Incentives through the cycle: microfounded macroprudential regulation

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Abstract

We use an incentive model in which improvements to fundamentals boost the ability of leveraged financial firms (banks) to expand the balance sheet (as in Adrian and Shin (2010)). The rise in asset prices due to the amplified response of procyclical systems distorts bankers' incentives in providing (costly and non observable) monitoring effort. On the one hand, the fundamental value of assets positively affects the optimal effort of the banker, thus allowing supervisory authorities to relax incentive-compatible capital requirements and boosting asset demand and prices. On the other hand, in a macro perspective, high prices positively affect the banker's payoff in the bad state of asset liquidation (via asset prices), jeopardizing incentives. This type of externality follows from a purely "macro" phenomenon *à la* Borio (2003) and should be taken into account by the regulatory authority in designing capital requirements. In procyclical and advanced (low agency costs and highly liquid) financial systems, incentive compatibility requires a higher capital requirement in the face of an improvement to fundamentals. Our results provide a theoretical foundation to the countercyclical buffer provided for by the Basel Committee.

Keywords: Macroprudential regulation, incentives, financial stability.

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1 Introduction

The fact that under certain conditions the financial system contributes with additional volatility to macroeconomic dynamics is nowadays a shared and well analyzed view (Kiyotaki and Moore (1997), Bernanke et al. (1999), for a recent survey Panetta et al. (2009)). And indeed, in the aftermath of the crisis, many analysts, commentators and policymakers blamed the financial industry for their devastating contribution to the run-up of the crisis.

Financial regulation did also have some responsibilities. Flaws in microprudential rules have in fact provided bankers with head-we-win-tail-they-loose incentive structures, fostering excessive risk-taking, deterioration of lending standards and perverse behaviors (Borio (2008); Buiter (2007); Kashyap et al. (2007); for a discussion, see Cannata and Quagliariello (2009)). In the benevolent version, bankers and individual institutions were not perfectly in the position to foresee the ongoing overheated dynamics and the imminent burst as they miss a bird's eye view of the economic system. In this respect, it was up to policy makers and regulatory authorities to address the problem of externalities that arise from the inefficient aggregate outcome of individually optimal decision-making. And they have failed to do so. While macroprudential issues were increasingly debated before the eruption of the crisis (Crockett (2000), Borio (2003)), they were mainly confined to macroprudential analysis, with almost no room for macroprudential policies, not to mention concrete tools (Clement (2010)).

To be fair, this aptitude is somehow understandable. First, the actual magnitude of composition fallacies, externalities and procyclicality in the financial sector was largely underestimated, if at all quantified. Second, the mandate of central banks (and banking supervisors) rarely included financial stability. For instance, according Oosterloo and de Haan (2004), in the OECD countries the responsibility for financial stability was not explicitly formulated in laws and, in any case, there was considerable heterogeneity in how central banks pursued financial stability goals.

Against this background, it is not surprising the renewed interest for this issue in the post-crisis debate on the future of financial regulation. The Financial Stability FSF (2009), clearly stated that a macroprudential orientation focuses policy on avoiding damage to the financial system as a whole with an eye to the impact on the real economy. Accordingly, Bernanke (2009) pointed out the need to combine a systemwide, or macroprudential, perspective with firm-specific risk analysis to better anticipate problems that may arise from the interactions of firms and markets. These principles have been transposed in prudential regulation by the Basel Committee (2010). While the system-wide perspective cannot be circumscribed to it, most of the policy measures focused on procyclicality. In particular, the Committee introduced countercyclical capital buffers above minimum capital requirements that banks are required to build-up in buoyant economic conditions.

A new macroprudential orientation was undoubtedly one of the key blocks of the reform roadmap and the need for such measures has been unanimously agreed. Less consensus has been reached on their actual functioning and operational details though. In practice, it is still controversial what macroprudential policies are supposed to achieve. On the one hand, the most pragmatic view advises not to attach excessive emphasis to the potential of such instruments. Macroprudential tools should just aim at ensuring that financial intermediaries accumulate sufficient resources in good times when they are cheap and risk is underestimated that can be run-down in bad times with no or little repercussions to financial stability. On the other, according to a more ambitious view, the macroprudential policy should go hand in hand with monetary policy and directly aim at managing economic cycles (for a survey, see Galati and Moessner (2010)).

In our view, this is also due to the lack of appropriate theoretical frameworks for macroprudential regulation. In this paper, we use an incentive model in which improvements to fundamentals boost the ability of leveraged financial firms (banks) to expand the balance sheet (as in Adrian and Shin (2010)). The rise in asset prices due to the amplified response of procyclical systems distorts bankers' incentives in providing (costly and non observable) monitoring effort. On the one hand, the fundamental value of assets positively affects the optimal effort of the banker, thus allowing supervisory authorities to relax incentive-compatible capital requirements and boosting asset demand and prices. On the other hand, in a macro perspective, high prices positively affect the banker's payoff in the bad state of asset liquidation (via asset prices), jeopardizing incentives. This type of externality follows from a purely "macro" phenomenon *à la* Borio (2003) and should be taken into account by the regulatory authority in designing capital requirements. In procyclical and advanced (low agency costs and highly liquid) financial systems, incentive compatibility requires a higher capital requirement in the face of an improvement to fundamentals. Our results provide a theoretical foundation to the countercyclical buffer provided for by the Basel Committee.

What is peculiar of our model is that it contemplates an externality, and the need for a policy intervention, as the consequence of improvements to fundamentals. Our approach is thus complementary to standard models, which rely mainly, if not uniquely, on negative (exogenous) shocks and amplification mechanisms (see Rochet et al. (1996), Allen and Gale (2004)). We rather follow the idea of Borio et al. (2001) according to which the business cycle is endogenous with respect to the collective decisions of financial institutions[1]. Risk endogeneity due to commonality in the financial system and to the market participants'

[1]According to Borio et al. (2001), those decisions are frequently based on misperceptions of the evolution of risk over time. The stylized facts are simple. During expansions, inter-

response to shocks is the key issue of a recent body of literature (Morris and Shin (2003), Danielsson and Shin (2003)).

Our results provide hints to give a theoretical foundation to the countercyclical buffer provided for by the Basel Committee. We show that assets' market liquidity and developed financial markets (low agency costs), eventually, increase the sensitivity of bankers' incentives to macro shocks and then requires a more severe scrutiny by macroprudential authorities.

2 The model

In the economy there are three types of agents: (i) banks, (ii) a large number of market investors (say households, pension funds, etc. and the like) that inelastically accomplish banks funding needs and (iii) final borrowers with profitable investment opportunities. To strengthen the role of banks, assume borrowers cannot raise external financing directly from market investors, i.e. bank intermediation is essential[2]. The role of borrowers is really passive and we often treat them as securities that can be purchased by banks. All the following considerations hold for the case of firms that are financed with loans or households that take out mortgages. All agents are risk neutral and do not discount future cash flow. In the baseline version of the model, market investors are perfectly competitive so they make zero profits.

There are three dates: 0, 1 and 2. A bank enters date 0 with a given balance sheet (i.e. a portfolio of securities and a liability structure) and may purchase new securities at date 1, after raising additional funds from market investors. For sake of expositional convenience only, we refer to assets that are held by the bank since date 0 as long-term securities and those purchased at date 1 as short-term. The supply of short term securities is fixed and exogenous (the economy is populated by a given amount of final borrowers with finite profitable investment opportunities). In particular, the date 0 asset side of the balance sheet (initial endowment) of a bank is made of $a > 0$ units of (long-term) securities, purchased before date 0 at a price p_0. On the liability side, the equity is $e > 0$ so that initial debt is $p_0 a - e$.

mediaries tend to underestimate risk exposures to risks, relaxing borrowers selection criteria and monitoring processes. Accordingly, they also reduce the amount of provisions for future losses. After the peak of the cyclical upturn, customers' profitability worsens, borrowers creditworthiness deteriorates and losses are revealed. This pattern is often coupled with the fall of asset prices that, in turn, further affects customers' financial wealth and depresses the value of collateral. Banks' exposures to credit risk increase, thus requiring larger provisions and higher levels of capital, at the very moment when capital is more expensive or simply not available. Intermediaries may react by reducing lending, thus exacerbating the effects of economic downturn.

[2]This assumption can be easily relaxed without effects on our qualitative results.

Table 1: Bank's initial balance sheet

Assets	Liabilities
$p_0 a$, securities	$p_0 a - e$, debt e, equity

Each security (both long and short term) that is held by a bank at date 1 payoffs at date 2 a random amount $\tilde{w}$ with expected value $E(\tilde{w}) = q$, $\min(\tilde{w}) = q - z > 0$ and $\max(\tilde{w}) = q + z$, so that z is a measure of the riskiness of the security. Trivially, $q \geq p_0$ otherwise long term securities would be not attractive for banks. Moreover, for a similar argument, we assume throughout the paper that the market clearing price p of securities at date 1 (see below) is not higher than q.

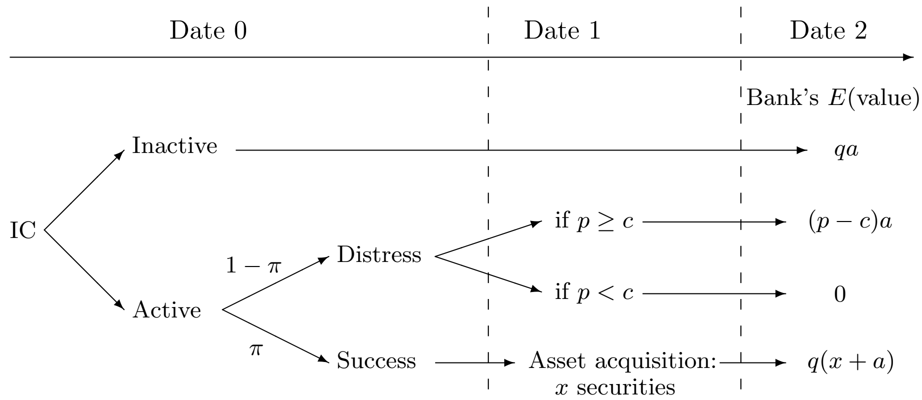
At date 0, a bank can either be *inactive* (maintain its initial balance sheet until date 2) or try to implement at date 1 a project of acquisition of short term securities (*active* bank) to expand the balance sheet (issuing additional debt to market investors). However, an active bank, with a probability $1 - \pi$, between date 0 and 1, faces a negative idiosyncratic shock (distress, bad state) that forces the bank to liquidate the initial holding of long term securities[3]. Thereafter, at date 1, a bank in distress tries to sell off its securities a to some successful (not distressed) active bank. Due to informational frictions, a bank that purchases an asset in liquidation must bear a fixed and exogenous cost c that can be interpreted as a measure of the asset market liquidity (the higher c, the less liquid the market). It follows that securities in liquidation are traded in equilibrium if and only if the market price p is higher than c (they would be traded at the discount price $p - c$)[4].

Each bank is run by a banker that is affected by a moral hazard problem (for a similar incentive problem, see for instance Holmstrom and Tirole (1997)). Banker's effort y affects the probability of distress. In particular, the probability of distress is $1 - \pi(y)$, with $\pi(y) = y$ and $y \in (0, 1)$. However, effort implies private costs $d(y) = y^2/2$ for the banker. The effort level is not observable.

[3]This can be the case as an active bank should simultaneously (i) search for short term securities (say, evaluate new would be borrowers) and (ii) monitor long term securities (preserve the value of its initial asset holdings)

[4]Note that at date 1 long and short term securities are perfectly identical so that the fact that long term securities from banks in liquidation are traded at the price $p - c$ represents a non arbitrage condition.

Figure 1: The timing of events in the model.



According to risk neutrality, the expected utility of an active banker is

$$U = y\left[(q-p)x + (q-p_0)a\right] + (1-y)\gamma(p-c)a - \frac{y^2}{2} \qquad (1)$$

where $\gamma = 0$ when securities in liquidation are not traded (i.e. $p < c$) or $\gamma = 1$ (otherwise). The term $(q-p)x + (q-p_0)a$ is the expected payoff from a portfolio of x short- and a long-term securities if the banker avoids distress. Conversely $\gamma(p-c)a$ is the payoff of the banker in liquidation. The expected utility of an inactive banker is

$$U = (q - p_0)a$$

In general, the banker maximizes her utility subject to two constraints: the first one is the amount of short term securities to purchase at date 1 (if successful) that follows from the maximization of the value of the bank's portfolio under a Value-at-Risk constraint (see below). Secondly, as active banker faces a positive probability of distress and this probability is decreasing in the effort, there exists a minimum effort level that guarantees that the project of asset acquisition is not value-destroying with respect to the strategy of remaining inactive. As we will see below, one can alternatively imagine that the role of designing incentive compatibility constrained follows purely from market discipline or is assigned to a prudential regulation authority.

2.1 Optimal bank's balance sheet

Let's first derive the optimal (date 1) balance sheet position for the bank, and then turn to incentive considerations. We follow Adrian and Shin (2010) assuming that, for a successful bank (an active bank that does not experience distress between date 0 and date 1), the optimal amount of short term securities x to purchase is derived from the maximization of the date 2 value of the bank's portfolio under a Value-at-Risk (VaR) constraint:

$$\max \quad E\left(\tilde{w}(x+a)\right) \quad \text{such that} \quad \text{VaR} \leq e \tag{2}$$

The VaR constraint stipulates that the bank's equity is large enough so that the default probability is kept below some benchmark level. Default would occur when, at date 2, the value of the bank's assets is lower than the value of the bank's debt (i.e. $(p_0 a - e) + px$) towards market investors. With no loss of generality, assume that the benchmark default level is zero. Then the VaR constraint is

$$(q-z)(x+a) \geq (p_0 a - e) + px$$

or, rearranging terms:

$$e - \{[p-(q-z)]x + [p_0 - (q-z)]a\} \geq 0$$

where $[p-(q-z)]x + [p_0 - (q-z)] > 0$ is the worst case loss on a portfolio $x+a$. As the value of the portfolio is increasing in x, at the optimum the VaR constraint is always binding. Solving for x, we get the demand for short term securities for a bank with equity e:

$$x = \frac{e - (p_0 - q + z)a}{p - q + z} \tag{3}$$

The optimal portfolio is increasing in the equity e, in the fundamental q and decreasing in the price p and risk z. In this sense, the demand for assets purely follows from initial endowments and fundamentals and the banker is left with no discretion on it.

2.2 Incentive compatibility and capital requirements

The banker's optimal effort level derives from banker's utility maximization. From the first order condition of equation (1), the optimal effort level y^* is

$$y^* = (q-p)x + [(q-p_0) - \gamma(p-c)]a \tag{4}$$

where, once again, the demand x for assets follows from equation (3). The demand x and the expected return $q-p$ are both disciplinary devices for the banker and increase the optimal effort. The amount a of initial assets (long term securities) plays a similar role. On the other hand, the possibility to extract a positive payoff $(p-c)a$ in liquidation lowers the optimal effort. Above all, and as we will see more in details below, the market clearing price jeopardizes banker's incentives: it decreases the good state payoff and increases the bad state one.

Let's turn now to the constraint on the minimal effort that is necessary to avoid value destruction. Define $\bar{y}$ as the effort level at which the expected (date 2) value of the portfolio of a bank that performs the asset acquisition equals the value of an inactive bank with identical equity. In other words, $\bar{y}$ is the minimum effort such that the balance sheet expansion does not destroy value in expectations. The condition is:

$$\bar{y}q(x+a) = qa$$

and, rearranging terms:

$$\bar{y} = \frac{a}{x+a} \tag{5}$$

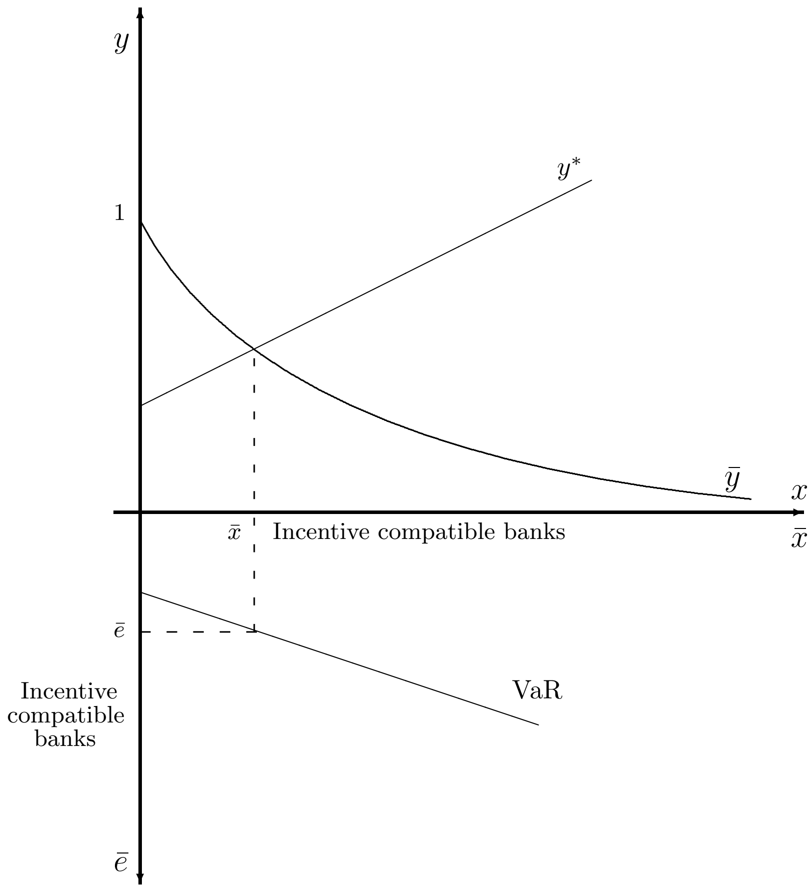
Only bankers whose (optimal) effort is larger than $\bar{y}$ should be allowed to be active and (if not in distress) participate to asset acquisition and expand the balance sheet. Indeed, imagine the banker's optimal effort is $y^* < \bar{y}$. In this case, the project of asset acquisition decreases the expected value of the bank as the probability of distress $(1-y)$ is too large to compensate for the expected additional value from asset acquisition. Moreover, as the optimal effort is an increasing function of the demand of short term securities given by the equation (4), the condition on the minimum incentive compatible effort can be easily arranged as a condition on the minimum incentive compatible x. Only banks whose demand x is larger than $\bar{x}$ are allowed to be active. The cut-off $\bar{x}$ is decreasing in q and increasing in p. Finally, as the demand of short term securities is linearly increasing in equity e, incentive compatibility constraint can be reformulated as a condition on the equity.

The banker's incentive compatibility constraint $e \geq \bar{e}$ can be interpreted as a capital requirement: only banks meeting that requirement are allowed to participate in the date 1 trading on short term securities[5].

Graph 1 clearly depicts how the capital requirement would work in practice. Each bank is endowed with a certain amount of capital e, which determines its ability (quantity) to subscribe assets under the VaR constraint. The quantity of assets (x), in turn, is the driver of the bank's optimal effort. However, as we mentioned, the supervisory authority does not allow bankers to carry on investments that lead to value destruction (i.e., the creation of value is the final policy objective). In other words, the authority requires banks to put a minimum effort and pursues this intermediate objective setting a minimum capital requirement (the policy instrument). In what follows, we use $\bar{x}$ as a proxy of the capital requirement as it is linearly and positively related to $\bar{e}$.

[5] Note that in principle, market investors may also impose a minimum effort (through requiring banks to hold at least $\bar{e}$), making prudential regulation useless (or redundant). However, it is well known that in the banking sector, due to the presence of small-sized depositors and the moral hazard linked to deposit-insurance schemes, market discipline is less effective and needs to be complemented by capital regulations.

Graph 1: The derivation of the capital requirement $\bar{e}$.

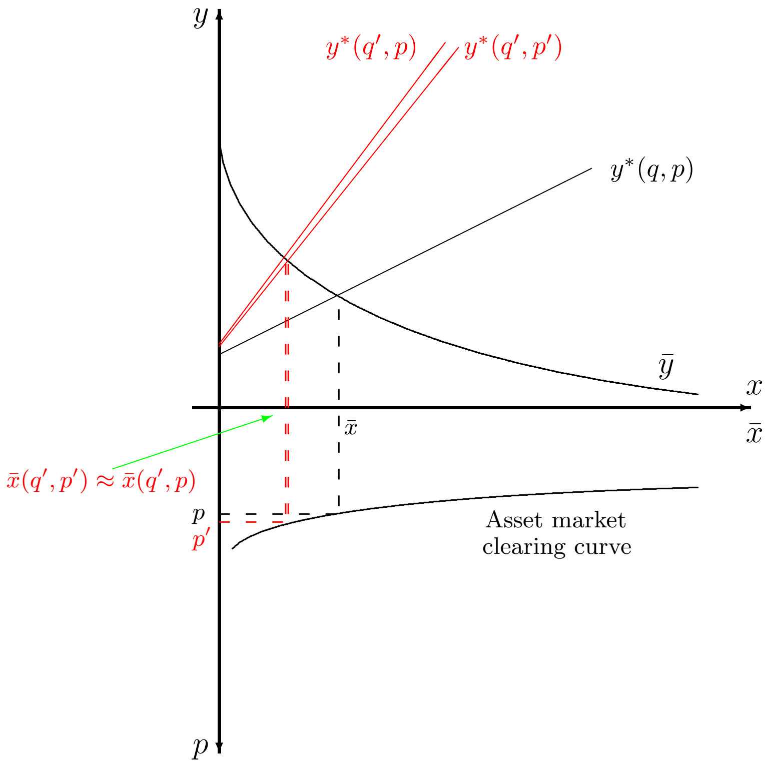


2.3 Fundamentals and incentives without procyclicality

In this section we analyze the effects of an improvement to fundamentals on incentives, maintaining the *ad hoc* assumption that the effects of the shock on asset prices are negligible. We remove this assumption in the next section. For now, assume a (negative but almost flat) relationship between $\bar{x}$ and the clearing price p (the asset market clearing curve - AMCC) and that this relationship is independent from q. In other terms, as in Graph 2, we restrict the analysis to a situation in which financial firms' response to shocks does not exhibit amplification properties and the associated effect on asset demand and prices is moderate.

Then, an improvement of q shifts the optimal effort curve y^* upward and makes it steeper. The demand x and thus the equity of marginal bankers (bankers whose optimal effort equals the cut-off $\bar{y}$) decreases: the minimum incentive compatible equity decreases. In the regulatory interpretation, in the expanding phase of the cycle, the minimum capital requirement declines as booming conditions boost effort and incentives are more easily aligned.

Graph 2: The effects of a positive shock to q, absent procyclicality



It is interesting to point out that, while the incentive-compatible capital requirement used in our model is extremely simplified (and very far from actual prudential rules), it still shows some characteristics that make it consistent with the Basel II risk-sensitive regulation. In particular, the time-dynamics is similar, with the minimum capital requirement decreasing in good times – as the consequence of increasing payoffs in good states (our model) and decreasing risk-weights (Basel II) – and decreasing in bad times. In other word, our model is able to replicate Basel II cyclicality, even though via different drivers. In this respect, Basel II regulation is *microprudential* in the sense that as it disregards the feedback effect that macro variables (i.e. changes in asset prices) exert on banks' behavior.

2.4 Fundamentals and asset prices with procyclicality

In the analysis of the previous section we disregarded the second part of the story, namely the link that goes from fundamentals to prices and, finally, to incentives. In this section we investigate the first part of the chain, namely the link between fundamentals and prices.

Graph 3 shows the three effects that determine the amplified response of prices. First of all, the improvement q' moves the optimal effort curve and the VaR constraint. The relationship in the bottom left quadrant shows the mass of active banks as a function of the capital requirement: assume banks are heterogenous with respect to equity, and the population of banks is distributed with cumulative distribution function $G(e)$; then $1 - G(\bar{e})$ is the mass of active banks. Adrian and Shin (2010) shows, in a very similar setting, that leveraged financial institutions' demand for assets generates an amplified response of asset prices to shocks to fundamentals. Their effect goes uniquely through the VaR effect (see Graph 3). This mechanism is at work in our model as well. Moreover, in our setting, the price response is amplified through different and additional channels.

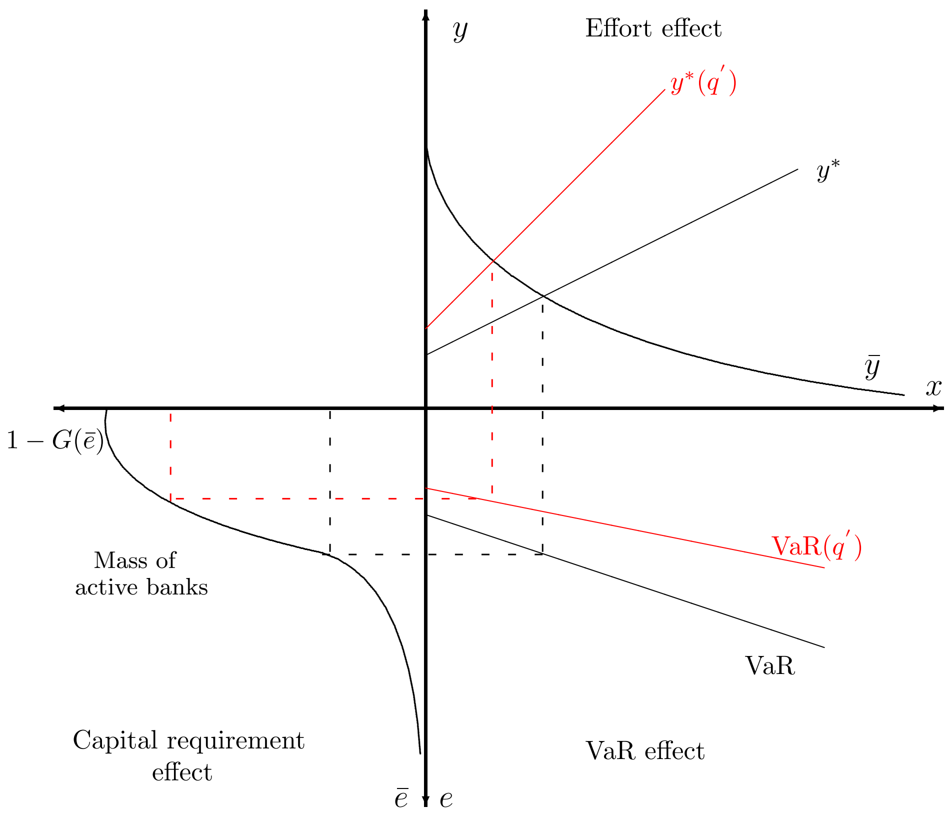
An improvement of q

- Increases the optimal effort y^* for each bank[6], decreasing the probability of distress and increasing the mass of successful banks (effort effect). The effort effect shifts the AMCC curve outward.
- Increases the optimal demand $x(e)$ for each bank[7](VaR effect). The VaR effect makes the AMCC curve steeper.
- Decreases the capital requirement $\bar{e}$, enlarging the mass of active banks (capital requirement effect). The capital requirement effect shifts the AMCC curve outward.

Those three effects guarantee an amplified response of p to q: following an improvement in fundamentals, the price displays an amplified response. We refer to this property of the system as *procyclicality*. According to these considera-tion, the AMCC becomes steeper and moves outward following the endogenous amplified response of prices to fundamentals.

[6]From equation (4), $\partial y^*/\partial q > 0$.
[7]From equation (3), $\partial x/\partial q > 0$.

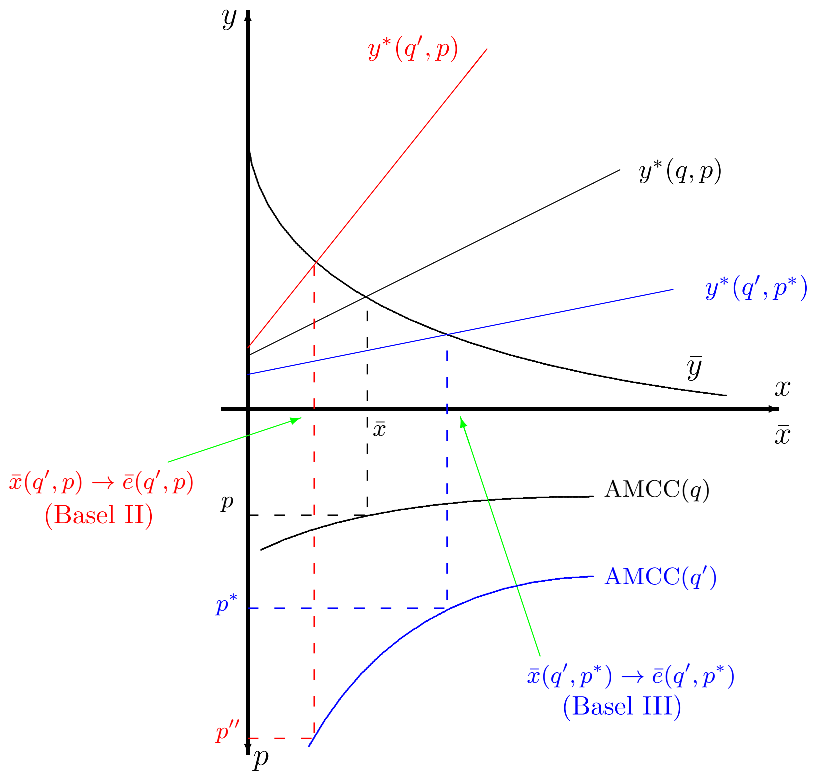
Graph 3: Amplification mechanisms of the price response to fundamentals.



2.5 Asset prices and incentives with procyclicality

From equation (4), besides the consolidated positive relationship between q and y, the optimal effort is negatively related to the price of assets: higher prices decrease good state payoffs and increase bad state ones. Note that the banker is able to extract utility both from purchasing assets and holding them to maturity or from the resale in the case of liquidation. When the bank avoids distress (good state) and participates to date 1 assets' purchase, a higher price lowers the return $(q-p)$ on assets. Moreover, a higher price increases the payoff of the banker in the case of distress and liquidation. In other terms the value of effort decreases with p as the banker is able to extract decreasing incomes in good states and increasing incomes in bad states. These two negative effects jeopardize incentives.

Graph 4: The effects of a positive shock to q, with procyclicality



Graph 4 shows the full picture of a shock to fundamentals. When the system is procyclical, the AMCC responds to q (blue curve) becoming steeper and shifting downward. The associated price shift feeds back pulling down the optimal effort curve (top panel). The higher the price response, the larger the downward shift of the optimal effort.

Capital requirements should embed the overall system response to the shock. Procyclical financial systems need higher capital requirements to preserve incentives. Indeed note that were the capital requirement not to move at all, or to decline in the style of Basel II ($\bar{e}(q', p)$), there would be a positive mass of active banks whose optimal effort is well below $\bar{y}$ (they destroy value). In this case, effective effort would be much lower than expected, and massive (unexpected) liquidation would become a real possibility. Beside the plunge in asset prices, and putting the argument a little forward, the effective cost of liquidation $p - c$ would be very large[8]. The effort in booming times, absent a proper policy intervention, would be in fact lower than in normal times.

In sum, what microprudential regulation misses is the feedback effect that changes in asset prices (due to the -amplified- response to improvements of q) exert on incentives. In other terms, microprudential regulation - not to mention market participants - is unable to appreciate that higher asset prices reduce banks' effort[9].

The effects described above resemble Borio et al. (2001)'s idea that the credit cycle is endogenous with respect to the collective decisions of financial institutions[10]. And indeed our model shows - admittedly in a simplified setting - that the forces that lead to the upswing carry the seeds of the subsequent downswing. In that respect, we are aligned with the spirit of Minsky (1992) financial instability hypothesis, which does not rely upon exogenous shocks to generate business cycles fluctuations (and financial instability), and with the more recent work of Bhattacharya (2010).

In the full picture, the policy response to a positive shock to fundamentals is simple. As proposed in Basel III, the undesirable consequences of too low capital requirements in good times can be mitigated by macroprudential buffers. Incentive compatible regulation should thus ensure that the effort is reinforced in extremely favorable conditions via higher capital requirements, which take the form of macroprudential add-ons (in the model, the quantity $e(\bar{x}(q', p^*)) - e(\bar{x})$.

Finally, from equation (4), the role of c, namely the loss of value of an asset in the case of liquidation, performs a subtle role. Very generally, c is inversely related to the asset market liquidity (the easiness to find a buyer without significant discounts on the sale price). Then, the sensitivity of banker's incentives to p is magnified when asset market liquidity is high. Indeed, the lower c, the wider the region in the price space in which the market clearing price is larger than c (so that $\gamma = 1$ and the payoff in liquidation is positive). It follows that, given those previously mentioned amplification effects, asset market liquidity contributes to give an additional boost to the sensitivity of incentives to prices (and thus to fundamentals).

[8] In our simplified framework we maintain the assumption that c, namely the inverse of asset market liquidity, is given and exogenous. One can easily imagine that liquidity would suddenly dry up (c increases) in the case of a sharp fall in asset prices associated to bad news concerning the quality of banks' portfolios. The latter would reinforce the effect of the fall in prices, dramatically reducing $p - c$.

[9] The growth of the subprime market and securitization in the US in 2002-07 is a vivid and recent example; in particular, it can be truly problematic to appreciate the negative distortion of incentives induced by higher payoffs in liquidation induced by increasing asset prices; many argue that the deterioration of lending standard has been largely determined by the belief that increasing real estate prices would have continued to provide a floor to the value of assets.

[10] According to Borio et al. (2001), those decisions are frequently based on misperceptions of the evolution of risk over time.

3 Conclusions

In the aftermath of the financial crisis, a lively debate on the cyclicality of financial regulation and the possible options for mitigating it took place among policy makers, regulators and the industry. The outcome has been an unanimous call for a macroprudential approach to regulation. However, the discussion has been largely on the policy side, while the theoretical underpinnings of macroprudential devices have been generally neglected.

In this paper, we set up an incentive model in which banks face – beyond endogenous constraints to asset demand – a capital regulation that also affects their ability to subscribe new assets. The objective of capital regulation is to ensure that banks put a minimum effort in their monitoring activities, thus avoiding too risky investments. Banks' effort is affected both by micro and macro variables. While our aim is not to setup a general framework for banking regulation as we concentrate only on one aspect of it, the model sheds some light on how microprudential rules (those that disregard the feedback effect of macro variables on incentives) may pose – particularly in benign economic conditions – wrong incentives to banks and suggests that a macro-perspective may be deemed necessary.

The starting point of the model is a positive macro shock to fundamentals (say, an improvement of assets expected return) that boosts the ability of banks to expand the balance sheet (Adrian and Shin (2010)). In fact, extremely favorable financial conditions affect bankers' incentives. On the one hand, expected returns increase and banks' optimal monitoring efforts also improve. Since banks are expected to voluntarily (endogenously) put higher effort, (microprudential) capital requirements decrease. Lower capital requirements would add to other endogenous mechanisms and boost the demand for assets. Indeed, booming demand is the result of the procyclical nature of leveraged financial institutions' behavior. Unfortunately, the soar in prices feeds back on incentives and, due to the amplified response, more than countervails the initial direct effect of the improvement of fundamentals: this implies that the effort in booming times is in fact lower than in normal times and that stricter – not more lenient – capital requirements would be needed to avoid perverse behavior and value destruction. Finally, asset market liquidity (the easiness to liquidate assets in the case of distress due to poor monitoring effort) and financial markets development (low agency costs, embedded here in the banker monitoring cost function) increase the sensitivity of bankers' incentives to asset prices so that both procyclical and advanced financial systems require a more severe scrutiny by macroprudential authorities. While the model is very simplified, the mechanisms it envisages are fully consistent with what happened before and during the big financial crisis.

There are two important policy implications of these results. First, banks plant in favorable conditions the seeds for future problems. In the dynamic version of the story, the initial improvement in fundamentals (that ameliorates incentives) is quickly coupled with the increase in the asset prices (that jeopardize incentives). In this expanding phase, absent proper policy intervention on capital requirements, the incentive distortion is under way. Therefore, it is key that a macroprudential capital buffer is added to microprudential capital requirements to align incentives through the business cycle. Our evidence provides thus strong theoretical support for the Basel III countercyclical buffer.

Second, effective macroprudential policies should not only aim at the accumulation of reserves to be used when, somehow exogenously, "bad times arrive". Rather, they stand as effective policy tools to correct a class of distortions associated with the mutual reinforcing interaction between leveraged institutions balance sheet positions and increasing asset prices. The realignment of incentives may however require severe buffer levels and their costs in terms of credit supply should not be neglected. We leave this as an open issue for future research.

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