

## E THE IMPACT OF DIFFERENT BANK CHARACTERISTICS ON RISK AND PERFORMANCE<sup>1</sup>

*This special feature outlines the evidence on the relationship between different bank characteristics and risk before and during the recent financial crisis. A significant amount of bank risk materialised during the crisis. It is argued that two major structural developments in the banking sector (namely deregulation and financial innovation) probably had a large effect on banks' business models and capital levels. This, among other factors, affected banks' incentives to take on new risks in the decade leading up to the crisis. The empirical evidence from a number of studies suggests that banks with higher levels of capital, more stable funding and stronger risk controls performed better during the recent crisis. It also suggests that greater regulation of banks experiencing large increases in stock market valuation is warranted. The main empirical findings are in line with the Basel III recommendations.*

### INTRODUCTION

The assessment and management of risk are two of the banking sector's core activities. Indeed, a basis for the existence of banks is that they are better than other institutions at screening and managing risks, implying that they can act as delegated monitors for uninformed depositors.<sup>2</sup>

Despite this role, the materialisation of risks observed during the recent crisis raises significant doubts as to whether banks were provided with the right incentives to manage risk effectively. It is likely that certain structural developments occurring within the banking industry over the last two decades have changed banks' business models and affected their incentives regarding risk-taking.<sup>3</sup> This is the theme of this special feature, which, first, reviews the accumulated evidence regarding the impact that banks' business models have had on their performance and the risks they have faced. It then looks at the structural changes brought about by deregulation and financial innovation

in the run up to the crisis; changes that have made the banking industry significantly more complex, larger and more dependent on financial markets. It concludes by analysing the evidence on the realisation of bank risk during the financial crisis period and its implications from a regulatory perspective.

### PREVIOUS LITERATURE

A bank's business model has traditionally been considered a major determinant of the risks it faces. Hence, even prior to the crisis, a number of studies had focused on the relation between bank risk and certain characteristics, such as capital, funding sources, corporate governance and diversification.

Conditional on the particular focus and modelling approaches, the literature provides contradictory results on the impact of capital on bank risk. In principle, the higher the capital reserves, the stronger the cushion to endure losses. Higher capital also lowers the incentive to shift risk from shareholders towards exceptionally risky projects at the cost of debt-holders. This is especially the case in the banking sector where a quasi-flat (i.e. not fully risk-adjusted) deposit insurance exists, which can create incentives for shareholders to take on excessive risk in order to optimise the option value of the deposit insurance.<sup>4</sup> Recent studies also find that a higher level of capital is conducive to a more rigorous screening of borrowers, thus implying less bank risk.<sup>5</sup> However, a positive relationship between capital and risk may also exist. Increasing leverage can reduce agency conflicts between managers and

- 1 This special feature draws on Y. Altunbas, S. Manganelli and D. Marques-Ibanez, "Bank risk during the financial crisis: Do business models matter?", *ECB Working Paper Series*, No 1394, November 2011.
- 2 D.W. Diamond, "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies*, 51, 1984.
- 3 A. Boot and A.V. Thakor, "The Accelerating Integration of Banks and Markets and its Implications for Regulation", in A. Berger, P. Molyneux and J. Wilson (eds.), *The Oxford Handbook of Banking*, 2010.
- 4 S. Bhattacharya and A.V. Thakor, "Contemporary banking theory", *Journal of Financial Intermediation*, 3, 1993.
- 5 H. Mehran and A.V. Thakor, "Bank Capital and Value in the Cross-Section", *Review of Financial Studies*, forthcoming.

shareholders, since informed debt-holders could intensify the pressure on bank managers to become more efficient.<sup>6</sup>

A positive empirical relationship between bank capital and risk can exist if regulators (or the markets) force riskier banks to build up capital. Overall, the empirical literature tends to find that higher capital levels increase bank soundness. In this respect, higher quality (i.e. core) forms of capital are found to be particularly helpful during crisis periods.<sup>7</sup>

Another influential determinant of bank risk is the funding structure. The years preceding the crisis saw a rapid growth in off-balance-sheet financing by banks following the massive expansion of securitisation markets. This changed the role of banks and their business models, dramatically altering their incentives to hedge and take on new risks.<sup>8</sup> From the perspective of individual banks, securitisation allowed banks to manage and diversify their credit risk portfolio more easily.

However, banks might also have responded to the static reduction in risks resulting from securitisation by taking on new ones, for instance by loosening their lending standards, increasing their leverage, or becoming systemically riskier.<sup>9</sup>

Leading up to the crisis, banks also borrowed more intensively from wholesale markets through instruments such as covered bonds, repurchase agreements and commercial paper. Prior to the crisis, most of the earlier literature pointed to the benefits derived from the use of market financing. Banks could, in the wholesale markets, raise large new amounts of funding swiftly and at relatively low cost. Compared with depositors, financial market investors were expected to provide more market discipline.<sup>10</sup> The recent financial crisis has illustrated that market sources of funding are heavily dependent on market perceptions, raising concerns about the monitoring role of wholesale investors. By contrast, retail deposits tend to be more stable in periods of crisis since they are typically insured by the government.

A further element has been a geographical expansion, which usually coincides with high rates of credit growth. Historically, most systemic banking crises have been preceded by periods of excessive lending growth.<sup>11</sup> Microeconomic evidence from large international banks suggests that loan growth represents an important driver of risk.<sup>12</sup>

The other business aspect that can have a major impact on bank risk is the trend towards more diversification in sources of bank income and an expansion of non-interest income revenues which can provide banks with supplementary sources of revenue. Such diversification could, in principle, bring about stability in overall income. However, as this category of income tends to be a relatively unstable source of revenue compared with interest rate income, there could, in periods of financial stress, be a drop in traditional sources of revenue, coupled with a larger decline in income from non-interest rate income.

The empirical evidence for the impact of diversification on bank risk in the United States and around the world is mixed. A broad conclusion from these studies is that the mounting reliance on non-interest income cannot be linked to diminished volatility in earnings.<sup>13</sup>

6 D.W. Diamond and R.G. Rajan, "Liquidity Risk, Liquidity Creation, and Financial Fragility: a Theory of Banking", *Journal of Political Economy*, 109, 2001.

7 A. Berger and C. Bouwman, "How Does Capital Affect Bank Performance During Financial Crises?", *Wharton Financial Institutions Center Working Paper Series*, 11-22, 2011.

8 D. Marques-Ibanez and M. Scheicher, "Securitization: Instruments and Implications", in A. Berger, P. Molyneux and J. Wilson (eds.), *The Oxford Handbook of Banking*, 2010.

9 B. Keys, T. Mukherjee, A. Seru and V. Vig, "Did Securitization Lead to Lax Screening? Evidence from Subprime Loans", *Quarterly Journal of Economics*, 125, 2010.

10 C. Calomiris and C. Kahn, "The Role of Demandable Debt in Structuring Optimal Banking Arrangements", *American Economic Review*, 81 (3), 1991.

11 C.M. Reinhart and K.S. Rogoff, *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press, 2009.

12 D. Foos, L. Norden and M. Weber, "Loan Growth and Riskiness of Banks", *Journal of Banking and Finance*, 34, (12), 2010.

13 K. J. Stiroh, "Diversification in Banking", in A. Berger, P. Molyneux and J. Wilson (eds.), *The Oxford Handbook of Banking*, 2010.

**THE BUILD-UP: DEREGULATION, FINANCIAL INNOVATION AND RISING STOCK MARKET PRICES**

The future validity of the evidence documented above relating to the pre-crisis period is subject to distortions if structural developments in the banking industry in the decades before the crisis have led to alterations in banks' business models and their incentives as regards greater risk-taking, which could only become apparent in a financial crisis.

The first major structural development was deregulation. Over the past two decades deregulation in the banking sector aimed to achieve economic benefits from greater competition. In the United States, this liberalisation dismantled most barriers to the geographical expansion of banks and included an extensive deregulation of investment banking activities. There was an analogous experience in the European Union, supported by the creation of the Single Market in 1992 and the introduction of the euro which, in effect, removed some of the lingering regulation that limited the ability of banks to conduct certain activities and expand geographically.

Financial innovation was the other major structural change, particularly large increases in the use of direct funding via the financial markets and securitisation activity. An important implication of this financial innovation is that banks became more closely linked to financial markets and increased the share of non-interest income as a proportion of total revenues derived from own-trading, brokerage and investment banking activities.

Deregulation and financial innovation led to a profound overhaul of banks' activities and business models while altering banks' incentives to take on risks. These changes took place along several dimensions, such as size, recourse to non-interest income revenues, corporate governance and funding practices, all of which were affected by the macroeconomic environment.

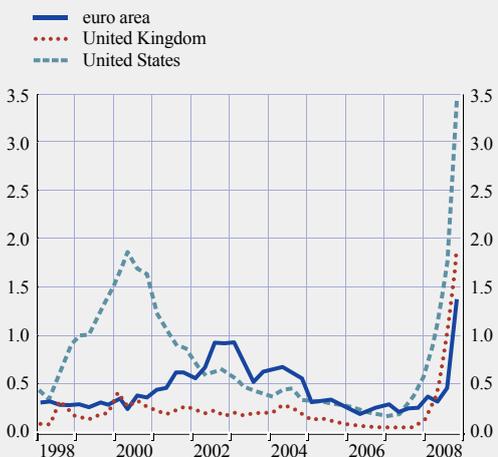
The deregulatory process was partly counterbalanced by regulators giving bank capital a more important role in the prudential

regulatory and supervisory processes. Indeed, the international regulatory response to these enhanced incentives to take on risk concentrated on the Basel recommendations, which focused on capital requirements as the basis of prudential regulations for banks. In this respect, the Basel II Accord, initially published in June 2004, aimed to more tightly connect capital requirements to underlying bank risks. It also favoured best practices within financial markets. For instance, it allowed a stronger reliance on capital requirements within banks' internal risk assessment models and encouraged a greater role for financial markets as a supervisory disciplining device. A side effect of the Basel II Accord was to compound problems of cyclicity within the financial system, which were already exacerbated by the ongoing changes in the financial system.

Despite the likely significant build-up of risks arising from these factors, the majority of the most commonly used indicators of bank risk showed a fairly benign picture in the years preceding

**Chart E.1 Expected default frequencies of banks in selected regions**

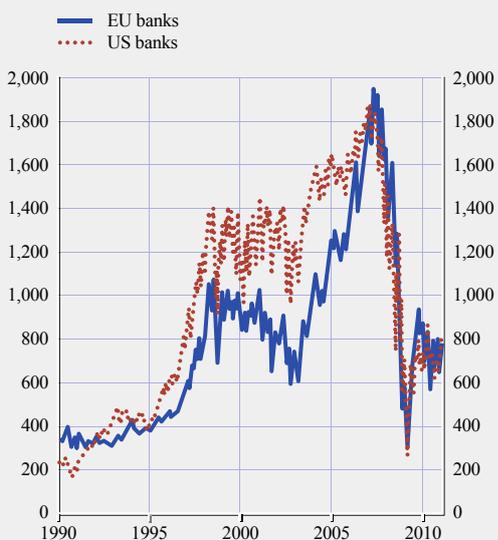
(1998 – 2008; one-year ahead estimated percentage probability of default)



Source: Moody's KMV.  
Notes: Expected default frequency (EDF) is the probability that a bank will default within a given time horizon (one year ahead in this case). EDF is a well-known, forward-looking indicator of risk computed by Moody's KMV. It builds on Merton's model for pricing corporate bond debt. The EDF value, expressed as a percentage, is calculated by combining banks' financial statements with stock market information and Moody's proprietary default base.

**Chart E.2 Bank stock price indices in the United States and the European Union**

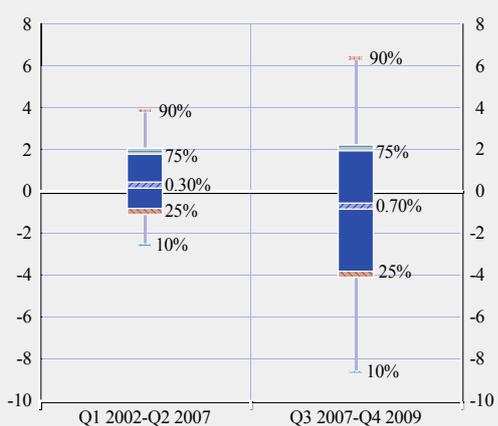
(Jan. 1990 – Feb. 2011; index: Jan. 1973 = 100)



Source: Thomson Reuters Datastream.

**Chart E.3 Distribution of the stock market returns of individual European and US banks**

(percentages)



Source: Thomson Reuters Datastream.

Notes: The chart presents the cross-sectional distribution of stock market returns for the listed European and US banks. It is based on data for monthly stock market prices. The 10%, 25%, 50%, 75% and 90% quantiles of the distribution of average stock market returns for the pre-crisis (first quarter of 2002 to the second quarter of 2007) and crisis (third quarter of 2007 to the fourth quarter of 2009) periods are presented. The “box plot” consists of a “box” that moves from the first to the third quartile. Within the box itself, the blue shaded horizontal line represents the median. The area below the bottom whisker moves from the 25% to the 10% quantile, while the area above the top whisker moves from the 75% to the 90% quantile of the distribution.

the crisis. Indeed, even the forward-looking measures of bank risk regularly used by investors to monitor the health of the financial system remained at very low levels (see Chart E.1).

### EVIDENCE FROM THE CRISIS

During the financial crisis the contrast in the behaviour of indicators of bank risk was stark when compared with the pre-crisis period, as the build-up of hidden risks materialised. For instance, between May 2007 and March 2009 there was an unprecedented decimation of stock market value as European and American banks lost in the region of €3 trillion in stock market capitalisation. This corresponded to an 82% decline in their aggregate stock market capitalisation and represented the largest materialisation of bank risk since the Great Depression (see Chart E.2).

This realisation of bank risk has been used to shed light on the effect of business models on banks’ performance. The idea is to use the crisis as a basis for analysis by looking at the risks related to certain bank business models that were not apparent in bank risk indicators prior to the crisis, but which manifested themselves during the crisis. In other words, evidence relating to the diverse manner in which banks performed during the crisis is connected back to differences in bank characteristics prior to the crisis (i.e. before those risks materialised). The effects of this unprecedented realisation of risk were extremely varied, as already indicated. The wide dispersion of cross-sectional stock market returns prior to and during the crisis suggests a high degree of heterogeneity in risk-taking in the pre-crisis period (see Chart E.3).

As a result, a number of recent studies have focused on the determinants of performance using stock market information from large banks.

There is strong evidence that banks’ capital enhanced the performance of all sizes of banks during the crisis.<sup>14</sup> The relationship between

14 A. Berger and C. Bouwman, op. cit.

stock returns and capital is stronger when higher quality forms of capital, such as Tier 1 capital, are measured, rather than the risk-adjusted capital ratio.<sup>15</sup>

Funding fragility also seems to have been a major determinant of performance during the crisis. Recent evidence suggests that when funding from financial markets became unavailable, or prohibitively expensive, the market valued more positively those institutions that were more heavily funded via customer deposits. As a result, a larger deposit base and more liquid assets were also associated with higher returns.

A strong and independent risk management function within the bank also helped to contain bank risk. Recent results show that US bank holding companies that had implemented stronger internal risk controls before the onset of the financial crisis were more prudent in their risk-taking and did relatively better during the crisis. The effects of corporate governance are more mixed.<sup>16</sup> At the same time, banks with more shareholder-friendly boards performed worse during the crisis.<sup>17</sup>

Turning to measures of materialised risk during the crisis (as opposed to stock market performance), Altunbas, Manganelli and Marques-Ibanez<sup>18</sup> analyse several aspects of bank risk during the crisis. In other words, information from the crisis period is exploited to capture the various dimensions of bank risk that manifested itself at this time by using different measures of bank distress – including the likelihood of a bank rescue and systematic risk.

For a large panel of listed international institutions, these measures are related to the business models employed by banks in the pre-crisis period. Bank size, undercapitalisation and the degree of credit expansion in the years preceding the crisis are found to be important factors behind the distress eventually experienced. The interaction of banks with financial markets also influenced bank distress, with those banks relying on

**Table E.I The effects of bank business models on bank risk: OLS estimates for systematic risk**

Undercapitalised	-0.0487*** (0.0180)
Short-term market funding	0.0087*** (0.0030)
Deposit funding	-0.0149*** (0.0030)
Excessive loan growth	0.1405*** (0.0280)
Non-interest income	-0.0043* (0.0020)

Sources: Extract from Altunbas, Manganelli and Marques-Ibanez, op. cit.

Notes: The table provides the OLS estimates for bank distress, measured as individual bank systematic risk during the crisis period, calculated using stock market information. A selection of the main results are presented. \* \*\* \*\*\* indicate statistical significance at the 10%, 5% and 1% levels respectively. Standard errors are in parentheses.

a large deposit base (and less on short-term market funding) suffering to a lesser extent (see Table E.I).

The results indicate that business models had a significant influence on banks' performance during the recent crisis. Banks with a lower risk profile or banks that followed a more traditional business model with stronger reliance on deposit funding and interest rate income had lower returns in the pre-crisis period, but came through the crisis with significantly lower losses.

Interestingly, those banks that did particularly well prior to the crisis – i.e. those banks with the highest stock market returns in 2006 – were also more likely to have the worst returns during the crisis. This calls for a better understanding of risk-taking incentives, particularly for those banks experiencing rapid increases in their stock market valuations.

15 A. Demirguc-Kunt, E. Detragiache and O. Merrouche, "Bank Capital: Lessons from the Financial Crisis", *The World Bank Policy Research Working Paper Series*, No 5473, 2010

16 A. Ellul and V. Yerramilli, "Stronger Risk Controls, Lower Risk: Evidence from U.S. Bank Holding Companies", *NBER Working Papers*, No 16178, 2010.

17 A. Beltratti and R.M. Stulz, "Why Did Some Banks Perform Better During the Credit Crisis? A Cross-country Study of the Impact of Governance and Regulation", *Journal of Financial Economics*, forthcoming.

18 Y. Altunbas, S. Manganelli and D. Marques-Ibanez, op. cit.

Recent evidence also suggests that banks that did badly in the previous crisis were also the ones that performed the worst in the recent crisis. In fact, there is a statistically significant relationship between banks' performance in 1998, when the latest period of stress occurred, and their performance in 2007/08.<sup>19</sup>

### CONCLUDING REMARKS

One of the major reasons for the existence of banks is that they are better at managing risks than other institutions. In the recent financial crisis, however, banks encountered risk on a scale not witnessed since the Great Depression. Structural changes brought about by deregulation and financial innovation made the industry significantly more complex, larger, more global and dependent on financial markets. A number of recent analytical studies take advantage of the evidence provided by the crisis to analyse whether the differences in bank business models and capital levels can be related to banks' performance during the crisis period.

Lower capitalisation and a high degree of credit expansion in the years preceding the crisis were linked to a worse performance during the crisis. The bank funding structure also seems to be of significance, with those banks relying on a large deposit base suffering less than those more dependent on market funding. Stock value creation in the run-up to the crisis also seems to be related to a worse performance during the crisis.

Overall, the results support the prudential regulatory initiatives of Basel III, which aim to raise the core capital levels of institutions, particularly undercapitalised ones. They also provide support for efforts directed at reducing the cyclicity of credit provided by banks and increasing the capital charges for those institutions relying more strongly on short-term market funding.

19 R. Fahlenbrach, R. Prilmeier and R.M. Stulz, "This Time is the Same: Using Bank Performance in 1998 to Explain Bank Performance During the Recent Financial Crisis", *NBER Working Papers*, No 17038, 2011.