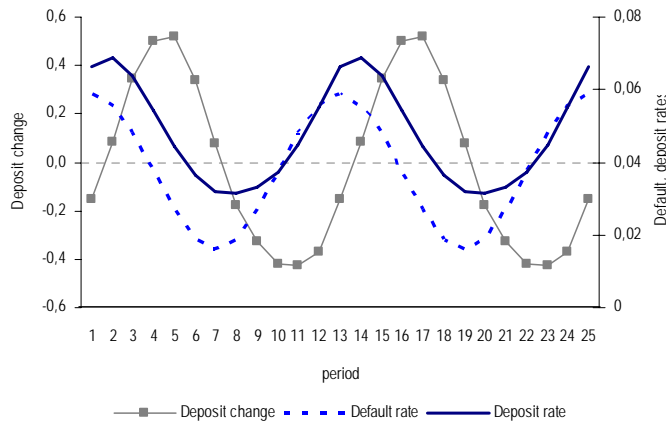
The outcome shows a considerable pro-cyclicality (credit reduction in the downturn) for the representative bank (see Figure 4.3.1).

Figure 4.3.1: Credit Pro-Cyclicality



Despite the reduction in new credit during downturns, the bank needs to raise deposits when the default rate is increasing (Figure 4.3.2). To attract depositors, it has to increase the deposit interest rate. The need for funds results from a decline in collections of amortizations and interests payments on loans, which is only partially offset by the reduction in loan granting.

Figure 4.3.2: Funding with Deposits



The lending rate shows a sharp pro-cyclicality due to both default rate and funding cost movements. Figure 4.3.3 shows that though the deposits and the lending rates follow a similar pattern through the cycle, the spread increases in the economic contraction.

Figure 4.3.3: Interest Rates

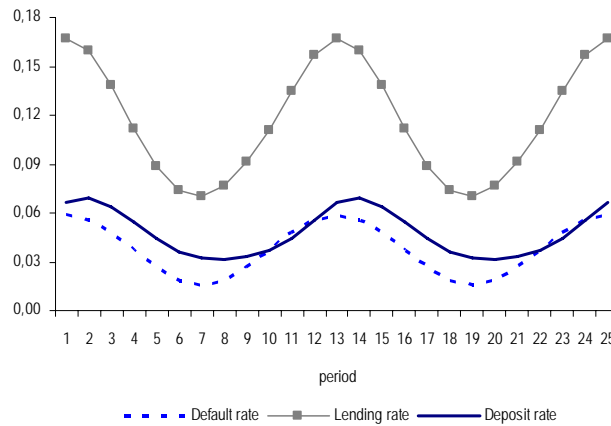
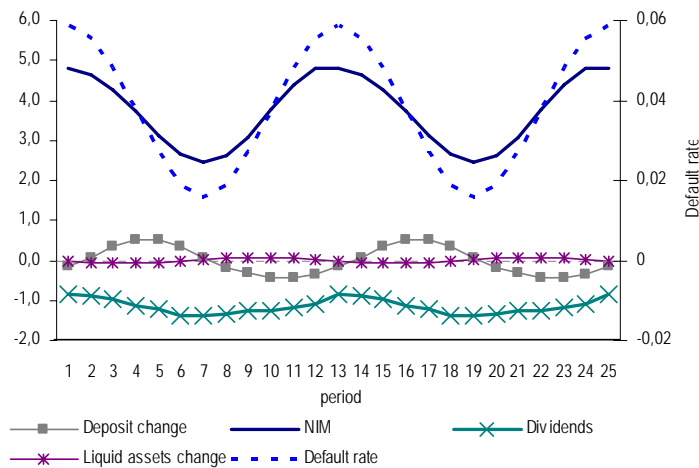


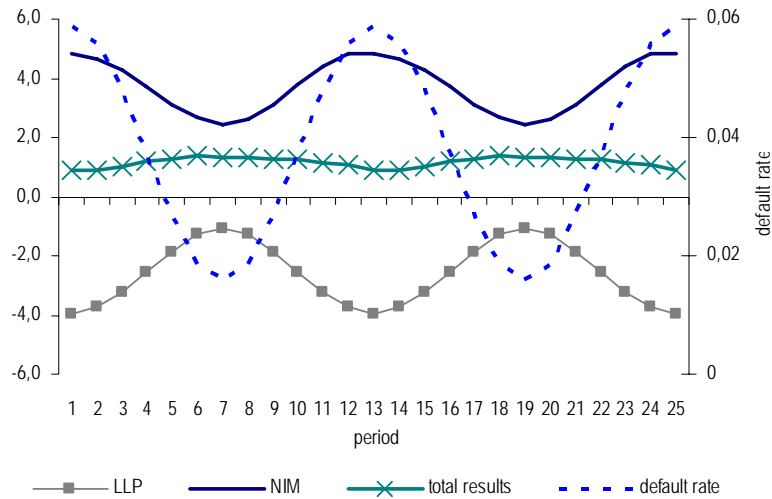
Figure 4.3.4 shows the behavior of cash flows (positive values indicate an inflow while negative values indicate a use of liquid resources). The NIM is the component with the highest incidence on cash flows, both in terms of resources and volatility. It can be seen that, as far as cash flow is concerned, the NIM acts counter-cyclically: a higher amount of resources are generated precisely when the bank is most in need, i.e. during a contraction. The increase in spread observed in this phase concurs with a simultaneous increase in the deposit base, which together contribute to generate the cash flow needed to fund new credit and comply with the liquidity regulation. In other words, the behavior of the NIM partially offsets the pro-cyclicality of loan losses as cash flow is concerned.

Figure 4.3.4: Cash Flow



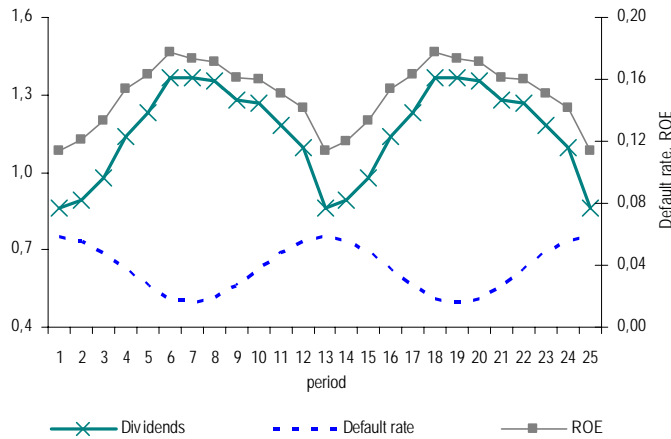
Additionally, the NIM also acts counter-cyclically on Total Results, by generating earnings in the contraction that partially compensate the hike in default losses (Figure 4.3.5).

Figure 4.3.5: LLP, NIM and Total Result



Profitability, as measured by ROE, goes down in the contraction. Dividend payments show a behavior similar to that of the ROE: they decrease in the downturn but their volatility is not substantial (Figure 4.3.6).

Figure 4.3.6: ROE and dividends



4.4. Comparison of schemes

Figure 4.4.1 shows credit evolution in the base scenario ("base") and in scenarios with different counter-cyclical regulation schemes: the application of time-varying capital requirements ("capital"), time-varying liquidity requirements ("liquidity"), anti-cyclical provisions ("AP") and anti-cyclical provisions partially allowed as capital ("AP-capitalization").

Under the assumptions made, the scheme allowing for higher credit stability is that of time-varying liquidity requirements, basically because it produces a larger availability of own funds at the time when funding is scarcest. On the contrary, a scheme with variable

capital requirements amplifies that scarcity. Lastly, anti-cyclical provisioning schemes generate virtually the same behavior as the base scheme.

Figure 4.4.1: Credit Pro-cyclicality

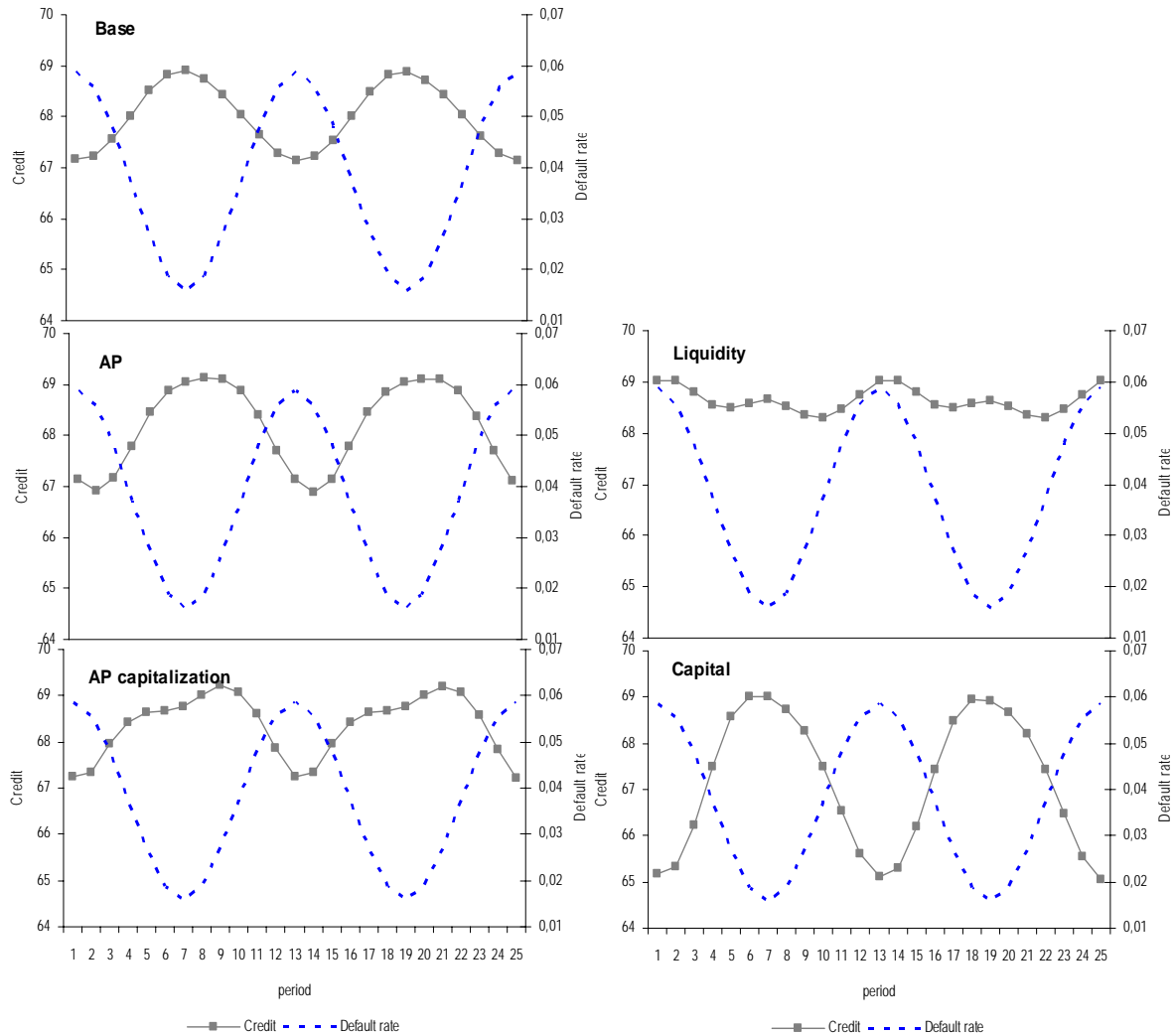
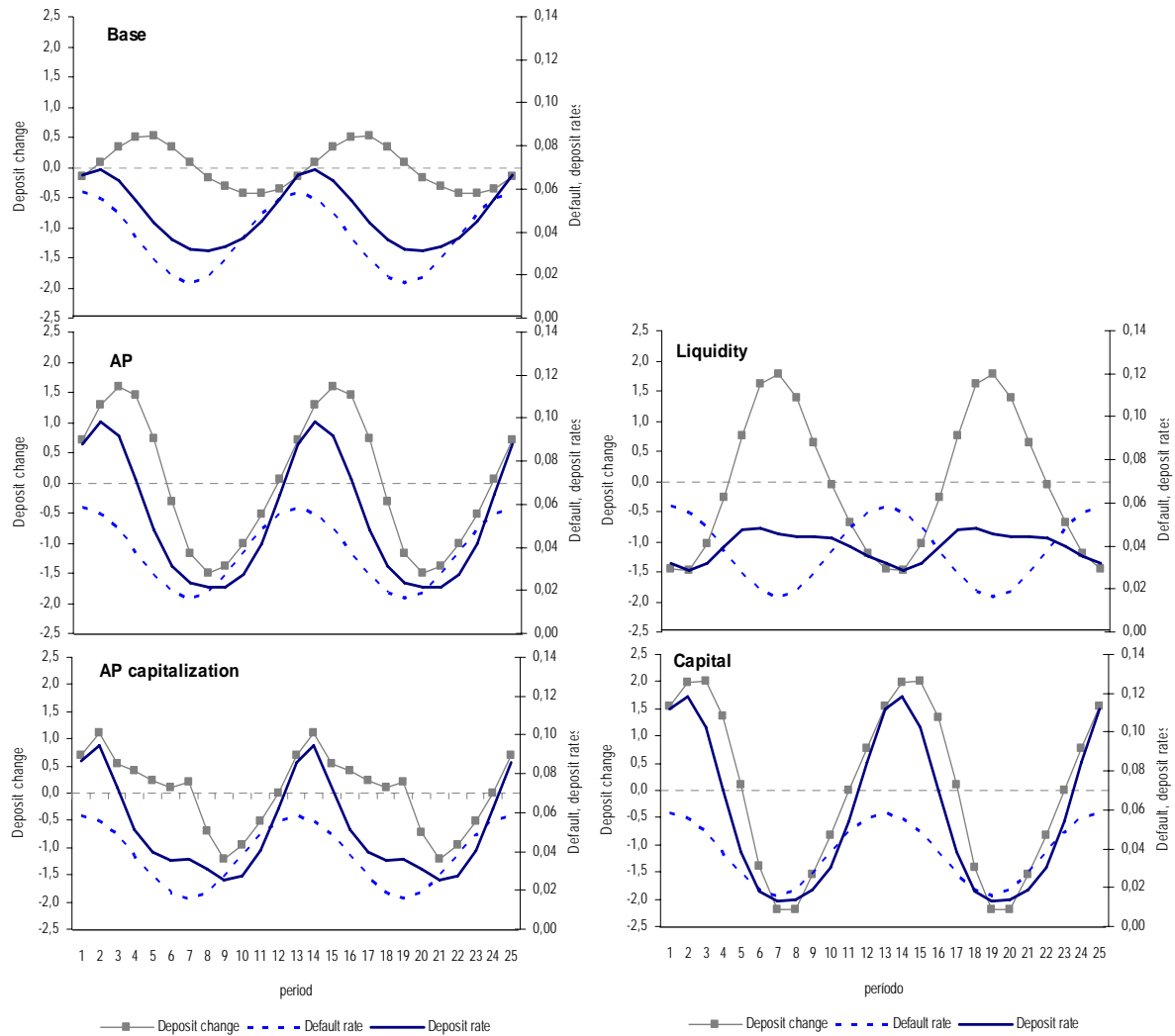


Figure 4.4.2 shows the evolution of deposits and the deposit interest rate under the different schemes. Anti-cyclical provisioning does not prevent the lack of liquid resources during economic contractions –in fact, it worsens the situation– as shown by the sharper variations in the deposit interest rate if compared to the base exercise. A similar situation occurs in the time-varying capital scheme. Instead, the variable liquidity requirement scheme shows the opposite: the deposit interest rate (and deposits amount) has a counter-cyclical behavior. This is due to the fact that, during a contraction, the bank has the internally-originated resources it needs to keep credit levels (with the parameters used, we even see a reduction in deposits²⁸).

²⁸ This result seems somewhat exaggerated and prompts to calculate a lower additional liquidity requirement. We have tested this alternative and got results tending to converge with the base scenario. We opted for

Figure 4.4.2: Funding with Deposits



All the schemes generate higher spreads in the economic downturns (see Figure 4.4.3) though under some schemes they are more substantial. The increase is widespread due to a shared reduction in the base on which revenue is generated (i.e. performing loans).

The variable capital scheme generates the highest spreads and the highest dispersion in this variable. In the contraction, the bank finds itself with an excess capital and is allowed to pay extra dividends. A change in the composition of the Credit side of the balance sheet follows (the bank reduces capital and increases deposits). The need to increase the depositors' base –not only as a result of the difficulties to collect loans but also due to the substitution effect– leads to sharper increases in the deposit interest rate if compared to the other schemes. On the other hand, the change in the balance sheet's Credit side forces to modify asset composition; for an equivalent level of total funding (capital plus deposits), a higher proportion of deposits entails a higher share of liquid assets (to comply with

keeping the original definition of the exercise at the time of showing comparative results with a view to providing a comparison base in which the amount of additional requirements coincides in all schemes.

liquidity requirements) and a lower share of loan portfolio. The revenue of the bank decreases then due to the reduced share of loans on total assets, on top of the increase in loan losses from the portfolio outstanding, thus demanding sharper hikes in the lending rate in order to achieve the desired ROE.

In turn, anti-cyclical provisioning schemes not only reduce the spread (if compared to the base scheme) but also its variability. This is due to the fact that the bank books a constant default rate; therefore, the lending interest rate need not be modified to cover different loan loss rates as it occurs in the other schemes.

When variable liquidity requirements are applied, the higher default rate of the economic downturn is offset by an increase in the lending rate. However, this increase is not so sharp since part of the effect is offset by the above-mentioned deposit interest rate fall.

Figure 4.4.3: Interest Rates

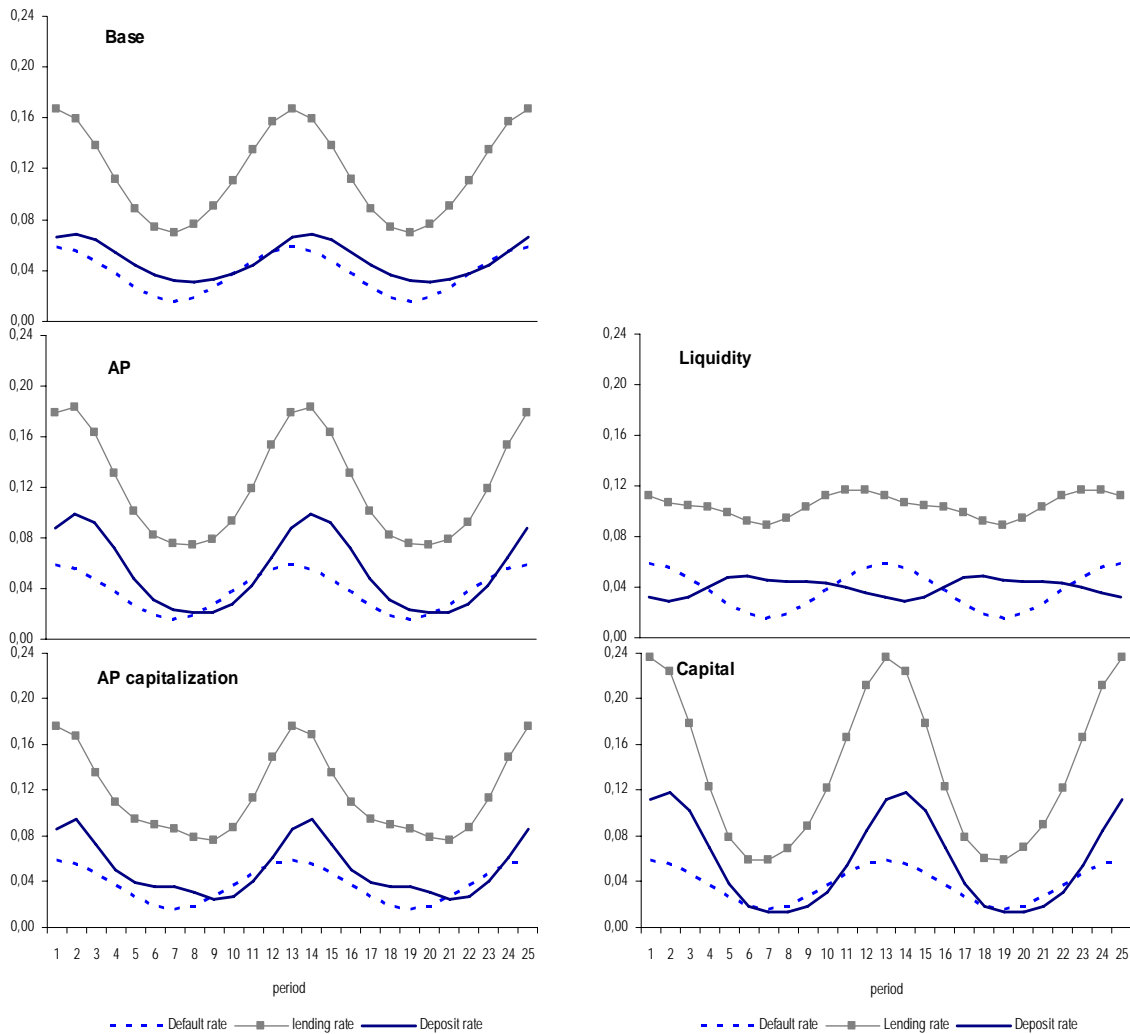
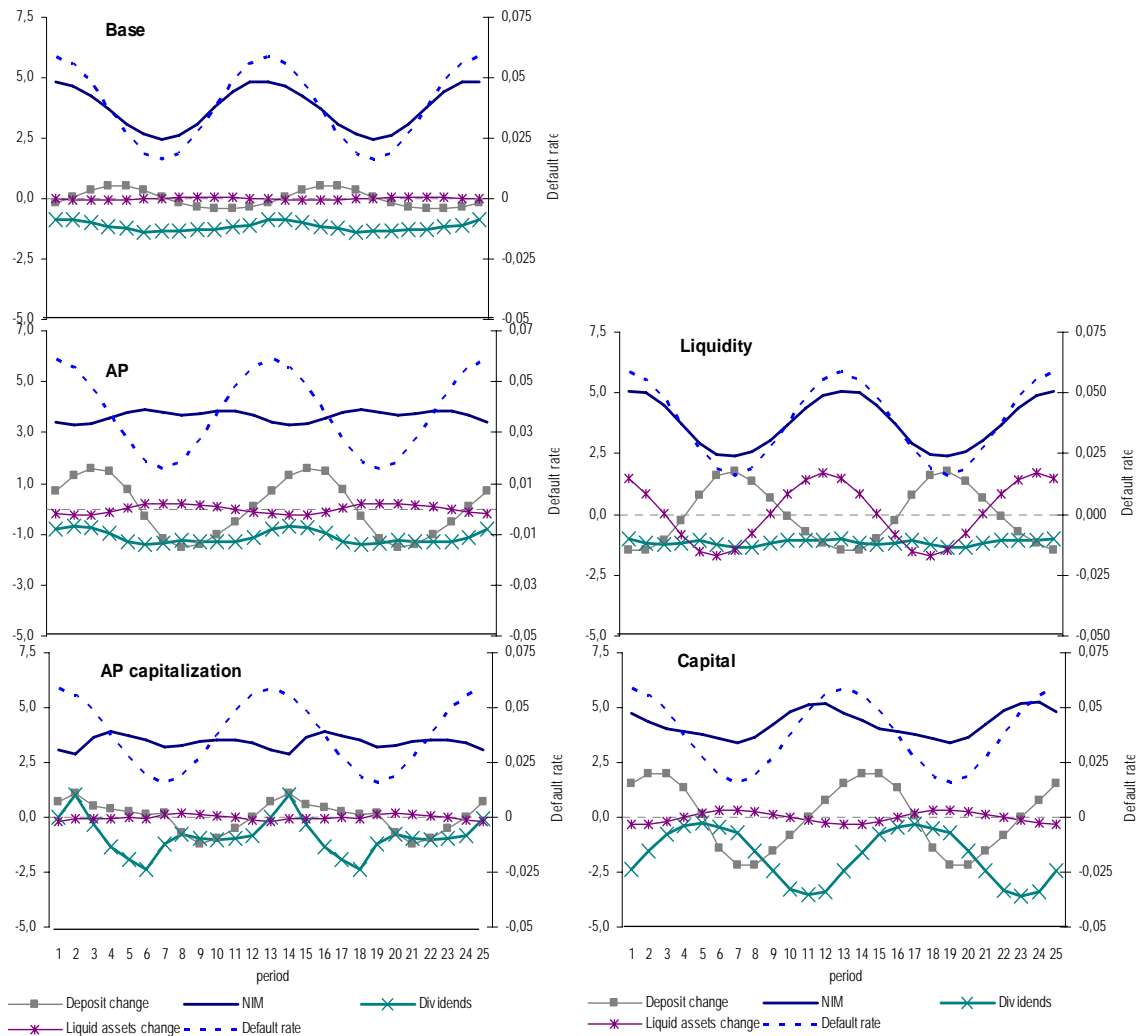


Figure 4.4.4 shows the different funding pictures generated by the alternative schemes. The anti-cyclical provisioning schemes smooth out the NIM by keeping LLP booking constant through the cycle. However, under these schemes deposit movements are sharper.

Under the liquidity scheme, the easing of liquidity requirements during contractions leads to an atypical movement of deposits. However, this does not mean that the NIM differs significantly from that resulting from the base scheme.

Time-varying capital requirements generate a marked variability to dividend payments²⁹.

Figure 4.4.4: Cash flow



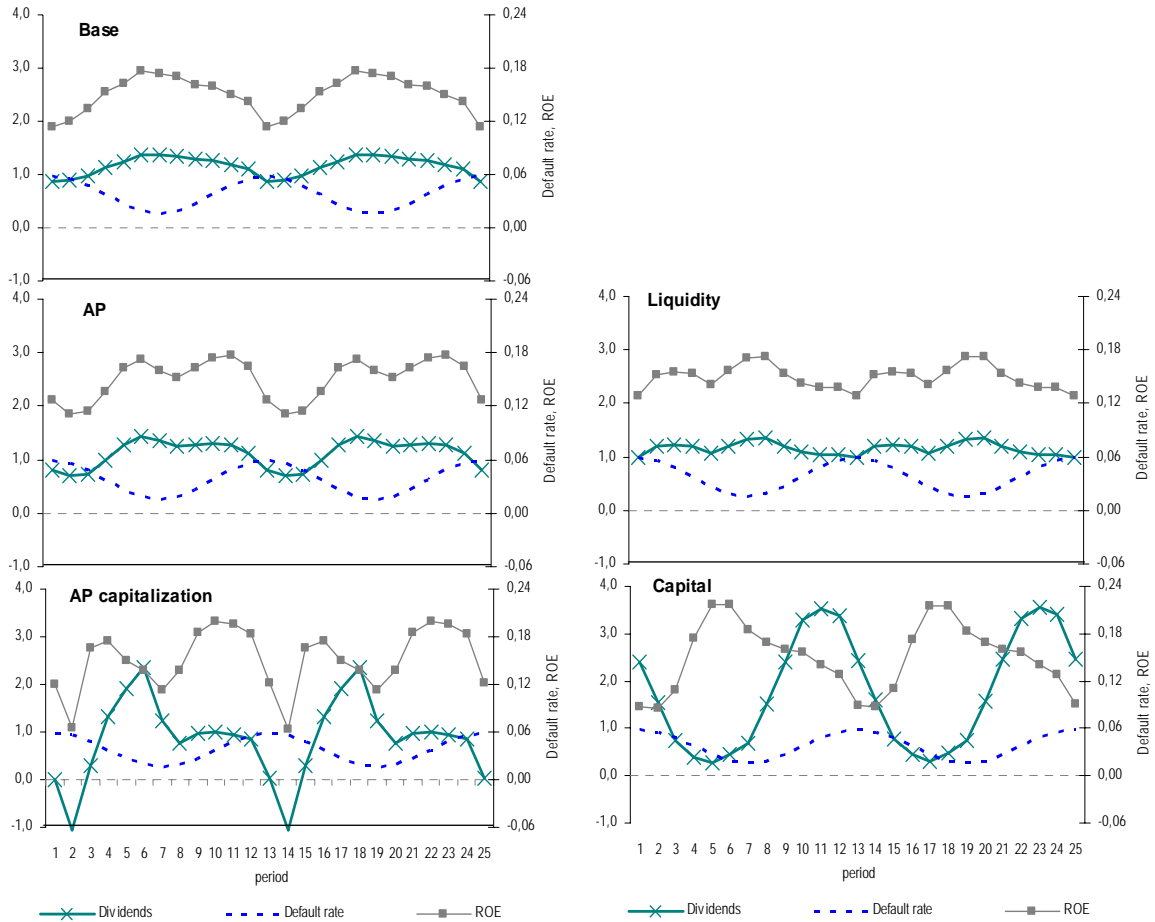
An overall and visual comparison of the cash flows under the alternative schemes against the base scheme shows that stabilizing the NIM leads to a compensating loss of stability in other sources of funds (Figure 4.4.4). Only the liquidity scheme is somewhat different as long as, in this scheme, liquid assets see their volatility increase although not as a result of

²⁹ As in the previous footnote, this result prompts to repeat the exercise with a counter-cyclical regulation involving lower additional capital amounts, but in that case results tend to converge with the base scheme.

the stabilization of the NIM. In fact, such volatility comes from a reduction of liquid assets positions during contractions, which provides an inflow of funds from internal resources that allows for a reduction in the need for deposits.

Given the lay-out of the exercise, the ROE of all the schemes fluctuates around 15%. The liquidity scheme shows the lowest volatility while the capital scheme shows the highest. A similar behavior is observed in dividend payment. See Figure 4.4.5.

Figure 4.4.5: ROE and Dividends



4.5. Pricing distortions and incentives to “manage the books”

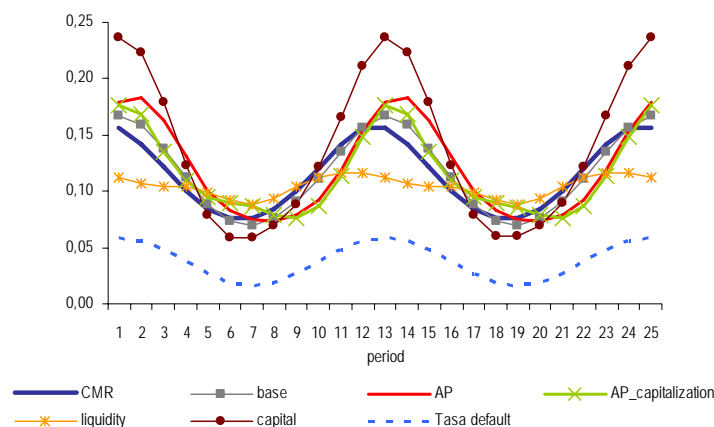
The enforcement of a regulation creates distortions in prices and amounts. It is important to quantify, or approximate these distortions so as to better assess a regulatory scheme in terms of incentives and indirect costs.

The mechanisms aimed at smoothing out the effect of the cycle on banks’ business are not free of that kind of distortions. As an indicator of these problems, we have decided to make a comparison between the cost of borrowing one peso from the bank (under the different regulatory options) and the cost of one peso if it were borrowed from a non-regulated lender, which we call “capital market” (see Annex 2 for the calculation of this rate).

The capital market interest rate shows only a slight difference compared to the lending rate of the base scheme (though there are some discrepancies due to the composition of the bank balance sheet and capital and liquidity regulations on banks). Instead, the other schemes show higher values for bank loans rate during contractions and lower values during economic expansions, except when a liquidity regulation is introduced, in which case the discrepancy takes the opposite sign. It is worth noting that the discrepancies tend to be quite substantial under the liquidity scheme indicating a weakness for a scheme that, up to this point, had looked preferable over the others.

The difference between the capital market interest rate and the rates arising from the alternative schemes embeds an incentive for the bank to "manage" its balance sheet. There are periods when it would be convenient for the bank to grant loans and then "sell them" in the market, thus modifying the structure of the balance sheet (possible turning on-balance items into off-balance) and booking a profit that is only due to regulatory differences.

Figure 4.4.7: Lending Rate versus Capital Markets Rate



4.6. More than one credit type

In the exercise the bank grants only one type of loans. If there were more than one type, then the same pricing arguments stated above would lead not only to a bias in terms of the differences between market value and accounting value but also to an additional bias in the entity's portfolio allocation decisions among credit types.

Let us assume that there are two loan types and that one of them has a more volatile expected default rate than the other. The AP leads to a misperception of the volatility of loan losses (based on accounting records), thus is more favorable in relative terms for the type of credit that is farther away from this perception and encourages a higher share of these loans in the portfolio. Besides, this credit type would show a higher difference between bank valuation and market valuation, for two reasons: (1) in some periods the "market" interest rate would be farther away from the rate set by the bank because the gap between the actual default rates and the average booked rate is higher and (ii) the market would require a higher return to account for a higher volatility.

In addition, if we added to the model a portfolio of traded securities and modeled the evolution of their value along with the cycle, the exercise would be more complex but the nature of the results would not change.

5. Conclusions

In general, the proposals for counter-cyclical prudential regulation have been founded on capital constraints observed during contractions. In these periods, banks tend to offset the increase in asset risk (which generates a relative shortage of capital) by restricting loans and increasing lower-risk asset holdings, such as some securities. Regulatory changes have been put forward which aim at decreasing capital demand during downturns and, therefore, avoiding the transformation of banks' asset portfolios, at least for regulatory reasons. But these proposals may have undesirable effects if they are just accounting changes and do not encompass liquidity-related aspects (accounting changes per se do not alter cash flow, which are lower during contractions). Undesirable effects may also occur as a result of potential impacts on banks' lending interest rate and signaling problems.

The exercise has underlined the fact that the business cycle not only affects earning statements but also the banks' cash flows and has made focus on internally generated funds. Importantly, the NIM has a counter-cyclical feature within the banks' business that tends to offset such shortage of liquidity during downturns. If a change in regulation deprives the NIM from this feature, then the need for external resources during contractions may be exacerbated and pro-cyclicality accentuated.

There may be additional drawbacks to the proposals for regulatory modifications, e.g. signaling problems due to the changes in the information available to economic agents. In addition, since the value of the loans generated by regulated financial institutions would be altered, incentives might be created for the development of non-regulated sectors, thus encouraging "balance-sheet manipulation" and rendering other regulations non-operational.

Annex 1: Estimation of parameters

The main parameters in the exercise have been calibrated according to the data of the Argentine banking system. This information was taken as reference only because in recent times Argentina has experienced crises and recoveries rather than business cycles. These swings result not only in macroeconomic aggregates showing a special behavior but also banks' balance sheet indicators are affected by temporary and exceptional regulations introduced due to the crises and then progressively eliminated over time.

In general, parameters have been calibrated using expert judgment and checking that the generated behaviors were plausible. The most critical parameter is the elasticity of the demand for loans to the lending interest rate spread; consequently, its value has been studied with a stronger empirical basis.

The following charts show the simulated evolution of the lending and deposits interest rates during an economic expansion.

Figure A.1.1: Evolution of the lending rate in Argentina and in the exercise

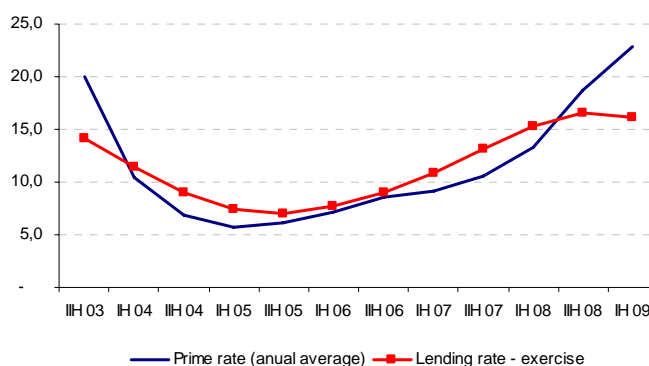
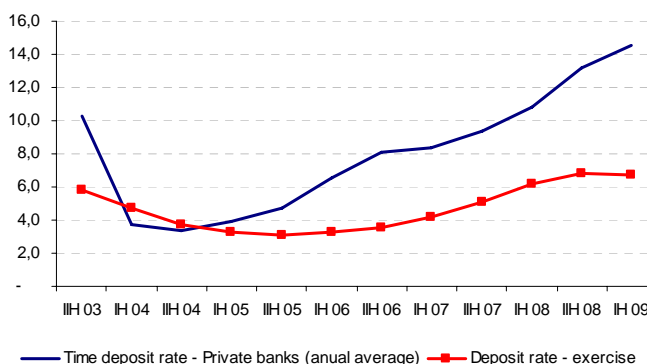
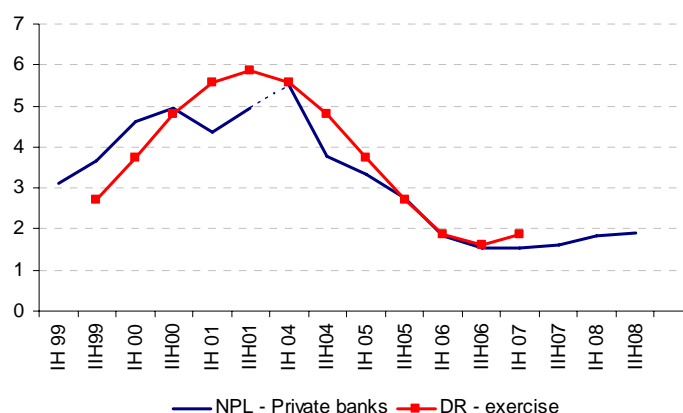


Figure A.1.2: Evolution of the Borrowing Rate in Argentina and in the exercise



To calibrate the default rate, we have used the evolution of the “Non-Performing Portfolio” indicator, calculated on a half-year basis for private banks.

Figure A.1.3: Default Rate – Argentine Private Banks



Calibration of the loan demand elasticity³⁰:

Since bank loan demand and lending interest rates are simultaneously determined by demand-and-supply interaction, we have applied a two steps least squares procedure so as to reach a consistent estimation of the parameters. We have selected an endogenous variable –the interest rate spread– and “instrumented” it as a function of a set of exogenous variables³¹.

Loan demand is defined as a function of the lending interest rate spread, an income effect (related to the economic activity level) and a substitution effect (associated to a measure of uncertainty). In the exercise, we have used the spread between the private banks’ average lending rate and the Central Bank of Argentina reverse repo rate. The latter represents an opportunity cost or risk-free alternative placement for the bank. In turn, the rate spread is explained in terms of the funding cost and the evolution of credit risk, in addition to the instrumental variables (inflation and economic activity).

The exercise was calculated using data from the segment in pesos of the Argentine banking system between 2004 and 2008³². Due to this short time span and to the fact that the representative bank exercise uses annual observations, estimations were made using monthly observations of 12-month rolling windows. We applied the $\ln(I+x)$ transformation to all variables not expressed in rates.

The model used is as follows:

³⁰ We thank Emilio Blanco for his contribution in this part of the paper.

³¹ We used this estimation methodology due to the potential endogeneity of some regressors: when the orthogonality assumption between regressor and error of the model is violated, the estimation by ordinary least squares (OLS) results in inconsistent estimations of the parameters. To solve this problem, we can select a vector of exogenous variables to “instrument” the endogenous variable. However, and in order to control potential errors introduced by the technique, estimations are usually made with the OLS. We have done so and the applied an endogeneity test to prove if endogeneity was present. The Durbin-Wu-Hausman test provided evidence in favor of endogeneity at a level of 5% significance.

³² It is worth mentioning that this period was not characterized by a complete business cycle; it was only the final phase of the recovery from the 2001-2002 crisis, whose influence was quite strong –though decreasing– both from the macroeconomic & financial standpoints and because of the exceptional regulatory changes introduced, especially regarding the classification of credits with problems.

$$L_t^d = \beta_0 + \beta_1(r^l - r^r)_t + \beta_2 \text{EMAE}_{t+1}^e + \beta_3 \pi_{t+1}^e + \beta_4 L_{t-1}^d \quad (1)$$

where:

- L_t^d is the loan demand, measured by the balance of loans to the private non-financial sector;
- r^l is the lending interest rate, measured as the average of the annual nominal interest rates collected on new loans granted to the private non-financial sector;
- r^r is a benchmark rate, represented by the interest rate of reverse repos' transactions of the financial institutions with the Central Bank, pledging Central Bank bonds as collateral (Lebacs and Nobacs);
- EMAE_{t+1}^e , Monthly Economic Activity Indicator (EMAE, for its acronym in Spanish), represents the expected (future) economic activity levels; and
- π_{t+1}^e is the expected future annual inflation and is measured by the CPI rate of change.

Since L^d and $(r^l - r^r)$ are simultaneously determined, we have instrumented the interest rate spread using a funding rate and an indicator of loans quality as explaining factors³³:

$$(r^l - r^r)_t = \alpha_0 + \alpha_1(r^l - r^r)_{t-1} + \alpha_2 \text{BADLAR}_t + \alpha_3 \text{PREV}_t \quad (2)$$

where:

- BADLAR_t is the funding cost, measured by the interest rate of a 30-59 day deposit in Argentine pesos in private banks for amounts over 1 million pesos;
- PREV_t is an indicator of credit risk, measured as the change in the stock of provisions.

The spread also depends on intermediation costs (screening process, monitoring, fixed costs, etc.). In the short term, they may be assumed as constant.

The results are illustrated in Table A.1.1.

³³ The instruments fulfill validity and range conditions. To assess the fulfillment of the first requisite, we used Sargan (1958) and Basman (1960) test that controls that no system equations are overidentified (i.e., that the instruments vector is not correlated with regression errors). As regards the second requisite, there may occur that instruments are exogenous to errors but are also very weakly correlated with the endogenous variable of interest. The Kleibergen-Paap test was used. Results are available upon request.

Table A.1.1. Estimation to calibrate loan demand elasticity

	1° stage: Interest rate spread	2° stage: Loan demand
EMAE	0.094 (0.145)	0.003 (0.053)*
Inflation	0.031 (0.004)***	-0.003 (0.001)**
Provisions	0.443 (0.046)***	
Badlar (private banks)	0.094 (0.145)***	
Interest rate spread		-0.447 (0.029)***
Loan demand t_{-1}		0.216 (0.046)***
Constant	1.104 (0.478)**	1.375 (0.154)***
N° observations	52	52
Adjusted R ²	0.958	0.958

Instrumented: Interest rate spread

Instruments: EMAE, Inflation, Badlar and Provisions

Standard errors in parentheses under each coefficient

* / ** / *** Indicate significance levels of 10, 5 and 1 percent respectively

The coefficients obtained are significant and the signs are in line with the findings in the literature. EMAE shows a positive impact on demand indicating some pro-cyclicality of credit in Argentina³⁴. On the other hand, a higher macroeconomic uncertainty (measured through the expected inflation rate) would reduce credit demand³⁵. Lastly, a higher credit cost (higher spread) reduces credit stock. Specifically, a 1pp increase in this cost implies a stock fall of around 0.5%.

³⁴ Generally speaking, better economic conditions increase the number of projects that become profitable in terms of net present value, resulting then in a higher credit demand (Kashyap, Stein and Wilcox, 1993). On the credit supply side, an income increase raises deposits demand and reduces banks incentives to set high borrowing rates which, as they pass through to the lending rate, would indicate a larger credit supply.

³⁵ Inflation indicates a higher macroeconomic uncertainty and reduces banks' return; in turn, this exacerbates the potential problems of credit rationing and leads to credit reduction and a less efficient allocation of resources (Boyd et al., 2001).

Annex 2: Loan pricing

The loans originated by the representative bank are very simple: a fixed interest rate is applied; there is an interest payment in the first year, and an interest payment and capital amortization in the second year.

We will analyze the pricing of a loan in general to derive then a formula for the lending interest rate to be set by the representative bank according to the loans' characteristics of the exercise.

Within a risk-neutral framework, the present value of a risk-free loan that pays \$1 in a year time –discounted at the risk-free rate– should be equal to the present value of a risky loan that pays \$1 in a year time but which is subject to default risk –discounted at the risk-adjusted rate. In other words, the risky loan and the risk-free loan should have the same future value, which is verified when:

$$(1 + r_1^F) = (1 + r_1^A)(1 - PD_1) + PD_1(1 - LGD)$$

Where r_1^F is the risk-free rate and r_1^A is the risk-adjusted rate (both in a year time), PD_t is the risk-neutral probability of default for the following period, LGD is the risk-neutral loss resulting from default.

So, by working out the risk-adjusted rate in a year time, we obtain:

$$r_1^A = \frac{r_1^F + PD * LGD}{1 - PD}$$

For a simple loan exceeding one-year term, which pays an interest coupon on the basis of a fixed rate i , its current economic value V_t results from:

$$V_t = \frac{PD_t(1 - LDG) + (1 - PD)(i + E^Q(V_{t+1} | no default))}{1 + r_1^F}$$

where i means the interest payments made on the loan in the following period and $E^Q(V_{t+1} | no default)$ is the expected value of the loan (calculated under a risk-neutrality) at the end of the following period provided the debtor did not default. For simplicity reasons, we continue assuming that the capital owed is \$1.

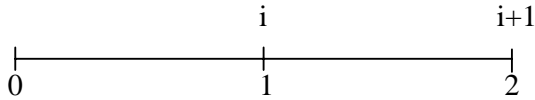
The value of the loan is broken down in the discounted value of two states of nature: default and non-default. The present loan value in the default state is equal to the discounted value of $1-LGD$, i.e., the present value of the recovery. The present value of the loan in the non-default state equals the sum of the discounted value of interest payments plus the loan value after these payments are made in the following period. Today, the loan value is the weighted sum of these two states, where their respective probabilities under a risk-neutral measure are the weights.

If we consider $V_t = E^Q(V_{t+1} | \text{no default})$, i.e., that the loan yields the risk-free interest rate and we break down i into the risk-free rate r^F and a spread s , then s can be solved as a function of the expected loss (risk neutral), and we obtain the following:

$$LGD * PD = s + PD(s + r^f) \approx s$$

This means that the loan value remains at par if the coupon interest rate spread is equal to the expected risk-neutral loss.

In the case of this exercise, we assume, for simplicity reasons, that $LGD=1$ (there is no recovery in case of default) and payments occur according to the following scheme:



Today, the loan value is:

$$V_0 = \frac{(1 - PD_1) i}{1 + r_1^F} + \frac{(1 - PD_1)(1 - PD_2) (i + 1)}{(1 + r_1^F) (1 + r_2^F)} = \frac{i}{1 + r_1^A} + \frac{(i + 1)}{(1 + r_1^A) (1 + r_2^A)}$$

The loan value in $t=2$ is:

$$V_0(1 + r_1^F)(1 + r_2^F) = i(1 - PD_1)(1 + r_2^F) + (1 + i)(1 - PD_1)(1 - PD_2)$$

When risk cannot be diversified away, the investor will require the return from the portfolio to cover the risk-free rate, the expected loss and the price of risk. Assuming that the price of risk is properly measured by the 9% capital requirement times the required 15% equity return (“hurdle rate”), and that V_0 is one peso, then:

$$\begin{aligned} 9\% * hurdle * (1 + r_2^F) + 9\% * hurdle + r_1^F * (1 + r_2^F) + r_2^F + 1 &= \\ &= i * (1 - PD_1) * (1 + r_2^F) + (1 + i) * (1 - PD_1) * (1 - PD_2) \end{aligned}$$

If we also consider that s_1 is the probability of surviving period 1 (equal to $1 - PD_1$) and s_2 is the probability of surviving period 1 and period 2 (equal to $1 - PD_1$ multiplied by $1 - PD_2$), then:

$$\frac{9\% + hurdle * (2 + r_2^F) + (1 + r_2^F) * (1 + r_1^F) - s_2}{s_1(1 + r_2^F) + s_2} = i$$

i would be the interest rate that the market would demand on a loan similar to those that the representative bank grants in the exercise, assuming always that risk is correctly measured by the above-mentioned 9% capital times the hurdle ROE. There is, of course, a non-financial cost of issuing debt in the market that is not negligible. Local studies show that, on average, this cost represents a 3% of the capital³⁶, therefore, an annual 1.5% should be added to rate i .

³⁶ IERAL, Novedades en ieralpyme.org, year 2 – Number 6, June 2008.

The bank of the exercise seeks a required return on equity (target ROE) over its funding cost (instead of over the risk-free rate). If we bear this in mind and considering the composition of the balance sheet, especially that the bank has no source of return other than liquid assets³⁷ and loans, while capital is a function of all the assets (including other non-profitable assets duly weighted), then an adjusted i rate can be solved, which is fixed along the life of the loan and corresponds to a 15% return on equity (target ROE). This is the formula used by the bank of the exercise to set the lending spread on its new loans.

When the bank is subject to an anti-cyclical provision regulation, the rate determined by the regulation is taken as PD in the formula, instead of the period incurred default rate. This means that the pricing follows accounting criteria. Clearly, this will cause a deviation from the lending interest rate defined under purely financial criteria. In our opinion, though the impact of accounting criteria on pricing is unquestionable, we might say that a financial consideration would also play a role, though partial, in the determination of the rate. In this case, results would be somehow lessened. In order to analyze the difference between the bank's lending rate and the potential "market rate" (i.e., the rate that is not distorted by the regulation), in the exercise we calculated the bank's rate as determined by the accounting provision straight away.

Since there is a portion of the market that is not regulated, the market rate would be in an intermediate point between the representative bank's rate and the above calculated "market" rate. In the text, we have compared one against the other without considering this partial convergence because this would imply assuming participations and interactions which are not justified in an exercise that is illustrative in any case.

³⁷ Always paying 4% annually

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