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FINANCIAL SECTOR PRO-CYCLICALITY
LESSONS FROM THE CRISIS[1]

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Abstract

We analyze the main forces affecting financial system pro-cyclicality (the fact that developments in the financial sector can amplify business cycle fluctuations). We first review some major structural developments in financial markets that may influence pro-cyclicality and that have been overlooked in earlier analyses. We then examine three issues that are center stage in the current debate: capital regulation, accounting standards and managers' incentives. After reviewing the institutional set-up and the key mechanisms at work, we critically examine a series of proposals designed to mitigate pro-cyclicality.

Executive summary

The idea that the financial sector can amplify the business cycle (the concept of pro-cyclicality adopted here) dates back at least to Irving Fisher (1933). In this original view, however, financial factors have an asymmetric role: financial frictions limit the availability of external finance to firms and households, worsening downturns; however, they do not have a symmetric positive role during upturns. The modern financial accelerator (FA) theory removes this asymmetry. The FA works mainly through the value of collateral: a rise in asset prices makes it easier for households and firms to obtain loans, while a decline makes it more difficult. This mechanism is pro-cyclical because asset prices tend to be positively correlated with the business cycle, and because credit availability feeds back onto investment and consumption, and hence onto economic growth.

A similar mechanism affects banks' balance sheets: a negative shock to asset prices depletes capital and increases leverage. Since raising new capital is difficult in a downturn, banks tend to react by reducing assets. Disposals feed back onto asset prices, propagating the initial shock. This may have a strong impact on economic activity, especially when shocks hit several banks simultaneously, as is typical of systemic events. In this framework, which we refer to as the New Financial Accelerator (NFA), the propagating factor is leverage: when banks are highly leveraged, the initial shock and the ensuing reduction in asset prices will induce massive asset liquidations, accentuating the price fall and possibly triggering a vicious circle, especially if banks want to restore a target leverage level (see Section 1). In principle, the mechanism is symmetric: a positive shock increases capital and reduces leverage, inducing banks to expand assets. We look at the relationship between leverage and asset prices in the main industrial countries, and find that NFA-type mechanisms may be at work, but that the evidence is not clear cut.

Section 2 briefly reviews financial liberalization, technological and financial innovation, and their effects on the financial system: an increase in securitization, fostering the originate-to-distribute model of intermediation; a shift from relationship to arm's length banking; an increase in the level of banking competition; the development of credit scoring and remote banking; international financial integration; and greater household exposure to financial risk. We discuss how these changes may have affected the pro-cyclicality of the financial system.

In theory, pro-cyclicality would not emerge if banks held sufficient capital buffers through the cycle, improving their capital position in upturns in order to withstand losses in downturns. Analyses of this issue should therefore recognize the trade-off between the effects of pro-cyclicality of banks' balance sheets on the one hand and the cost of holding capital on the other. Acknowledging this trade-off, we examine how pro-cyclicality can be mitigated and the need for additional capital be contained. We focus on capital regulation, accounting standards and managers' incentives. This choice leaves out important issues, more or less closely intertwined with that of pro-cyclicality: the causes of the crisis; the shortcomings of macroeconomic policies; the features of supervisory frameworks; the role of credit rating agencies. We refer to de Larosière *et al.* (2009), Volcker *et al.* (2009), and Acharya and Richardson (2009) for a discussion of these issues and a focus on reforms to improve financial stability. Also, see Financial Stability Forum (2009) for a series of recommendations to reduce financial sector pro-cyclicality, many of which are also discussed in the present paper.

Capital Regulation

Section 3 reviews the link between risk-based capital regulation and pro-cyclicality. We emphasize the following points. First, *Basel II* strengthens the link between banks' regulatory capital and the risk of assets, and thus is inherently pro-cyclical; this reflects the fact that while risk accumulation proceeds during expansions, risk materializes in downturns (Borio *et al.* 2001). Second, *Basel II* does contain safeguards against pro-cyclicality; for example banks are encouraged

to use smoothed estimates of the inputs of the capital function (the formula linking asset risk to capital requirements), so as to limit cyclical variations. However, the evidence suggests that the implementation did not fully conform to the regulation's spirit. This reflects several factors, including a set of incentives that may prompt banks to adopt more cyclical estimates so as to maximize profits. Third, risk-based capital regulation that only refers to individual banks underestimates systemic risk by neglecting the macro impact of banks reacting in unison to a shock (Brunnermeier *et al.* 2009).

Several measures have been proposed to mitigate the pro-cyclicality of risk-based regulation. Most of these measures may well set off a search for ways to circumvent them. All rules require further harmonization of accounting standards and of the criteria for consolidation, in order to avoid elusion via off balance sheet items and ensure uniform implementation across countries.

Measures addressing micro-economic risks

Adjusting for expected losses – Accounting standards as applied in most countries only recognise loan losses after a specific loss event occurs (see below); because defaults increase in downturns, this induces pro-cyclicality. In order to counter this effect, statistical provisioning for expected losses could be introduced. Banks could be required to adopt a simple rule, linking loss provisions to a measure of the outstanding value (or expansion) of their credit. This "dynamic provisioning" rule would take into account the observed correlation between credit booms and loosening credit standards, and would be relatively simple to apply. A version has been in use in Spain for some time. Critics have suggested that it does not take into account large losses which may occur with small probability; however, this objection overlooks the fact that the rule would complement, not replace, other capital rules which ensure against low probability or even systemic events (see below). Another objection is that it could penalize banks with high loan growth, which might be the most efficient ones. Its conformity with existing accounting standards (IAS/IFRS) has also been questioned.

We propose an alternative, slightly different approach which would require banks – for supervisory purposes – to consider credit value adjustments (CVA) during upturns in order to provision for the likely losses in the ensuing downturn. This mechanism would be similar to that already used for market risk in *Basel II*; it would share the main advantages and disadvantages of dynamic provisioning but would not interfere with the IAS/IFRS framework as it would not affect the profit and loss account.

Adjusting for unexpected losses – In the *Basel II* framework capital requirements aim to insure against large and rare (i.e. unexpected) losses. The capital function could be modified in order to smooth capital requirements through the cycle. One possibility would be to smooth the inputs (i.e. the parameters needed to quantify risk), for example by using conservative estimates in expansions in order to reduce adjustments in downturns. Alternatively, one could smooth the function's output (i.e. the amount of capital for given risk). These solutions would be relatively easy to implement, but their effects could be partially undone by banks' choices of parameters and risk models.

Limits on banks' leverage ratio

Risk-based capital requirements could be supplemented by a ceiling on banks' leverage ratio, computed on the basis on non-risk-weighted assets. This ceiling, which various countries have already adopted, can be considered an insurance against the failure of the complex models used to assess credit risk and compute capital requirements. In spite of its conceptual simplicity, the implementation of a ceiling would imply addressing a number of technical issues concerning the appropriate concept of leverage and its calculation.

In our view, simple rules of this nature – based on quantitative limits on risk – could represent a useful tool for other risks as well. For example, the crisis has pointed out the importance of liquidity risk. Innovative ways of measuring this risk and translating it into capital requirements have been proposed. However, as with credit risk, given its systemic nature and the externalities it involves, liquidity risk may be difficult to identify, hard to measure and costly to insure. Due consideration should be given to simple, readily enforceable rules to cap banks' liquidity risk. Solutions worth examining in depth are: constraining maturity mismatches; imposing buffers of liquid assets proportional to the share of illiquid ones; imposing supervisory provisions on new financial instruments, which could decline over time, as information about the instruments and their risk improves.

Measures taking into account systemic factors

The foregoing proposals would attenuate pro-cyclicality at the level of single banks, but they might still leave the system vulnerable at the macro level. This issue is addressed by proposals to adjust capital requirements in response to signals of macro instability.

Linking capital requirements to macro risk – Capital requirements could be linked to system-wide measures of credit expansion or risk (e.g. aggregate lending growth), or to a wider set of indicators (e.g. system-wide leverage, liquidity risk, asset price dynamics). Application of this rule would require addressing a series of practical difficulties (e.g. which macro variable(s) to consider and how to combine them, especially for cross-border banks).

An alternative proposal focuses on systemically relevant institutions, tying equity to the probability of spillover risk (the risk that problems at one or few institutions may cause systemic instability). This probability could be measured using sophisticated statistical techniques, on the basis of such variables as leverage, maturity mismatch, credit and asset price expansion. The regulation should not be restricted to banks alone but should extend to all financial institutions that could generate systemic risk. As argued by the authors, this proposal is in many respects similar to dynamic provisioning and as such it shares many of its virtues and caveats. Its higher level of sophistication makes it possible to take into account the complex interaction between lending standards, credit growth and other relevant variables, as well as the potential instability arising from large and complex financial institutions (due e.g. to size or interconnections). But the complexity of the proposal may also be seen as a weakness, as its implementation, and supervision, could be difficult. One may wonder whether the same objective could be achieved via simpler criteria, based primarily on the size of intermediaries.

Capital insurance – An insurance-like approach to systemic risk could be considered. By recognizing that tail risk (the risk of rare events with incalculable costs) is a serious issue but that holding worst-case levels of capital at all times would be inefficient, a number of proposals advocate what amounts to contingent claims that turn into equity when needed. Our view is that "systemic" reverse convertible-type securities may provide a viable solution: banks could issue bonds that convert into equity given a trigger event, defined by some industry-wide indicator to avoid moral hazard. These instruments would provide capital when needed and could be traded, which would lower transaction costs and allow price formation. On the other hand, the fact that systemic risk is non-diversifiable by definition might make these instruments expensive.

Accounting Standards

In recent years listed firms, and in some countries the entire banking sector, have been adopting the new accounting standards drafted by the two main worldwide accounting bodies, the International Accounting Standards Board (IASB) and the United States Financial Accounting Standards Board (FASB). The principal change brought about by the new regulation is the move

from Historical Cost Accounting (HCA) to Fair Value Accounting (FVA). The new system defines fair value as the amount for which an instrument "could be exchanged between knowledgeable, willing parties in an arm's length transaction". For actively traded assets, this is the market price (mark-to-market accounting); in the absence of a quoted price, estimation techniques must be used (mark-to-model accounting). The rules promoted by the IASB, known as IAS/IFRS, are now used by more than a hundred countries. The share of bank assets at fair value differs from country to country, ranging between 30% and 50% in the most advanced; it is typically larger for systemically relevant institutions.

According to the literature, the choice between FVA and HCA involves a trade-off: FVA provides timely information and improves transparency but brings excessive volatility to banks' balance sheets; HCA neglects timeliness but minimizes volatility. In Section 4 we depart somewhat from this consensus, arguing that some form of FVA (e.g. a time series average of point-in-time fair-value estimates) strictly dominates HCA in all cases.

Our review of the debate on accounting and pro-cyclicality suggests several conclusions. First, the new accounting standards affect banks' investment choices and managers' incentives pro-cyclically. The key issue is that FVA immediately transposes asset price changes into balance sheets, whether the gains or losses have been realized or not. Since asset prices are pro-cyclical, the expansion of balance sheets during booms (and their contraction in downturns) is sharper than under HCA. This effect is magnified further if banks target a given level of leverage. Second, the role of FVA should not be overemphasized: business practices based on mark-to-market – such as stop-loss strategies, margin calls or Value at Risk models for risk management – were widespread well before FVA was introduced. Third, although a number of the factors affecting pro-cyclicality pre-date FVA, their effects can be mitigated by amending accounting rules.

There is an ample debate on possible actions to mitigate the pro-cyclical bias of FVA. The main organizations involved – in particular the FSF and accounting bodies – are working on proposals. Here we focus on the main issues emerging from our review in Section 4.

Discretionality should be reduced – At times, the new accounting standards proved to be complex and subject to various interpretations, to the detriment of comparability of accounts. This heightened uncertainty and reduced market liquidity, aggravating the crisis. The accounting bodies are working to clarify the specific definitions (e.g. "active market", "distress sale", or "other than temporary" impairment), which play a non-trivial role in the implementation of FVA.

Broader issues are harder to address. One example is the principle of valuation according to holding intention, introduced by the new accounting standards: for example, an instrument must be marked to market if managers intend to sell it in the short term but can be valued at cost if the intention is to hold it to maturity. This mechanism has been questioned because of the discretion it leaves to each bank in valuing the same product. Valuation based on the instruments' nature could limit discretion but would not eliminate it and would sever the link between valuation and the role of assets/liabilities in the balance sheet, which was a key motivation for the adoption of the new accounting standards. Another area in which convergence on methodologies is essential but may be hard to achieve is valuation of illiquid/complex instruments.

Excessive use of FVA should be avoided – The crisis has shown that assets not intended for immediate sale were often nonetheless included in the trading portfolio and booked at fair value instead of amortized cost, possibly in order to exploit potential short-term valuation gains. The treatment of "ineffective hedges" (trades in which the hedge does not fully cover the underlying risk) had similar effects: banks often chose to value all risks of the hedged asset at FV, resorting to estimation techniques. These valuation choices inflated the share of assets booked at FV, magnifying the perverse interaction between asset prices and balance sheets. To avoid excessive recourse to FVA in the future, the securities that can be included in the trading portfolio should be

rigorously defined (as by fixing a maximum holding period). Uniform and simplified accounting treatment of FV hedges might be introduced as well.

Prudential reserves should be compatible with accounting rules – The practice of building up generic reserves is no longer permitted under IAS/IFRS: e.g. loan loss provisions cannot be booked unless impairment losses are actually incurred. However, the realization that risks tend to build up undetected during expansions and then to materialize in downturns is prompting proposals to (re)introduce forms of forward-looking provisions and reserves, which should work as automatic stabilizers and reduce pro-cyclicality. The credit valuation adjustment approach discussed above may represent a solution compatible with the accounting framework. Valuation adjustments for products that are marked-to-model and for illiquid instruments in general could also be considered. These reserves would not show up officially in the accounts but would matter for the determination of regulatory capital (via a regulatory capital reduction) and could be subject to disclosure principles.

Amortization of goodwill – Under HCA, the bidder in a merger could write the value of goodwill among assets and amortize it over many years. Under IAS/IFRS goodwill is treated as an indefinite-life asset and is no longer amortized. But it is subject to annual impairment tests. In the presence of negative shocks, impairment tests generate losses that directly affect both the profit and loss account and the balance sheet. The treatment of goodwill under IAS/IFRS is pro-cyclical because M&As are also pro-cyclical; these problems could be eased by reintroducing some degree of amortization.

Convergence in accounting rules should be speeded up – While similar in many respects, the two main accounting systems (GAAP for the U.S. and IAS/IFRS for the rest of the world) still have non-trivial differences. Convergence on truly global accounting standards should be speeded up, to ease comparisons and transparency and avoid regulatory arbitrage.

We also examine factors affecting pro-cyclicality that pre-date the adoption of the new accounting standards but whose effects can be mitigated by amending accounting rules. First, the accounting treatment of off-balance-sheet items, which is crucial in computing leverage, should be tightened in order to reduce discretionality. Second, the IASB is examining a proposal to reintroduce the upfront recognition of profits even when prices are based on unobservable inputs, as in the case of Level 3 assets (complex products that are typically priced by model). This would strengthen the incentive to create such products, in order to sell them at prices higher than the model-based valuation and book upfront profits. A possible solution might be the amortization of day-one profits over a longer term. Third, while FVA improves the accounting treatment of risk, certain risks – especially liquidity risk – are often underestimated in market prices, and this affects valuations. The accounting bodies are working to define uniform valuation methodologies for illiquid assets. Liquidity premia could be estimated taking into account the holding period of each instrument and banks' ability to keep the asset. This aspect, closely related to funding liquidity, has been largely overlooked by accountants and regulators alike.

A controversial issue concerns the treatment of banks' liabilities, which are still mostly at cost. This accentuates pro-cyclicality, as profits tend to increase in booms and decline in downturns more sharply than they would under symmetrical FVA treatment of assets and liabilities. Increasing the share of liabilities valued at FV would mitigate pro-cyclicality. However, one paradoxical consequence of this proposal is that a deterioration in a company's creditworthiness would compress liabilities and thus increase profits.

Incentives

The separation between management and control in the modern corporation has driven a wedge between the interests of decision makers and those of investors. Theoretical research focused

on the need for incentives to align the interests of risk-averse managers with those of shareholders. And practice has conformed to the theory, so that the remuneration of managers commonly includes a variable, performance-related component.

The crisis has shown that managers took on excessive risk and focused on short-term performance, at the expense of sound management and long-term results. Such conduct was fostered by remuneration schemes linked to short-term results (e.g. annual profits). Excessive risk-taking induces pro-cyclicality, as risk is more easily taken in upturns and tends to aggravate downturns. The asymmetry of remuneration schemes (managers are paid handsomely if they make profits but not penalized for losses) acts as an incentive for high-risk projects even if they have negative expected value, since in some cases they generate profits – at least in the short run.

In Section 5 we review the evidence: loan officers focusing on volumes tend to charge excessively low rates during expansions, helping to inflate property prices and to aggravate the subsequent downturn; high-powered incentives can entice managers to distort accounts in order to boost earnings; overvalued equity creates incentives for managers to support the firm's stock price in the short term, helping to make a stock market boom self-sustaining and exacerbating the subsequent correction; incentive fees may tempt asset managers to take hidden risk in hopes of boosting performance, exploiting the fact that risks are difficult to assess ex ante. The substantial increases recorded by the variable part of executive compensations in recent years suggest that the importance of incentive mechanisms for pro-cyclicality has increased.

These considerations have led to widespread recognition that incentives are one of the driving factors in the current crisis. A consensus has emerged on at least two basic principles: that the parameters to be used to determine managers' variable remuneration should be adjusted for risk and that managers' compensation should be linked to long-term profitability.

Financial institutions have begun to move in this direction, pressed on by governments, who are imposing conditions for public support of the financial sector, by wide media coverage of the compensation issue and by mounting pressure from public opinion. Several banks and banking associations have revised their pay packages. Nevertheless, reforming managers' remuneration schemes is a difficult task. First, risk adjustment methods are difficult to implement because risk remuneration is hard to disentangle, ex ante, from genuine performance. Second, measures that lengthen the horizon of managers' compensation schemes reduce short-termism but at the same time reduce the incentive to exert effort: thus, the choice entails a trade-off. Third, the temporal mismatch between bonus payments and materialization of risks and losses can be very great indeed. Fourth, many of the firms that failed in the current crisis were following best practice standards in key areas such as board independence, separation of chairman and CEO positions, incentives and remuneration issues. Finally, experience has shown that stricter rules on managers' remuneration schemes are hard to enforce and easily circumvented. In spite of these problems, mechanisms connecting compensation to long-term, risk-adjusted profitability, such as deferred bonuses, long-term cash incentives, restricted stock grants, claw-back clauses and longer vesting horizons, are likely to become widespread in the future.

Banks' governance is also crucial. A thorough review of internal processes should improve banks' decision-making, covering the mechanisms that set and monitor managers' remuneration schemes, in order to remove conflicts of interest. Internal risk management systems must be reinforced, to make sure that the recommendations of the risk management apparatus cannot be overruled, and to improve estimates of tail risks. Risk managers could report directly to top management or to the board. Independent directors, compensation committees, powerful internal and external audits, and abundant information flows among all relevant actors should all contribute to a system of checks and balances that ensures internal discussion and reduce the risks in financial institutions' portfolios.

The crisis is also likely to encourage changes in the organization of financial firms, fostering models that emphasize the importance of teamwork in well-organized structures over that of individual talents, in order to limit the excessive bargaining power of managers (clearly one of the main drivers of the high-powered compensation schemes).

But market discipline has its limits. A more active role for regulators and supervisors in a matter such as that of remuneration, typically left to private contractual arrangements, is probably warranted when it comes to banks and other systemically relevant institutions, whose CEOs have strong incentives to invest in risky assets and, if they lose their bets, dump the loss on the taxpayer. Disclosure is crucial. Some supervisors are requiring banks to make the full details of managers' compensation public: the fixed and variable components, the breakdown of the performance-related part, the benefits in case of contract termination. Some regulators are pushing the banks themselves to analyze the effects of compensation schemes and determine whether they encourage excessive risk-taking. Supervisors are also considering options to link capital requirements with the risks produced by unsatisfactory remuneration schemes. As with other proposals, the problem is that risk may be difficult to detect in advance.

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A number of common, structural factors affecting pro-cyclicality *indirectly* have emerged repeatedly in our review. The first is market imperfections. Frictions in asset markets (e.g. illiquidity) amplify the mechanism of the financial accelerator; raise the cost of issuing capital in downturns, thus forcing banks to sell assets rather than increase equity; and force deep discounts on many financial products, feeding back immediately onto banks' balance sheets through the new accounting standards.

The second factor is incentives. Not only are incentives relevant *per se*, as we have seen, but they also interact with capital requirements and accounting rules. In upturns, high-powered incentive schemes based on short-term profit may discourage managers from accumulating sufficient capital buffers, the "air bags" of the financial system (Trichet, 2009); they may also drive managers to distort the interpretation of the rules or, in extreme cases, commit outright fraud.

The third factor is financial innovation. Although it has positive effects when it completes markets, improves risk allocation or reduces transaction costs, financial innovation can also wreak havoc, as the current crisis has so well demonstrated. This is the case, for example, when new, complex financial instruments are designed to exploit loopholes, regulatory arbitrage or informational asymmetries for the benefit of some parties to the detriment of others, as was probably the case with some of the most opaque instruments (Draghi, 2008a). Distinguishing *ex ante* between products that mainly improve efficiency and those that mainly increase risk is no easy task, but regulators and market participants alike will need to assess the role of innovation.

The combination of these factors creates a situation that, in our view, is difficult to address by means of separate reforms focusing on single problems. Even the best designed rules are liable to be circumvented over time. A "diversification principle" of regulation suggests the need for a broad net of norms and provisions, based on heterogeneous and complementary approaches; it also suggests the need for dynamic adaptation of this net to keep abreast of market forces – incentives and innovation, which jointly end, in time, by circumventing the rules. The costs entailed by this approach must be weighed against those of lagging behind market forces.

1. THE (NEW) FINANCIAL ACCELERATOR: THE ROLE OF LEVERAGE

A vast macroeconomic literature, developed over the last 20 years, has incorporated the idea – dating back at least to Fisher (1933) – that financial factors can be a powerful amplifier of the business cycle.[2] Financial markets are seen not just as reflecting the conditions of the real economy but as an important determinant of the level of economic activity. The essence of this mechanism – which is generally referred to as the financial accelerator (FA) – is the existence of frictions that limit external finance to firms and households. For example, a negative exogenous shock to the economy reduces the value of collateral and firms' access to credit, with potential adverse effects on production. Studies have shown that there are several ways of explaining the FA.[3]

An equally vast literature has ascertained the empirical importance of the FA. Many works have studied how changes in net worth affect investment by financially constrained firms.[4] Evidence of financing constraints has also been documented for households[5] and for the functioning of housing markets.[6] Most analyses have focused on the way in which financial market imperfections influence the business cycle *indirectly*, via their impact on the non-financial sector (firms and households). Much less work has been devoted to the *direct* role of financial firms in amplifying shocks to the real economy.[7] In section 1.1 we describe the underlying mechanism, which we call the New Financial Accelerator. Section 1.2 reviews features that may magnify its effects. Section 1.3 discusses some consolidated and some new empirical evidence on leverage at financial institutions.

1.1 A two-way interaction between real and financial variables

Several analyses prompted by the financial crisis point out that a financial accelerator mechanism may be at work for financial firms as well, and for banks in particular.[8] For further reference, we call this mechanism the New Financial Accelerator (NFA), although its functioning has been well known at least since Kindleberger (1978).

The mechanism, which is complementary to the FA, works as follows.[9] Suppose a bank has assets worth 100, nominal liabilities equal to 90, and hence equity (net worth, i.e. assets less liabilities) equal to 10. Then its leverage, defined as the ratio of assets to net worth, is equal to 10. Suppose an exogenous shock reduces the value of assets by 5%, to 95. Then leverage almost doubles, to 19. Assume the bank targets some level of leverage – say 10, the pre-shock value. To restore this desired level the bank could issue equity or sell assets. When losses are large, however,

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[2] The seminal work in this field is Bernanke and Gertler (1989).

[3] See Bernanke *et al*. (1996). One group of models links the FA to fluctuations in the value of collateral assets (e.g. housing wealth; Iacoviello, 2005, and Iacoviello and Neri, 2008): rising prices allow financially constrained agents to expand borrowing and thus consumption and investment; conversely, collateral devaluations force agents to cut expenditure. A second group of models emphasizes how endogenous changes to firm balance sheets amplify the business cycle (see Carlstrom and Fuerst, 1997, and Bernanke *et al*., 1999). A third line of research directly analyzes banks' contribution to real fluctuations (Christiano *et al*., 2007, Gerali *et al*., 2008, Goodfriend and McCallum, 2007).

[4] See Fazzari, Hubbard, and Petersen (1988) and the review in Hubbard (1998).

[5] See Zeldes (1989), Jappelli and Pagano (1989), Campbell and Mankiw (1989), Carroll and Dunn (1997).

[6] Almeida *et al*. (2002) find that house prices are more sensitive to income shocks in countries with higher loan-to-value ratios, so the credit multiplier has greater impact on household spending in those countries.

[7] A notable exception is the research activity carried out in the current decade at the Bank for International Settlements on the inherent pro-cyclicality of post-Bretton Woods financial arrangements. See Borio *et al*. (2001), Borio and White (2004) and White (2006) and references therein.

[8] See Adrian and Shin (2008), Brunnermeier (2009), Brunnermeier and Pedersen (2009), Caballero and Krishnamurty (2008).

[9] The example in the text is adapted from Adrian and Shin (2008).

banks tend to liquidate assets, since equity-raising tends to be sluggish and costly, especially in unfavorable market conditions, due to market frictions.[10] Note that, assuming constant prices, to restore the desired leverage value of 10 the bank will have to liquidate assets and liabilities until, in the new equilibrium, its balance sheet will be 50% smaller than before – an enormous effect that is amplified still more if the initial shock hits a sufficiently large number of intermediaries. In this case the simultaneous wave of asset sales will put further downward pressure on asset prices, generating a vicious circle.

In this scheme, pro-cyclicality is mainly caused by a chain reaction triggered by an exogenous shock (for example, a fall in house prices) and amplified by the interplay between the shock and asset market dynamics. The propagating factor is leverage: when banks are highly leveraged, the initial shock and the ensuing reduction in asset prices induce massive asset liquidation, accentuating the price fall and possibly starting a vicious circle. In principle, the mechanism is symmetrical: an initial positive shock (e.g. a technological breakthrough, actual or expected) may lead to a broad rise in asset prices and hence to an expansion of intermediaries' balance sheets, starting a positive circle.

1.2 Features that magnify the NFA

The NFA interacts with a number of other factors – such as accounting standards, capital requirements and incentives – that are not encompassed in the traditional financial accelerator and are discussed in the next sections. The following mechanisms may also amplify the functioning of the NFA and/or magnify the pro-cyclicality of the lending supply.[11]

i)   *Liquidity spirals* – In declining markets, the value of collateral is eroded, putting pressure on the funding liquidity of intermediaries and forcing them to liquidate positions. If sellers dominate, market liquidity may contract significantly and the loss spiral will be magnified (this mechanism will also work in reverse, in reaction to positive shocks).[12] Liquidity spirals may be precipitated or aggravated by several non-mutually exclusive mechanisms:

- *Contractual/statutory arrangements* – Many institutional investors and financial companies have constraints on their investment policy, often based on the ratings of assets; for example, pension funds tend not to invest in securities with low ratings. Because downgrades are more frequent during downturns (see Section 3), this may force these investors to sell in a falling market, adding to downward price pressure.

- *Maturity mismatches* – Investors financing long-term positions with short-term liabilities expose *themselves* to the risk of a sudden liquidity freeze, which would make the rollover of debt hard

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[10] See Basel Committee on Banking Supervision (2004, paragraph 757). Barakova and Carey (2001) show that banks need an average of 1.6 years to restore their capital after becoming undercapitalized. Kashyap *et al.* (2008) emphasize two frictions that contribute to this sluggishness: (i) equity issues increase the value of existing debt, thus generating an externality in favor of debtholders and harming existing shareholders; (ii) equity issues may signal forthcoming losses. They also note that under *Basel II* the pressure to liquidate assets is stronger in crisis periods, when risk and hence risk-weighted capital requirements increase. Repullo and Suarez (2004) emphasize that the market for seasoned offerings is plagued by informational frictions, which may entail prohibitive costs of raising new capital.

[11] Kashyap *et al.* (2008) emphasize credit crunch externalities, which magnify the traditional financial accelerator. If a bank decides to liquidate a loan, e.g. to a small firm, it generates a negative externality since it does not internalize the lost profits from projects that the firm will have to forgo. Note that this mechanism is at work even under normal circumstances, not just in situations of crisis.

[12] *Market liquidity* measures the ease with which an asset can be traded – the extent to which potentially large quantities of that asset can be sold or bought without significant impact on its market price. *Funding liquidity* measures the ease with which investors can obtain funding. See Brunnermeier and Pedersen (2009). In monetary policy jargon, "liquidity" is the amount of monetary base that the central bank injects into or drains from banks' settlement accounts in order to affect its operational target, typically a very short-term interbank interest rate.

or impossible. This may induce forced liquidation of assets. While we are not aware of systematic investigations of the cyclical behavior of maturity mismatches, anecdotal evidence clearly suggests that these mismatches played an important role in the current crisis.[13]

- *Strategic behavior of large players* – In times of financial stress, when markets become *illiquid*, large players may deliberately amplify asset price swings in order to put fund-strapped competitors under pressure, pushing an otherwise liquid intermediary into illiquidity.[14]

ii)   Margins/haircuts – In a cyclical downturn, margin calls become frequent and haircuts increase; this reduces leverage, as margins and haircuts implicitly determine the maximum level of borrowing in collateralized transactions. The opposite happens in expansions.[15] Margin increases will contribute to liquidity spirals.

iii)   Misperception of risk – Misperception of risk may be driven by non-rational behavior. Disaster myopia and cognitive dissonance, two well-known concepts from experimental psychology, help explain why investors may misestimate risk. Disaster myopia refers to the tendency to underestimate the likelihood of low-probability, high-loss events, resulting in excessive weight being placed on recent events and too little on remote ones.[16] Cognitive dissonance refers to the agents' tendency to read the available information as consistent with their beliefs. These cognitive biases could generate pro-cyclical risk perceptions: when an economic expansion proceeds, the memory of past defaults fades and new information is interpreted as confirmation that the economy is moving along a sustainable, low risk path. Merely cyclical movements are perceived as part of a new long-run trend. With the downturn, this process may be suddenly reversed, as actual defaults and other information now belie the prevailing beliefs. Misperception conducive to excessive risk taking can also be driven by incentives (see Section 5).

iv)   VaR – The widely used Value at Risk (VaR) models are essential to determining the size and leverage of banks' balance sheets. Empirically, measured risk (e.g. volatility, which directly influences the VaR) is low during booms and high during busts,[17] so banks expand their balance sheets and increase leverage during upturns and do the opposite during downturns.

In a financial crisis, other mechanisms may also be at work.

v)   Contagion in the interbank market – A shock to one bank may be amplified and propagated to others via the interbank market, generating systemic risk.[18] If the liquidity crisis deepens, bank failures may shrink the pool of liquidity shared within cross-border groups, creating "ponds" of liquidity delimited by national boundaries (in relation, for example, to international differences in bankruptcy law) and exacerbating the liquidity shortages at the global level. This could lead to a contagion of failures, with spillovers on the real sector.

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[13]   See e.g. the account of the troubles of Hypo real estate in the Financial Times of 20 March 2009.

[14]   See Adrian and Shin (2008), Brunnermeier and Pedersen (2005, 2009), Shleifer and Vishny (1997). On 17 July 2008 the *Wall Street Journal Europe* reported rumours about traders of investment banks manipulating competitors' stocks and an SEC investigation on market manipulation. In his testimony to the U.S. Congress on 6 October 2008, R. Fuld, former CEO of Lehman Brothers, claimed that "…a litany of destabilizing factors: rumors, … naked short attacks, … and strategic buyers sitting on the sidelines waiting for an assisted deal …." led to the Lehman collapse.

[15]   For instance, suppose a financial firm has 2 euros of capital. A haircut of 2% would imply that the fund could borrow 98 euros, and reach a leverage of 50. If the haircut is lowered to 1% the fund could borrow up to 198 euros thus increasing leverage to 100. For an extensive discussion of this issue and evidence that margin calls/haircuts increase in times of financial stress, see Pedersen (2008), Brunnermeier and Pedersen (2009) and Brunnermeier *et al.*, (2009).

[16]   See Guttentag and Herring (1984) for an application to credit markets. See Borio, Furfine and Lowe (2001) for additional references on the subject.

[17]   See Panetta *et al.* (2006).

[18]   See Allen and Gale (2000) and Diamond and Rajan (2005). Allen and Carletti (2008c) and Frank *et al.* (2008) provide evidence on the transmission of liquidity shocks during the subprime crisis in the U.S..

vi)   *Fire sales* – This is the crisis outcome of the vicious circle illustrated above: sales of financial assets by enough banks strongly depress prices; other banks holding similar assets come under pressure and are forced to liquidate some of their own assets, closing the loop.[19] Problems may be aggravated by technical constraints (limits to arbitrage due to over-exposure or undercapitalization of traders) or by mark-to-market accounting, which can deter potential buyers (since short-run price reductions could severely affect their balance sheet, even if prices are expected to increase in the long run; see Section 4).

1.3 A preliminary look at the data

In section 1.1 we described the NFA mechanism with reference to a shock to the value of bank assets, which triggers an undesired increase in leverage and obliges banks to adjust. This example suggests that for the NFA mechanism to generate pro-cyclicality at least two conditions are necessary. The first is that the shock to financial asset prices must be pro-cyclical; if this were not the case (e.g. if negative shocks tended to occur during upturns), then the NFA would be muted. The second condition concerns leverage. Recall that banks were assumed to target an optimal leverage value. Clearly, the empirical strength of the NFA depends on whether this assumption holds in practice: if banks did not target leverage, letting equity absorb shocks, the vicious circle would be mitigated or even eliminated. The actual behavior of leverage over the cycle is therefore crucial to our analytical purposes. In this section we take a look at the available empirical evidence on these conditions.

Concerning the first condition, there is indeed evidence that negative shocks to the value of assets tend to be associated to negative cyclical conditions, and vice-versa (for instance, corporate defaults and bad loans are more frequent in downturns).[20] In industrial countries asset prices tend to be positively correlated with output growth, but this property appears to be limited to certain classes of asset and to depend on the liquidity of national secondary markets.[21] In particular, stock prices have significant predictive power for economic activity[22]; property prices tend to be less forward-looking and more contemporaneously correlated with growth.[23]

Concerning the second condition, Adrian and Shin (2008) show that the relationship between increases in leverage and rises in asset prices in the U.S. differs according to groups of investors. For households it is negative, denoting passive behavior (that is, when the value of their assets falls, households passively accept an increase in leverage, and conversely when it rises). For non-financial firms there is no clear relationship. But commercial banks do appear to target leverage levels.[24] The relationship is also positive for security brokers and dealers (which used to include investment banks): that is, these operators increase leverage when assets prices go up and reduce it when they go down, making the greatest contribution to the vicious circle described above. The authors argue that in their case as for commercial banks, the supply curve for assets is downward

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[19] Kashyap *et al.* (2008) and Plantin, Sapra and Shin (2008a) point out the externality nature of this effect.

[20] The correlation between asset prices and the business cycle reflects at least four factors. First, being determined on the basis of discounted expected cash flows, asset prices should reflect investors' anticipation of future economic conditions and thus influence consumption and investment. Second, asset prices influence the value of collateral and thus the financing constraints on households and firms. Third, they may affect consumption via their impact on consumers' permanent income, as predicted by life cycle models. Fourth, they influence investment by modifying the ratio between the firms' market values and the cost of acquiring new capital (i.e. the Tobin's q).

[21] See Borio *et al.* (1994), IMF (2000) and Borio *et al.* (2001).

[22] See Fama (1981), Fisher and Merton (1984), Asprem (1989), Fama (1990), Choi *et al.* (1999), Mauro (2000) and Avouyi-Dovi and Matheron (2005).

[23] The property prices are a much stronger leading indicator for the output gap (IMF, 2000).

[24] Targeting of leverage could be induced by market discipline: investors consider leverage an important gauge of firm behavior and health and so monitor it closely (Gropp and Heider, 2008). For banks, leverage targeting may also be induced by capital regulation, or by specific limits on leverage in some countries (see section 3.4.5).

sloping and the demand curve is upward sloping, generating market instability: for instance, a shock that causes a price drop reduces demand and increases supply, triggering further price declines. IMF (2008a) confirms this evidence for U.S. investment and commercial banks, and finds analogous evidence for the top 10 German commercial banks. It also finds that commercial bank leverage tends to be more pro-cyclical in financial systems characterized by a prevalence of arm's length finance, such the United States and the United Kingdom.

For additional insight into the relationship between assets and leverage, we replicated the graphical evidence in Adrian and Shin (2008) for the main euro area countries (Germany, France and Italy), the United Kingdom and Japan. Lacking quarterly data on tangible assets, we have used the national financial accounts to calculate quarterly rates of growth of both total financial assets and leverage, defining the latter as the ratio of financial assets to the difference between financial assets and financial liabilities. Results for households (unreported) strongly confirm the findings of Adrian and Shin: asset growth and leverage growth are negatively correlated in all countries, suggesting that this sector may dampen the effect of the NFA. Evidence for financial intermediaries, reported in Figure 1.1, suggests stark differences with respect to the U.S. evidence of a fixed target level for commercial banks.[25] U.K. monetary and financial institutions display a positive correlation between growth rates of assets and leverage, while all other countries show a negative relation.[26] Thus, evidence in line with the NFA seems to be limited to the U.S. and the U.K..

Further insights on the pro-cyclicality of the financial system can be gained from the analysis of the *direct* relationship between leverage and the business cycle, to see whether financial institutions do indeed expand leverage in periods of high GDP growth. In this case as well, the evidence of the NFA effect seems to be limited: the relationship between GDP growth and the change in leverage is negative, or at most flat, in all countries, including the U.S. (Figure 1.2).[27]

The measure of leverage used so far (like those used in previous analyses) reflects two components: (a) investors' portfolio decisions (to increase or decrease exposure to each market/asset class); and (b) price changes that are largely exogenous to the individual investor. Genuine pro-cyclical behaviour should directly affect the former, as one would expect pro-cyclical investors to increase their balance sheet and leverage when prices increase and decrease them when prices fall. In what follows we separate these two components. For U.S. households, non-farm non-financial companies and chartered commercial banks, we compute the quarterly average return on total assets[28] and plot it against the net acquisition of assets as a percentage of total assets (figure 1.3). This simple exercise suggests that non-farm non-financial companies contribute to the NFA, exploiting the greater availability of collateral (determined by capital gains) to acquire new financial assets (Panel B); for households too the relationship between asset returns and asset

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[25] We believe that, given the structure of the European banking system, the appropriate U.S. term of comparison is the commercial banking sector. However, because the euro area flow of funds refers to "monetary financial institutions" (which include commercial banks, central banks and money market funds), our graph for the U.S. also refers to this sector. For this reason, and because we do not use data on tangible assets, our U.S. charts are not directly comparable to those of Adrian and Shin (2008).

[26] We had a deeper look at Italian banks over the last decade. While the general picture of a countercyclical leverage is confirmed for the largest banks, small banks appear to have a pro-cyclical leverage.

[27] Using the first or second lag of leverage growth does not yield significant changes in these patterns (results unreported).

[28] We compute the return on total assets by subtracting the net flow of acquisitions of new assets from the increase in the outstanding stock of total assets. For households and non-farm non-financial corporations we used both data on tangible assets and data on financial assets; for chartered commercial banks, financial assets only.

Figure 1.1

Financial Assets and Leverage of Monetary Financial Institutions (1)
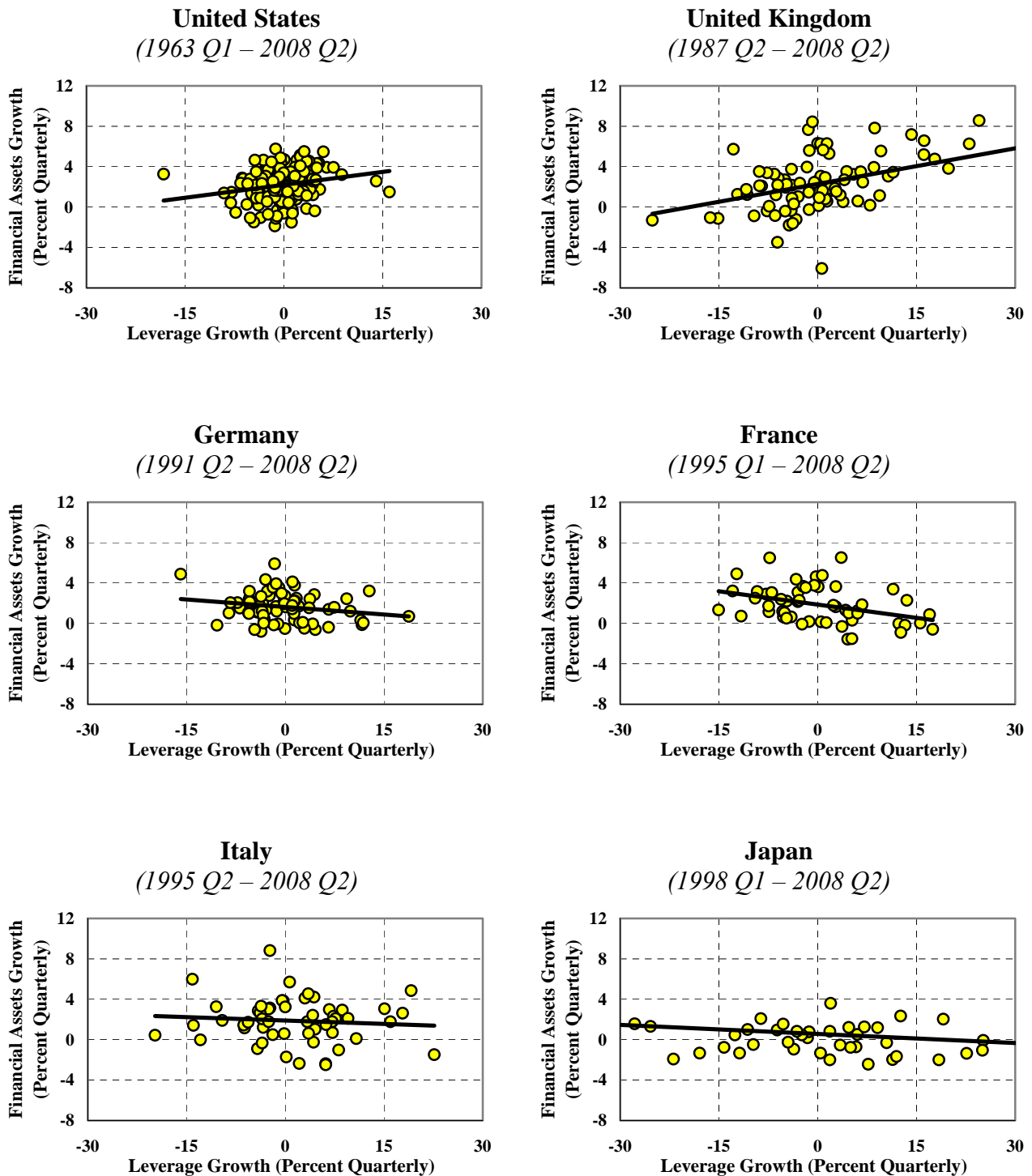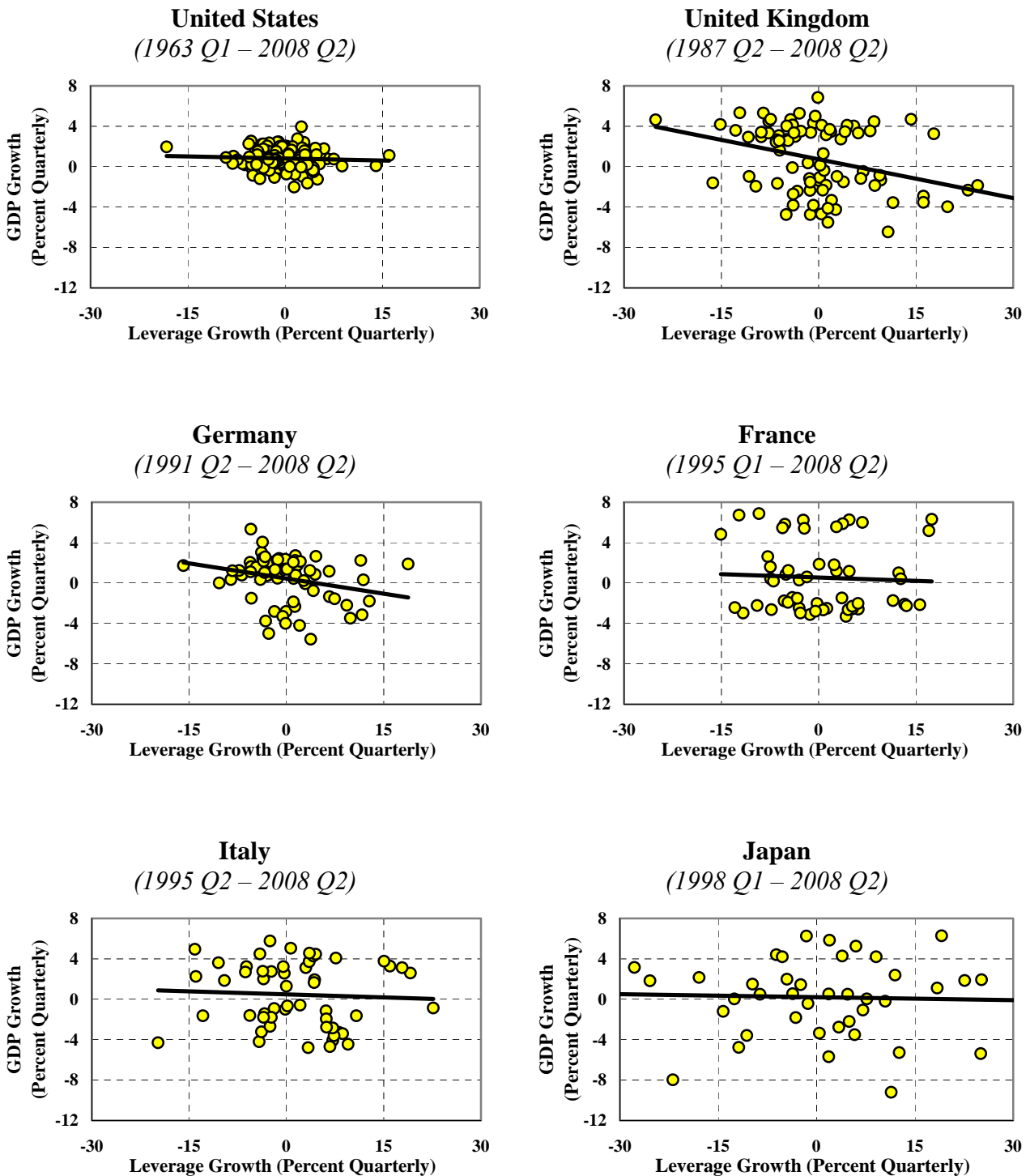

Sources: Calculations based on national financial accounts (Federal Reserve System, Office for National Statistics, Bundesbank, Banque de France, Banca d'Italia and Bank of Japan).
(1) Leverage is defined as the ratio between financial assets and the difference between financial assets and liabilities. Data refer to commercial banks, monetary authority and money market mutual funds for the United States, to banks for Japan and to monetary financial institutions (banks, central banks and money market mutual funds), for European countries.

Figure 1.2

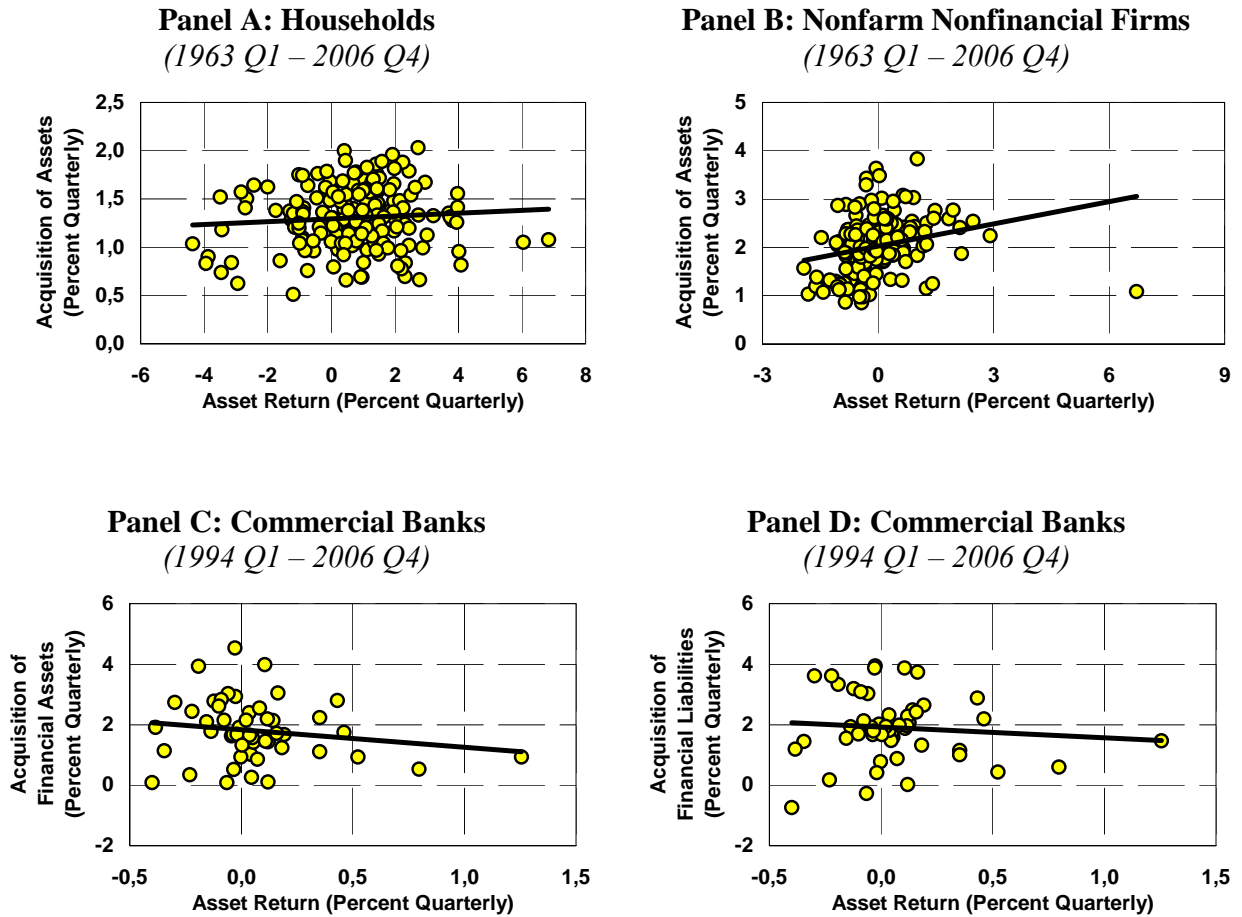**GDP (constant price) and Leverage of Monetary Financial Institutions** (1)

Sources: Calculations based on national financial accounts (Federal Reserve System, Office for National Statistics, Bundesbank, Banque de France, Banca d'Italia and Bank of Japan) and GDP data (constant price) from the Statistical Data Warehouse (ECB).

(1) Leverage is defined as the ratio between financial assets and the difference between financial assets and liabilities. Data refer to commercial banks, monetary authority and money market mutual funds for the United States, to banks for Japan and to monetary financial institutions (banks, central banks and money market mutual funds), for European countries.

Figure 1.3

Acquisition of Financial Assets and Liabilities and Asset Return in the United States (1)

Panel A: Households
(1963 Q1 – 2006 Q4)

Panel B: Nonfarm Nonfinancial Firms
(1963 Q1 – 2006 Q4)

Panel C: Commercial Banks
(1994 Q1 – 2006 Q4)

Panel D: Commercial Banks
(1994 Q1 – 2006 Q4)

Source: Calculations based on the Flow of Funds of the United States (Federal Reserve System).
(1) Asset return and net acquisition of financial assets (liabilities) are defined, respectively, as $100*((TFA\_t-NAFA\_t)/TFA\_(t-1)-1)$, $100*(NAFA\_t/TFA\_(t-1)-1)$ $(100*(NAFL\_t/TFL\_(t-1)-1))$, where TFA_t, TFL_t, $NAFA\_t$ and $NAFL\_t$ are, respectively, total financial assets, total financial liabilities, net acquisition of financial assets and net acquisition of financial liabilities at time t.

acquisition is positive (Panel A), although weaker than that for firms.[29] However, the banks' reaction to capital gains contradicts the prediction of the NFA: larger capital gains correspond to lower net acquisition of financial assets (the results are unchanged for liabilities; see Panels C and D). One possible interpretation is that banks smooth changes in the size of their balance sheet by offsetting larger gains with more prudent asset acquisition policies (e.g. moderating lending; and vice-versa).[30]

Another essential element in assessing the empirical relevance of the NFA is the actual *level* of leverage of financial institutions. In fact, higher level would magnify the underlying mechanisms (liquidation of banks' assets, fire sales, liquidity spirals, etc.). To analyze this issue, in Figure 1.4 (Panels A, B and C) we report the leverage (total assets over capital) of the largest international banks (that is, the intermediaries whose activity is most likely to have systemic impact on financial markets). By country, this comparative evidence must be taken with caution, as differences may be influenced by different accounting standards,[31] but time series comparisons are not affected by such considerations. In the years 2000-2006 the leverage of commercial banks rose significantly in all countries. The increase was sharpest in the United Kingdom (from 15 to 21 for the five largest banks) and Switzerland (it peaked at 34 for the top three banks). The ratio also rose significantly among U.S. investment banks, to a maximum of 29 in 2007; this is likely due also to a change in regulation (see section 3.4.5). The low level of leverage of U.S. commercial banks, and its flat trend, contrasts sharply with the much higher and growing leverage observed among U.S. investment banks; these differences presumably reflect regulatory provisions.

Average values conceal the state of individual banks. In fact, in all countries the maximum value of bank leverage (the top value on the vertical line above each data point) is substantially higher than the average (represented by the data points on the curve).

Data limitations preclude drawing conclusions about the cyclical behavior of hedge fund leverage. But Panel D of figure 1.4 clearly shows its decline since the onset of the current crisis.

Overall, while NFA-type mechanisms are clearly at work in the current crisis, our analysis suggests that over long periods and broad number of countries the evidence in line with such mechanisms is not so clear cut. Our graphical evidence of leverage levels indicates that banks' response to an adverse exogenous shock can indeed have serious repercussions on asset markets. However, given the simplicity of the analysis, our suggestive results do not allow us to draw firm conclusions. Further research is certainly warranted.

[29] We replicate the analysis in terms of financial liabilities; results are unchanged.

[30] We also plotted banks' assets and liabilities against the capital gains realized by households: if households do indeed react to capital gains by expanding their holdings of financial assets (and/or liabilities) as is suggested by the evidence reported in Panel A of figure 1.3, then the balance sheets of banks (which represent the main counterparty to households) should also show a parallel reaction. The results (not reported) are consistent with the previous ones: households seem to exploit the opportunity offered by higher collateral values to expand bank debt; financial institutions satisfy their additional demand. This is consistent with the prediction of the standard financial accelerator.

[31] International comparisons of accounting measures of leverage are influenced by accounting practices on asset derecognition and consolidation (which affect the size of the balance sheet and hence leverage). Given the different criteria adopted by U.S. GAAP and IAS/IFRS and the considerable expansion of off-balance-sheet items and exposures in recent years, direct comparisons of the level of leverage across different countries could be misleading.
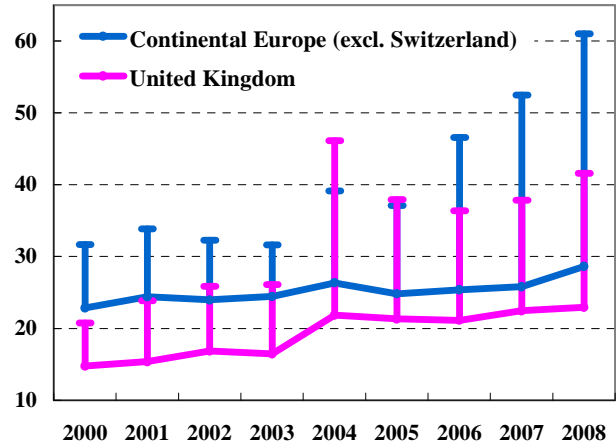
Figure 1.4

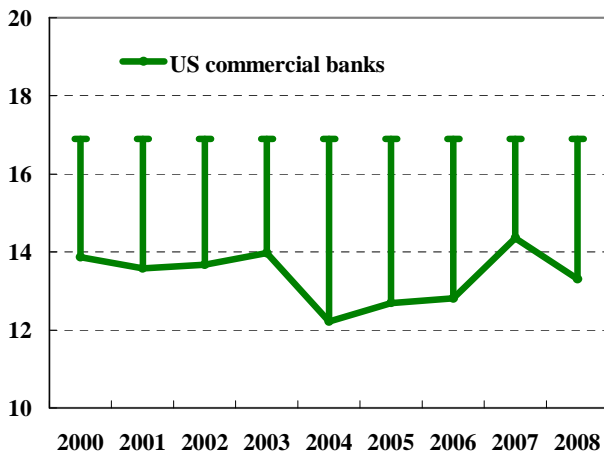## Leverage of large international banks and hedge funds

Panel A: Large Swiss commercial banks and US investment banks (1)
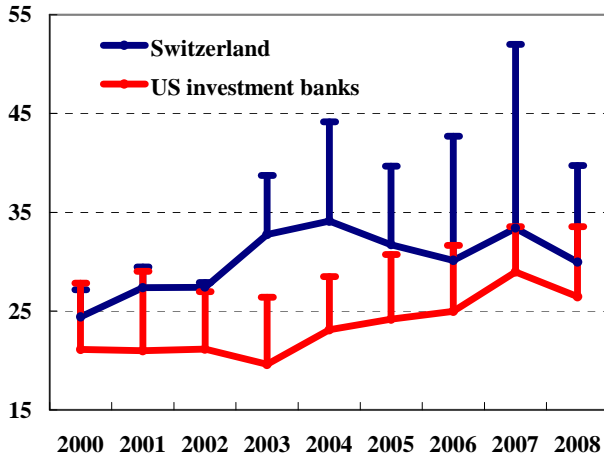
Panel B: Large Continental European and UK banks (1)

Panel C: Large US commercial banks (1)

Panel D: Hedge funds (2)
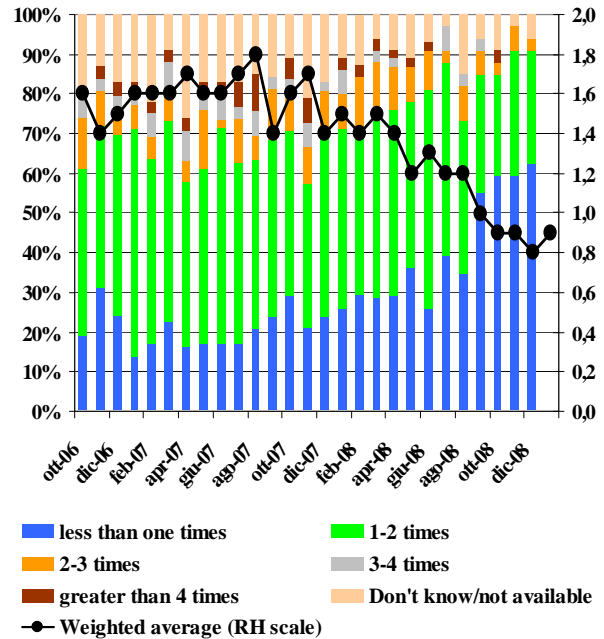
(1) Source: Fitch-Ibca. Leverage is defined as total assets over capital. The data points linked by a continuous line represent the weighted average of the leverage of the sample of banks in turn considered; the top of the vertical segments correspond to the maximum value of leverage of the sample of banks considered. Continental Europe: ten major commercial banks; Switzerland: three major banks; U.K.: five major commercial banks; US commercial banks: five major banks; US investment banks: five major banks. Data are as of June 2008.

(2) Source: Merrill Lynch, Global Fund Managers survey. Based on a monthly survey of about 30-40 hedge funds.

2. TECHNOLOGICAL CHANGE AND LIBERALIZATION

Changes connected with radical liberalization and technological and financial innovation had a sweeping impact on the financial system, increasing its efficiency. In section 2.1 we briefly recall the main drivers of change, and in section 2.2 we review their implications for financial sector pro-cyclicality.

2.1   Drivers of change

(i)   Technological progress – Technological advances have had implications for bank relationships both with retail customers, due to credit scoring and remote banking, and with other intermediaries, mainly in connection with improvements in financial market infrastructures.

- *Credit scoring, remote banking* – Greater availability of reliable information on borrowers, due to improvements in data collection and credit scoring techniques, allowed banks' loan officers to cut down on monitoring and on resort to soft information.[32] Credit scoring is further encouraged by bank consolidation.[33] Technology has fostered more intense use of remote banking.

- *Improvements in financial market infrastructure* – Over the last 20 years, the post-trading infrastructure that supports modern financial markets has achieved enormous technology-driven improvement. The global move towards real time gross settlement systems for interbank payments and the introduction of risk control measures in clearing systems have diminished settlement risk. In most industrial countries the creation of central securities depositories has permitted dematerialization of securities and simplification of bookkeeping, resulting in large efficiency gains. The development of central clearing houses for the trading of the main currencies has reduced credit risk in foreign exchange transactions. As a result, risks and transaction costs have fallen dramatically, fostering unprecedented growth in the volume of national and cross-border payments. For instance, in 2008 the Target system handled a daily volume of payments averaging almost €2.7 trillion, as against just over €1.0 trillion in 2000. In addition, interdependence among the world payment systems has increased, strengthening the global infrastructure but increasing the potential for contagion.[34] The net effect of these two trends on the overall quantity of risk in the financial system is unclear.

(ii)   Financial innovation – This issue has been a source of concern for policymakers at least since the mid-eighties. Some of the key issues (e.g. the consequences of securitization; the potential underpricing of risks and the consequences for financial stability) have been clearly analyzed by CGFS (1986). However, problems have been exacerbated by the dramatic acceleration of financial innovation in recent years. The array of new financial products and intermediaries is too long to list here.[35] The standardization of contracts made possible and fostered by technological progress contributed to the spectacular development of securitization, whereby banks repackage individual loans for resale on the market. As many commentators have pointed out, the wave of innovations has had two main consequences. On the positive side, it reduced market incompleteness, with beneficial effects in terms of risk sharing and access to finance for previously excluded agents. On the negative side, it increased the complexity of financial products and intermediaries. Furthermore, because they are often tailored to specific needs or are in an initial stage of development, new

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[32]   See Rajan (2005).

[33]   See Stein (2002) and Berger and Scott Frame (2007).

[34]   See CPSS (2008).

[35]   For a review of the financial products that became available in recent years see Ferguson *et al.* (2007).

products generally trade in opaque and illiquid OTC markets. This is a challenge for regulators, analysts and market participants. Again, the net effect of these trends on the overall quantity of risk in the financial system is unclear.

(iii)   Financial sector liberalization and deregulation – Technology and financial innovation have interacted with regulatory change, modifying the structure and boundaries of credit markets.[36] For example, until the early 1990s the United States limited interstate branching and in some cases even mandated unit branching. As technology allowed remote competition, regulation limiting branching was eventually eliminated. In the European Union the Second Banking Directive removed entry barriers in the early 1990s, allowing banks from any EU country to branch freely into other member states, and competition increased significantly.[37] Together with product innovation and persistently favorable financing conditions, this facilitated households' access to credit and relaxed financing conditions for first-time home buyers, contributing to sweeping changes in household finance over the last fifteen years.[38]

2.2   *Implications for pro-cyclicality*

The changes described above have created a series of mechanisms that influence the efficiency, the stability and the pro-cyclicality of the financial system.

(i)   From relationship banking to arm's length banking – The move towards arm's length banking under the impetus of automation has contributed to a process that Rajan (2005) dubbed the "commodification" of financial transactions. By making monitoring less valuable to loan officers, this process weakened the incentive to collect soft information, possibly to the detriment of credit quality.[39] According to some commentators, this contributed to the explosive growth of subprime lending in the U.S.[40]

Furthermore, credit scoring, unlike relationship lending, relies on balance sheet information, which mainly reflects past performance. Thus, during economic downturns, when balance sheet indicators worsen, loan supply will tend to contract (and conversely during expansions), augmenting pro-cyclicality. What is more, the banks that rely on credit scoring for automated loan origination all tend to use highly similar models, which makes their decisions more correlated, as in models of herding.[41]

(ii)   Securitization – It has been argued that asymmetric information on the secondary market for loans may weaken banks' incentives to screen/monitor.[42] Securitization and the originate-to-distribute (OTD) model of financial intermediation, at least in the form that developed over the last decade, are likely to be plagued by systematic underestimation of liquidity risk; moreover, they reduce the information on the ultimate bearers of risk, making the financial system opaque and prone to sudden collapses of mutual trust.[43] On the other hand, securitization can improve risk allocation by enabling investors to diversify.

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[36] See Bhattacharya *et al.* (1998).

[37] See Angelini and Cetorelli (2003).

[38] See Ferguson *et al.* (2007).

[39] Casolaro and Mistrulli (2008) and DeYoung *et al.* (2006) provide evidence for Italy and the U.S., respectively, that "proximity" stimulates monitoring.

[40] See Dell'Ariccia *et al.* (2008).

[41] See Allen *et al.* (2004) for a survey on the properties of credit risk models.

[42] See Parlour and Plantin (2008).

[43] The recent experience suggests that risk may have been shifted off the originators' balance sheets only formally; in many cases banks have been called upon to act as soon as the risk materialized.

To the extent that securitization involves loans with low information sensitivity, banks' incentives might be affected only marginally.[44] Intermediaries might retain the junior (riskiest) tranches to signal the unobservable loan quality or their commitment to monitor borrowers.[45] Moreover, if securitization is not a one-off process, banks might want to build a reputation for not selling lemons; they might even end up securitizing only high-quality loans.

Overall, the effect of credit risk transfer techniques on credit quality is ambiguous and could well differ strongly according to market segment. The evidence suggests that securitization impaired screening and monitoring, resulting in increased risk-taking.[46] But these results refer only to the U.S. subprime market.

(iii)   Competition in the banking sector – Whereas the efficiency effects of competition are well-known, the debate on the implications for financial stability is still open. On the one hand, the "competition-fragility" view holds that competition may induce banks to do "whatever it takes" to survive, including excessive risk, therefore contributing to financial sector pro-cyclicality. Some observers have argued that heightened competition may have contributed to the financial crisis: for example, according to Eichengreen[47] the aggressive conduct of investment banks (distributing complex derivative securities, jacking up leverage to sustain profits) was to some extent a reaction to competition from commercial banks following the repeal of the Glass-Steagall Act (however, see section 3.4.5 for an alternative explanation). More generally, a number of papers argue that competition induces higher risk and leverage and lowers credit quality.[48] On the other hand, the "competition-stability" view maintains that competition enhances efficiency and stability.[49] Not surprisingly, a third strand of the literature contends that general conclusions cannot be drawn or that they depend heavily on model specification.[50]

The empirical evidence is not conclusive. Some authors find that increased competition is associated with increased risk taking,[51] whereas others fail to support this conclusion[52] or favor the

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[44] Drucker and Puri (2007).

[45] Franke and Krahnen (2005) find that the equity tranche is larger when the quality of the securitized loans is lower.

[46] Keys *et al.* (2008) show that the loans that are more likely to be securitized have 20% higher default probability than otherwise similar loans with less likelihood of securitization. Mian and Sufi (2008) show that an expansion in the credit supply led to the rapid increase in house prices from 2001 to 2005 and subsequent defaults from 2005 to 2007.

[47] Reference available at http://dailystaregypt.com/article.aspx?ArticleID=16596. See also comments by Dany Rodrick at http://rodrik.typepad.com/dani_rodriks_weblog/2008/09/can-too-much-competition-be-the-culprit.html.

[48] Keeley (1990) argues that in competitive environments excessive risk-taking tends to be more severe, as in case of default bank owners lose their license which has little value. Freixas *et al.* (2007) show that the probability of financing low-quality projects increases as the number of banks increases. Bolt and Tieman (2004) find that loan market competition loosens the criteria for granting loans, resulting in higher default probability.

[49] Boyd and Graham (1996) show that beyond deposit insurance, another, implicit, form of guarantee is the "too-big-to-fail" theorem, which makes more concentrated banking markets take excessive risk.

[50] In Boot and Marinç (2007) competition improves the monitoring incentives of efficient banks and lessens those of low-quality banks. Boyd and De Nicolò (2005) show that if the borrower – rather than the bank – chooses the riskiness of the project, increased competition reduces risk (lower banking competition results in higher loan rates, which reduces borrowers' profits and induces them to seek more risk). Allen and Gale (2004) consider a broad variety of models and find that only in some cases is there a trade-off between competition and financial stability.

[51] Keeley (1990) finds that increased competition following the relaxation of state branching restrictions in the 1980s, induced U.S. banks to increase risk. This result supports the franchise value paradigm and is consistent with Jiménez *et al.* (2007), who find that in the 1990s Lerner indexes for the Spanish loan and deposit markets are negatively related with non-performing loans.

[52] Boyd and Runkle (1993) find no evidence that large U.S. banks have significantly greater stability (higher z-scores): the advantages of diversification do not lower default probability because of higher leverage. Boyd and Graham (1996) find that large U.S. banks were more likely to fail than small banks in the period 1971-1986 but less likely in the period 1987-1994.

opposite one.[53] In a recent survey, Berger *et al.* (2004) conclude that while bank competition is good from a social perspective, the effect of low concentration is ambiguous. This may simply reflect the difficulty of disentangling the various effects.[54] More recently, Beck *et al.* (2006), based on information for 69 countries, argue that both higher concentration and tougher competition are associated with lower frequency of banking crises.[55] Although they do not explore the mechanism linking concentration to the frequency of banking crisis, this result may reflect a possible trade-off: banking competition may promote stability only to the extent that it does not entail a reduction in bank size and concentration.

Few theoretical studies explicitly examine the effect of competition on the pro-cyclicality of lending supply. In the model of Rajan (1994), markets judge bank managers by their performance relative to that of other banks, so that the evaluation forgives poor results more readily when others also get low profits. In this environment, managers tend to behave myopically, loosening credit standards and inefficiently inflating current profits (as by extending new credit to low-quality borrowers when this provides sufficiently high up-front fees). The model's assumption that when the economy is weak, good and bad bank managers get *identically* low profits implies that it is precisely in a downturn that banks coordinate to tighten credit policy (as this is when bad managers do not need to inflate profits in order to mimic good ones).

Ruckes (2004) reaches similar conclusions assuming that the bank's incentive to screen projects depends on the expected return to this activity, which tends to decrease in downturns; in the extreme case in which no project is profitable, there is no useful information to be gained from costly screening, and banks are unwilling to extend loans on an unsecured basis. This means that in recessions banks reduce credit supply by tightening lending standards (i.e. requiring more collateral and covenants).[56] Based on the "winner's curse" argument, the paper shows that such pro-cyclicality is exacerbated by banking competition.

Notice that the potential pro-cyclical effects of bank competition should be evaluated against its well documented advantages in terms of efficiency and, possibly, higher risk taking. A crucial question is whether institutional arrangements exist to protect competition while at the same time limiting potential pro-cyclicality. For example, if competition exacerbates credit supply fluctuations due to winner's curse mechanisms, as in Ruckes (2004), then this problem could be addressed by inducing banks to share information on loan rejections.[57]

(iv) *Financial market globalization* – Another distinct consequence of financial deregulation and technical progress has been the surge in international financial integration. For industrial countries, the sum of foreign assets and liabilities has increased much faster than either GDP (Figure 2.1,

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[53] Boyd *et al.* (2006) find that banks' market power is positively related to their probability of default. Berger *et al.* (2000) show that entry of foreign banks has positive effects on efficiency, at least in developed nations.

[54] Berger *et al.* (2008) find that market power is positively related to: (i) the ratio of non-performing loans to total loans; (ii) the z-score; (iii) the equity-to-asset ratio. The authors argue that although market power may result in riskier loans, overall bank risk need not increase, as banks may apply risk-mitigation techniques (more capital, reduced interest rate risk, sales of loans or credit derivatives, a smaller loan portfolio).

[55] Beck *et al.* (2006) find that: (i) concentrated banking systems are less likely to experience systemic crises; (ii) entry restrictions increase bank fragility; (iii) the openness and competitiveness of banking markets and the economy reduce the probability of systemic banking crises.

[56] In upturns, when most of the investment projects are profitable, screening incentives are low again and credit standards are loose. Screening incentives are greatest in intermediate states of the economy.
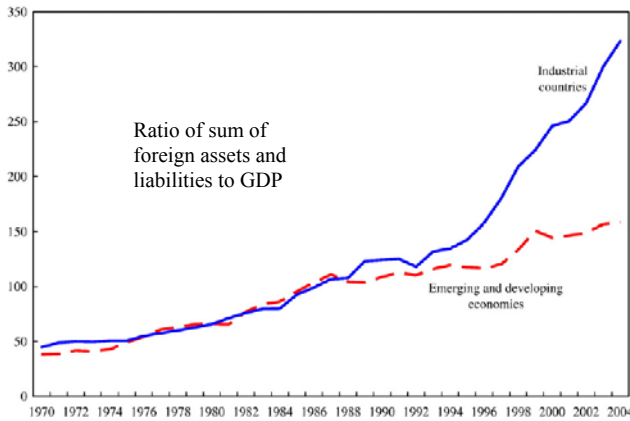
[57] An interesting example is given by Italy, where this type of information sharing is provided through the Central Credit Register (in response to requests for preliminary information).
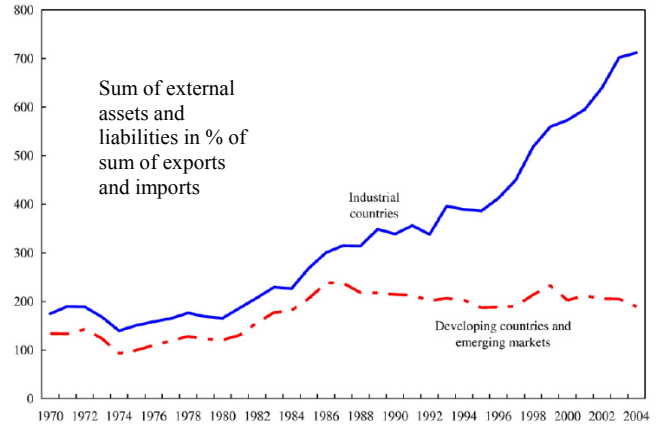
panel a) or trade (panel b); in developing countries and emerging countries the trend has been relatively limited.[58]

Figure 2.1: Trends in global finance

(a) International financial integration   (b) Financial versus trade integration

Source: Lane and Milesi-Ferretti (2007).

What are the implications of financial integration for financial sector pro-cyclicality? One view is that financial integration provides better opportunities for countries to diversify idiosyncratic risk, which should weaken the correlations between consumption and GDP at the national level and strengthen those between consumption in different countries, leaving GDP-based measures of business cycle synchronization unchanged, or even reduced, if financial linkages stimulated product specialization.[59] An alternative view is that large-scale geographical financial diversification accentuates and hastens the transmission of regional shocks to other areas, turning them into global shocks. For example, a bank run in one country might lead to a run in connected banking systems,[60] fostering the transmission of crises and ultimately producing more closely correlated GDP-based measures of business cycles.[61]

To answer the foregoing question, one must decide which view is correct. The latter view entails that financial integration generates pro-cyclicality by increasing cross-country GDP correlations, i.e. by reducing the ability of national cycles to offset each other. The former view has opposite implications. The issue is clearly complex. The available evidence is heterogeneous, and we do not attempt a systematic review. Overall, our reading of the literature suggests that the degree of international business cycle synchronization over the globalization period 1985-2005 is not historically high,[62] although this is subject to several caveats (due to differences in methodology, number of countries covered, length of the periods considered, etc.).

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[58] See Lane and Milesi-Ferretti (2007), Ferguson *et al.* (2007) for recent evidence on international financial integration.

[59] Kose *et al.* (2003).

[60] See for example Allen and Morris (1998)

[61] Goldstein and Pauzner (2004) derive this effect within a formal model of crises.

[62] According to Kose *et al.* (2008a), this reflects an increase in synchronization among both industrial and developing countries, but divergence or decoupling between these two groups, and a decline in the importance of a common global factor. However, Heathcote and Perri (2002, 2004) find that the synchronization of the U.S. business cycle with that of the main industrialized countries has declined significantly over the financial globalization period. Their theoretical model reverses the usual causality link: growth in cross-border financial flows took place to exploit the increased diversification possibilities offered by this decreased real synchronization.

Few works directly address the question of whether financial linkage cause greater synchronization of world business cycles. The answer is that it does, but the effect is indirect and weak.[63] Some elements suggest that this link has strengthened in recent periods. First and foremost, the recent crisis clearly reinforces the argument. The ever-closer correlations among financial variables in industrial economies over the last ten years (Figure 2.2) suggest that financial shocks are becoming truly global. And there is indirect evidence that capital inflows influence the business cycle in emerging economies via their effect on the national monetary policy stance. From 2001 to 2007 growth in net foreign assets of the monetary authorities has been strongly correlated with growth in reserve money, M2, and credit to the private sector (see CGFS, 2009).

Figure 2.2: Covariance indices[1]
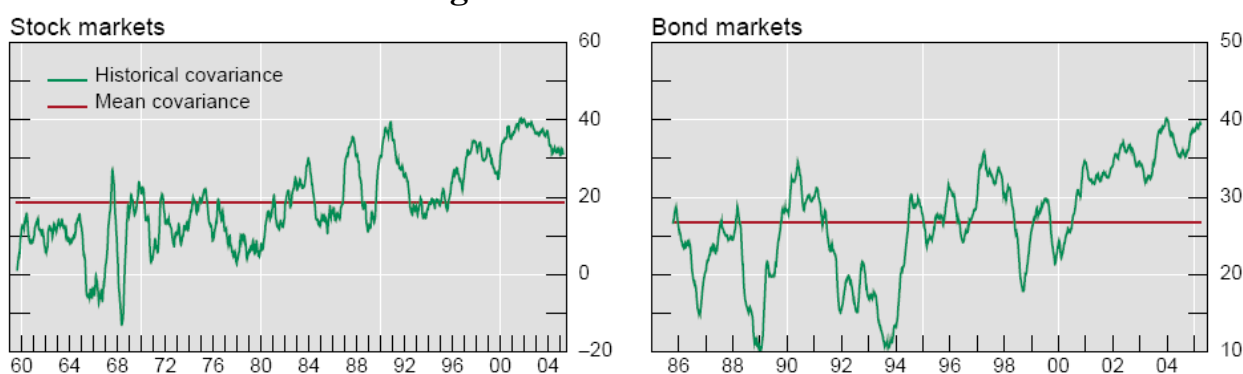
Source: Panetta *et al*. (2006). Note: In percent. Calculated as the proportion of portfolio variance due to covariances between the domestic markets included in the portfolio. Bond and stock markets are equally weighted portfolios of benchmark indices for the United States, Germany and Japan.

(v) *Households' finance* – The household sector's exposure to financial risk has increased substantially over the past fifteen years,[64] with steadily rising debt, a significant increase in real and financial wealth both in absolute terms and relative to disposable income, an increase in risky assets as a proportion of total assets, and the gradual shift from defined-benefit to defined-contribution pension plans, which has shifted the burden of providing for retirement onto households (see Group of ten, 2005). Longevity risk has also increased (see Visco, 2007).

We have analyzed the effect of debt and leverage in Section 1. In this respect, the U.S. differs from European countries for higher loan-to-value ratios and more frequent mortgage equity withdrawals, which increase households' exposure to the fluctuations of house prices.[65]

Here we emphasize the greater sensitivity of households to changes in asset prices and wealth, which is likely to have a significant impact on consumption. The increase in real and financial wealth, coupled with that in the share of risky assets, means that households are more exposed to changes in asset prices and more influenced by changes in wealth. Given the cyclicality

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[63] Kose *et al.* (2003) find that restrictions on capital movements weaken output correlations but that various measures of financial integration fail to strengthen consumption correlations. The hypothesis that financial integration has increased consumption risk sharing finds only limited support among industrialized countries and none among developing economies (see Kose *et al.*, 2003, 2008b). Peek and Rosengreen (1997) show that the Japanese banking crisis of the 1990s had real effects on the U.S. economy through the American affiliates of Japanese banks.

[64] For an in-depth analysis see Ferguson *et al.* (2007).

[65] For a comprehensive analysis of housing finance in the euro area see Task Force of the Monetary Policy Committee of the ESCB, 2009).

of asset prices (see Section 1), consumption may have become more sensitive to the business cycle, intensifying pro-cyclicality.[66]

Households' exposure to financial risk has been accentuated by their growing direct involvement in financing retirement, due to aging (mainly in industrial countries) and to the recent pension reforms in many countries.[67] For decades now the burden of providing for retirement has been shifted increasingly directly on households, who should save more than before (all else being equal; in fact, at least at the aggregate level there are no signs of this happening), invest more in financial assets, and therefore face more financial risk. Furthermore, households have to bear a larger share of longevity risk (loosely speaking, the risk of outliving their savings).

(vi)   Interest rates – Low interest rates can cause pro-cyclicality in the financial sector by encouraging excessive risk-taking. The inverse relationship between asset values and interest rates means that, other things equal, when rates are low the value of collateral is high, and vice-versa. So low rates can drive credit growth above the level compatible with a "normal" value of collateral. The financial accelerator may be reinforced by banks' lending policies. It has been shown that under imperfect information bank managers affected by short-termism have an incentive to adopt an excessively liberal credit policy (Rajan, 1994, 2005). And recent evidence confirms this thesis: lower short-term interest rates decrease the probability of default on existing loans but increase it on new loans, so the latter are riskier than average.[68] Furthermore, periods of low interest rates tend to be accompanied by low volatility and high risk appetite.[69] This mechanism can in turn be reinforced by financial innovation; the evidence shows that securitization allows faster credit growth,[70] which may entail even more bad loans in periods of low interest rates.

Low interest rates may also induce institutional investors to take on excessive risk. Rajan (2005) reports various mechanisms. For instance, insurance companies and pension funds may have a large share of liabilities that are fixed in nominal terms. In periods of low rates they seek higher returns to meet their commitments; they tend to perceive mainly the upside and to overlook the downside risk, because if they did nothing they would fail to fulfil their obligations and would be in trouble anyway.

The role of monetary policy in this context is not obvious. In fact, short-term interest rates are typically countercyclical. However, it has been argued that the improvements in monetary

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[66] Households' sensitivity to asset prices depends on the magnitude of the wealth effect. The evidence indicates that the long-run marginal propensity to consume out of wealth is around 3-5% in the U.S., somewhat higher for the UK and Canada and lower in the euro area (see Altissimo *et al*., 2005, and Ludwig and Sløk, 2004). Given that net wealth in different countries is between 7 and 10 times disposable income, a drop in asset prices of 20% would cause a drop in consumption of between 4% and 10% (taking realistic parameter combinations, the likely range is between 4% and 6%), which is sufficient to cause serious macroeconomic fluctuations. This estimate should be taken cautiously, however, as consumption may respond asymmetrically to asset price changes in upturns and in downturns, or to households' differential response to permanent vs. transitory changes in asset prices. The composition of wealth is also relevant, as the marginal propensity to consume is thought to be greatest for non-equity financial assets (because of their high liquidity and predictable returns), lowest for equity and somewhere in between for housing (illiquid but distributed among income classes). Finally, mortgage equity withdrawal mechanisms, common in the U.S. and the U.K., may also influence the relationship between households' wealth and consumption.

[67] See CGFS (2007).

[68] See Jiménez *et al.* (2008) and Ioannidou *et al.* (2007). However, banks apparently fail to recognize this, so the interest rates on new loans do not reflect their greater risk, and credit standards deteriorate. Low interest rates thus lead to a build-up of risks in the banking system, which tend to materialize when rates finally increase.

[69] See, for example, Pericoli and Taboga (2008), Rudebusch, Swanson and Wu (2006), Kim and Wright (2005). For an explanation of the low level of long-term bond yields not based on risk premia, see Taboga (2009).

[70] See Altunbas *et al.* (2009). Banks resorting to securitization are better able to shelter loan supply from the effects of monetary policy and have an increased capacity to supply new loans.

policymaking worldwide over the last two decades may have played a role in the establishment of an environment of low and stable inflation and excessively low short-term rates. This may have led to excessive risk-taking, and therefore to increased financial sector pro-cyclicality (Borio *et al.*, 2001; Borio and White, 2004). This thesis can be accommodated within the theoretical framework of Diamond and Rajan (2008), who show that the incentive of highly leveraged institutions to become more illiquid increases with expectations that future rates will be low. Diamond and Rajan (2009) explicitly cite the commitment to keeping short-term rates low (the so-called "Greenspan put") and argue that in good times monetary policy should be kept tighter than strictly necessary based on current economic conditions, in order to diminish banks' incentive to take on liquidity risk.

3. BANK CAPITAL REQUIREMENTS

Since the end of the 1980s the G-10 countries have introduced capital requirements based on risk assets. At the microeconomic level, the reasons for capital regulation include potentially excessive risk-taking by managers induced by flat-premium deposit insurance schemes[71] and insufficient monitoring of banks' lending policies by small, dispersed depositors.[72] From a macroeconomic perspective, capital requirements are one of the tools available to reduce the externalities associated with bank failures (in terms, for example, of public funds needed in case of systemic crises or contagion across intermediaries).[73]

Can capital requirements generate pro-cyclicality? In theory, in a frictionless economy they should not. If bank capital could be freely adjusted, capital requirements should not induce a denial of credit to projects with positive present net value. However, as we saw in Section 1, imperfections in capital markets do exist, and an accelerator mechanism may generate feedback from bank capital to the real economy. In practice, risk-based capital requirements tend to generate pro-cyclicality, because risk itself is counter-cyclical both in quantity and in value. The quantity of risk tends to rise during contractions, partly reflecting the process of accumulation during expansions.[74] Similarly, the price of risk – that is, investors' risk aversion – decreases during upswings and increases during downswings.[75]

In this section we analyze the potential pro-cyclicality arising from the Basel supervisory framework. After reviewing the institutional setting,[76] in section 3.2 we examine credit risk, likely a more important source of pro-cyclicality than either operational or market risk. In section 3.3 we review the empirical evidence. In section 3.4 we examine the mechanisms now being considered by scholars and regulators to reduce the undesired pro-cyclical effects of capital regulation.

3.1 The institutional setting

A common international approach to bank capital regulation was introduced for the first time by the accord adopted in 1988, so-called *Basel I*, which introduced a minimum capital requirement equal to 8% of banks' risk-weighted total assets. Risk-weighted assets were computed assigning to each asset category a fixed weight (decided by the regulator) according to presumed degree of risk.[77]

The New Capital Accord, the so-called *Basel II*, was stipulated in 2004, revised in 2006 and finally implemented in Europe at the beginning of 2008 (in the U.S. it has not been implemented yet). *Basel II* was designed to strengthen the link between risk exposure and capital.[78] A key difference with respect to *Basel I* is that the risk weights are no longer specified for broad asset

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[71] See Kohen and Santomero (1980) and Kim and Santomero (1988), and references therein. See also Rochet (1992) for a more recent study along these lines.

[72] See Dewatripont and Tirole (1994).

[73] See Kashyap and Stein (2004).

[74] See Borio *et al.* (2001).

[75] See Lowe (2002).

[76] For a comprehensive review of the institutional setting and of the internal rating methods, see Cannata (ed.) (2007).

[77] If a bank held two risky assets, loans to firms (L^F) and to other banks (L^B), then its capital requirement K had to satisfy the inequality $K>0.08*W$. In the inequality W represents risk-weighted assets, defined $W=w^{lf}*L^F +w^{lb}*L^B$, where w^{lf} and w^{lb} are the fixed risk weights for loans to firms and to banks. The weights were 0% for sovereigns, 20% for banks, 50% for mortgage loans, 100% for all other loans (which include loans to firms and households).

[78] See Taylor and Goodhart (2004), BCBS (2006).

classes (e.g. loans to firms) and invariant over time but are now tailored to the individual asset (e.g. a loan to a given firm) and, in principle, vary with time. Under *Basel II*, capital requirements are explicitly calibrated on unexpected losses (a proxy of the risks that banks incur)[79] and can be computed using two different approaches: "standardised" (SA) and "internal ratings-based" (IRB). The IRB approach itself has two versions: "foundation" (FIRB) and "advanced" (AIRB), which differ in the number of risk parameters the bank must estimate.

Under SA, the risk weights are based on the ratings computed by rating agencies recognized by supervisors ("external ratings"). For instance, Table 3.1 reports the relationship between ratings and risk weights currently adopted for corporate loans. Under IRB the weights are computed by the bank itself on the basis of its own estimate of the riskiness of each asset/borrower ("internal ratings"). In either case, lower estimated riskiness entails smaller weights and hence lower capital absorption.

Table 3.1

**RISK WEIGHTS FOR CORPORATE LOANS
IN THE STANDARDISED APPROACH**

External Rating	Risk Weights	
	New approach	*Basel I*
From AAA to AA-	20%	100%
From A+ to A-	50%	100%
From BBB+ to BB- and unrated	100%	100%
Below BB-	150%	100%

Note: the external rating scale is the one used by Standard & Poor's.

In the IRB approach, the capital requirement for each asset is obtained by a specific formula (see box) factoring in the following four parameters: (i) the probability of default (PD) of the borrower; (ii) the exposure at default (EAD); (iii) the loss given default (LGD); and (iv) the maturity of the loan (M). Under the FIRB approach the bank must estimate only PD, the other parameters being set by supervisors; under AIRB the bank must also estimate the other parameters.

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[79] Strictly speaking, this applies to the IRB approach only. Expected losses are covered by loss provisions. However, under the new accounting rules provisions can be accumulated only for incurred losses (i.e. if there is some evidence of impairment), and not in a statistical sense. See section 4.

Box. Capital requirements under the Internal Ratings Based (IRB) approach

The model defined by the *Basel II* Accord to calculate the capital requirements against banks' credit risk is a simplified version of the Credit Metrics model, which in turn stems from the model of Merton (1974). Formally, the value of the assets of any borrower i at time t is defined as

$$V_{i,t} = \sqrt{\rho_t} X_t + \sqrt{1-\rho_t}\, \varepsilon_{i,t}$$

where X_t and $\varepsilon_{i,t}$ are independent (standard normal) random variables respectively representing a common and an idiosyncratic risk factor. The common factor X_t can be interpreted as a variable summarizing the state of the economy. The parameter ρ_t measures the correlation among the values of the assets of the different borrowers. The model assumes that borrower i defaults when $V_{i,t}$ falls below a given threshold. In practice, parameters referring to individual borrowers (PD) and parameters that are specific to each type of loan (LGD, EAD and M) are integrated in a portfolio model in order to compute the unexpected loss and the associated regulatory capital.

To limit discretion by intermediaries, *Basel II* defines some key methodological steps: (1) total losses must be computed at a 99.9% confidence interval (that is, assuming that the value of the common risk factor lies in the worst 0.1% of its distribution); (2) the correlations ρ_t are fixed by the regulation;[1] (3) it is assumed that the underlying loan portfolio is fully diversified (i.e. that individual loans are identical and of small size).

In the model as designed, the probability of default of borrower i, conditional upon X_t being in its 0.1% left tail, is given by:

$$\Pr\!\left(V_{i,t} \leq \Phi^{-1}(PD_{i,t})\right) = \Pr\!\left(\varepsilon_{i,t} \leq \frac{\Phi^{-1}(PD_{i,t}) - \sqrt{\rho_t}\, X_t}{\sqrt{1-\rho_t}}\right) = \Phi\!\left(\frac{\Phi^{-1}(PD_{i,t}) - \sqrt{\rho_t}\, \Phi^{-1}(0.001)}{\sqrt{1-\rho_t}}\right)$$

where $\Phi(x)$ is the cumulative distribution function for a standard normal random variable. In the last equality, the normality of $\varepsilon_{i,t}$ and assumption (1) have been used. This reasoning led to the use of this formula in computing the capital requirements on loans. To exemplify, neglecting for simplicity the effect of maturity, the formula is:

$$K = 1.06 \cdot \left(\underbrace{\Phi\!\left[\Phi^{-1}(PD)\cdot(1-\rho)^{-0.5} + \Phi^{-1}(0.999)\cdot\left(\frac{\rho}{1-\rho}\right)^{0.5}\right]\cdot LGD}_{a)} - \underbrace{(PD \cdot LGD)}_{b)} \right) \qquad (1)$$

Term *a*) is the expected value of credit losses conditional on the common risk factor being in the worst 0.1% tail of its distribution. Term *b*) is the unconditional expected loss, obtained by multiplying the individual probability of default of the loan by the loss given default. The capital requirement is given by the unexpected loss – the difference between a) and b) – as the expected loss is to be covered by specific loss provisions.[2] Finally, 1.06 is a multiplying factor chosen by the Basel Committee to keep the overall level of capital requirement in line with *Basel I* on an aggregate basis. *Basel II* confirmed a minimum capital ratio of at least 8% of risk-weighted assets. In this respect, the capital requirements K are translated into risk weights by multiplying by 12.5 (the reciprocal of 8%)[3]; $w = 12.5 \cdot K$ and the risk-weighted assets are obtained as $RWA = EAD \cdot w$

Figure 3.1 reports the relation between the estimated risk of a borrower (its PD) and the risk

weights assigned to corporate loans in the FIRB approach. The concavity of the curve indicates that capital absorption increases less than proportionally with estimated risk. Still, as the estimated PD moves up along the horizontal axis, migrating from lower to higher risk classes (a phenomenon that is frequent in downturns), capital requirements increase. Finally, an increase in the LGD shifts the curve upward (a decrease, downward), because the risk weights are linearly dependent on that variable.[4]

The potential pro-cyclicality of the *Basel II* regulation clearly depends on the cyclical behaviour of the parameters PD, EAD, LGD, and M, which we analyze in the main text.

Figure 3.1

PD-RISK WEIGHT CURVE IN THE INTERNAL RATINGS BASED (IRB) APPROACH
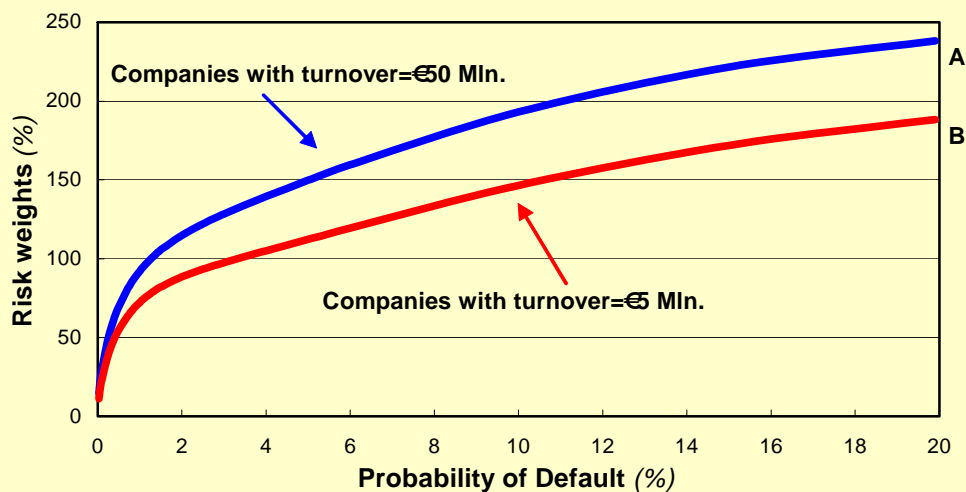
Note: The figure assumes a fixed LGD equal to 45% (the value used in the Accord for the FIRB approach).

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[1] The correlations depend on the type of portfolio, and in some cases they vary within a given interval. Specifically, for corporate loans the correlations range between 12% and 24%, depending on the PD. They are 15% for residential mortgages, 4% for qualifying revolving exposures and between 3% and 16% for other retail exposures.

[2] If total net value adjustments should exceed expected losses, the absolute value of the difference is included among the positive elements of tier 2 capital for an amount up to 0.6% of credit-risk-weighted assets. If total net value adjustments are less than expected losses, the entire absolute value of the difference is deducted from capital (50% from tier 1 and 50% from tier 2 capital)

[3] Applying the formula with an LGD of 45% (i.e. equal to the regulatory parameter in the FIRB approach) and a PD equal to 0.03%, one gets $w=14.44\%$. If one assumes a higher PD (20%), then $w=238.23\%$. A reduction of the correlation parameters is permitted for firms with annual sales of less than €50 million (to take into account their lesser dependence on the business cycle). Thus for a firm with annual sales of €5 million, w ranges from 11.30% to 188.42%.

[4] The same linear relation is also valid with reference to maturity (M).

3.2 Capital requirements and pro-cyclicality

If losses are counter-cyclical the simple mechanism underlying *Basel I* may generate pro-cyclicality. With capital market frictions, a shock to banks' assets produces a pro-cyclical movement in bank capital, and through the mechanism described in Section 1, this feeds back to the economy. Is such pro-cyclicality reduced or enhanced by the switch to *Basel II*? Note first that the new regulation still relies on a formula that links capital requirements to assets, so the mechanism just described for *Basel I* will still work. The outcome thus depends on the cyclical behaviour of the risk weights: the new procedure generates greater pro-cyclicality if the weights increase in downturns, reflecting the deterioration of ratings, and decrease during expansions. Most of the following sub-section will be devoted to this issue.

Note preliminarily that rating methodologies, used by rating agencies and by banks, can follow either a 'point-in-time' (PIT) or a 'through-the-cycle' (TTC) approach. PIT ratings represent an assessment of the borrower's ability to discharge his obligations over a relatively short horizon (e.g. a year), and so can vary considerably over the cycle. The TTC approach focuses on a longer horizon, abstracting in principle from current cyclical conditions. TTC ratings are therefore inherently more stable than PIT ratings, although their predictive power for default rates is lower.[80]

3.2.1 Potential pro-cyclical effects in the standardised approach

The added pro-cyclicality of this approach depends on the behaviour of the external ratings, as they have a direct relationship with risk weights. Rating agencies claim that they use the TTC approach. But are they actually successful in doing this? The answer is not straightforward. Figure 3.2 suggests that, in the United States and the euro area, in economic contractions ratings downgrades become relatively more frequent than upgrades, and conversely in expansions. The empirical evidence available confirms that agency ratings retain some positive correlation with the business cycle,[81] although they are less pro-cyclical than market-based indicators of credit risk.[82] Notice however that even if agencies rate correctly through the cycle, their ratings could still exhibit some co-movement with economic activity: to the extent that changes in firms' prospects are driven by long-lived shocks, and these shocks also induce business cycle fluctuations, the long-term creditworthiness of firms, and hence their ratings, should parallel the cycle (Löffler, 2008). The question, then, is whether the ratings show *excessive* co-movements with the cycle. This is harder to address, as it entails additional assumptions, but the analyses performed to date suggest that ratings do not generally exhibit excessive sensitivity to the business cycle.[83] However, this issue will have to be revisited to include the most recent years, to carefully examine the performance of rating agencies during the crisis.

Another factor that may affect pro-cyclicality in the SA is the degree of "granularity" of the system (the number of rating classes). Empirically, borrowers migrate to riskier rating classes in downturns, less risky in upswings. Thus, a large number of narrow risk-buckets would increase the number of migrations, magnifying pro-cyclicality. Furthermore, because the risk weights change in

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[80] For a comparison of the PIT (cyclical) and TTC (permanent) components of default risk, see Löffler (2008).

[81] For example, Cantor and Mann (2003), Löffler (2008), Amato and Furfine (2004), Segoviano and Lowe (2002) and Ferri *et al*. (1999) show that credit ratings are positively correlated with the business cycle. Transition matrices (estimates of the probability of moving from one rating class to another) tend to exhibit higher frequency of downgrades during recessions than during expansions.

[82] Such indicators can be obtained from Merton-type models, from credit spreads and from equity-based measures of risk. See Nickell *et al*. (2000), Bangia *et al*. (2002), Cantor and Mann (2003) and Catarineu-Rabell *et al*. (2003).

[83] These analyses use models of ratings determination that take into account firms' business and financial risks, in addition to macro indicators; see Blume, Lim and MacKinlay (1998), Amato and Furfine (2004).

discrete fashion, the system may generate significant cliff effects. For example, for corporate loans a downgrade from A- to BBB+ would increase the risk weight from 50% to 100%, doubling the capital requirement (see Table 3.1). This problem is aggravated by the fact that when ratings adjust, they tend to overreact to current conditions,[84] especially for structured finance products.[85]

Summing up, it would appear that the *Basel II*-SA is probably more risk-sensitive than *Basel I*, and therefore more prone to generate pro-cyclical effects.

3.2.2 Potential pro-cyclical effects in the Internal Ratings Based approach

Basel II establishes that banks, in estimating the parameters relevant to capital requirements (PD, LGD, EAD and M), must consider borrowers' ability to repay the loan under current conditions but also in potentially adverse cyclical conditions, using data for long enough periods. In other words, the spirit of the regulation requires banks to follow a TTC estimation approach. As we shall see, for various reasons they often fail to conform to this spirit, so that all these parameters may end up playing a role in terms of pro-cyclicality.

Figure 3.2

Ratings drift and GDP growth: US and euro area (1)
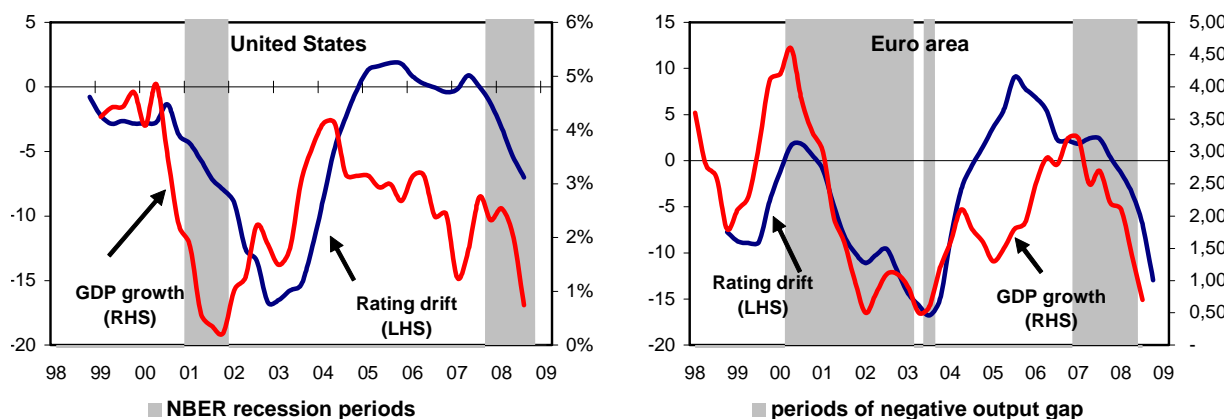
Note: ratings drift is equal to upgrades minus downgrades divided by the number of rated issuers (source: Moody's). GDP growth is the annualized quarterly percentage change in GDP (source: Thomson Financial).

Probability of default (PD) – Basel II specifies that the probability of default can be estimated by three different techniques: (i) banks' internal default experience; (ii) statistical default models; (iii) mapping banks' internal ratings onto external ratings.[86] Regardless of the technique chosen, and even though practices may differ across banks, lines of business and categories of borrower, in

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[84] See Amato and Furfine (2004).

[85] Studies performed before the subprime crisis show that – due to pooling, which mitigates exposure to idiosyncratic risk – structured finance products more stable ratings than bonds. But when the ratings of structured finance products do change, they move by several classes, perhaps reflecting the fact that these instruments are highly leveraged. See CGFS (2005), Fitch (2002) and Moody's (2003).

[86] See Taylor and Goodhart (2004). For a detailed treatment of the issue of the relationship between PDs and pro-cyclicality, see Cannata (ed.) (2007), BCBS (2005).

practice the more cyclical PIT approach is often preferred to the TTC approach.[87] This may be due to implementation difficulties (e.g. lack of historical data), and possibly to incentives.[88] Techniques of type (i) tend to induce pro-cyclicality because default rates are strongly correlated with cyclical conditions (Figure 3.3).[89] The same holds for option-based statistical models, which rely on inputs that are themselves characterized by cyclical variability (such as equity volatility, corporate leverage and equity prices).[90] Finally, techniques based on mapping of internal grades to external ratings suffer from the same problems discussed above for the agency ratings.

Another potential source of pro-cyclicality is banks' common failure to re-calibrate PDs regularly, but only when the entire system is overhauled – which tends to be associated with cyclical fluctuations. Finally, the degree of granularity is generally higher under IRB than SA (15 rating classes or even more). Borrowers' migrations across classes over the business cycle are therefore likely to be more frequent.

Figure 3.3

Default rates and GDP growth: US and euro area
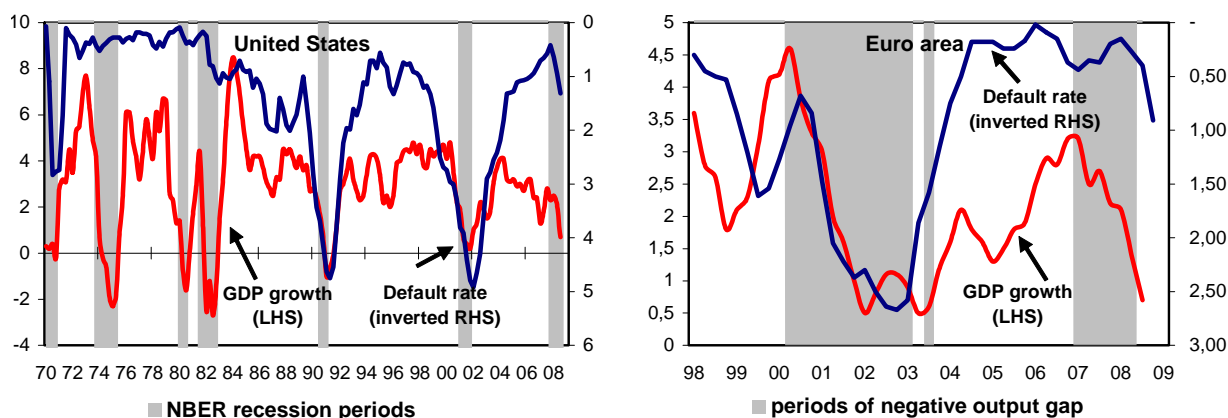
Note: The default rate is the 12-month moving average of corporate bonds in default weighted by their nominal amount; data for the euro area refer to all non-US corporate bonds (source: Moody's). GDP growth is the annualized quarterly percentage change in GDP (source: Thomson Financial). The shaded areas for the United States are the NBER recession quarters (source www.nber.org) and for the euro area are the quarters when the euro area GDP is below its exponential trend

Loss given default (LGD) – As for PD, the *Basel II* framework requires banks to use prudent (high) and a-cyclical LGD estimates, employing data ideally covering at least an entire economic cycle.

Do losses as a percentage of the amount at risk tend to vary with the cycle? There is solid evidence that collateral values and recovery rates on corporate bond defaults fall in economic downturns.[91] Evidence for the U.S. market suggests that in recessions bond recovery rates may fall up to 25 percentage points from their average non-recession value. Yet the state of the economy cannot fully explain the volatility of LGD, which is significantly affected by market and industry-

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[87] Araten *et al.* (2004) analyze JPMorgan-Chase internal ratings, finding that: (i) ratings are relatively stable at a one-year horizon but much less so over 2-5-year horizons; (ii) ratings stability is differentiated by rating classes (speculative grades show the least stability) and business lines (e.g. investment banking vs. middle market).

[88] Catarineu-Rabell *et al.* (2003) show that profits would be higher if banks adopted ratings that varied over the cycle, as such a system would let them transfer the cost of the recession to the rest of the economy.

[89] See Amato and Furfine (2004).

[90] In Merton-type models, estimated default probabilities are correlated positively with a firm's leverage and equity volatility and negatively with its equity price. Given that in recessions stock price volatility is greater (see Panetta *et al.*, 2006), leverage increases and stock prices fall (see Section 1), these models are inherently pro-cyclical.

[91] See Altman *et al.* (2002, 2005), Bakshy *et al.* (2001), Frye (2000a), and the review in Altman (2006).

specific conditions.[92] Evidence for bank loans is limited; the studies done suggest that recovery rates are higher in expansions and that the cyclical variations consists in a sharp increase of LGD in recessions, not a reduction in upturns.[93] Notice, however, that banks could require additional collateral during contractions, thus attenuating the cyclical variations in LGD; this may happen, for example, through contractual clauses that allow banks to renegotiate loan conditions.

Exposures at default (EAD) – While for balance sheet items the EAD is a known value, the AIRB approach requires banks to estimate EAD for off-balance-sheet items as well (excluding derivatives). The rationale is that borrowers in trouble tend to have greater recourse to unused credit facilities, so that banks' actual exposure in case of default is likely to exceed the current value of the loan. Overall, the evidence is scarce and the results not always clear cut, but there would appear to be some degree of pro-cyclicality in the actual behaviour of estimated EAD.[94]

Maturity (M) – Because capital requirements are linearly dependent on the maturity of the loan, this parameter can also induce pro-cyclical effects. During an economic downturn, exposures become *de facto* less liquid, because borrowers have trouble repaying the loans, say, or because securitization becomes more difficult. Besides, banks tend to reschedule loans to counterparties in temporary difficulties but with good medium-term growth potential. Both effects lengthen the maturity of the loan portfolio, thus increasing capital requirements.

3.2.3 Macro-prudential risk

The foregoing evidence refers to the pro-cyclicality of the capital requirements of individual institutions. Brunnermeier *et al.* (2009), building on ideas similar to those set forth by BIS economists (see e.g. Borio, Furfine and Lowe, 2001, Borio and White 2004), emphasize that financial crises are not driven just by exogenous shocks but by the interaction between these and market dynamics. Hence, regulatory policies should not focus only on the impact on single institutions but should fully take account of the risk of an amplifying spiral (whose mechanisms are described in Section 1).[95] In the authors' view, the main problem with *Basel II* is not an incorrect or pro-cyclical assessment of micro-prudential risk (that is, the risk of individual financial institutions) but that it ignores (and may even aggravate) macro-prudential risks. As we shall see below, they argue that correct measures of macro-prudential risk should be based on indicators of the likelihood

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[92] Altman *et al.* (2005) show that the LGD is significantly affected by bond market conditions (e.g. demand for defaulted bonds from niche investors). According to Acharya *et al.* (2003, 2007) industry-specific conditions are also relevant (higher LGDs in recessions reflect the increase in the number of distressed business sectors).

[93] See Frye (2000b, c), Carey and Gordy (2004).

[94] The increase in EAD seems to be particularly strong for firms that had better credit ratings prior to default; this might reflect the fact that these firms have fewer restrictions and/or covenants or are subject to less stringent monitoring, so that when they get in trouble they can draw down their credit line with little objection by the bank. The findings on the relationship between EAD and firm characteristics are ambiguous. Finally, the most recent studies suggest that loan-specific variables (e.g. commitment size and collateral) may affect EAD, although the effect seems to be relatively small. See Allen and Saunders (2002), Asarnow and Marker (1995) Araten and Jacobs (2001), Jacobs (2008) and Jiménez *et al.* (2009).

[95] Brunnermeier *et al.* (2009) deal extensively with the issue of financial crises. Although strictly speaking this is not the same issue as pro-cyclicality, for the practical purposes of this analysis these two concepts overlap. They examine several of the weaknesses of regulatory systems focused only on micro-prudential policies. Rather than review their analysis, let us clarify their argument by a simple example. Assume a sequence of 50 banks, each of which lends to the next one the same amount X that was originally deposited by an external investor in the first bank. At each transfer, the maturity of the loan lengthens by one week, and the last bank in the sequence lends the sum to an outside investor. The result is that each bank has a small asset-liability mismatch (1 week), but the banking system has a much larger mismatch (1 year). Due to the interconnections between banks and the externalities that may arise from difficulties at individual banks, this mismatch may represent a non-negligible systemic risk.

that a shock to a financial institution will be amplified and subsequently transmitted to the rest of the financial system.

3.3 Empirical evidence on the pro-cyclicality of capital requirements

Evidence on Basel I – Goodhart *et al.* (2004) estimate that the introduction of *Basel I* increased capital ratios from 9.5% to more than 13%. Bassett and Zakrajsek (2003) examine the results of the US Senior Loan Officer Survey from 1990 to 2003 and find that pressure from regulators (and investors) to rebuild capital induced banks to decrease the credit supply in recessions and expand it in upturns. Their findings suggest that this pressure may have been more intense after the adoption of *Basel I*. Watanabe (2007) finds a causal nexus between bank capital regulation and the credit crunch of the late 1990s in Japan. Montgomery (2005) finds that lending by Japanese banks was related to capital ratios in the post-*Basel I* years (1988-1999) but not earlier (1982-1987).

A large body of empirical research surveyed by the Basel Committee on Banking Supervision (BCBS, 1999) shows that the introduction of *Basel I* was followed by a rise in capital ratios in many countries and that pressures on capital may have limited bank lending during the cyclical downturns of the early 1990s in the U.S. and the late 1990s in Japan. This evidence fits with the thesis that capital regulations may have accentuated the pro-cyclicality of the financial system.

Evidence on Basel II – An empirical assessment of whether *Basel II* is more pro-cyclical than *Basel I* is problematic, in view of its extremely recent application (in Europe most banks deferred it to 2008). The scanty evidence available derives from counterfactual and simulation exercises or from comparisons with similar past experiences of regulatory change.

Kashyap and Stein (2004) perform a counterfactual exercise, assuming that *Basel II* was in force during the period 1998-2002. Their simulations suggest that the incremental pro-cyclicality associated with *Basel II* is potentially quite large, although the magnitude depends crucially on the credit risk model chosen. A number of other papers find similar results.[96] Repullo *et al.* (2009) use Spanish data to simulate the effect of *Basel II* assuming point-in-time PDs and find a strong pro-cyclical effect. Catarineu-Rabell *et al.* (2003) note that more pro-cyclical lending might reflect the endogenous response to the new regulation, as profit-maximizing banks may prefer pro-cyclical rating schemes.

In general, banks hold capital in excess of the regulatory minimum.[97] Hence, the pro-cyclicality of the *Basel II* capital ratios does not necessarily imply that the actual level of bank capital is also pro-cyclical, because the capital buffers that banks hold over and above the minimum could enable them to smooth or even eliminate ratio volatility. Heid (2007), in fact, finds that these buffers significantly mitigate the effects of the volatility of capital requirements. However, Repullo and Suarez (2008), using a calibrated model, emphasize that banks' choice of level of capital can attenuate but not eliminate the inherent pro-cyclicality of the new rules.

This brief review would appear to confirm that *Basel II* may increase pro-cyclicality, but that this conclusion must be treated with caution. The fact that the type of model used to estimate default risk significantly affects the results suggests that the extent of pro-cyclicality in *Basel II*

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[96] Goodhart *et al.* (2004) simulate bank capital charges in the U.S., Mexico and Norway. They conclude that pro-cyclicality may arise both under the standardized and under the advanced approach. Other contributions are summarized in Kashyap and Stein (2004). Several papers confirm that the pro-cyclicality of *Basel II* depends on the credit risk estimation techniques chosen; see Catarineu-Rabell *et al.* (2003), Carling *et al.* (2002) and Saurina and Trucharte (2007).

[97] This may reflect managers' choices, market discipline or a desire to avoid close supervisory scrutiny (see Taylor and Goodhart, 2004).

depends at least in part on actual implementation. This conclusion is particularly important, as the new rules leave the estimation of risk weights to individual banks, who can opt for either the standard or the IRB approach and, within the latter, can choose from different specific models of credit risk, with quite different properties in terms of cyclicality. This implies that a greater effort should be made to understand the incentives for banks to adopt one model or another.

3.4 Proposals to contain pro-cyclicality

The Basel Committee was well aware of the potential pro-cyclical effects of the new regulations. The "through the cycle" philosophy that in our view clearly permeates the Accord was meant to contain them. Several amendments were introduced specifically in response to this problem: the concave risk-weight-PD curve (see Figure 3.1 in the box), which implies that higher PD corresponds to lower elasticity of the capital requirement to changes in PD;[98] a moderate slope of the curve; the assumption of lower correlations among the PDs of small and medium firms. However, as we have seen, banks' practices have not always corresponded to the spirit of the regulation, and overall it seems fair to conclude that *Basel II* has the potential to generate significant pro-cyclicality.

The pro-cyclicality remaining in the system can always be addressed in the framework of the Pillar 2 supervisory review process, one of the most innovative features of *Basel II* but whose potentiality has not yet been fully exploited by supervisors.[99] In fact, under *Basel II* banks must determine the amount of capital needed for current and future risks, including both Pillar 1 risks (credit, market, counterparty, operational) and Pillar 2 risks. They must conduct stress tests to gauge how their overall risk exposure would be affected by exceptional but plausible adverse events. Ongoing supervisory activity could require banks to hold capital buffers over and above those needed for Pillar 1 and Pillar 2 risks, in recognition of the outcome of stress testing and possible unexpected losses in extremely adverse cyclical conditions. One problem with relying too heavily on Pillar 2 is that it generally entails a high degree of supervisory discretionality. In addition to introducing possible cross-country differences, this may make proposals along these lines hard to enforce in periods of stress.[100]

A number of solutions to reform the *Basel II* system and contain the pro-cyclicality of capital requirements have now been suggested by academics and regulators. While some commentators favour radical solutions,[101] most proposals focus on amendments of the current framework. A common premise is that the best solution – raising new bank capital in recessions, when losses materialize – is hard to implement, because of the capital market imperfections

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[98] In other words, the increase in capital requirements is less marked for riskier borrowers, which limits capital requirements in downturns, when migration towards higher-risk rating classes is more frequent.

[99] The role of the supervisory authorities in Pillar 2 is to ensure that banks have adequate capital to sustain all the risks of their business and to push the banks to develop and use better risk monitoring and management techniques. The purpose of Pillar 3 (market discipline) is to complement the minimum capital requirements (Pillar 1) and the supervisory review process (Pillar 2).

[100] Borrowing from the well known rules vs. discretion debate in monetary policy studies, one could argue that the discretion under Pillar 2, while granting flexibility to the regulator, may reduce her degree of commitment and induce excess risk-taking by banks, who may expect to be able to rely on *ex-post* forbearance.

[101] E.g. Di Noia and Micossi (2009) argue that *Basel II* should be scrapped altogether and replaced by a tight ceiling on leverage ratios.

discussed in Section 1. Most are relatively simple, which may be a weakness but also a strength.[102] We now present a critical review of these proposals.[103]

3.4.1 Adjusting for expected losses

The dynamic provisioning approach – Pioneered by Spain, this approach requires banks to accumulate general loss provisions in good times – when credit growth is above trend, credit risk increases but impairment losses are low – as a buffer in recessions, when credit decelerates and impairment losses surge. The provisions are computed by a relatively simple formula, provided by the Bank of Spain, whose inputs are data on current risk-weighted loans and losses experienced in previous economic cycles.[104]

While recent experience has shown that dynamic provisioning alone is not sufficient to avoid excessive credit growth or episodes of rapid contraction, this system has the advantage of simplicity and, if properly calibrated, could guarantee a stable ratio between *total* provisions and total loans.[105] In particular, by linking general provisions to lending growth, it takes account of the correlation between credit booms and laxer credit standards. Moreover, because the rule would be relatively automatic, the market impact of the provisions would be less negative than the alternative of issuing capital in bad times.

A number of drawbacks have also been pointed out (see e.g. Bank of England, 2008): (i) the rule addresses only average losses, not large losses that may occur with a very small probability; (ii) it could penalize the more efficient banks, which have above-average lending growth; (iii) like any simple rule-based scheme, it would be prone to circumvention (in particular via off-balance-sheet transactions and commitments). Objection (i) is a serious one, to be sure, but it could be raised against most other proposals just as well. And it should not be pushed too far, insofar as dynamic provisioning should complement – not replace – other capital rules, such as the risk-based capital regulation of *Basel II* (which, in principle, should take low-probability events into account) or the capital insurance schemes discussed below (which let the banks directly insure against systemic events). Objections (ii) and (iii) are correct as far as they go; as Section 4.3 observes, the accounting bodies are currently reviewing the rules on consolidation and derecognition. This should help address problem (iii).

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[102] The European Commissioner for the Internal Market and Services, Charlie McCreevy, has recently advocated crude but simple measures of capital adequacy, arguing that complexity played a significant role in confusing top managers, investors and regulators about the risk embodied in the financial products they were dealing with.

[103] Diamond and Rajan (2009) point out that the "market" capital requirement – the level of capitalization that markets perceive as adequate – is too low in good times and too high in bad, possibly because of shifting patterns of risk appetite through the cycle. This prompts banks to escape stricter regulatory norms in good times through regulatory arbitrage, but when bad times come regulatory capital provides little relief, because markets view it as insufficient. This represents an important difficulty – which we do not address here – for policies that address pro-cyclicality via regulatory capital requirements.

[104] In practice, each bank classifies its loans into six homogeneous risk classes, and performs the following steps for each class: (i) the inherent provision (applied on each new loan granted to cover the average credit risk) is computed as $\alpha_j \Delta C_{jt}$, where the coefficient α_j measures the loss inherent for risk class j (not individually identified as referred to a specific transaction) and ΔC_{jt} is the absolute increase/decrease of the loans recorded by the bank in the reference period; (ii) the average specific provision is computed as $\beta_j C_{jt}$, where β_j is the specific provision over a business cycle, common for all banks, and C_{jt} is the bank's stock of loans; iii) the provision for the period is computed based on the actual impaired loans observed in the period. Then the general provision for each risk class is computed as (i) plus (ii) minus (iii). The component (ii) minus (iii) is designed to adjust the provision for the current economic circumstances, as it tends to be positive in upswings and negative during recessions. The total general provision is computed by adding the general provisions of the six classes. This provision is bounded upward and downward. The parameters α_j and β_j are provided by the Bank of Spain. See Banco de España (2005, p. 73). See also Jiménez and Saurina (2006) and Saurina and Trucharte (2007).

[105] See Bank of England (2008); de Larosière *et al.* (2009) also strongly support this option.

A final problem is that, from a technical viewpoint, provisions take the form of value adjustments that are registered in the profit and loss account and affect regulatory capital through a reduction in total earnings. For this reason, this method has problems of compatibility with IAS/IFRS standards, which mandate that only incurred losses can be recorded in the financial statements.[106]

The credit value adjustment approach – An alternative to dynamic provisioning would be to modify banks' own funds by introducing, for supervisory purposes only, credit value adjustments (CVA). Under this proposal, banks would compute value adjustments on the basis, say, of the deterioration in credit quality experienced in downturns, to cover loan losses that are not yet incurred; CVA would therefore not affect the profit and loss account.[107] This would reduce the volatility of own funds by incorporating in advance the credit value adjustments that are likely to emerge in a recession without interfering with current accounting rules.[108] An approach similar to CVA is already used in *Basel II* to set capital requirements for market risk, whereby banks must take into account, for regulatory purposes, value adjustments of their trading book portfolio (via a regulatory capital reduction);[109] such value adjustments would impact on tier 1 capital but would not show up in the accounts.[110] CVA could be computed based on simple rules, such as those used in dynamic provisioning schemes. In good times, the mechanism would anticipate the regulatory capital reduction because, when a recession occurs and losses materialize, they affect earnings but not regulatory capital.

The advantage of the CVA approach is that it would not affect the accounting standards, as the adjustments would be made only for regulatory purposes, and would run in parallel with – and independently from – the value adjustments required by IAS, which are based on the "incurred losses". Its drawbacks would otherwise be similar to those of dynamic provisioning.

The approaches described in this sub-section could reduce pro-cyclicality by stabilizing regulatory capital. However, they would have no effect on the pro-cyclicality induced by ratings. This issue is addressed in the next sub-section.

3.4.2 Adjusting for unexpected losses

A first group of proposals are designed to contain the pro-cyclicality of the *Basel II* requirements by smoothing the variations of the *inputs* of the capital function (PD, LGD, EAD, M) over time. Conservative parameter estimates could be used in good times, to reduce the necessary

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[106] However, the issue is still open. According to the Bank of Spain, dynamic provisioning could be made compatible with the current accounting framework, as it mandates that banks set aside provisions for losses that *in practice* have *already* been incurred (from an economic and statistical perspective, since the model is backward looking) but simply not yet matched with individual loans.

[107] CVA might be considered as a proxy of expected losses during a recession, after deduction of incurred losses recorded in the profit and loss account. Unexpected losses should instead be covered by capital requirements.

[108] The measure proposed would work as follows. Suppose the bank's regulatory capital at time T1 is equal to 100 and the credit value adjustment equal to 10 is introduced. The measure would lower capital to 90 at T1, with no impact on the profit and loss account. When a recession occurs and losses materialize, the CVA would absorb the losses, offsetting the negative impact on total earnings; the bank's capital would remain unchanged at 90. This would moderate the recession-induced volatility of capital.

[109] To take into account that, under exceptional conditions, banks may be unable to sell or hedge positions, the Basel regulation mandates that they make downward valuation adjustments/reserves for these less liquid positions, and that they review the appropriateness on an on-going basis. Further, the Basel text states that "close-out prices for concentrated positions and/or stale positions should be considered in establishing those valuations adjustments/reserves for less liquid positions".

[110] A similar scheme was used prior to the adoption of IAS/IFRS by the Bank of Italy, which required banks to calculate, for regulatory purposes, value adjustments of the loans portfolio due to country risk.

adjustments in recessions.[111] As we have seen, the regulations already promote this approach. Thus, the common denominator of these proposals is the intention of reducing banks' discretionality in estimation. A second group of proposals focus on the *output* of the capital function. For example, the multiplying factor, which is fixed at 1.06 (see equation 1 in the box), could vary counter-cyclically.[112] Alternatively, capital requirements could be allowed to change gradually, for example by varying them in an autoregressive fashion.

Repullo *et al.* (2009) compare these methods using simulations with Spanish data. They find that the best countercyclical properties are obtained by smoothing the output of the capital function using an adjustment factor that depends on the deviation of GDP growth from its long-run average. Adjustment factors based on credit growth or stock market returns yield worse results than smoothing the inputs.

These proposals can help avoid abrupt changes of capital requirements due to business fluctuations. One possible drawback is that rules based on uniform smoothing for different banks would penalize the more prudent ones (this would be the case for the proposal to smooth the constant factor of the capital function). Carefully drafted rules should therefore be bank-specific and take into account the extent to which banks already rate their customers through the cycle.[113] However, there remains the question of how far banks, anticipating the effects of the rule, could manage to circumvent them, e.g. by appropriately modifying other aspects of the capital function that are discretional or hard to monitor for the supervisor.

3.4.3 Adjusting for macro-prudential risks

The proposals described so far would help contain the pro-cyclicality of lending at the *micro* level but leave the system vulnerable at the *macro* level. Two proposals address this issue. The idea is to adjust banks' capital requirements in response to early signals of macroeconomic instability.

Goodhart and Persaud (2008a) propose to link capital requirements to the rate of expansion of bank lending and to asset prices in the relevant sectors. For example, capital requirements for mortgage lending "… could be linked to the rise in both mortgage lending and housing prices".[114] This mechanism (which could well be part of Pillar 2 within the Basel framework) would penalize excessive credit growth and limit pro-cyclical effects by building buffers in booms. Coupled with a sufficiently low floor under capital adequacy requirements (the authors mention 3%) it would permit stimulating lending in downturns. The limitations of the proposal, acknowledged by the authors themselves, are similar to (ii) and (iii) discussed above for dynamic provisioning (potential penalization of efficient banks and circumvention via off-balance-sheet items). In our view, the 3% floor on capital requirements could be too low, but adoption of a higher floor would not alter the rationale of the proposal. The implementation would require addressing a series of practical difficulties (e.g. which macro variables to consider and how to combine them, especially for cross-border banks).

Brunnermeier *et al.* (2009) argue that since both micro-prudential regulation and measures of macro-prudential risk have strengths and weaknesses, the two approaches should be combined.

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[111] For example, banks could increase the conservatism of their estimates in good times by considering, for each rating class, the upper bound and not the central value of the PD. Another possibility would be, in good times, to shift borrowers into higher risk classes on the basis of the estimated worsening of their PDs in recession (*de facto* downgrading them).

[112] See Gordy and Howells (2006).

[113] For example, PDs could be modified so that the adjustment would be small or negligible for intermediaries already adopting prudent TTC estimates and comparatively sharp for PIT raters.

[114] Goodhart and Persaud (2008b) suggest linking credit growth to the inflation target, the growth of potential output plus an additional factor taking into account structural changes in the ratio of bank assets to GDP.

Specifically, capital requirements of financial institutions should be linked to measures that capture *risk spillovers*, that is the risk that problems at one bank could cause systemic instability. To this end, the basic capital ratio of *Basel II* should be multiplied by a macro-prudential risk spillover factor, computed on the basis of leverage, maturity mismatch, credit and asset price expansion. This spillover factor would generate significant additional capital requirements for institutions that may originate or propagate instability (due e.g. to size or interconnections), whereas it would have a negligible effect for non-systemically relevant banks.[115] Also, it would entail higher capital requirements in boom periods, and vice-versa in downturns.

As argued by the authors, this proposal is in many respects similar to dynamic provisioning (although the accounting impact is different as it does not affect loan loss reserves) and as such it shares many of its virtues and caveats. Its higher level of sophistication permits to take into account the complex interaction between lending standards, credit growth and other relevant variables. The main strength of the proposal is that it takes into consideration the potential instability arising from large and complex financial institutions, whose opacity magnifies agency problems between managers and shareholders, hampering or even impeding efficient risk management and adequate monitoring by external investors, with adverse consequences for the financial system at large.[116] But the complexity of the proposal may also be seen as a weakness, as its implementation, and supervision, could be difficult. One may wonder whether the same objective could be achieved via simpler criteria, based primarily on the size of intermediaries and maybe on a few other key variables, such as those pointed out by Brunnermeier *et al.* (2009).

3.4.4 Contingent capital

In the proposals discussed above, the capital needed to withstand adverse shocks and stimulate lending in recession is generated exclusively by banks' internal resources. An alternative set of proposals relies on external resources: the idea is to use hybrid instruments, with both insurance and financing components, to provide capital to large firms (not necessarily in the financial sector). These proposals have been motivated on the grounds of efficiency, but in our view the real common denominator is their reliance on external insurance, whereas the proposals illustrated in the previous sub-sections focus on self-insurance. Specific proposals, which include contingent capital, catastrophe bonds and options, have been advanced by re-insurers but have not been widely implemented (Rochet, 2008).

Capital insurance – Kashyap *et al.* (2008) suggest that banks should stipulate insurance contracts that would pay off in states of the world, such as a systemic crisis, involving a shortage of bank capital. To make the contract default-proof, the insurer (e.g. a pension fund or a sovereign wealth fund) should put the potential pay-off in a custodial account upon signing the contract.

Though not without intellectual appeal, this proposal may be hard to implement. First of all, Rochet (2008) notes that imposing a 100% collateral deposit could be too demanding, and suggests that the role of insurer should be taken up by the State, which can promote intergenerational risk-

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[115] The authors propose to adopt the CoVaR measure proposed by Adrian and Brunnermeier (2008) which, unlike the VaR, also captures the links across several institutions. To address the well-known pro-cyclicality of such methodologies (due to the fact that in boom periods volatilities are low, and vice-versa) the authors propose that estimates be based primarily on past "crisis data", underweighting recent data.

[116] According to some commentators, the ongoing crisis is to some extent a crisis of the (excessively) large and complex financial conglomerates that have emerged from the consolidation wave of the last 15 years. For example, Wolf (2009) argues that "We are painfully learning that the world's mega-banks are too complex to manage, too big to fail and too hard to restructure"; see also Partnoy (2009). For an in-depth analysis of the weak relationship between M&As, size and efficiency in the banking sector see Pilloff and Santomero (1998) and Amel *et. al.* (2004).

sharing.[117] Problems would still remain, though. Such a contract is likely to be very expensive (banks might well be reluctant to subscribe it)[118] and complex (banks should subscribe staggered insurance policies with many counterparties, with possibly complicated triggers for the payments). If such a scheme were mandatory, it is not clear how it could be correctly priced, especially if the insurer were the State. Finally, the State's inability to commit not to rescue banks that did not purchase any insurance would strongly limit banks' incentives for such coverage.[119]

Reverse convertibles – Capital insurance resembles earlier proposals relying on reverse convertible securities. Banks could issue bonds automatically converted into common stock if the issuer's share price falls below a given threshold (Flannery, 2005). The main problem is that the firm-specific trigger mechanism would be subject to moral hazard. This problem could be overcome by a trigger mechanism not within the issuer's control, such as a broad index of bank equities. Like capital insurance, this non-standard reverse convertible would provide bank capital overnight in case of a systemic crisis. Its other advantages would be simplicity and liquidity (these securities could be traded, and hence priced through market forces), which would presumably translate into relatively low costs.

3.4.5 Target leverage ratios

Limits on leverage – defined as the ratio between total bank assets (not weighted for risk) and capital – could represent a complementary solution to the foregoing proposals. Target leverage ratios can be considered as an insurance against the failure of the complex models used to assess credit risk and compute capital requirements. As such, they could address micro- as well as macro-prudential risks.[120]

The main advantage of this class of rules is that they would directly affect leverage, a key factor in the pro-cyclicality and instability of the financial system, as should be clear from our discussion of the New Financial Accelerator mechanism in Section 1. For containing macro-prudential risks, leverage caps could help if solutions based on capital or contingent rules turned out to be too costly or difficult to implement (the experience regarding other instruments providing insurance against certain types of systemic risk, such as longevity bonds, is not encouraging; see Blake, Cairns and Dowd, 2008, Visco, 2008). From a micro-prudential perspective, caps would likely prove useful to prevent capital from falling too low in upturns, especially when hidden risks (e.g. the model risk inherent in the *Basle II* framework) are particularly elevated.

One drawback of leverage caps is that because total assets (the numerator of the ratio) are risk-invariant, banks would have an incentive to invest in more risky assets; however this would not be a problem if the rule, as it seems reasonable, were to complement the Basel framework. A second problem is the apparent simplicity of the rule. Indeed, while measures of leverage based on

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[117] Rochet (2008) notes that this proposal would eliminate insolvency risk and permit issuing liquidity *ex post*, thus avoiding its waste in the states of the world when it would not be needed.

[118] Kashyap *et al.* (2008) implicitly assume that the cost of capital insurance would be lower than that of holding extra capital. However, given its characteristics, the contract would appear likely to be very expensive (as it would be illiquid, would pay off in bad states of the world and would be linked to systemic risk, which cannot be diversified).

[119] Pedersen and Roubini (2009) propose that each bank should be required to pay an insurance policy against its systemic risk. In contrast to Kashyap *et al.* (2008), here in case of pay-off on the insurance, the payment would not go to the company but to the regulator responsible for stabilizing the financial system. This would reduce moral hazard and give each bank the incentive to contain its systemic risk (to lower the insurance premium), but the cost of such policy and the difficulty of pricing would likely be non-negligible. Perotti and Suarez (2009) present an insurance-type proposal which focuses on liquidity risk. The proposal is aimed at correcting problems stemming from maturity mismatches between assets and liabilities, in the spirit advocated by Persaud (2008); see section 4.3.

[120] The Basel Committee on Banking supervision seems oriented towards considering instruments of this class as an important complement to risk-based regulation. See Wellink (2009).

balance sheet data are easy to compute, they may nonetheless be difficult to interpret and compare across banks, especially cross-border. Proper measures of leverage should be robust to:[121] (i) the accounting treatment of off-balance-sheet operations and implicit commitments (see Section 4.3); (ii) the treatment of derivatives and hedges (a firm could modify its leverage through derivatives); (iii) the treatment of leverage embedded in structured finance products (e.g. subordinated tranches of ABS). Ceilings to leverage must also take account of different business models (e.g. retail vs. wholesale), which entail different levels of risk and therefore of sustainable leverage. They can also be used as active supervisory instruments. For example, in Canada leverage caps are set at the individual institution level, taking into account factors such as operating and management experience, earnings, asset diversification, etc.. The standard limit is 20, but for certain institutions, e.g. start-up banks, it can be set as low as 5.[122]

Leverage caps have been imposed in various countries,[123] and there is some evidence of their effectiveness. Armstrong *et al.* (2009), commenting on the Canadian experience, argue that the ceiling has moderated pro-cyclical pressures, contributing to the resiliency of Canadian banks to the effects of the crisis. Blundell-Wignall *et al.* (2008) argue that until 2004 U.S. broker-dealers were subject to stringent supervisory rules limiting the maximum debt to net equity ratio to 15:1. Afterwards, investment banks could agree voluntarily to SEC consolidated oversight (not just broker dealer activities), but with less stringent rules that allowed them to increase their leverage ratio to 40:1 in some cases (the increase is clearly visible in Figure 1.4.A in Section 1). The related SEC document mentions that the new voluntary regime required computing group-wide capital and risks in accordance with the Basel Standards. This evidence, albeit indirect, is in line with the view that caps on leverage may usefully complement the standard risk-based approach. In a similar vein, Hildebrand (2008) notes that the two major Swiss banks were among the best capitalized in the world in terms of risk-based measures, but among the worst capitalized in terms of simple leverage. He argues that, with the benefit of hindsight, more emphasis should have been put on the risks of excessive leverage.

Like the other mechanisms discussed above, leverage limits could be manoeuvred in countercyclical fashion. Borio *et al.* (2001) discuss the advantages and the difficulties of doing so, not only for leverage caps, but also for loan to value ratios, and supervisory instruments in general. They argue that adjustment should be made infrequently, and only when there is evidence that serious financial imbalances are developing. The interaction between monetary policy and active countercyclical management of supervisory instruments could warrant further study.

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[121] See Counterparty Risk Management Policy Group (CRMPG, 1999, 2008). CRMPG (1999) argues that no single definition captures all aspects of leverage, and that leverage should not be viewed as an independent risk factor, but rather as a potential amplifier of market risk, funding liquidity risk and asset liquidity risk. In spite of its critical attitude, CRMPG (2008) acknowledges that leverage ratios provide useful information and cannot be dismissed out of hand in the light of the current crisis.

[122] See Armstrong *et al.* (2009).

[123] Caps were imposed since the early eighties on banks and other deposit-taking institutions in Canada, and on commercial banks in the U.S.. Similar limits have been adopted in Switzerland in 2008.

4. ACCOUNTING STANDARDS

In the last decade banks – in particular the large, international banks – diversified their functions away from the traditional intermediation model. They decoupled the lending functions by originating loans and selling them to outside investors. On the funding side they diversified sources, increasing the share of the wholesale component and reducing that of traditional deposits. Financial services to the corporate and household sectors have increased substantially; in many European countries banks own much of the asset management industry. As a result, in the U.S. the non-interest income has increased from 20% of total income at the beginning of the 1980s to around 45%. Similar growth patterns hold in Europe.

The increased exposure of bank profits to market volatility – in particular the greater role of capital gains and losses – has altered the information needed to assess banks' performance, contributing to the shift from cost accounting – booking assets at purchase price or origination value – to fair value accounting (FVA) – marking assets and liabilities to market.

As decisions are based on the information available, changes in accounting standards may influence the financial system by affecting investment choices, managers' incentives and firm behaviour. In this section, after reviewing the main features of FVA, we focus on how accounting standards affect pro-cyclicality. We conclude by examining the main policy suggestions.

4.1 Main features of fair value accounting

The gradual shift from historical cost accounting (HCA) to fair value accounting has been prompted by the new financial environment characterized by the greater importance of capital markets, rapid financial innovation, and market-based risk management. The change has been led by the two main accounting bodies worldwide, the United States Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB), responsible for two distinct accounting standards (U.S. GAAP and IAS/IFRS, respectively). IAS/IFRS were widely adopted starting in January 2005, when the EU made them applicable for listed companies (Commission Regulation No. 1606/2002). IAS are now used in more than a hundred countries. In what follows we will mostly illustrate general principles widely shared by the two systems. Some important but technical distinctions will be addressed in the final section.

The main innovation of the new accounting rules is the standard of fair value, defined as the amount for which an instrument "could be exchanged between knowledgeable, willing parties in an arm's length transaction". For actively traded instruments, this is the market price (*mark-to-market accounting*). In the absence of a quoted price in an active market, the holder of the instrument must use a valuation technique (*mark-to-model accounting*).[124] Both IAS/IFRS and GAAP contain a hierarchy of inputs for determining fair value, from the most to the least reliable: Level 1 assets (marked directly to market), Level 2 assets (priced using comparable instruments or models with observable inputs) and Level 3 assets (marked to model, for instruments that have very thin markets or are not traded at all; this group includes almost all structured products, such as ABSs and CDOs).

The second major novelty is that the accounting rule applicable to any instrument depends chiefly on whether the intention is to sell it or hold it to maturity. The rationale is that since a financial instrument can be held for different purposes, there must be a close link between its

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[124] Valuation techniques must incorporate all the factors that market participants would consider in setting a price, minimizing entity-specific inputs.

valuation and its role in asset/liability management.[125] Table 4.1 shows the classes envisaged by the IASB and the related accounting criteria. The instruments classified as HTM, which the management will hold to maturity, are measured at amortised cost, and changes in their value do not affect the balance sheet or the profit and loss account, unless the instruments are impaired.[126] The same goes for loans and receivables (L&R). The instruments recorded at fair value are those classified as held for trading, fair value option, or available for sale. For the HFT and FVO portfolios, unrealized changes in fair value affect the balance sheet and the income statement; for the AFS portfolio they are recognised in a component of equity, the AFS reserve, and affect the income statement only if the asset is impaired.

In general, once a financial instrument is allocated to a given portfolio, under IFRS firms have limited opportunities to transfer it. In particular, instruments cannot be reclassified into or out of the fair value through profit and loss portfolios.[127] Because of the current financial crisis, this rule has now been amended.[128] Obviously, the switch to FVA significantly increased the portion of assets and liabilities recorded at market value, including derivatives, which had often been booked at cost.

A number of other important changes brought about by FVA may also have an impact on financial sector pro-cyclicality:

(i)   Increased discretionality – Fair value has increased banks' discretional choices in representing their accounting situation. The recent crisis has shown that this can be crucial in times of stress, because it may reduce comparability of balance sheets, indirectly increasing opacity and making valuations more uncertain.

    a.   In principle, two banks holding identical assets and liabilities could choose different accounting representations, reflecting classification choices based on different holding intent.

    b.   Accounting rules provide only generic indications about the mark-to-model application of FVA (e.g. for level 3 assets), and the related disclosure levels. In practice the models differ widely. There is evidence that in the current crisis a major role was played by the difficulty of assessing the risk and the market value of complex securities.[129]

    c.   Certain accounting prescriptions are open to differing interpretations by different intermediaries. This can lead to a wide dispersion of estimated values for similar instruments. Among the numerous examples,[130] one that is potentially relevant to pro-

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[125] For instance, if an investor intends to hold a fixed-rate long-term bond to maturity, then booking valuation changes due to interest rate fluctuations may generate unnecessary volatility in the accounts.

[126] A financial asset is impaired and impairment losses are incurred only if: (i) there is objective evidence of impairment as a result of a "loss event" occurring subsequent to the initial recognition of the asset; (ii) the loss event has a reliably estimated impact on the future cash flows of the asset.

[127] Under the so-called "tainting rule", if more than an insignificant amount of HTM instruments are reclassified or sold, then all HTM assets must be reclassified and the HTM portfolio cannot be used for two years.

[128] The amendment (passed by the IASB in October 2008 to bring its framework closer to GAAP) allows financial institutions to reclassify assets from fair value to amortized cost and from HFT to AFS under "particular circumstances", sparing them from posting heavy losses and further depleting capital.

[129] See Senior Supervisors Group (2008). Perraudin and Wu (2008) show that the pricing of ABS of various degrees of seniority broke down during the turmoil. As a result, no one really knows the true value of these instruments. Clerc (2008) notes that the use of ABX indices for the pricing of ABS, common before the crisis, has now been shown to have serious weaknesses.

[130] Consider the following: (i) the regulation uses the concepts of "active market" and "distress sale", but does not define them rigorously. In the recent crisis, market participants had no guidance about when they could move from a mark-to-market to a mark-to-model approach, and had to make subjective judgments (Matherat, 2008); (ii) under FAS 115, if impairment is deemed "other than temporary" it must be recognized in the profit and loss account, but

cyclicality is the classification of instruments as held for trading: an asset or liability may be put in the HFT portfolio if "it is acquired or incurred principally for the purpose of selling or repurchasing it in the near term". But "near term" is not specifically defined.

Table 4.1: Accounting classes in the IAS/IFRS

Accounting classification	Assets/liabilities categories	Accounting method:	
		Balance sheet	**Profit and loss**
Amortised cost[a]	o *loans & receivables (L&R)*: non-derivative financial assets with fixed or determinable payments that are not listed in active markets [b] o *held to maturity (HTM)*: non-derivative financial assets with fixed or determinable payments and fixed maturity that the company has the intention and ability to hold to maturity	*Amortised cost less impairment*	*Not marked to market, unless impaired*
At fair value through other comprehensive income	o *available for sale (AFS)*: non-derivative financial assets that are not included in the previous categories.	*Fair value; change in fair value recorded in AFS reserves*	*Not marked to market, unless impaired*
At fair value through profit and loss	o *held for trading (HFT)*: financial assets/liabilities acquired/incurred for the purpose of selling/repurchasing them in the near term or assets/liabilities that are part of a portfolio managed together and for which there is evidence of a recent actual pattern of short-term profit-taking; derivative instruments are included in this portfolio, except for effective hedging instruments. o *Fair value option (FVO)*: financial assets/liabilities designated by the holder as at fair value through profit or loss since doing so results in more relevant information (e.g. elimination or reduction of an accounting mismatch) or allows the holder to value a hybrid instrument without separating the embedded derivative.[c]	*Fair value*	*Marked to market*

Notes. (a) The amortised cost of a financial asset is the amount at which the asset is measured at initial recognition minus principal repayments, plus or minus the cumulative amortisation of any difference between that initial amount and the maturity amount (using the effective interest method) and minus any reduction for impairment. (b) Under U.S. GAAP loans may be classified as either "held-for-sale" (carried at lower of cost or market value), "held-for-investment" (at amortised cost), "fair value option" (fair value). – (c) An embedded derivative is a derivative that is part of a hybrid (combined) instrument that includes a non-derivative host contract (e.g. a debt or equity instrument). IAS 39 generally requires embedded derivatives to be separated from the host contract if the risk and economic characteristics of embedded derivatives are not closely related to the host contract. Because the steps needed for assuring compliance with these requirements can be complex or result in less reliable measures than measuring the entire instrument at fair value, IAS 39 permits the entire instrument to be designated as at fair value through profit or loss.

d. Under FVA, hedging instruments (derivatives) are always carried at fair value through profit and loss. The valuation of the hedged item depends on whether or not the hedge is

the meaning of the expression is highly subjective (JPMorgan, 2008); (iii) to classify an asset as HTM the firm "must have intention and ability to hold it to maturity", but of course that ability may come under strain in a crisis.

"highly effective".[131] If it is, the hedged item is also valued at fair value with reference to the hedged risk (e.g. interest rate risk), whereas the remaining portion can be valued using different criteria (e.g. amortized cost).[132] If it is not, the bank can evaluate the hedged asset/liability in two ways: (a) use an alternative valuation method (e.g. amortized cost), which, however, would create asymmetries and reduce the quality and transparency of the accounts; (b) use the fair value option for all the risks of the asset/liability, not only the risk that is hedged; however, this may force the bank to resort to estimates and to excessively expand the share of its assets/liabilities valued at FV.[133] This is a most important if technical issue, to which we return below.

(ii)   Prohibition on recording "generic costs" – Prior to IAS/IFRS, during good times many intermediaries used to enter "generic costs" in the financial statements – such as larger-than-necessary loan impairment losses or provisions against "hypothetical liabilities" – as a cushion for bad times. These practices are no longer permitted: loan losses cannot be recorded unless impairment losses are actually incurred. The justification for this prohibition is that these "generic costs" unduly increase management discretionality and reduce account transparency.[134] In particular, accountants argue that setting up a provision when the loan is granted (say) implies that the loan is priced below its face value, as risk of credit losses should already be factored into the interest rate (Viñals, 2004). For these reasons, with FVA retaining earnings is the only feasible way to create a reserve buffer.

(iii)   Treatment of risks – The historical cost criterion provided for no accounting treatment of risks except the recording of impairment losses, so the switch to FVA represented a major improvement. The approach is implicit but comprehensive: by stating that the valuation should be the "market price" (real or estimated), the fair value principle mandates that *all* risks be covered in the valuation. This all-inclusiveness makes the criterion very powerful, but not completely foolproof. Considering the mark-to-market application of FV, for instance, it is obvious that any bias incorporated into market prices will carry over to accounting valuations.

The issue of risk treatment is closely related to item ii (generic costs): under FVA, provisions against generic business risks cannot be accumulated[135]; the only possible source of such a provision is retained earnings.

(iv)   Treatment of liabilities – FVA is typically applied to a significant portion of the assets side, but even though IFRS allows booking liabilities at fair value under certain conditions, liabilities are still mostly carried at cost. As a direct consequence, changes in interest rates affect banks' assets and liabilities symmetrically, but only the impact on assets is recorded in the accounts.

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[131] According to IAS 39, a hedging relationship is highly effective if the hedge is expected to work through the entire lifespan of the hedged item, and the ratio between the loss/gain on the hedge and the corresponding gain/loss on the hedged item is within a range of 80-125%.

[132] For example, consider a retail mortgage whose interest rate risk is covered by a highly effective hedge (via an interest rate swap, IRS), but the credit risk part is not. Then the IRS and the interest rate risk component of the mortgage are at FV, but the credit risk component could be valued at, say, amortized cost.

[133] Consider the example of the previous footnote, but assume that the hedge is not highly effective. Under option (a) the bank will use fair value for the IRS and amortized cost for the mortgage. Fluctuations in the market value of the IRS will then show up in the accounts, even though they are simply offsetting the corresponding fluctuations of the mortgage interest rate. Under option (b), the bank must adopt fair value for both the interest rate risk and the credit risk component of the mortgage. The former is easy to calculate, since the price of the IRS is readily observable, but the latter component may be problematic.

[134] Generic provisions reduce earnings; this may serve proper but also improper purposes (tax elusion, profit smoothing, creating a smokescreen on the real economic and financial condition of a company).

[135] A provision has to be recognised only if a firm has an obligation that can be reliably estimated and is likely to generate an outflow of resources. See IAS 37 "Provisions, contingent liabilities and contingent assets".

(v)   *Treatment of goodwill*[136] – Under historical cost accounting, the buying firm could write the value of goodwill among its assets, and amortize it over a certain number of years. Under IAS/IFRS, goodwill is considered in practice an indefinite life asset and is therefore no longer amortized but must be subjected to annual impairment tests. Losses are recorded directly in the income statement as well as on the balance sheet.

4.2 How Fair Value Accounting Affects Pro-cyclicality

There is broad agreement that FVA, in particular IAS39, increases the pro-cyclicality of the financial sector (see e.g. Taylor and Goodhart, 2004, and Banque de France, 2008).

The main point is that changes in the prices of financial assets recorded at FV are reflected immediately in banks' balance sheets (HFT, FVO and AFS categories) and profit and loss accounts (only the first two categories), regardless of whether or not they are realized. Since asset prices are pro-cyclical (see Section 1), the expansion of balance sheets during booms and their contraction in downturns are sharper than under historical cost accounting. The current crisis shows how this mechanism works in reverse in a downturn: the immediate recording of fair value reduction on assets reduces banks' capital base, hence their lending and their demand for securities; and this in turn feeds back onto economic activity.[137]

FVA may also prompt pro-cyclical behaviour of balance sheets indirectly, through its effect on the demand for assets. In Section 1 we discussed a sale externality reinforcing the New Financial Accelerator (NFA): agent A's sale of an asset depresses the price and so affects the balance sheet and profitability of agent B, who holds the same or a similar asset. Plantin, *et al.* (2008a), (2008b) point out that mark-to-market strengthens this effect: a bank manager with short-term incentives will be tempted to pre-empt the fall in price by selling the asset itself, amplifying the price fall; and conversely during upswings.

Other features of FVA described in section 4.1 may also increase financial sector pro-cyclicality. We refer to them using the same numbering:

(i)   Increased discretionality – In section 1 we argued that reduced liquidity may magnify the effects of the NFA mechanism. The increased discretionality brought about by FVA may have aggravated the uncertainty of valuations and so reduced market liquidity. This is likely the case for complex products, which are generally Level 3 assets; it is not surprising that investors and financial analysts, in the absence of specific information, have tended to see large holdings of level 3 assets held by a bank as a signal of fragility.[138]

(i.c)   Securities held for trading, (i.d) treatment of hedges – As we have seen, the regulation does not specifically define when an instrument meets or fails to meet the criteria for inclusion in the HFT portfolio. The crisis has revealed that, in many cases, assets that were not intended to be sold quickly were reclassified as HFT. While there is no hard evidence on what led banks to make these choices, presumably the urge to post short-term gains on the underlying securities played a part. Regardless of the motivations, these valuation choices contributed to an excessive increase in the share of assets assigned to the HFT portfolio.

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[136] Goodwill represents the premium that the acquirer of a firm pays over the fair value of all assets minus liabilities.

[137] The simulations in Enria *et al.* (2004) suggest that, under full FVA, a "typical" real estate crisis would lead to a 3.2% fall in bank assets and a 54% fall in capital and reserves. This compares to 1.6% and 26%, respectively, under the old accounting regime.

[138] For example, in 2007 almost one fifth of Citigroup's financial instruments measured at fair value through profit or loss (trading portfolio, fair value option and derivatives) consisted of Level 3 assets (see the Citigroup Annual Report for 2007).

A similar mechanism is at work in the treatment of hedges that fail the "highly effective" test. In practice, banks often chose to value at fair value (FVO) all the risks of the hedged item, resorting to estimation techniques. This is partly due to the fact that the obligation to value ineffective hedging derivatives at FV, in the HFT portfolio, would have otherwise created fictitious profits or losses: it would make little economic sense recording in the income statement a variation in the value of the derivative and neglecting the variation of the underlying asset valued at cost, since the derivative was acquired precisely to offset the latter. Regardless of the effectiveness of the hedge, in some cases banks simply chose not to apply hedge accounting to avoid its high costs (in terms of complexity of the documentation and computational burden of assessing the effectiveness of the hedge).

Both these factors – excessive use of the HFT portfolio and of the FVO for hedged instruments – inflated the share of instruments valued at fair value through profit or loss: on the basis of 2007 consolidated annual reports, this share reached 50% at some major banks, and with peaks exceeding 70%, far above the system average. Clearly this magnified the impact of the crisis on balance sheets, and thus intensified the NFA mechanism.

(ii)   Prohibition on recording "generic costs" – The prohibition on building up generic reserves as a cushion for bad times clearly increases pro-cyclicality. As we have seen, this prohibition is a source of tensions between accountants and regulators.

(iii)   Treatment of risks – Similar considerations apply to changes in fair value, which are barred under the implicit treatment of risks under FVA. Such treatment of risks is an additional source of pro-cyclicality because, as we have seen, FVA endorses market estimates of risks, which are accentuated in downturns (see Section 3.2.2). Thus, during buoyant growth marking-to-market will generate overoptimistic valuations, and conversely during downswings. And with the benefit of hindsight it is now clear that certain risks were grossly underestimated; the list includes liquidity risk, but also, for Level 3 assets, model, input, data and parameter uncertainty.[139] The underestimation of such risks, especially liquidity, certainly amplified the pro-cyclicality of the treatment of risks during the crisis.

(iv)   Treatment of liabilities – The fact that liabilities are still mostly valued at cost increases pro-cyclicality, as profits tend to increase in booms and decline in slumps more than they would under symmetrical FVA treatment of assets and liabilities (recall from Section 1 that the NFA is triggered by a shock to bank assets with liabilities values fixed).

(v)   Treatment of goodwill – Although goodwill is deducted from supervisory capital, changes in its valuation under FVA may contribute significantly to the expansion and contraction of the balance sheet, with a twofold effect on pro-cyclicality: (a) since M&As are clearly pro-cyclical, their expansive impact on the aggregate assets of financial institutions during upswings will be strong, and conversely in slumps; (b) in bad times, impairment testing will cause losses on goodwill to emerge, unless the initial accounting was done very conservatively.

The above is a non-exhaustive list of the ways in which FVA may affect pro-cyclicality. For instance, it has been argued that FVA may have enhanced perverse incentives, fostering herding (Gorton *et al*. 2006) and short-termism (see Viñals 2008). Incentives are dealt with in Section 5 below. The role of FVA should not be overemphasized, though. While there is undoubtedly some truth in these arguments, it is important to distinguish the pro-cyclicality induced by FVA from the effects of business practices based on mark-to-market as such, which were widespread well before FVA was introduced. Several examples come to mind: (a) Caruana and Pazarbasioglu (2008) argue that in the run-up to the crisis liquidity risk was not fully taken into account, so part of the recorded

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[139] See Viñals (2008), Clerc (2008).

profit actually represented liquidity risk premia that should have been provisioned. The issue certainly needs to be addressed (we return on it in the next section), but in any case the underestimation of liquidity risk can hardly be ascribed to FVA. (b) The pro-cyclical effect of "margin calls" reflects the market valuation of financial instruments, irrespective of the accounting criterion used. (c) FVA is sometimes blamed for the widespread adoption of automatic decision-making rules that amplify price spirals (e.g. stop-loss rules, linked automatically to the prices of financial instruments), but these became common not with FVA but with the advent of computerized trading. (d) The growth of off-balance-sheet vehicles (SIVs, conduits, etc.) – usually characterized by high leverage, significant maturity mismatches and financed with credit lines by sponsor banks – increases pro-cyclicality, since banks are more likely to create SIVs when asset prices increase (because they are more likely to get good ratings and place ABCPs among investors). However, SIVs existed well before FVA; their expansion in recent years is probably due to the desire of banks to avoid capital charges and to the growth of securitization activity. (e) Day-one booking of profits has also been criticized. Under this rule, day-one profits – the difference between the estimated fair value of an instrument when the transaction is entered into and the price of the transaction – can be posted on the day of the transaction. This criterion may be questionable, in particular, if applied to structured products such as Level 3 assets, whose valuation is difficult and discretionary. In this case, upfront recognition of profits constitutes a powerful incentive to create these products, in order to sell them at a higher price than resulting from the valuation model. In the hands of managers with short-term incentives (see Section 5), this mechanism can be a powerful cause of pro-cyclicality. However, the recognition of day-one profit as income was possible in some countries even before the introduction of IAS/IFRS; actually IAS 39, if anything, made this practice more difficult, by allowing it only under specific conditions.[140] As a consequence, the transition to IAS/IFRS generally brought – other things equal – a decline of day-one profits, in particular for investment banks.[141] In general, day-one booking of profits was fostered by the expansion of Level 3 products that are not listed and whose valuation is highly discretionary.

**Box. Cost Accounting vs. Fair Value Accounting**

Diffusion of FVA – The share of assets and liabilities valued at fair value varies greatly across countries (Fig. 4.1, Panel A). It is higher in banking systems such as Switzerland, France, the U.S. and the U.K., dominated by very large institutions that engage heavily in sophisticated financial strategies (or used to), and lower in countries such as Italy and Spain where banks are more focused on traditional credit activity. The composition of fair valued assets also varies: the share of the trading and derivatives portfolio that directly affects the profit and loss statement is above 75% in Switzerland, the U.K. and France; the share of assets available for sale, whose changes in valuation affects only the balance sheet, is highest in Luxembourg and Spain (Fig. 4.1, Panel B). In terms of valuation, international differences are not great: Level 1 assets comprise around 25% of banks' portfolios and Level 2 assets 70%. Level 3 assets, the most opaque, account for the rest (Fig. 4.1, Panel C); while this part is relatively small, there is evidence that it may have

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[140] Day-one booking is allowed only if the valuation is supported by the price of current market transactions in the same instrument or is based on the use of a valuation technique whose variables include only observable market data.
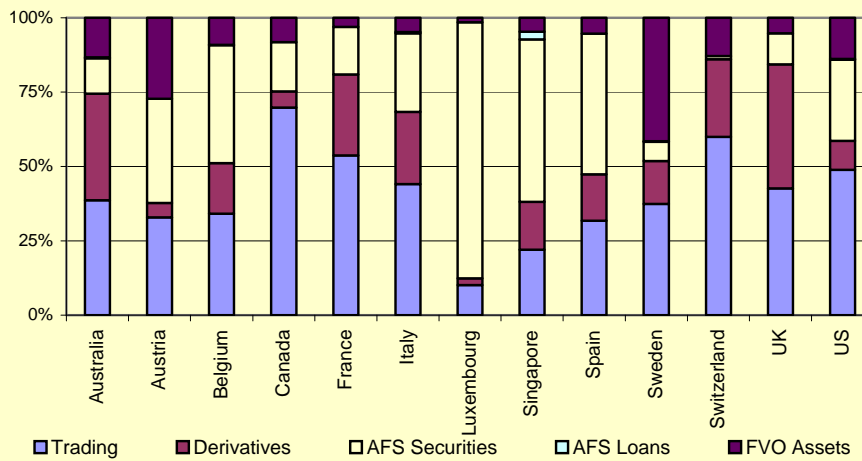
[141] In the case of Société Générale, for instance, the changed treatment of day-one profits caused by the transition to IAS/IFRS reduced shareholder's equity by €574 million (on the basis of French accounting principles, day-one profits had been booked immediately through profit and loss on the trade date; see annual report 2005).

Figure 4.1

Panel A: Share of Bank Assets and Liabilities Valued at Fair Value
(percentage values; December 2007)

■ Total FV assets to total assets   ■ Total FV liabilities to total liabilities
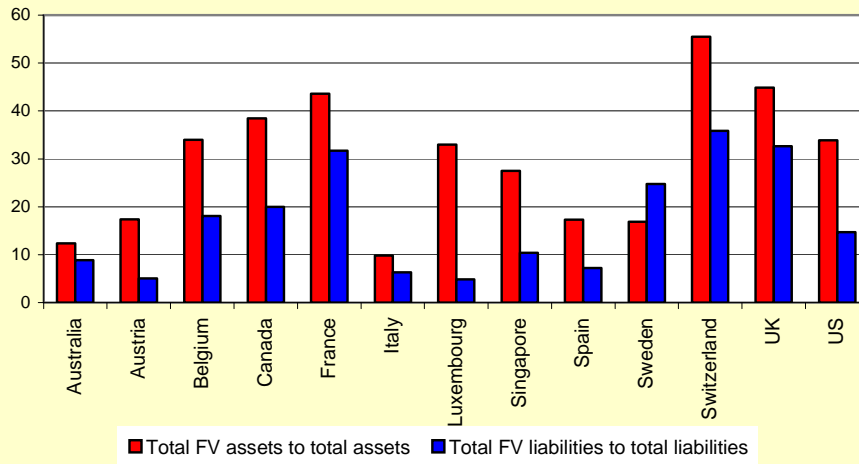
Panel B: Composition of Bank Fair Value Assets
(percentage values; December 2007)

□ Trading   ■ Derivatives   □ AFS Securities   ■ AFS Loans   ■ FVO Assets

Panel C: Aggregate Bank Fair Value Hierarchy, End-2007
(In percent)

■ Level 1 valuations   ■ Level 2 valuations   □ Level 3 valuations
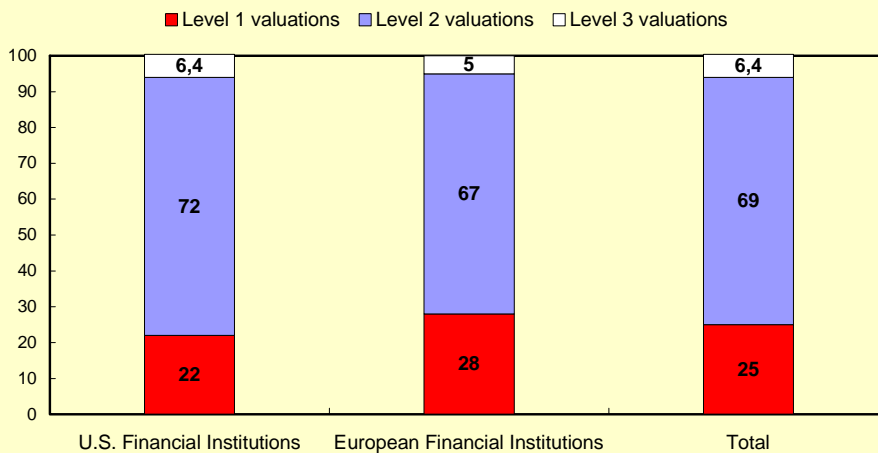
Source: Fitch Ratings.

grown considerably of late.[1] The share of total assets that is marked to market is not exceedingly high, although aggregate data conceal the fact that for systemically relevant institutions the weight of fair valued assets is typically higher. But when marked-to-market assets are compared with bank capital, the picture is more worrisome: if equity is around 5% of total assets and fair valued assets are 50% of the total, then a drop of 10% in asset value would totally wipe out a banks' capital.

Historical Cost Accounting vs. Fair Value Accounting – The relative pros and cons of fair value and historical cost accounting (HCA) for financial institutions have been widely debated (see Taylor and Goodhart (2004) for a list of references). A consensus seems to have emerged that FVA provides more timely information and helps improve transparency, although it adds excess volatility.[2]

According to Plantin *et al.* (2008a,b) "The historical cost regime is inefficient because it ignores price signals. However, in trying to extract the informational content of current prices, the mark-to-market regime distorts this content by adding an extra, non-fundamental component to price fluctuations. As a result, the choice between these measurement regimes boils down to a dilemma between ignoring price signals, or relying on their degraded versions" (p. 92).[3] They also argue that HCA has a countercyclical effect, because when the market price rises above its historical cost value, the manager (possibly affected by short-termism) has an incentive to sell it to boost current profits, and vice-versa. While likely sub-optimal in terms of efficiency, this mechanism is clearly countercyclical.

The pros and cons of FVA and HCA have been examined by several authors using recent historical examples (see Banque de France, 2008). Just as the current crisis has highlighted the shortcomings of FVA, the U.S. savings and loan crisis and Japan's lost decade clearly revealed the inadequacy of historical cost accounting and prompted the move to FVA. By allowing banks to postpone the booking of losses on loans to insolvent companies, HCA may have delayed effective action against these crises for years and vastly increased the cost of salvaging the financial industry and restarting the economy.[4]

Allen and Carletti (2008c) present a good summary of the prevailing view. They argue that, due to market imperfections, mark-to-market may lead to balance-sheet changes not justified by fundamentals. HCA largely avoids these problems, but is inferior to mark-to-market when price changes do reflect fundamentals. In their view, the key market imperfection is potentially insufficient liquidity.[5] Thus, the debate centres on whether liquidity factors, and not other fundamentals, are the key determinants of market prices. The conclusion is that each system works better in some cases and worse in others.

Departing somewhat from this consensus, we argue here that in effect HCA is strictly dominated by some form of FVA under all circumstances. Consider, for simplicity, two instruments, one with high price volatility around a constant mean, the other with low price volatility around a trend (and hence with a mean value that increases over time). Clearly point-in-time FVA (mark-to-market) is the optimal accounting representation method for the second instrument, as HCA would fail to capture the price increase, and would become obsolete more or less rapidly depending on the strength of the trend. Point-in-time FVA will be inadequate for the first (constant-mean) asset, because the frequent snapshots would give an incorrect, over-volatile representation of the true underlying value. The proper representation for such instrument would not be historical cost accounting but instead a time series average of point-in-time FVA, because a sample mean would clearly dominate an individual realization.[6] This reasoning is summarized in the following table:

Table 4.2: Fair value accounting and instrument characteristics

Type of FVA	Volatility of information	Delay of information	Best suited for instruments characterized by:
Point in time	Maximum	Minimum	Trending value, low short-term volatility
Average	Minimum	Maximum	Stationary value, high short-term volatility

Indeed, proposals to average FVA values have been made recently (see e.g. Plantin *et al.* 2008a, JPMorgan, 2008). In practice, HCA is likely to favour intertemporal smoothing: as profits are booked when realized, banks can accumulate reserves in good times and deplete them in bad, thus smoothing their lending policy (Freixas and Tsomocos, 2004).

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[1] Matherat (2008) argues that the crisis induced many financial institutions to switch from valuation methods based on observable prices or deemed to be observable (indices) to model-based valuations. This is in line with Clerc (2008), who reports estimates by Goldman Sachs suggesting that the share of Level 3 assets had increased substantially in the first quarter of 2008.

[2] Note that for financial derivatives FVA is the only possible valuation method, as valuation at cost would make no sense. Hodder *et al.* (2007) simulate the volatility of net income under full fair value (i.e. with all assets and liabilities priced at fair value) and compare it with income volatility measures drawn from market data. They conclude that full fair value income volatility captures some risk that is not reflected in traditional measures of income volatility. This is consistent with FV being a better representation of underlying variables than other accounting methods, but it neglects the possibility that in some cases it is precisely marking to market (combined with capital regulation) that generates market volatility, i.e. fair value volatility might not merely proxy market volatility but actually cause it.

[3] Their model yields the following results, summarized in Plantin *et al.* (2008a): (i) for sufficiently short-lived assets, marking-to-market induces less inefficiencies than HCA. The converse is true for long-lived assets; (ii) for liquid assets, marking-to-market induces less inefficiencies than HCA. The converse is true for illiquid assets; (iii) for sufficiently junior assets, marking-to-market induces less inefficiencies than HCA. The converse is true for senior assets. In the authors' view, these results may explain why the opposition to marking-to-market was led by banks and insurance companies, while investors in equity markets were among its most enthusiastic proponents.

[4] See Michael (2004) and Jackson and Lodge (2000) for the role of HCA in the U.S. S&L crisis. Allen and Carletti (2008c) argue that the LTCM crisis in 1998 was also due to the malfunctioning of market prices, which was why the Federal Reserve Bank of New York became actively involved.

[5] See Allen and Carletti (2008a, 2008b) and Allen and Gale (2007).

[6] In principle, the asset value could be computed via a standard filtering approach (Kalman filter).

4.3 Corrective actions

A consensus is building that although the causes of the crisis do not lie in accounting standards,[142] FVA may have magnified certain passages.[143] In reaction to the latest developments and to the recommendations of the Financial Stability Forum (2008), the IASB and the FASB have provided guidance and amendments to their accounting standards (e.g. reclassification of financial instruments) and planned measures to improve their quality in the medium term. The return to cost accounting is not being considered, as it would decrease the transparency of financial statements, against the requests of investors and risk managers.

While a thorough review of the ongoing work in this field is outside the scope of this essay, we do now discuss the key areas for improvement, focusing on those of particular importance for pro-cyclicality.

Banks' discretionality should be reduced – The excessive complexity and ambiguity of some accounting rules opened the door to divergent interpretations and opportunistic behaviour. The IASB and the FASB have now issued several clarifications of some of the concepts discussed in Section 4.1; they have stressed that fair value cannot be represented by the price of a forced liquidation or distress sale.[144]

A prominent factor of discretionality is valuation according to holding intention: a given instrument must be marked to market if it is to be sold in the near term, but can be valued at cost if the intention is to keep it to maturity. After the initial decision, the accounting treatment of instruments can be changed only under exceptional circumstances. Some commentators (JPMorgan, 2008) have questioned this mechanism, which seems too flexible initially and too rigid afterwards, when intent might have changed in good faith due to changing circumstances. A return to valuation principles based on the nature of financial instruments rather than the holder's intent has been proposed to reduce discretion.[145] However, this change would sever the link between valuation and the role of assets/liabilities in the balance sheet, which was a key motivation for the adoption of the new accounting standards. Furthermore, for complex financial instruments, whose nature is difficult to assess, discretionality could not be entirely eliminated.

Valuation of illiquid/complex financial instruments is one of the most difficult areas, and one in which progress is needed. On the one hand, convergence on methods and models would appear to be essential, as the differences among market participants was one of the main causes of the current market freeze.[146] On the other hand, such convergence may be hard to achieve, considering that good proprietary models are typically part of a bank's competitive edge.[147]

Transparency and disclosure should be enhanced – Where discretionality cannot be eliminated, a second-best solution could be enhanced transparency and disclosure. Following the recognition that

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[142] According to SEC (2008), the vast majority of the assets of U.S. banks that failed consisted in loans booked at amortized cost; fair value losses had no significant impact on their capital.

[143] See Noyer (2008).

[144] See, for example, FASB (2009), which provides additional guidance on determining whether a market for a financial asset is active and a transaction is distressed.

[145] Brunnermeier *et al*. (2009) propose an intermediate system – the "mark-to-funding" approach – to deal with liquidity mismatches during a crisis. The idea is that assets should be valued and managed "…not according to the intention of the holder or the short-term vagaries of the market, but according to the capacity of the holder. Capacity to hold on to assets is driven by the maturity of the funding of the assets."

[146] See Banziger (2008)

[147] See Clerc (2008).

an informational breakdown was a powerful amplifier of the recent crisis, a consensus has emerged that further enhancement of transparency is essential. The main organizations (Basel Committee, FSF, CEBS, accounting bodies) are working on proposals.[148] For instance, firms could be required to include a specific, standardized note in financial statements and interim reports providing information on the performance and volatility of complex or, more generally, illiquid financial instruments. Additional disclosures could be also required about the sensitivity of Level 3 fair value estimates to key model assumptions.[149] Auditors could be required to assess compliance on these issues.[150]

Excessive recourse to FVA should be prevented – At least two ways to avoid excessive recourse to fair value could be considered:

- the HFT portfolio could be restricted exclusively to securities effectively held for trading purposes, in whose regard evaluation at market price and accounting for accrued but unrealized gains or losses entails no special risk (since they will quickly become realized profits or losses anyway). For example, a minimum turnover rate/maximum holding period could be set. Assets failing to meet these more stringent criteria could be included in the AFS portfolio. This would attenuate pro-cyclicality of balance sheets, as banks would not be forced to record unrealized gains and losses in the income statement; furthermore, in expansionary periods the AFS reserve mechanism described in Section 4.1 would cause an accumulation of funds that could help weather difficult times (see also below).[151]

- uniform accounting treatment of fair value hedges, together with a simplification of hedge accounting requirements, could be introduced. All hedged items could be included in the same portfolio, whether or not the hedge is "highly effective", thus avoiding accounting asymmetries and an unnecessary increase in assets/liabilities valued at FV (see Section 4.1). This would attenuate income volatility and ensure that instruments that are matched economically are matched on the books as well. Of course, if a hedge is ineffective or introduces new risks (e.g. a cash flow risk due to margins on the derivative product) this should be clearly signalled as additional information (i.e. outstanding amounts, results, etc.).

Accounting rules should allow for prudential reserves – The broad consensus that risks materialize in downturns but tend to build up undetected during expansions (Borio *et al.*, 2001) has engendered proposals for reintroducing some kind of forward-looking provisions and reserves, which should work as automatic stabilizers and reduce pro-cyclicality. The tension between regulators and accountants on this issue could be addressed, for example, via the *credit value adjustments* (CVA) approach discussed in Section 3.4.1. In addition to CVA, the following changes in supervisory regulation could be considered:

- valuation adjustments could be introduced for marked-to-model products and illiquid instruments in general. The related reserves would recognize the uncertainty associated with the calculation of fair value for complex or illiquid products, giving a more reliable measurement of value than direct application of a point estimate of its fair value (see Viñals, 2008). These

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[148] See, for example, IASB (2009, 2008a).

[149] See Ryan (2008).

[150] Bolder proposals have also been made. Viñals (2008) and Clerc (2008) suggest adjusting fair value estimates to account for model, input, data or parameter uncertainty, or introducing these concepts into prudential regulation. Caruana and Pazarbasioglu (2008) argue that fair value should use not only the latest transaction price but also information on volatility and cyclical behaviour, as well as management's forecast of asset price progression. These proposals, appealing as they may be, raise problems of implementability and increased discretion.

[151] No relevant information on company performance would be lost, as the instruments would be aligned to current values and the changes in fair value would be reported in the notes (movements of AFS reserves).

reserves would not appear formally in the accounts but would count towards reducing regulatory capital and could be subjected to disclosure requirements;

- high initial valuation adjustments could be introduced for new or recently introduced instruments, declining gradually as information improves (e.g. the valuation adjustments could be eased when an instrument moves from OTC to a regulated market);

- the impact of the AFS reserves (discussed in section 4.1) on supervisory capital could be entirely eliminated.[152]

Risks need to be addressed more explicitly – It is now evident that in the run-up to the present crisis certain risks, first and foremost liquidity risk, were underestimated by market prices and mark-to-model approaches and had been fictitiously recorded as profits in previous years. To address this issue, mechanisms similar to the CVA approach discussed for loans in Section 3.4.1 could be flanked by alternative measures. The FASB and IASB are working to improve the guidance about valuation methodologies for illiquid assets, relying on risk-adjusted expected cash-flows.[153] During a crisis, however, adjusting for liquidity risk might drive prices down towards "distressed" levels.[154] To avoid this, liquidity risk premia estimates could take account of the holding period and the bank's ability to keep each instrument. The recent crisis has shown that this capacity depends on whether funding liquidity is short-term or long-term, an aspect that accountants and regulators alike have overlooked.[155]

Should the share of liabilities valued at FV be increased? – As noted, most of the liabilities side is being carried at cost today, although IAS/IFRS leaves intermediaries ample scope for choice. JPMorgan (2008) argues that FVA should be fully applied to liabilities as well. This would clearly reduce pro-cyclicality, but it is controversial: paradoxically, a deterioration in the company's credit rating would reduce the fair value of its liabilities and thus increase profits.[156] JPMorgan (2008) argues that this paradox could be handled by providing for full transparency of the effects in the accounts, leaving analysts free to assess the situation; furthermore, application of FV could be limited to actively traded liabilities. The proposal remains nonetheless highly controversial.

A minimum annual amortization of goodwill could be reintroduced – This would mitigate the negative impact of impairment when economic conditions turn adverse (impairment losses would be partially offset by the portion of goodwill that has already been amortized).[157]

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[152] Under the current regulation (drafted at the national level based on the recommendations of the Basel Committee and CEBS) the AFS reserves affect supervisory capital as follows: (i) reserves vis-à-vis loans and receivables are completely sterilized (they do not affect regulatory capital); (ii) for reserves vis-à-vis equity securities, an asymmetrical filter is applied: an increase in reserves concurs only partially to increase regulatory capital, whereas a decrease fully concurs to decrease it; (iii) for reserves vis-à-vis debt securities, banks can choose from either option (i) or (ii). Our proposal would reduce pro-cyclicality because it would completely eliminate the impact of AFS reserves on regulatory capital.

[153] See IASB (2008b, 2008c).

[154] This point is raised by the SEC (2008).

[155] Persaud (2008) argues that the total failure at the regulatory and accounting level to distinguish between agents with short-term funding (the first to run into trouble in a crisis) and those with long-term funding (the system stabilizers) contributed to the disproportionate growth of the former, and hence to the outbreak of the crisis.

[156] A quantification of the effect of application of full FVA to the liabilities side, and a discussion of the objections of this option is in IMF (2008b).

[157] The importance of this issue will show up in the balance sheets for 2008; for instance, Royal Bank of Scotland has announced large impairment losses on goodwill.

Enforcement needs to be improved – In the initial phase, controls on the application of the new IAS/IFRS standards may not always have been effective, in part owing to the excessive complexity and murkiness of some standards. The enforcement of accounting rules should therefore be tightened, as by assigning specific responsibilities to audit firms. To this end, it will be necessary to reinforce the coordination between supervisors, auditing firms and the accounting bodies.

It is also worth discussing some of the pro-cyclical factors recalled in Section 4.2 that pre-date the move to FVA but whose effects can be mitigated via appropriate amendments.

Consolidation and derecognition rules should be improved[158] – The treatment of off-balance-sheet assets may have major impact on pro-cyclicality through its effect on leverage, which we discussed in Section 3. Consolidation and derecognition are intertwined, as derecognition of assets sometimes involves the use of structured entities. The crisis has shown that the treatment of special purpose entities may be crucial in assessing a bank's risk exposure and resilience.[159] We have argued that the expansion of off-balance-sheet assets cannot be blamed on FVA, but it is clear that the way these assets are treated is decisive in assessing leverage, and hence in pro-cyclicality. Both IASB[160] and FASB have moved promptly to address the issue.

The IASB, in particular, in the proposed new standard on consolidation focuses: (i) on the introduction of a unique definition of control, to address perceived inconsistencies within current regulation between IAS 27 (which focuses on control) and SIC 12 (which focuses on risks and rewards and is referred to special purpose vehicles);[161] (ii) on enhancement of disclosure about consolidated and non-consolidated entities. Critics of this proposal maintain that the lack of clarity in the definition of control and the abandonment of the risk and rewards approach could determine a reduction of the consolidation area, compared to that resulting from the current rules.

The treatment of day-one profits could be reconsidered – As discussed in the previous section, the pro-cyclicality induced by the treatment of day-one profits cannot be attributed to FVA. However, the IASB is working on a proposal to reintroduce upfront recognition of profits also when prices are computed with the help of unobservable inputs, e.g. Level 3 assets.[162] However, the new approach – possibly motivated by harmonization needs (it would be similar to U.S. SFAS 157) – could heighten the incentive to create products or transactions that allow such upfront recognition. Moreover, both the absence of observable input and the greater discretion involved in marking to model could induce an underestimation of the risks. A possible solution to this incentive problem would be amortization of day-one profits over the term of the instruments.

Convergence in accounting rules should be speeded up – While similar in many respects, the two main accounting systems (GAAP for the U.S. and IAS/IFRS for the rest of the world) still have non-trivial differences. Convergence on truly global accounting standards should be speeded up, to ease comparisons and transparency and avoid regulatory arbitrage.[163] Although GAAP and

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[158] Derecognition is the removal of a financial asset from the balance sheet (e.g. through a sale in which the entity transfers to another party all of the significant risks and rewards).

[159] Financial Stability Forum (2008) highlighted "the need for clarity about the treatment of off-balance sheet entities and about the risks they pose to financial institutions".

[160] See IASB (2008d), according to which "a reporting entity controls another entity when the reporting entity has the power to direct the activities of that other entity to generate returns for the reporting entity".

[161] SIC 12 is an Interpretation of the accounting rules on consolidation, provided by the Standing Interpretations Committee of the IASB.

[162] See, in particular, IASB (2008e).

[163] In February 2006, FASB and IASB signed a Memorandum of Understanding for progressive convergence of accounting standards. The market turmoil has accelerated this process. On 27 August 2008, the Securities and

IAS/IFRS have similar requirements for financial instruments, they are still characterized by different approaches (the GAAP is more rule-based, the IFRS is more principle-based) that sometimes lead to divergent accounting treatment of the same transaction. One example is the treatment of day-one profits, just mentioned. Another example is the different approach to off-balance sheet arrangements: according to some commentators (JPMorgan, 2008) reliance by the IFRS on qualitative rather than quantitative tests for control compared to GAAP has been more effective at ensuring the consolidation of special purpose entities.[164]

Exchange Commission endorsed a road map that could lead to the use of IAS/IFRS by U.S. issuers beginning in 2014 (and in 2009 for about 110 top companies).

[164] See also SEC roundtable on the performance of IFRS during the market turmoil (August 2008; www.connectlive.com/events/secroundtable080408). During the roundtable, Deutsche Bank noted that upon conversion from GAAP to IFRS the group was required to consolidate many more special purpose vehicles, due to the different treatment of Qualified Special Purpose Entities (QSPE) that GAAP rules would allow not to consolidate. The conditions necessary for a SPE to qualify as a QSPE are defined in paragraph 35 of FAS 140. Notice however that in the proposed new standard on consolidation (see FAS 140 exposure draft) enterprises involved with qualified special purpose entities would no longer be exempted from consolidation.

5. MANAGERS' INCENTIVES

The principal-agent problems stemming from the inevitable conflict of interest between shareholders and managers require incentives to align the divergent motivations. The traditional view is that managers are naturally risk-averse and so need an incentive to undertake risky but profitable projects for the firm. Bonuses, options and restricted stocks are therefore typically included in the executive compensation structure to overcome risk aversion and heighten managers' willingness to bear risk.[165] These instruments are also used by companies to retain highly talented managers; in this case stock options, golden parachutes and very large bonuses play the role of "golden handcuffs": they work as monetary disincentives for valuable employees to leave.[166]

The current financial crisis has shown instead that managers of financial institutions may take risks that are excessive in relation to the interests of other stakeholders (small shareholders, banks' counterparties and the society at large).[167] In this section we discuss how this may be partly due to the incentive structure incorporated in remuneration schemes, which may encourage them to attach too much importance to short-term gains and correspondingly to underweight the risks and potential future losses. All in all, this accentuates the degree of pro-cyclicality of the financial system.

We first look at the compensation schemes of the managers of financial institutions (banks, investment funds, hedge funds). We then discuss the relationship between incentives and pro-cyclicality and examine the evidence. Finally, we review the solutions now under consideration within the financial industry and among regulators.

5.1 Incentives in the structure of managers' remuneration

Executive pay packages often consist of a base salary, resulting from a combination of position requirements and ability (termed "pay-for-the-job" and "pay-for-the-person" schemes in the literature), plus a variable performance-based component, which may involve annual cash bonuses, stock options and other long-term incentives (restricted stock plans).[168] To ensure that managers look after the interests of shareholders, the variable component (bonus plans, stock options) is generally linked to profits, but such plans can induce managers to take excessive risk, to increase current at the expense of future profitability and, more generally, to undertake actions that may not be in the shareholders' interests. Several interrelated mechanisms have been highlighted:

(i) Short-termism – Remuneration schemes based on short-term performance are common. Typically, the gauge of performance is accounting profit, which is inherently backward-looking, short-run, and to some extent subject to manipulation by the managers themselves. Such schemes may prompt executives to take excessive risk and to overlook inefficiencies and long-term underperformance in order to boost immediate results.[169] For example, in good times bank managers may opt for lax lending standards in order to artificially inflate short-term profits, despite the potential drain on future profits (see below). In a similar vein, especially when volatility is high, the

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[165] See Haugen and Senbet (1981), De Fusco *et al.* (1990), Guay (1999).

[166] See Cappelli (2000).

[167] See Becker (2008).

[168] See Murphy (1999), Lemieux *et al.* (2008).

[169] Incentives for managers to smooth the reported income stream have also been observed (see Healy (1985) and Fudenberg and Tirole, 1995). These clearly reduce pro-cyclicality but do not appear to have been predominant in the financial sector over the last decade.

managers of mutual funds or hedge funds may achieve some sub-periods (quarters, say) with positive returns even when the return for an entire year is negative. If managers are rewarded when they make profits but don't have to pay back when they underperform (see mechanism (ii)), they have an incentive to increase the risk of the portfolio (credit risk, return volatility, etc.).

(ii) Discontinuity, asymmetry of incentives – The structure of bonuses and stock options is discontinuous and asymmetrical. Bonuses are typically awarded if some threshold performance is achieved, and stock options are exercised if they are in the money; but if the performance is negative or the stock price declines, the manager owes nothing to the firm. This produces a powerful incentive to take risk in order to reach the threshold (say, by advocating projects with low or even negative net present value and a high risk profile that the manager would not have considered save for the discontinuity; see mechanism *(vi)*).

(iii) Fake alpha[170] – As the financial crisis has revealed, bonuses are often paid based on deals that entail large immediate gains but also large risks. However, these risks were largely overlooked, as managers generated income that appeared to stem from their superior abilities but was actually just a market risk premium.[171] Even though the bank had risk managers whose job is to contrast this tendency, risks were overlooked for at least two reasons. First, *ex ante*, risk remuneration is hard to disentangle from true "alpha", so that accurate assessment often doesn't come until after the risks have materialized as actual losses; this is especially true for tail risk – risk related to events that are rare or hard to foresee (see below). Second, top managers are themselves partly remunerated on the basis of short-term earnings through bonuses and stock options (to the extent that high short-term earnings help boost stock prices), so they may also have incentives to overrule risk managers.[172]

(iv) Unintended consequences of incentive schemes – A relatively new empirical literature suggests that incentive schemes may have unintended consequences that are detrimental to shareholders: managers may persuade the executive compensation committee to award them options in advance of favourable earnings announcements;[173] they can use hedging instruments to reduce the risk associated with their ownership stake in the firm if they foresee stock price volatility;[174] they may deliberately distort financial statements, or even misreport.[175] Finally, there is evidence that incentives may interact with governance structure to produce suboptimal results.[176]

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[170] According to the CAPM model, returns reflect systematic risk (beta risk) and the value that the manager's ability contributes to the investment process (alpha). See e.g. Rajan (2005).

[171] The *Shareholder Report on UBS Writedowns* says: "The CDO desk received structuring fees on the notional value of the deal, and focused on Mezzanine ("Mezz") CDOs, which generated fees of approximately 125 to 150 bp (compared with high-grade CDOs, which generated fees of approximately 30 to 50 bp)." (p. 13). The greater fee income from riskier, lower quality mortgages fed directly to the originating unit's bottom line, even though this fee income was, at least in part, compensation for the greater risk of being stuck with unsold securities if market conditions turned (as reported in Kashyap *et al.*, 2008).

[172] A risk manager at one large global bank reported: "Traders saw us as obstructive and a hindrance to their ability to earn higher bonuses…..Most of the time the business line would simply not take no for an answer, especially if the profits were big enough." (*The Economist*, 7 August 2008). Similarly, a recent review of risk management practices by financial institutions reports "At most firms, risk managers are not viewed as 'profit centers', so they lack the clout of the money-makers on the trading desk. That was especially true at the tail end of the bubble, when firms were grabbling for every last penny of profit" (see the article by J. Nocera, *New York Times*, 4 January 2009).

[173] See Yermack (1997). Similarly, Aboody and Kasznik (2000) suggest that executives may manage the timing of their disclosures opportunistically (delaying the announcement of good news and rushing bad news forward) so as to maximize the value of their stock options.

[174] See Bettis *et al.* (2001), for the thesis that risk-averse managers are more likely to diversify their holdings as their wealth in the firm increases and when they are exposed to increased volatility.

[175] See Burns and Kedia (2006, 2008). Efendi *et al.* (2007) find that the likelihood of a false financial statement is significantly greater when the CEO has very sizable holdings of in-the-money stock options. Benmelech *et al.* (2008)

(v)   Large incentives may induce fraud – Recent evidence supports the economic theory of crime proposed by Becker (1968), revealing that executives are more likely to engage in fraudulent behaviour when the payoff is greater. In particular, the likelihood of corporate fraud has been found to be positively related to incentives from unrestricted stockholdings, whereas it is not correlated with incentives from restricted stock and unvested and vested options.[177] Moreover, unrestricted stockholdings are the main form of managerial incentive in the firms under SEC investigation for fraud, whereas in the control group of firms the main form is vested options.

(vi)   Drawbacks of stock options – Since stock options turn paid managers into part-owners, they should mitigate incentive problems, but the incentives produced by stock options don't mimic those of straight stock ownership. For one thing, the value of the option increases with the volatility of the company's stock. Thus, option-loaded CEOs have an incentive to go for risky projects and to disregard early signs of failure.[178] Second, they have an incentive for buy-backs in order to boost stock prices, whether or not this maximizes the long-term value of the company.

(vii)   The golden parachute trade-off – The original motivation for the "golden parachute" was to give managers the incentive to maximize the value of the firm by sheltering them from worry over losing their job if control changed hands. But the scheme may also create a perverse incentive to drive the stock price down and make the firm an attractive takeover target, especially in the case of poorly performing firms that require substantial turnaround effort.

(viii) Incentives specific to asset managers – The remuneration of asset managers is characterized by industry-specific incentives, in addition to those just seen. First, payoffs are directly related to performance through incentive fees. Hedge fund managers, for example, usually receive 20% of the fund's excess return over a given benchmark. This incentive fee may induce managers to make risky investments for high returns. Second, fund managers' remuneration is also linked to performance indirectly, in that it depends on total assets under management.[179] Chevalier and Ellison (1997) show that young investment funds tend to have the convex flow-performance relationship graphed in Figure 5.1: investors quickly move their money into funds that have been successful in the recent past, but are slow to disinvest in poorly performing funds. As a result managers are likely to concentrate on the upside and overlook downside risks, as the materialization of the former boosts inflows strongly and the latter increase outflows only mildly.[180] Finally, fund performance is often gauged in relative terms, against an industry benchmark. This can create two perverse incentives:[181] (a) underperforming managers may try to catch up by taking additional risks that are not in their

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study the trade-off, typical of a non-linear compensation scheme, between managers' effort and truth-telling behaviour.

[176] Core *et al.* (1999) argue that firms with weaker governance have greater agency problems; that CEOs at firms with greater agency problems receive greater compensation; and that firms with greater agency problems perform worse.

[177] See Johnson *et al.* (2009). Bruner *et al.* (2005) find that equity compensation increases effort but also managerial fraud. Vesting mechanisms allow employees to acquire incentives only gradually, over time. For instance, a typical vesting mechanism may envision a 25% "cliff" at the end of the first year, and monthly vesting of the remaining 75% over the following 3 years. That is, the employee gets nothing if he leaves the company before a year, 37.5% of the benefits (stocks, options) if he leaves after 18 months, and so on. Various vesting schedules (frontloaded, backloaded, etc.) can be used to attune the incentive to stay with the company.

[178] See Sanders and Hambrick (2007).

[179] Hedge fund managers, for example, are typically paid a fixed fee of 2% of the assets under management.

[180] The figure suggests that at extreme positions these incentives may reverse: managers well behind the market may want to reduce their risk in order to avoid large outflows, whereas those well ahead of the market may have a strong incentive to gamble in an attempt to qualify as "top performers" of the year.

[181] See Rajan (2005).

benchmark and are hidden from investors;[182] (b) managers may be tempted to herd with other managers in order to be sure that they will not underperform their peers.[183] In periods of rising prices these two incentives may reinforce each other and make the system pro-cyclical, moving asset prices away from fundamentals and increasing the likelihood of sharp realignments.

Figure 5.1

US mutual funds return performance and inflows[1]
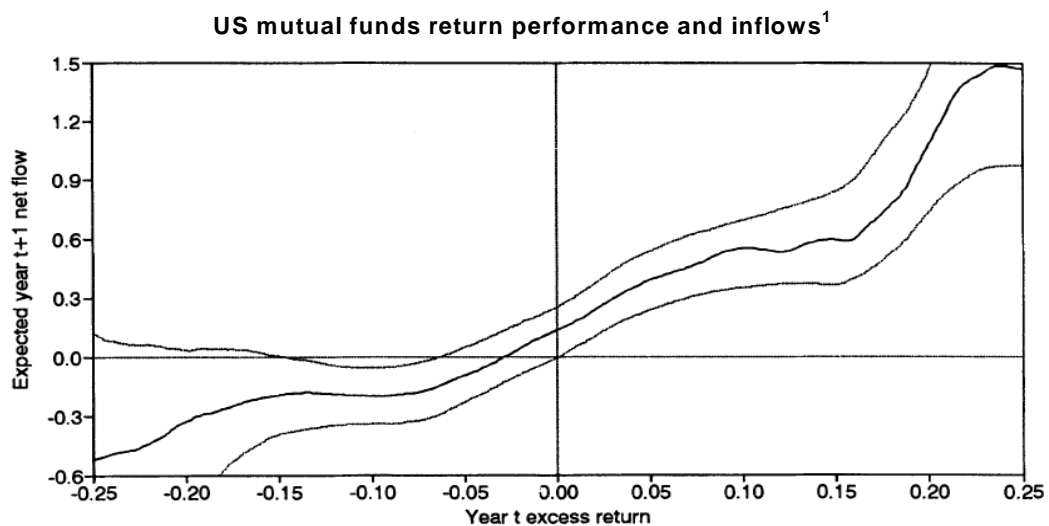
[1] Flow-performance relationship for young funds (2 years) with 90 per cent confidence bar.
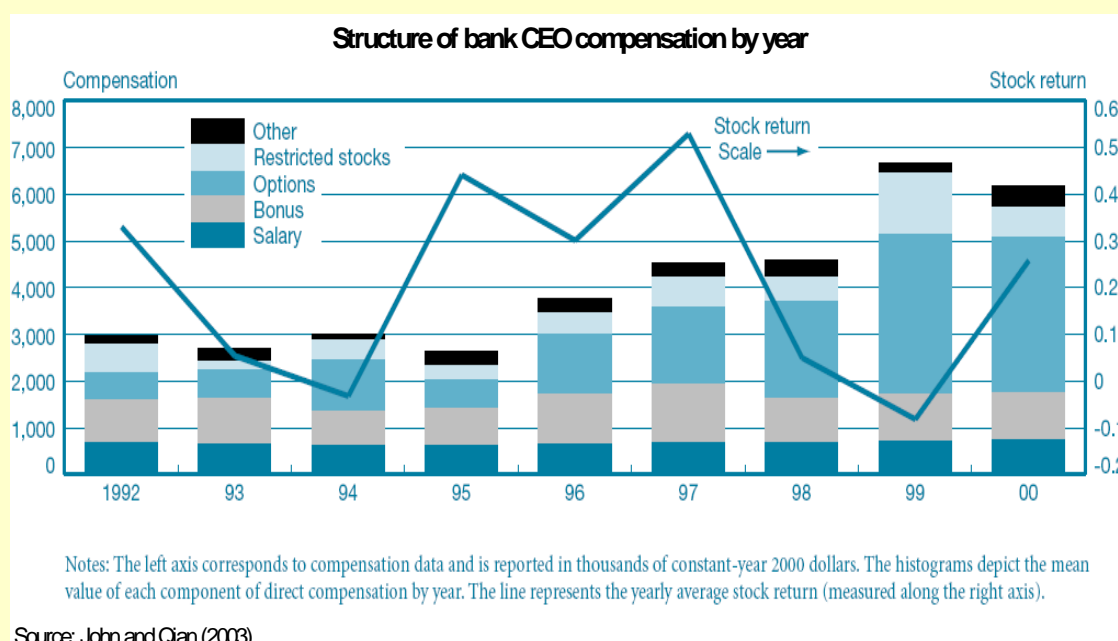Source: Chevalier and Ellison (1997).

Box. Recent trends in bank executives' compensation

During the deregulation period of the nineties, as banks tilted their product mix toward fee-based income and away from traditional lending business, the average pay level for the CEOs of U.S. banks increased much faster than nominal GDP.[1] This increase reflects the variable, incentive-related component of the compensation, while the fixed component (the salary) remained unchanged (fig. 5.2).[2]

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[182] For example, a fund manager who buys AAA-rated tranches of CDOs gains excess returns over similar AAA-rated bonds, but that return is in reality remunerating the default risk and liquidity risk of the CDO. The high rating allows the manager to create a fake alpha, obtaining excess return with no apparent additional risk.

[183] Kashyap *et al.* (2008) quote Citigroup Chairman Chuck Prince describing why his bank continued financing buyouts despite mounting risks: "When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing".

Figure 5.2

Structure of bank CEO compensation by year

Notes: The left axis corresponds to compensation data and is reported in thousands of constant-year 2000 dollars. The histograms depict the mean value of each component of direct compensation by year. The line represents the yearly average stock return (measured along the right axis).

Source: John and Qian (2003).

The reasons for this surge are still open to debate. One view is that the use of stock options and other non-cash compensation schemes was fostered by fiscal and accounting rules aimed at curbing top executives compensation. In particular, in 1993 the U.S. Congress passed the Omnibus Budget Reconciliation Act, which defined non-performance related compensation of managers in excess of $1 million "unreasonable" and therefore not deductible for corporate income tax purposes. Jensen and Murphy (2004) point out that although the objective of the new regulation was to curb "excessive" CEO pay levels, the ultimate outcome was a significant increase in executive compensation. In fact, as soon as the Act introduced the $1 million threshold, many companies increased cash compensation to that threshold and began to add option grants that *de facto* restored the tax deductibility of pay in excess of $1 million. Jensen and Murphy (2004) also report that the Deficit Reduction Act of 1984, whereby the U.S. government imposed a special excise tax on payments exceeding three times the executive's average remuneration, had similar unintended effects. The Act was meant to reduce the generosity of parachute payments, but apparently it spurred adoption in many companies that had not heretofore used them.

Accounting rules have also played a role in fostering the increase in managers' compensation. In the U.S., until 2006 option grants were not expensed in the firms' income statement: since stock option compensation expense was based on the "intrinsic value method" at the grant date, by issuing stock options to employees with strike prices equal to current market prices no compensation expense was recognized.[3]

A different view suggests that the great increase in the relative compensations in the financial sector over the past 20 years was due mainly to deregulation and the resulting increase in competition. Philippon and Reshef (2009) find that deregulation accounts for 83% of changes in the relative compensation of the U.S. financial sector (with respect to the rest of the non-farm private sector) from 1909 to 2006. In a similar vein, Cuñat and Guadalupe (2009) argue that deregulation and increased competition in the nineties triggered an increase in the variable component of pay (whereas the fixed component fell).

There is now a rapidly growing consensus that compensations in the financial sector have

become excessive. A measure of excess compensation in the financial sector computed by Philippon and Reshef (2009) shows that current compensation levels are even higher than those last seen during the Great depression (Figure 5.3). Analogously, figure 5.2 loosely suggests that, at least in the banking industry, the connection between performance and top managers' compensation is weak at best.

Figure 5.3

Excess compensation in the financial sector
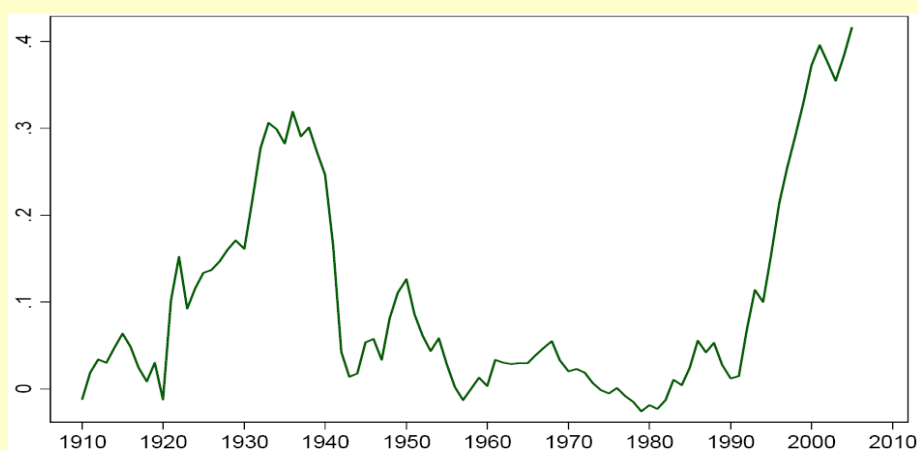
Source: Philippon and Reshef (2009). The figure reports the relative (excess) wage of the U.S. financial sector (with respect to the non-farm private sector).

The recent crisis corroborates the evidence of excessive compensation levels and weak relationship between pay and performance in the financial sector. In 2007 Wall Street bonuses declined by just 2%, to a total of $33.2 billion, even though the crisis battered profits.[4] The decline in 2008 was sharper, 44%, but it still left total bonuses well above $18 billion, at a time in which massive support from the U.S. government was essential to avoid the collapse of the system.[5]

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[1] See Brewer III *et al*. (2003, 2004), Philippon and Reshef (2009).

[2] See John and Qian (2003), Cuñat and Guadalupe (2009).

[3] In 1995 attempts by the Financial Accounting Standard Board to require firms to measure option value based upon the "fair value method" were rejected by the U.S. Congress; the FASB managed nevertheless to make firms disclose in the notes of their financial statements what stock-option expenses would have been according to the Black-Scholes or binomial option pricing methods. The issue of expensing stock-options returned to the front burner in mid-2002 with the Enron collapse. In December 2004 the FASB released Statement n. 123 (Revisited) *Share-Based Payment*, requiring public and non public companies to report stock-based compensation in their income statement starting in 2006.

[4] See New York State Comptroller's Office news releases (2008). This behaviour, possibly driven by the fear of losing high-performing employees, may have been modified lately. For example, some CEOs of top European and U.S. banks have recently announced their willingness to forgo their 2008 bonuses. Such announcements have been made, among others, by executives of Goldman Sachs, Barclays, Deutsche Bank and UBS.

[5] See New York State Comptroller's Office news releases (2009). The decline in the value of bonuses may partly reflect the limits on executive pay imposed by the federal Troubled Asset Relief Program.

5.2 Incentives and pro-cyclicality

Do the incentive-based remuneration schemes adopted by financial firms aggravate pro-cyclicality? While not all the mechanisms reviewed in the previous subsection are directly relevant, we have seen that most of them encourage risk-taking and some may induce managers to conceal risks. Insofar as risks are more easily taken in upturns and tend to materialize and worsen in downturns, the answer is that the schemes do foster financial sector pro-cyclicality. The substantial increases in the incentive-related component of executive compensations in recent years (see box) suggests that their importance for pro-cyclicality has also increased.

Only a few studies have sought to gauge the practical relevance of incentives and their direct and indirect effects on pro-cyclicality, probably because of the scarcity of reliable data on executive compensation. Evidence of excessive short-termism (incentive (i)) has been found for the banking sector. Caballero *et al.* (2008) show that in Japan, during the 1990s banks were able to comply with capital requirements only by "ever-greening" loans to unprofitable firms ("zombie lending"). They also argue that the flow of credit to otherwise insolvent borrowers comes at the expense of profitable firms, which are crowded out and end up suffering from credit rationing. This observation is fundamental in assessing the implications for pro-cyclicality: although forbearance lending might be considered counter-cyclical (because it ensures funding to otherwise insolvent borrowers), it is precisely during a downturn (i.e. when there are many zombies around) that capital allocation worsens and less credit is available to good borrowers, exacerbating the initial difficulties and possibly triggering a credit crunch.

Another instance of short-termism is the tendency for bank managers to charge excessively low lending rates and thus to underprice the put option that is implicitly granted to borrowers through non-recourse mortgage loans.[184] This increases the pro-cyclicality of credit: during expansions, excessively low rates may play a role in inflating a real estate bubble (which in turn sustains economic activity), but in downturns a decline in house prices will cause more defaults, which may impair bank capital, reduce credit supply and worsen the downturn. And in fact the recent evidence is that non-recourse loans played a crucial role in precipitating the current housing crisis. Bajari *et al.* (2008) find that the main driver of the recent wave of defaults in the U.S. subprime market was the nationwide fall in home prices. The decline in home prices caused many borrowers' outstanding liability to exceed their home equity, so that default would actually increase their wealth.[185] In a similar vein, Dell'Ariccia *et al.* (2008) find that mortgage delinquency rates in the U.S. between 2000 and 2006 rose more sharply in areas that experienced larger increases in the number of loans originated and lending volume and were positively correlated with looser lending standards (low denial rates, high loan-to-income ratios). They also find that the slackening of lending standards coincided with other facts often associated with aggregate boom-bust credit cycles, such as financial innovation (securitization), increased bank competition, fast-rising house prices, and ample aggregate liquidity. Evidence that strong credit growth and lenient credit standards led loan losses is also reported by Jiménez and Saurina (2006).

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[184] Non-recourse loans are debt contracts for which the borrower is not personally liable (in case of default, the lender's recovery is limited to the collateral pledged). In the U.S. non-recourse loans are typically used to finance real estate purchases. Effectively, these loans grant the borrower an implicit put option on the collateral: by defaulting, in practice the borrower sells the collateral to the bank for outstanding loan balance (in the literature this is usually referred to as "put option component of mortgages"; see Crawford and Rosenblatt, 1995, and Vandell, 1993). Pavlov *et al.* (2004) model the banker's incentive to underprice the loan, observing that the incorrect valuation of the put option results in an inflated asset price.

[185] See also Gros (2008). According to Morgan *et al.* (2008), another important factor in the recent housing crisis was the 2005 Bankruptcy Abuse Reform, which helped to increase foreclosures.

A third example of how short-termism may impact on pro-cyclicality is provided by Jensen (2005). He argues that when the firm's stock price is overvalued, managers cannot attain the performance needed to justify the high stock price except by pure luck. Overvalued equity therefore creates an incentive to do whatever it takes to keep the firm's stock price at a high level. This mechanism would help to make a generalized stock market boom self-sustaining, aggravating the subsequent correction.

Regarding stock options (mechanism (vi)), while the evidence that CEO option-based compensation increases a firm's risk is abundant, we could not find evidence that it induces *excessive* risk-taking.[186] At the same time, from 2000 through 2007 the eight largest U.S. commercial and investment banks[187] repurchased a combined $174.5 billion in stocks ($27.7 billion in 2007). This choice seems questionable, at least in retrospect.

Figure 5.4

Incentive fees and risk taking of hedge funds (1991-2008)
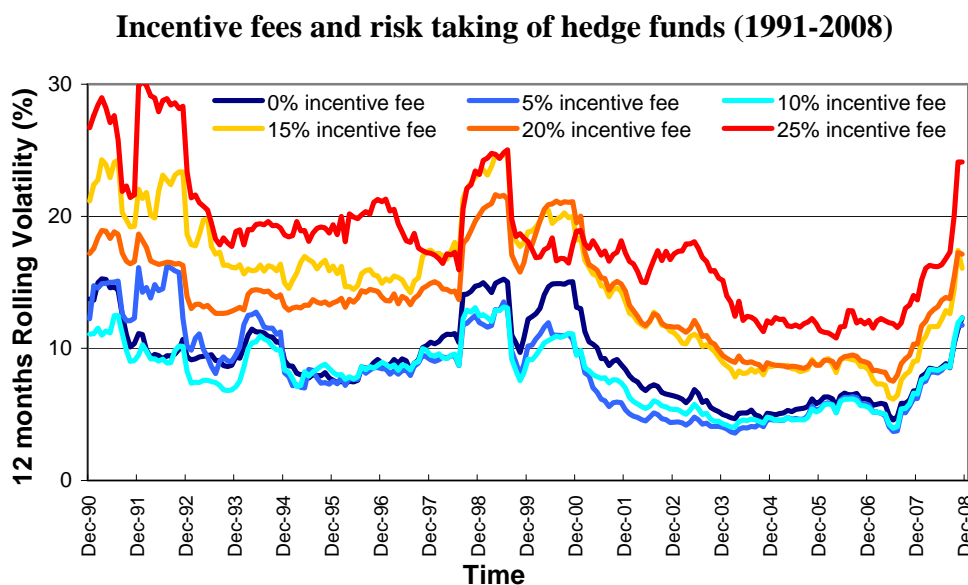
Source: Bank of Italy calculations on HFR data. Annualized monthly standard deviation of returns over a 12 months period, for a sample of around 6.900 hedge funds, grouped based on the level of their incentive fees.

In the asset management industry, incentive fees are associated with better performance on a risk-adjusted basis, suggesting that they alleviate agency problems.[188] However, mechanism (iii) above illustrates the incentive to generate fake alpha and the empirical difficulty of disentangling fake from true alpha – i.e., of computing properly risk-adjusted returns. In fact, the evidence suggests that true alphas are difficult to generate.[189] This conclusion is reinforced by the recent

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[186] Cohen *et al*. (2000) find that stock option programs are associated with increased bank risk, but they find no evidence that the increase is large or damaging to shareholders. Chen *et al*. (2006) find that risk impacts on compensation and option-based wealth. Mehran and Rosenberg (2007) find that an increase in the volatility sensitivity of a CEO's option portfolio (that is the change in his wealth for a given change in the standard deviation of stock returns) results in increased risk for the bank the following year through riskier investment decisions.

[187] Bank of America, Citigroup, Goldman Sachs, Merrill Lynch, Morgan Stanley, Lehman Brothers, JP Morgan and Bear Stearns. See Lazonick (2008).

[188] Ackermann *et al.* (1999) find a positive correlation between the Sharpe ratio and incentive fees of hedge funds. For mutual funds Massa and Patgiri (2007) find that contractual incentives increase risk-adjusted returns. Kouwenberg and Ziemba (2007) find that a 20% incentive fee reduces funds' average return and the Sharpe ratio; but for funds of funds, incentive fees appear to increase both risk and return, not worsening risk-adjusted returns.

[189] Fung *et al.* (2008) find that few funds generate positive alpha. Cesari and Panetta (2002) find that funds have no superior performance once management fees and other costs are taken into account. Similarly, the overperformance

crisis: investment strategies that were thought to generate extra-performance were in fact only apparent, in that returns turned negative as soon as the risks materialized. The limited empirical evidence appears to suggest that incentive fees are positively related to risk.[190] In fact, over the last eighteen years the group of hedge funds with higher incentive fees also exhibited higher volatility (figure 5.4).

5.3 Proposals to reshape incentive mechanisms

Executive incentive schemes were an important factor in preparing the way for the financial crisis, and this realization is generating proposals for sweeping change. The point is that compensation policies were designed to increase expected profits but – and this is especially true in the financial sector – higher returns are associated with higher risk, so high-powered incentives may tempt managers to go well beyond the range of acceptable risk-return combinations.

Our review has emphasized two basic principles for compensation reform: that the parameters for variable remuneration should be adjusted for risk and that remuneration should be linked to long-term profitability; the variable component should be linked to future outcomes, as in deferred bonuses, long-term cash incentives and restricted stock grants, claw-back clauses, and longer vesting horizons.[191] Regardless of the specific instrument, the key parameters are the risk-adjusted return, the length of the calculation horizon, and the timing of payments.[192]

In response to the pressure from government leaders who are imposing conditions for public support and rethinking regulation (see below), to wide media coverage of the compensation issue and to mounting pressure from public opinion, financial institutions have started moving in this direction. Several banks and banking associations have announced revisions to pay packages. For example, Morgan Stanley will withhold a portion of its employees' bonuses for three years, and will pay them only if the performance of the investments decided by the employee turns out to be positive. In Europe, the French Banking Federation, following the recommendations of the Institute of International Finance (2008), has issued guidelines under which the variable component of bankers', traders' and fund managers' pay will be based on net profits (taking into account all costs, including risk) and will be paid over many years on the basis of the profitability of the firm, not that of the operations of the single employee.[193]

Reforming executive remuneration is no easy task, however. First, risk adjustment methods are hard to apply because, as we have seen, genuine performance is hard to disentangle, *ex ante*,

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of hedge funds may simply reflect (hidden) liquidity risk, which is hard to detect until a liquidity shock occurs. Gibson and Wang (2008) show that the positive risk-adjusted returns of hedge funds reflect liquidity risk premia, not superior managerial skills.

[190] Elton *et al.* (2003) show that incentive fees add convexity to the flow-performance relationship illustrated under point *(viii)*, thus magnifying intertemporal risk shifting. See also Kouwenberg and Ziemba (2007).

[191] See e.g. Andergassen (2008) for evidence that increasing the stock option vesting period mitigates conflicts of interest between managers and shareholders. Deferred bonuses are paid in tranches through the lifetime of the transaction. Long-term cash incentives are typically based on a three- to five-year performance period; most companies use a single performance measure (e.g. stock returns relative to an industry index). Restricted stock grants allow managers to acquire stocks after some time (generally three years) only if he is still with the firm and the firm has reached specified targets. Claw-back clauses allow the firm to reclaim part of the bonuses if *ex post* performance falls short of pre-specified targets.

[192] Several mechanisms have been proposed to implement these principles. For example, Edmans *et al.* (2009) suggest that the manager's remuneration should be placed into an escrow account, invested in the firm's stock and in cash. As the stock price changes, the account is continuously rebalanced in order to maintain the proportion invested in stock constant; this ensures that the manager has adequate incentives even when the stock price falls.

[193] The code will be compulsory and will apply to the 2009 bonuses of French financial firms to be paid in 2010.

from simple risk remuneration. Second, measures that lengthen the horizon of managers' remuneration schemes mitigate short-termism but at the same time reduce the manager's incentive to exert effort. That is, there is a trade-off.[194] Third, the mismatch between bonus frequency and the time when risks and losses materialize can be very great,[195] and managers could manipulate the risk profile of the bank so that large losses are unlikely during the relevant period for bonus calculation. Fourth, many of the firms that have failed in this crisis were in compliance with best practice standards in such key areas as board independence, separation of chairman and CEO positions, incentives and remuneration.[196] Finally, experience has shown that stricter rules on managers' remuneration are prone to elusion.[197] These problems notwithstanding, mechanisms connecting compensation to long-term risk-adjusted firm profitability are likely to become quite widespread.

Progress in other directions is necessary. Banks should adapt their organization to promote models that emphasize the importance of teamwork in well-organized structures over that of individual talents. This would likely improve productivity (which depends much more heavily on the firm's organizational structure than on the ability of the managers)[198] and limit the excessive bargaining power of individual managers (clearly one of the main drivers of the high-powered compensation schemes).

Banks' governance is also crucial. The key shareholders of major banks bear heavy responsibility for condoning the behaviour that helped cause the financial crisis. A thorough review of bank governance should assess the adequacy of internal decision-making processes in several respects, from the mechanisms for determining managers' remuneration schemes, in order to remove conflicts of interest,[199] to the role of risk managers. For example, Brunnermeier *et al.* (2009) propose that a compensation committee be set up in each firm to make informed judgments on pay levels and structure and ensure alignment with shareholders' interests. A similar committee is required for TARP recipients by the American Recovery and Reinvestment Act of 2009.

Internal risk management systems must be reinforced, to reduce the danger of their position being overruled and to improve estimates of tail risk. In order to limit risk-taking, the first safeguard would be to strengthen risk management, its proficiency but also its independence and importance within the power hierarchy of the banks. As a general rule, traders should not be allowed to override risk managers, and risk managers should report directly to top management or to the board. Risk management should use accounting valuations and current market prices and volatilities only as a starting point; a wider range of factors should be taken into account to assess risk exposures; this highlights the role of experience and of the human factor as against the mechanical application of analytical models. The need for qualitative assessments is greatest in dealing with complex products, whose valuation is highly uncertain.

Independent directors, powerful internal and external audits, and abundant information flows among all the relevant actors should all contribute to a system of checks and balances that should

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[194] Rajan (2005) argues that investors themselves may lack the incentive, or be unable, to devise adequate incentive schemes for managers. Moreover, measures linking bonuses to firm-wide performance could discourage managers' effort; and they might appear inequitable in multi-functional firms; see Brunnermeier *et al.* (2009).

[195] According to Taleb (2009), it ranges from 5 to 20 years.

[196] See Berrone (2008).

[197] For instance, stock options became common after the U.S. Congress attempted to cap top executives' remuneration (see box). Another example is the Sarbanes-Oxley Act of 2002, which includes a claw-back provision (Section 304) for recouping compensation paid to CEOs and CFOs but it does not specify what misconduct is sufficient to trigger recoupment. As a result, firms have been over-restrictive in interpreting the circumstances for claw-backs and the executives to whom they would apply.

[198] See for example Ciapanna and Viviano (2009). Hart and Moore (1990) argue that if an agent is indispensable to an asset, then he should own it.

[199] For example, Montagnon (2008) notes that boards decide directors' pay and directors sit on boards.

ensure internal debate about acceptable risks and mitigate their weight in financial institutions' portfolios.

But market discipline has its limits. An active role for regulators and supervisors in a matter such as that of remuneration, typically left to private contractual arrangements, is probably warranted when it comes to banks and other systemically relevant institutions, whose CEOs have strong incentives to invest in risky assets and, if they lose their bets, end up dumping the loss on the taxpayer. Regulatory policies should aim, first of all, at improving disclosure on incentives. In this vein, the Bank of Italy has recently issued rules requiring supervised banks to disclose detailed information on their compensation policy. Banks must inform shareholders of managers' actual remuneration, indicating the fixed and the variable component, the breakdown between performance-related payments in cash or in other financial instruments, and the benefits granted to the manager in case of employment termination (Bank of Italy, 2008, 2009).

Supervisors are pushing banks to carefully scrutinize the effects of compensation schemes to make sure they are consistent with sound risk management and with the firm's stated risk appetite (see FSA, 2008). They are also considering options to link capital requirements to the risks caused by misconceived remuneration schemes[200]: the incentives for executives to assume excessive risks in search of short-term gains should be recognized as an explicit source of risk for the bank and taken into account in capital requirements. As with other proposals, the problem is that risk may be hard to spot in advance and that banks might invest in risks not yet fully understood and monitored (liquidity risk is a good example, given what has happened over the past few years).

Lawmakers are also focusing on executive compensation schemes and transparency. The U.S. Congress has approved a binding set of restrictions on executive pay, limiting bonuses to one third of total compensation and making them payable only in stocks that vest once the bailout funds have been repaid. Other countries are moving in the same direction. Some analysts argue that this could discourage financial firms from seeking government aid and possibly induce those that have already received it to repay over hastily. Moreover banks might try to get around the restrictions by boosting base salaries, a counterproductive effect since this component is not linked to performance. Nevertheless, even the critics concede that the case for such restrictions on banks whose survival depends on public money is very strong indeed. In any case, the restrictions need to be followed by a more comprehensive reform of executive remuneration to address the perverse incentives discussed above in the long run.

Summing up, a very broad consensus is emerging on the need for actions to avoid excessive risk-taking by managers through market discipline and self-regulation on the one hand and regulatory and supervisory policy on the other. It is crucial, in particular, not only to modify compensation policies but also to strengthen the corporate governance of financial institutions. But it must be recognized that the trade-off between risk and efficiency cannot be eliminated. Financial firms will always have incentives to retain top employees, given the competition for talent, and this will require high-powered pay-for-performance schemes, which create incentives to exploit any shortcomings in internal risk measurement systems. Nevertheless, incentive policies are still a crucial factor for market participants and regulators in working to design a new financial framework.

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[200] See "FSA to consider bonus clampdown", interview with Lord Adair Turner, Chairman of the UK supervisory body (FSA) on *BBC News*, 22 September 2008. See also Draghi (2008a, 2008b).

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