



EUROPEAN CENTRAL BANK

**OCCASIONAL PAPER SERIES**

**NO. 26 / APRIL 2005**

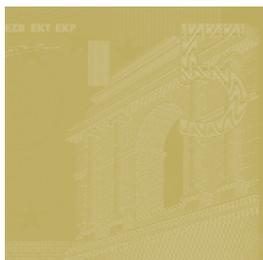
**ANALYSING BANKING  
SECTOR CONDITIONS**

**HOW TO USE  
MACRO-PRUDENTIAL  
INDICATORS**

by Leena Mörntinen,  
Paolo Poloni,  
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In 2005 all ECB publications will feature a motif taken from the €50 banknote.

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## EXECUTIVE SUMMARY

This paper presents the methodological and statistical framework for macro-prudential analysis of the EU banking sector health conducted by the Banking Supervision Committee (BSC) of the European System of Central Banks (ESCB). This analysis is a central component of a broader financial stability monitoring carried out by the ECB in co-operation with national central banks and supervisory authorities represented in the ESCB and with the support of the ESCB Statistics Committee (STC). The macro-prudential analysis has been conducted since 2000 on a regular basis.<sup>1</sup>

Much of the discussion on macro-prudential analysis has been based on the lessons from the “traditional” banking crises of the 1980s and 1990s (e.g. in the Nordic countries, United States, Asia and Latin America). While the stylised patterns of the “lending – asset price booms” and resulting credit risks reasonably describe many of these crises, there is no guarantee that future crises will follow a similar pattern. First, the rapid increase in banks’ financial market activities has heightened their exposure to market risks and earnings volatility. Second, the greater links between banks and non-bank financial institutions may have increased the likelihood that shocks emanating from non-banks become systemic and spread to banks. Third, owing to changes in banks funding and investment patterns, liquidity conditions in money and other financial markets and contagion risks may play an increasingly relevant role, rather than traditional liquidity crises due to runs by retail depositors (who are protected through deposit insurance).

In order to capture and monitor all relevant risks, both the traditional ones as well as those induced by the above (and other) structural changes, the framework for macro-prudential analysis needs to have a wide scope and be dynamic by nature. The framework adopted in the ESCB has three main building blocks, which draw on a large number of macro-

prudential indicators (MPIs). The first block – assessment of the current financial conditions in the banking sector – is largely backward-looking. It is a starting point for the analysis of the ability of the banking sector to withstand possible disturbances. A number of MPIs measure current efficiency, profitability, capital adequacy, asset quality, provisioning and reserves of liquid assets and provide the means to assess the size of banks’ buffers available to absorb losses or liquidity outflows.

The second building block is an analysis of actual and/or potential sources of risk to which banks are exposed and identification of the size of these exposures. This analysis is a combination of a backward-looking assessment of exposures in banks books and a forward-looking assessment of likelihood of different scenarios where these exposures could result in losses to banks. These risks can be common to all (or many) banks. They may stem from external macroeconomic developments affecting the conditions of banks’ borrower sectors and general financial market conditions. They can also be endogenous to the banking sector (e.g. over-extension of credit, excessive market risk taking, inadequate risk management, etc.). Sources of risk and vulnerability can also be induced by interlinkages between individual institutions via contagion, e.g. liquidity problems or failures of individual institutions spreading from bank to bank. As potential adverse developments can be induced by unforeseen sources and/or be of varying intensity, considering a range of scenarios is appropriate. In particular, scenarios of “low-probability but high negative impact” should also be included. Central for this scenario analysis is to allow for the possible correlation between the sources of risks and indicators of bank borrowers’ financial condition (indebtedness, payment arrears, collateral valuations, bankruptcies, market-based default risk measures).

<sup>1</sup> The BSC is the ESCB forum of cooperation among national central banks, supervisory authorities and the ECB. The STC provides the equivalent ESCB forum for central bank statisticians.

The final part of the analysis deals with the resilience of banks vis-à-vis the different sources of risk and vulnerability. The analysis of the impact of the identified risks on banks' financial condition is the ultimate objective of the macro-prudential analysis. The analysis focuses on systemic consequences and is concerned with the risk of disturbances spreading across the EU/euro area banking sectors. The analytical framework increasingly relies on forward looking default risk indicators devised from market prices on banks' securities. These are constructed to reflect the failure risk in the banking sector, induced by a combination of relevant underlying risks. Aggregation of these indicators and their dispersion can provide measures of systemic risk.

Since market indicators reflect the most likely outcome in the near future as perceived by market participants, the assessment of the sensitivity of banks' operations to severe shocks with lower probability of realisation will have to be conducted separately. To this end, stress-testing tools are being developed, in conjunction with the progressive evolution in this field in national central banks. These models also help understand the transmission channels of the shocks to the banking sector financial condition.

The analytical framework adopted in the ESCB has been reflected in the statistical production of MPIs. Given the nature of the financial stability tasks of the ESCB, the statistical requirements needed for the compilation of MPIs have been addressed through co-operation between the BSC and STC and voluntary arrangements. Further work is being undertaken in order to improve data quality aspects of the MPIs (concerning coverage, timeliness, reliability, comparability, accessibility, etc.).

The data sources of MPIs are rather diversified, but can be broadly grouped into three main categories: national supervisory data, harmonised macroeconomic statistics, and

market data. It is important to note that international harmonisation and statistical consistency is much easier to achieve in macroeconomic statistics. Conversely, the aggregation of micro-prudential data, which were originally designed to monitor the business of individual institutions, is often difficult. Moreover, the construction of meaningful time series is only possible if complemented by detailed metadata which explain the limitations (in terms of international comparison, etc.) of the data set.

While suffering from some shortcomings as regards consistency, aggregate micro-prudential data are well suited for macro-prudential analysis as they have a risk perspective and they are compiled on a consolidated basis, thus permitting the analysis of risks taken by all financial entities belonging to the same banking group. This is contrary to monetary and other macroeconomic statistics, which are unconsolidated, i.e. consist of the aggregation of individual institutional entities' data which are reported separately even if they belong to the same banking group. Moreover, macroeconomic statistics separate the accounts of the financial sectors (monetary financial institutions, other financial intermediaries, financial auxiliaries, insurance corporations and pension funds), while aggregate micro-prudential data focus on the financial sector as a whole, although within it the banking sector plays a key role.

In an ideal setting, for the purpose of macro-prudential analysis national supervisory data and harmonised macroeconomic statistics should be better integrated in two dimensions: 1) applying statistical concepts and classifications when the micro-prudential data are aggregated and 2) enhancing macroeconomic statistics with additional breakdowns and consolidation concepts for macro-prudential analysis. This objective can only be achieved in the long-term and requires extensive work in enhancing the coherence of the definitions of the basic prudential aggregates, the consistency,

coverage and homogeneity of the reporting population and the application of a full cross-sector consolidation approach.

Analytical tools and concepts for macro-prudential analysis are being developed also by many national central banks and international organisations, such as the IMF framework of Financial Soundness Indicators. Whereas there are many common features between the approaches developed by these institutions, differences also exist. As regards the comparison with the framework developed by national central banks in the EU and the ESCB, the approaches complement each other as the national central banks prepare an analysis on their national financial systems while the ESCB framework covers the whole euro area/EU financial system.

## I INTRODUCTION

The objective of this paper is to motivate and describe the framework for macro-prudential analysis of EU banking sector stability adopted within the ESCB. The paper also includes a review of the associated statistical issues related to the ongoing development of an improved set of macro-prudential indicators (MPIs) for the purpose of this analysis.

The analysis of the banking sector is a central component of a broader financial stability monitoring which covers also non-bank financial institutions, major financial markets and market infrastructures. While the stability of the banking sector continues to be key to financial stability as a whole, wider analysis is essential to cover increasing potential risks to financial stability stemming from non-bank financial institutions, financial markets and payment and settlement systems and other central parts of the infrastructure.

The series of costly banking crises in 1980s and 1990s gave birth to the development of macro-prudential analysis. Ex ante assessment of the resilience of financial institutions to withstand potential major disturbances and adverse developments stemming from external macroeconomic, financial market, or endogenous financial sector developments became key to preventing new crisis.

Macro-prudential analysis is distinct from micro-prudential supervision, which focuses on the financial condition of individual institutions, their risks and risk management. Macro-prudential analysis assesses the banking and financial system as a whole and covers the threats to financial stability stemming from common shocks affecting all (or a large part of) institutions or contagion of individual problems to the rest of the system. Macro-prudential analysis complements the work of micro-prudential supervisors, as the risk of correlated failures, or the economic or financial market implications of problems of financial institutions are not directly covered

under the (micro-) prudential perspective. The ultimate policy objective can also be different as prudential supervision can focus extensively on investor and depositor protection, while the macro-prudential perspective is more clearly concerned with avoiding loss of output (GPD).<sup>2</sup> However, macro-prudential analysis is concerned with the implications of distress in the financial system, not only necessarily focusing on the emergence of major financial and economic crises.

Formally, the role of the ECB/ESCB in financial stability is enshrined in the Maastricht Treaty. According to Article 105(5), one of the tasks of the ESCB is “*to contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system*”. The main objective of the Eurosystem, notably maintaining price stability represents per se a major contribution to financial stability. However, historical evidence shows that financial instability can also occur under stable prices and the real economic costs of such episodes can be very large (see e.g. Padoa-Schioppa, 2002). Hence, there is a need to pay attention to financial stability on its own right beyond the maintenance of price stability.

The monitoring and analysis of financial stability conditions from a euro area and EU-wide perspective is considered the main contribution of the ECB and the ESCB to the maintenance of financial stability within the EU. Such an area-wide perspective is more and more important due to the progressing integration of the financial sector in the EU.<sup>3</sup> Common shocks are increasingly the source of financial stability concerns in an economically

<sup>2</sup> See Borio (2003) for a more complete discussion of the differences between the macro- and micro-prudential perspectives. See also Crockett (1998) for the first clear motivation of independent macro-prudential analysis.

<sup>3</sup> See three ECB Occasional Papers characterising the progress in financial integration in the euro area and EU: Baele et al. (2004), Cabral et al. (2002) and Santillán et al. (2000), and Dierick and Vesala (2004). These studies contain ample references to studies by official bodies (e.g. the European Commission) and by academic researchers.

and financially integrated area and the common wholesale financial markets in euro can propagate financial disturbances across borders more easily than before. Given their supranational mandate the ECB and the ESCB have a natural role in conducting EU/euro-area-wide financial stability analysis on a regular basis.

Macro-prudential analysis is an integral part of general financial stability analysis.<sup>4</sup> Significant experience in the analysis of the stability of the banking sector has been already reached through the collaboration between the ECB and the national competent authorities within the Banking Supervision Committee (BSC). Regular analyses aiming at identifying sources of vulnerabilities in the euro area and EU banking sector and providing an overall assessment of its stability have been conducted since 2000. This analysis is supported by the use of macro-prudential indicators (MPIs). The findings of the macro-prudential analysis are discussed by the decision-making bodies of the ESCB, and are distributed to relevant EU bodies of policy makers (foremost the Economic and Financial Committee). Since February 2003, three annual banking sector stability reports have been published.<sup>5</sup>

The statistical requirements for the analysis of the EU banking sector have been addressed to date by using a mix of national supervisory data, harmonised money and banking statistics and market data sources. Given the growing importance of the macro-prudential analysis, the related statistical requirements are being further improved, in particular the data quality aspects. Data need to be available in a timely manner and should offer the appropriate time-series perspective. Moreover, the data coverage should be harmonised in order to ensure cross-country comparisons. This paper also describes how these statistical issues have been addressed in the ECB.

The paper is organised as follows. Section 2 reviews lessons from past banking crises for developing macro-prudential analysis and

describes the main changes taking place in the risk profile of EU banks due to structural developments in the economy, financial markets and banks' business activities. Section 3 summarises the overall analytical framework adopted for the ESCB macro-prudential analysis. Sections 4 – 6 describe in more detail the three core elements of the framework: (i) assessment of the current financial conditions in the banking sector, (ii) identification of major actual and potential sources of risk and vulnerability to banking stability, and (iii) forward-looking analysis of the ability of the banking sector to withstand possible risk realisations. Sections 7 and 8 turn to key statistical issues concerning, respectively, the compilation of the MPIs and the integration of information from different data sources. Finally, Section 9 compares the ECB approach with similar initiatives (in particular the IMF Financial Soundness Indicators' (FSI) project).

## 2 CHANGES IN EU BANKS' RISK PROFILE

When developing the analytical framework and indicators for macro-prudential analysis of the banking sector, the main objective is to sufficiently cover all major sources of risk. This requires due attention to the structural changes in the economy, financial markets, and banks' business activities as these changes influence banks' risk profiles.

Macro-prudential analysis of the banking sector has been much guided by the lessons of the banking crises experienced in the 1980s and 1990s. While the experience of these crises continues to provide useful insights, new potential sources of risk must also be appreciated. This Section reviews first the lessons from the past crises, turning then to relevant changes that have taken place more recently.

<sup>4</sup> The ECB published its first Financial Stability Review in December 2004. See ECB (2004c).

<sup>5</sup> See ECB (2003a), (2003b) and (2004b).

## 2.1 LESSONS FROM BANKING CRISES IN THE 1980S AND 1990S

The banking crises in Latin America and the crisis of US Savings&Loans institutions in the 1980s, the three Nordic banking crises of Finland, Norway and Sweden in the early 1990s, and the several emerging and developing country crises later in the 1990s (e.g. Brazil – 1994, Thailand, Korea and Philippines – 1997-1998), could be labelled as traditional banking crises.<sup>6</sup> In Latin America, the banking crises resulted from the rapid accumulation of credit by US banks. The US Savings&Loans crises had its origins in the outdated strategies and risk management that could not keep the pace with deregulation of US interest rate markets in 1970's which resulted in highly volatile nominal interest rates.<sup>7</sup> The Nordic banking crises were a consequence of very rapid credit expansion made possible by the deregulation of foreign capital inflows and restrictions on banks' assets, which dangerously propped up asset prices and the indebtedness of the domestic non-financial sectors of the economy. The emerging market crises were also driven by the over-extension of credit, but they mainly took place (like in Finland) in foreign currencies, which rendered banks' unhedged clients highly vulnerable to the eventual depreciation of the domestic currency.

The costs associated with the crises were very large. Both the direct resolution costs of crises to governments and the broader costs to welfare of the economy due to deficient allocation of resources and lack of funding represented large losses in output. Empirical studies estimate average output losses reaching 15-20% of annual GDP for developing countries that experienced banking crises.<sup>8</sup> Total losses reached 40-50% in Chile (1976) and Argentina (1980-82). Costs of a banking crisis were generally higher in case of a simultaneous currency crisis.

The "traditional" crises followed a fairly similar, although not always predictable

pattern.<sup>9</sup> Deregulation of the banking sector and removal of capital controls led to a lending boom, which resulted in high economic growth due to very high investment, very low risk premia and inflation in asset prices (stock and real estate prices). In the new liberalised environment, the risk management techniques of banks and the supervisory practices also proved inadequate. Favourable economic and asset price developments created and masked over-investment in some sectors in a market sentiment of "euphoria", which created imbalances and distortions. At some point, often triggered by some relatively benign event, the process went into reverse and the ensuing contraction resulted in widespread instability in the banking sector, as well as the macro-economy. In sum, financial instability was mainly due to credit risk and affected banks rather than non-bank financial institutions or financial markets.

Indeed, following Fisher's (1932, 1933) analysis of the Great Depression, many authors have suggested that the basic reason for the connection between asset price cycles and banking problems is the over-expansion of bank credit, fuelling the build-up of the asset prices and increasing banks' credit risks.<sup>10</sup> There is a self-sustaining process of increased collateral values, which enhances clients' ability to accumulate debt and the increasing value of bank capital enhances banks' ability to extend credit. Once the peak of the cycle is

6 See, for example, Goodhart et al. (1998), Drees and Parsabasioglu (1998) (Nordic crises), and White (1991) (US S&L crisis).

7 When S&L institutions tried to compete with money market funds by offering interest rates in line with or even above market rates, an unsustainable gap opened up between the cost of their funding liabilities (short-term interest rates) and the income generated by their assets (long-term, fixed-rate mortgage repayments) that resulted in solvency problems in many of these institutions.

8 See, for example, Hoggarth and Saporta (2001), who measure costs in terms of output foregone, and the references therein.

9 See, in addition to the references quoted above, e.g. Kaminsky and Reinhart (1996), Herring and Wachter (1999), Borio and Lowe (2002), Borio (2003), and Padoa-Schioppa (2002). Evans et al. (2000) reviews the evidence of the patterns leading up to the Mexican and Asian crises (their Section III).

10 See e.g. Minsky (1977, 1991), Kindleberger (1978), Eichengreen and Portes (1987) and Allen and Gale (1998).

being approached, the asset prices become increasingly disconnected from their “fundamental values” and vulnerable to exogenous shocks. The difficulties experienced by borrowers are transmitted to banks. Banks’ asset quality and capital adequacy problems may lead to tightening lending standards and credit rationing, thereby deepening customers’ difficulties further. In the most severe case, confidence problems with respect to the soundness of banks leads to runs on bank deposits (a “real financial crisis” in the terminology of Schwartz 1986).

Empirical evidence in favour of the causal links in this theory is somewhat mixed. However, the tests about the direction of causality and the origins of instability do not cast doubt on the main point, i.e. the link between a sharp reversal of prices in the stock or real estate markets and the spreading of instability in the banking sector.

In the light of the experiences from the past crises and the above-quoted literature, for instance, Borio and Lowe (2002) propose to use indicators, which may signal the build-up of financial imbalances in an economy. Their results suggest that the ratio of private sector credit to GDP, equity prices and real effective exchange rates should be leading candidates as indicators of financial instability. Further, they suggest that the use of cumulative deviations from trend provide the best signals of imbalances, which may be building up.<sup>11</sup>

## 2.2 MAIN STRUCTURAL CHANGES IN THE EU BANKING SECTOR

While the above noted stylised patterns reasonably describe many crises of the 1980s and 1990s, there is no guarantee that future crises will follow a similar pattern (see Padoa-Schioppa, 2002). More specifically, these crises took place when, first, financial markets were less developed. Second, there was strong separation between the three main categories of financial intermediaries (banks, insurance companies and securities houses or broker-

dealers), including the products they offered and the risks they incurred. Third, national financial systems tended to be insulated from one another as e.g. the European financial integration was yet to progress significantly. The following three Sections will discuss how these characterising factors have tended to fade away, having fundamental implications for banks’ risk profile and banking sector stability.

### 2.2.1 INCREASED FINANCIAL MARKET ACTIVITIES OF BANKS

In Europe, as well as elsewhere, financial markets have widened and deepened substantially over the past few years. ECB data show that the shift towards securities and away from bank deposits has been substantial in the euro area. The share of deposits in total household sector financial assets declined from over 40% to around 30% between 1995 and 2002 in favour of direct and indirect (though collective investment schemes) investments in securities. The share of all securities investments (including pension funds) rose from 55% to 65%, despite the slowdown due to the adverse equity market developments in 2001 and 2002, in particular the bursting of the IT-sector equity bubble. The fastest growing investment type has been pension funds and especially mutual funds, which doubled their share from 1995 to 2002.<sup>12</sup>

As the demand for securities has increased, the financing of firms has moved towards the use of capital market instruments. The introduction of the euro has also given a major impetus to the growth and integration of capital markets.<sup>13</sup> The share of bank loans in the euro area non-

11 Borio and Lowe (2002) test the properties of these indicators in a sample of 34 countries during 1960 to 1999. The sample spans 40 crises in 27 countries. Using combinations of the three variables, the authors are able to predict that a crisis will take place with up to 75 percent accuracy, although the timing of the crises appears to be more elusive.

12 See, for instance, Rajan and Zingales (2003) for a description and discussion of the underlying forces driving the European financial system towards a more market-oriented one. Allen and Santomero (2001) describe the earlier process of the decline of the traditional banking businesses in the United States.

13 See, for instance, Baele et al. (2004) and Cabral et al. (2002).

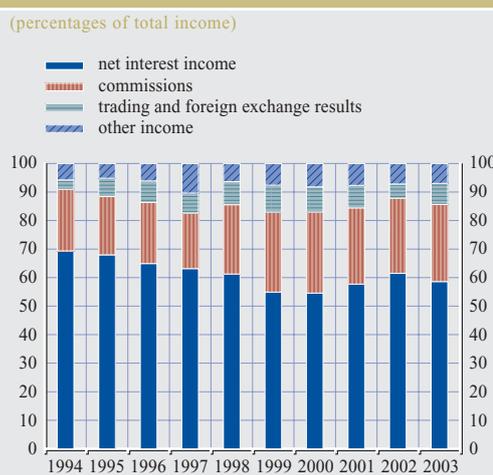
financial firms' total liabilities decreased slightly from 35% to 33% between 1995 and 2002, while the share of equity increased from 44% to close to 50% and that of corporate bonds from 3% to 5%. Despite fast growth, corporate bond markets are still quite small in the euro area and the importance of bank loans remains much higher than in the market-based United States.

For banks, these tendencies imply growing demand for services in the areas of investment banking (securities underwriting, loan syndication, advice), securities trading and market making, and asset management, while demand growth for traditional loan (on the corporate side) and deposit products becomes more subdued (i.e. disintermediation). Universal European banks are major underwriters of securities and market intermediaries in Europe, with a market share of roughly 50-60% in the underwriting of equity and bond issues in the euro area, competing against large US investment banks.<sup>14</sup> European banks are also the major managers of collective investment schemes with a market share of over 80% in many countries.

In terms of banks' income structure, disintermediation reduces the share of net interest income from lending-deposit taking activities in favour of fee income from securities activities. From 1994 to 2000, the share of net interest income to total income in EU15 banks reduced from approximately 70% to 55% (see Chart 1). For the largest banks active in the securities field, this shift has gone much further: the share of non-interest income amounted to 70% of total consolidated income; investment banking alone accounted for over 50% of total consolidated profits in some cases.

The trend turned around in 2001-2002. Banks' financial market activities were affected by the unfavourable market conditions, which reduced households' appetite to invest in securities as well as firms' mergers and acquisitions and issuance activity. When income from financial market sources

Chart 1 EU banks' income composition



Source: Banking Supervision Committee.

decreased, banks started to pay more attention to reviving their traditional income sources. Owing to the cyclical nature of these developments, the growth in non-interest income is expected to continue with pick-up in the pace of the economic growth. Further growth in securities markets is likely to be stimulated by increased disposable income and wealth, a greater propensity to invest in securities, and the development of collective investment and supplementary pension schemes (see e.g. Rajan and Zingales, 2003). In 2003, EU banks' non-interest income already started to recover with improved financial market conditions and signs of pick-up in economic activity.

### 2.2.2 INCREASED LINKS OF BANKS WITH NON-BANKS

EU banks' expansion into securities activities has mostly taken place via "organic" growth through expanding the parent's or subsidiaries' activities.<sup>15</sup> However, mergers and acquisitions have played an increasingly important role in order to take advantage of the developing and

<sup>14</sup> See Cabral et al. (2002) and Dierick and Vesala (2004).

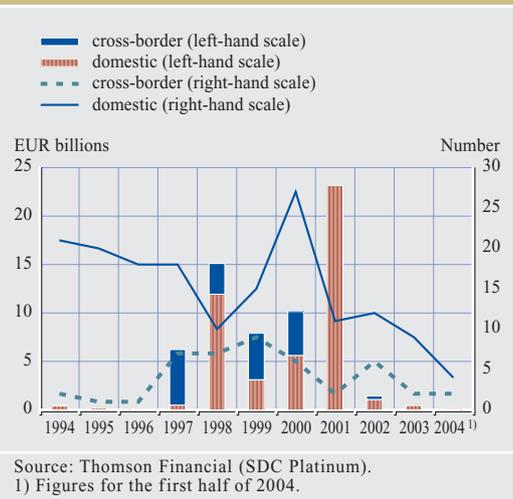
<sup>15</sup> In the EU legal framework, universal banking groups can organise their securities activities either directly or through specialised subsidiaries.

integrating securities markets and to cross-sell different products through wide branch networks. Banking groups have also progressively expanded into insurance activities, especially savings-like life and pension products, though mergers and acquisitions, or de novo establishment of insurance businesses to develop “bankassurance groups” (or financial conglomerates) (see Dierick, 2004). Between 1994 and 2003 roughly 25% of all mergers and acquisitions by EU banks were directed to the insurance industry, while the share is notably larger (37%) of cross-border deals (see Chart 2). There was a particularly large increase in cross-sector mergers and acquisitions after the launch of the euro. However, overall the major part of these deals has remained domestic.<sup>16</sup>

Another factor causing the blurring of the distinction between banks and non-bank financial institutions, has been very rapid growth in complex financial instruments, designed to unbundle, trade, and transfer risks. Although the statistics available are somewhat unsystematic, it can be said that the global markets for complex instruments – which for a considerable part consist of OTC derivatives – have doubled in size several times in ten years or so according to the BIS derivative market statistics. Whereas these instruments originally developed in the market risk area, they have been progressively extended into the field of credit risk as well. The markets for novel credit risk transfer (CRT) instruments (credit derivatives and structured products such as CDOs) are growing very fast. The markets for traditional securitisations (such as mortgage-backed securities) are also growing rapidly in Europe (see ECB, 2004a). The growth is expected to remain strong in the future.

Previously, banks were the main holders of credit risk and their ability to diversify their portfolio was dependent on their customer base. With CRT, banks are able to hedge or shed credit risks and diversify their portfolios by investing in credits that would not be

**Chart 2 Total volume and number of bankassurance mergers and acquisitions**



otherwise available to them. On the other hand, insurance companies and securities firms have the opportunity to increasingly invest in credit risk. Even though CRT is still relatively limited overall, there are some European banks that are already heavily involved either as protection seller, buyers or intermediaries in CRT markets (see ECB, 2004a). Also increasingly other financial institutions, in particular insurance companies and hedge funds, are involved.

### 2.2.3 PROGRESS IN THE INTEGRATION OF EU BANKING SECTORS

There is ample evidence that substantial integration has been achieved in the euro area wholesale markets. Integration has also taken place in securities market activities. In contrast, retail financial activities have remained strongly segmented.<sup>17</sup>

EU banks have diversified their activities geographically in euro area via cross-border provision of services, but to a different degree depending on the activity, reflecting the differences in the level of integration. Euro area banks’ cross-border interbank loans

<sup>16</sup> European “bankassurance” groups have to organise their insurance activities in separate subsidiaries according to the EU legal framework.

<sup>17</sup> See the references quoted in the Introduction.

increased from 20% in 1998 to 25% in 2003 of total holdings (see Chart 3). Cross-border securities issued by non-banks and held by euro area banks increased from 20% to 45%. In contrast, cross-border lending to non-banks remained low, less than 5% of total holdings.

Another, and a more comprehensive way to analyse the importance of banks' foreign operations is the share of foreign assets in total consolidated assets. This share (total foreign commercial presence) has reached more than 20% of EU-15 banks' total consolidated assets (see Chart 4). Naturally, for some major international banks this share is much higher, and the importance of foreign operations is further boosted through their importance for total consolidated group income. The situation is strikingly different in most new EU Member States, where foreign banks from other EU countries account for a very large share of the domestic banking markets (up to close to 100% in Estonia, for instance).

EU integration has led to convergence in the operating environment of banks. In particular, competition has increased, creating more pressure for efficiency and profitability. Combined with the income pressures stemming from more difficult conjunctural conditions,

banks forcefully aimed at cutting costs in 2002-2003. This shows up in the improved aggregate cost-to-income ratio of EU-15 banks in 2002 (see Chart 5), as well as in 2003 for a large number of individual banks (see ECB, 2003b). Banks have reduced costs through consolidation i.e. mergers and acquisitions and the consequent reductions in the numbers of branches and personnel (see ECB, 2003c).

### 2.3 CHANGING BALANCE OF RISKS

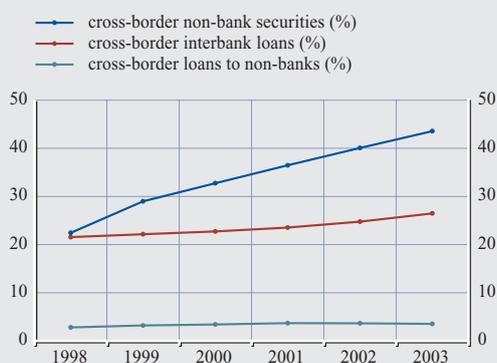
Banks' participation in securities activities, links to non-bank financial institutions and integration change the risks to which banks are exposed. As discussed more in detail in the following sections, market and income volatility risks may have increased in relative importance, while credit and interest rate risks (the traditional banking risks) may have declined. In terms of the overall risks of a bank, these changes have to be balanced against the benefits from increased diversification of risks and economies of scope in the production and distribution of different financial services.

#### 2.3.1 CREDIT RISKS

Credit risk (i.e. the possibility that lent funds are not paid back and that the bank suffers a loss depending on the received collateral) is still

**Chart 3 Shares of cross-border activity of euro area banks**

(percentages of total holdings)

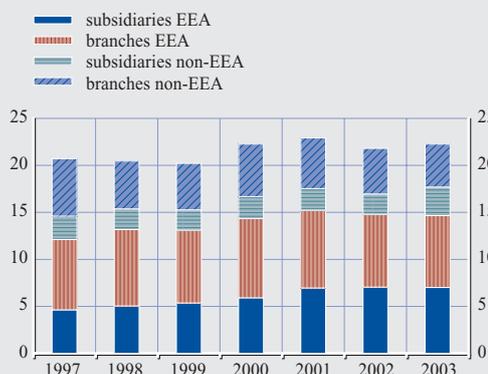


Source: ECB.

Note: Cross-border activity refers to cross-euro area activity in % of outstanding amounts (i.e., excludes cross-border activity in non-euro area and third countries).

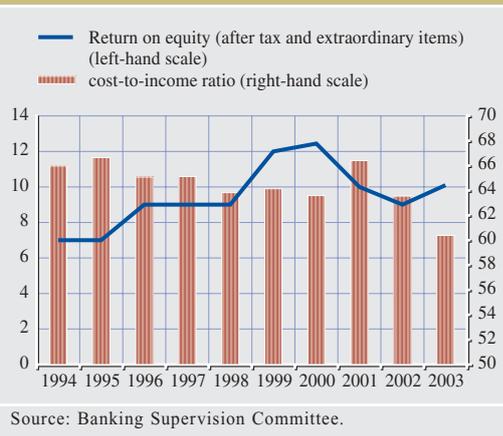
**Chart 4 Share of foreign presence in EU-15 banking sector assets**

(percentages of total assets)



Source: ECB.

**Chart 5 Profitability and efficiency of EU-15 banks**



undoubtedly the most important risk in banking. However, its relative importance may be declining due to the financial innovation, increased role of financial market-related risks, improved credit risk management techniques and more precise capital adequacy regulation for credit risk, forthcoming in the new Basel II rules. The two latter developments have been mutually reinforcing as Basel II is based on advances in banks' internal credit risk modelling, which, in turn, supports further the development in banks' risk management systems.

Credit risk transfer instruments allow banks to take large risk positions and to re-allocate them rapidly to third parties. If the activity grows as expected, this might lead to reduced transparency of banks' credit risk positions. Risk transfer instruments can also transform credit risk into other risks such as counterparty, pricing, modelling or legal risks (see ECB, 2004a).

Another important feature is that banks' credit risks no longer stem predominantly from on-balance sheet loans to non-financial corporations and households, but increasingly from counterparty risks in lending or derivatives dealings with other financial market participants (insurance companies, securities houses, hedge funds etc.).<sup>18</sup> The

apparent concentration of the global activity in a few major intermediaries may lead to significant counterparty risk concentrations, which could be particularly important in OTC derivative instruments, which have continued to grow very rapidly. When non-bank financial activities are conducted within banking groups (i.e. groups including securities and/or insurance businesses), the risks from these activities can affect the financial condition of these groups directly.

### 2.3.2 FINANCIAL MARKET-RELATED RISKS

Risks related to financial market movements (i.e. the potential losses due to changes in market prices of securities) arise in particular from banks' own proprietary trading activities, which often support asset management and investment banking businesses. EU banks' aggregate trading losses have so far been relatively limited. However, individual institutions may have exposures that greatly exceed the average. The failure of Barings in 1995 is an example of how large uncontrolled open positions in derivative markets can bring down the entire institution (see Board of Banking Supervisors, 1995). The trading in complex financial instruments increases substantially the importance of adequate risk management systems and internal risk controls at individual institutions (see below the section on operational risks).

Banks typically hold financial instruments for relatively short time periods in their trading book, which is marked-to-market. They also typically engage in extensive hedging due to the possibility of large and rapid fluctuations in the value of the portfolio. In turbulent times, such as those experienced after bursting of the IT-sector bubble in 2000, banks were faced

<sup>18</sup> Counterparty risk refers in the usual way to credit exposure to counterparties in derivative or structured product transactions. Counterparty risks may be mitigated by netting arrangements or collateral supplied under credit support agreements. Counterparty correlation risk refers to the possibility of a correlated deterioration in the credit standing of a counterparty and the underlying reference entity; and, where applicable, correlation between counterparty, reference entity and collateral.

with increasing hedging costs and some banks realised losses due to incomplete hedging.

Banks' assets on the banking book (including securities in the investment portfolio) are not marked-to-market but held at historical cost, and thus unaffected by daily changes in market prices. When the value of the investment portfolio does not reflect the market value of assets, the increasing (decreasing) value of these investments increases hidden reserves (losses). Positive hidden reserves can provide a useful buffer against income fluctuations. However, they are also an opaque source of flexibility.<sup>19</sup> Furthermore, changes in interest rates affect the refinancing costs of assets, which is the major traditional form of interest rate risk for banks. Banks hold, however, increasingly structural hedges against these on-balance sheet risks.

In addition to on-balance sheet assets, many banks have large off-balance sheet exposures to market risks via derivatives. The fluctuations of the underlying assets affect directly the value of these instruments. Basel II, as well as the implementation of IAS will provide rules on how the reporting of these items will be conducted. These reforms will increase the transparency of banks' activities and financial condition.

Banks are exposed to financial market developments also through their income. Income volatility risks have already demonstrated their relevance, as the recent reduction in capital market activity caused a significant drop in investment banking volumes and income for some of the major European banks.

### 2.3.3 OPERATIONAL RISKS

Financial contracts are becoming more complicated with increased financial innovation enabled by technological improvements. Furthermore, the growth of payment and settlement traffic and the automation of banks' back office and other functions has increased the reliance on smooth

operation of IT systems. For these reasons, the relevance of operational risks has increased sharply in recent years.<sup>20</sup>

A failure of internal risk management systems took place for example with failure of Barings in 1995 (see Board of Banking Supervisors, 1995). While inadequate internal controls can lead to problems also in the more traditional lending business, the speed at which Barings was brought down by one "rogue trader" is only possible in modern securities and derivative markets.

A good example of the vulnerability of banks to a breakdown in IT systems was provided in the immediate aftermath of the attack of 11 September 2001, as the telecommunications system, the major communications tool in the transfer of payments, was severely disrupted in the lower Manhattan district (see McAndrews and Potter, 2002). As a consequence, many banks were unable to execute payments to each other via Fedwire, the U.S. gross payments settlement system operated by the Federal Reserve, and liquidity became extremely scarce. At the same time, the Bank of New York, a dominant player in the settlement of US government bonds with several offices located in and around the World Trade Centre, was unable to continue operations. To avoid a major liquidity crisis, the Federal Reserve injected vast amounts of liquidity into the markets.

The recognition of the importance of operational risks has resulted in regulatory measures, which are reflected in the upcoming Basel II capital requirements. Banks are encouraged to actively measure the extent of operational risk either with standard tools suggested in regulation or to develop their own measurement models.

<sup>19</sup> International Accounting Standards (IAS), more specifically IAS 39, will provide rules on when a financial instrument should be marked-to-market. All European companies (including banks) with a stock market listing are required to prepare consolidated financial statements in accordance with IAS from 2005 onwards.

<sup>20</sup> The Basel II text defines operational risk as the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risks, but excludes strategic and reputational risks.

#### 2.3.4 LIQUIDITY, INFRASTRUCTURE AND CONTAGION RISKS

Liquidity risks related to interbank money markets have increased in importance, as banks become more dependent on the availability of funds from these markets to finance their operations. Hence, any shocks to these markets can become a relevant concern for banks' stability.<sup>21</sup>

Interbank money markets can also be a source of contagion risk, as the size of the key counterparties has increased through consolidation. Failure of a key counterparty can cause significant credit losses to other banks. Given the increased internationalisation of the interbank activity, especially in the common euro-denominated money market, these contagion risks are increasingly international (see Chart 3).<sup>22</sup>

As financial market transactions have vastly increased, payment volumes have grown substantially in private settlement systems that settle on a multilateral netting basis. This has increased the counterparty risks of banks participating in these systems and increased the fragility of the entire system due to a loss of liquidity and credit risks stemming from a failure of a major participant. In order to reduce these risks, the standards developed by central banks for large-value netting payment systems and securities settlement systems enable such systems to withstand the failure of major participants. In addition, central banks have put in place gross settlement in their publicly run systems (in the euro area the TARGET system), providing real-time finality of payments, which eliminates the credit risk associated to netting procedures.

Increased cross-border financial activity has largely taken the form of an expansion of exchange trading. This has increased banks' settlement risks in foreign exchange (so-called Herstatt-risks). A major improvement in settling foreign exchange transactions took place in 2002, as a new settlement arrangement (Continuous Linked Settlement, i.e. CLS bank)

became operational – at first, in limited capacity. It ensures that the final transfer of one currency occurs if and only if the final transfer of the other currency occurs.

It is important to note that concerns of liquidity could go beyond the interbank money markets and payment and settlement systems. The failure of the Drexel Burnham Lambert Group in the late 1980s and the market for perpetual floating rate notes in the mid-1980s were first illustrations of the importance of market liquidity outside interbank money markets (see Allen and Herring, 2001). More recently, the Russia/LTCM crisis of 1998 has shown that even though relatively specialised markets with a concentrated structure are more susceptible to abrupt declines, these can also take place in large and diversified markets. The crisis resulted in a substantial decline in liquidity in global corporate and emerging country bond markets. Moreover, the LTCM incidence highlighted the risk that a disorderly failure of a major securities player could lead to contagion via market prices.

When markets suffer from a lack of liquidity, the pricing of instruments becomes detached from fundamentals. In a worst-case scenario, trading reduces substantially, hedging becomes overly costly or impossible, and market prices collapse. For banks acting as intermediaries in financial markets (e.g. as market makers) this can result in large unforeseen losses. If only few banks are involved in trading and market making of instruments, liquidity will be directly affected by their actions. In a situation where a small number of key counterparties dominate the market, such as is the case in OTC derivatives

21 Failures of two Japanese securities houses in 1997 illustrated this risk. Liquidity shocks caused by these institutions were substantial enough to force the Bank of Japan to feed liquidity into the banking system in order to avoid crisis (see Nakaso, 2001). The interbank links were also the source of concern in the "small bank crisis" of the UK in 1991-92 (see Logan, 2001) and Continental Illinois (see Jayanti and Whyte, 1996).

22 Several studies exist that study empirically the possibility of contagion of individual failures through interbank markets and find varying degrees of contagion risk. Such studies include: Sheldon & Maurer (1998), Furfine (2003), Upper & Worms (2002), and Degryse & Nguyen (2004).

markets, the failure or discontinuation of one of the key counterparties may cause serious disruption in the markets and create problems in other key counterparties. Since market making is often done by systemically important institutions these disruptions may affect general liquidity and spread to other markets.

### 2.3.5 IMPLICATIONS FOR BANKING SECTOR STABILITY

In contrast to the “traditional banking crises” in 1980s and 1990s, new potential sources of disturbance for banks have emerged from the structural changes discussed above. While “traditional” lending – asset price booms should never be ignored as a potential major source of instability, the structural developments compel to develop a broader approach to macro-prudential analysis in order to cover all major sources of risk and vulnerability. In particular, a fully-fleshed financial stability analysis should cover banks’ exposures to financial markets (including counterparty risks) and non-bank financial institutions as potential sources of major disturbances.

The nature of a potential future banking crisis may have changed as well, which needs to be recognised in the framework of macro-prudential analysis. While runs by retail depositors may have become a rare event, effectively prevented by deposit insurance, runs by wholesale depositors (e.g. other banks or firms) may have become more important. While the deepening of markets has improved the access to funds in normal times, liquidity may still dry up when it is most needed at times of financial market turbulence. In addition, contagion via interbank money markets as well as other financial markets – increasingly on a cross-border basis – has become a substantial cause for concern. The growing role of banks as back-up liquidity providers, increased use of complex derivative and other instruments suggest that banks could be increasingly affected by contagion risks. Finally, the systemic implications of operational disruptions in the settlement of payments have

increased in importance with increased transaction volumes.

## 3 OVERVIEW OF THE ANALYTICAL FRAMEWORK

This Section provides an overview of the macro-prudential analysis framework adopted within the ESCB. It covers the main conceptual issues, elements of the analytical framework, and the main features of the analysis.

### 3.1 DEFINITION OF FINANCIAL STABILITY

Financial stability is often not defined at all by central banks conducting financial stability analysis and publishing financial stability reports, or it is defined negatively as financial instability.<sup>23</sup> However, a positive definition of financial stability is useful to give guidance on the extent of monitoring that should be performed (i.e. sectors and links covered). It is also useful in guiding possible policy decisions.

The ECB has attempted to derive a working definition of financial stability (see Padoa-Schioppa, 2002). This is to be seen as a practical contribution rather than an academic one. According to this definition financial stability is “*a condition where the financial system is able to withstand shocks without giving way to cumulative processes, which impair the allocation of savings into investment and the processing of payments in the economy.*”

The definition has a systemic focus, i.e. it relates to the risk of disturbances spreading across the area, potentially jeopardising the core functions of the financial system and thereby affecting real economic activity. The reference to cumulative processes highlights the danger of rapidly spreading disturbances, which might be particularly difficult to

<sup>23</sup> Houben et al. (2004) contains a useful discussion of what is meant by financial stability or instability (see their Section III and Appendix II).

contain. Structural weaknesses in the financial system might give rise to quickly spreading systemic problems once underlying weaknesses become apparent. For this reason, it is desirable that authorities in charge of financial stability also monitor key structural developments in the financial system.

For analysing financial stability, the concept of the resilience of the financial system – which is contained in the definition above – is a useful starting point. While it is impossible to predict all shocks that could lead to financial instability, the propensity of the financial system for distress can be assessed in terms of the loss absorbing capability of banks and other financial institutions. In this area, the key analytical issue is to identify to what extent the financial system is exposed to certain risks (such as a stock market decline) and how well the system is likely to be able to absorb adverse disturbances. This robustness, in turn, depends on the availability of financial buffers at financial institutions. Optimally, the analysis should capture potential threats to the stability of the system before materialisation so that market participants as well as authorities can adopt adequate measures.

The ECB definition emphasises the importance of identifying sources of risk and assessing the shock-absorbing buffers in the banking sector, while recognising the likely inability to foresee all potential sources of instability, which puts forward the importance of considering several scenarios and sensitivity analysis.<sup>24</sup> To be reassuring, the financial sector should remain resilient even in the face of the more severe, even though less-probable shocks (within the range of plausible scenarios).<sup>25</sup>

As noted above, the ECB has adopted a broad definition of the financial system for its overall financial stability work. The financial system is considered to consist of all financial intermediaries, organised and informal markets, payments and settlement circuits, technical infrastructures supporting financial activity, legal and regulatory provisions, and

supervisory agencies. This wide scope permits a complete view of the ways in which savings are channelled towards investment opportunities, risk is shared among economic agents, and payments are facilitated across the economy. It also captures the new risks to financial stability stemming from financial markets and non-bank financial institutions described in Section 2.

The macro-prudential analysis of the banking sector is central in the overall financial stability analysis due to the key importance of banks in the European financial system and for financial stability.<sup>26</sup> The analysis of the banking sector covers non-bank financial institutions as long as they are part of the banking groups (analysed on a consolidated basis). Analysis of disturbances to financial markets, other financial institutions (outside banking groups) and non-financial sectors is conducted (drawing on the economic analysis conducted at the ECB and national central banks) from the perspective of the impact on banks through direct exposures and second round effects.<sup>27</sup>

### 3.2 THE MAIN ELEMENTS OF THE ANALYTICAL FRAMEWORK

Exhibit 1 characterises the main elements of the macro-prudential analysis framework adopted within the ESCB. The first part of the analysis is fully backward-looking and it refers to the assessment of the current financial conditions in the banking sector. This provides a starting point for the analysis of the ability of the banking sector to withstand possible

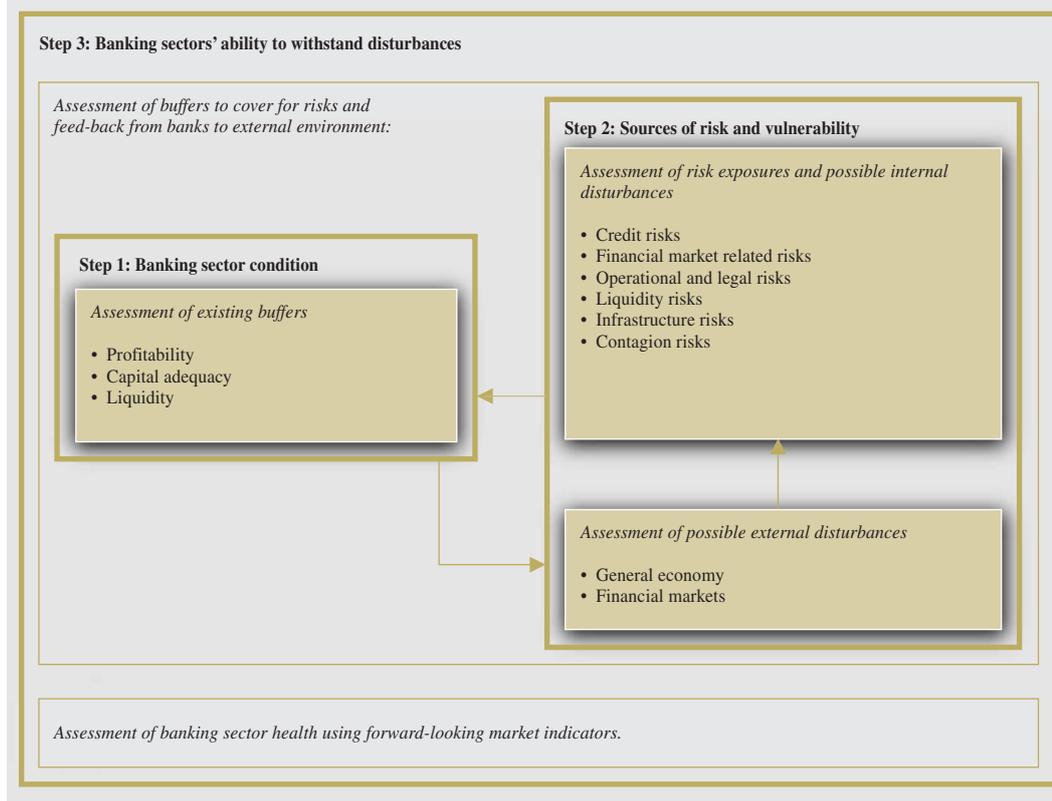
24 The analytical framework outlined by Borio (2003) and by Houben et al. (2004) focuses attention on identifying the sources of risk to financial stability, while the framework underlying the IMF FSIs (see further Section 9) stresses the shock-absorbing buffers in the banking sector (see Evans et al. 2000).

25 The Bank of England financial stability analysis is also based on a consideration of several and severe shocks (see, e.g., Drehmann et al., 2004).

26 See e.g. Schwartz (1986), Padoa-Schioppa (2000) and Houben et al. (2004).

27 For this reason, financial market and e.g. insurance sector analyses of the ECB are not covered in this paper.

## Exhibit I Main elements of the ESCB macro-prudential analysis framework



adverse disturbances, as current profitability, capital adequacy, provisioning reserves and reserves of liquid assets indicate the size of banks' buffers to absorb losses or outflows of funding sources. A number of MPIs reviewed in Section 4 are designed for these purposes.

The stability of the banking sector depends on the degree of risk in the environment in which banks operate, banks' exposure to these risks, their ability to manage these risks, and their resilience to adverse outcomes. Hence, the second part of the analysis deals with, first, the identification of actual exposures of banks to various sources of risks and the channels through which these risks could crystallise into losses for banks. These risks can be common to all banks (or to a large part of the banking sector), and stem from external macroeconomic, sectoral or financial market

conditions, or from endogenous developments in the banking sector (e.g. over-extension of credit leading to a system-wide fragility). Alternatively, banks can be subject to contagion risks from individual institution's liquidity problems or failures in the banking sector. Assessment of banks' exposures is largely based on backward-looking data. However, the analysis of possible scenarios under which these exposures could result in losses requires forward-looking information.

The assessment of potential sources of vulnerability is complicated by the inherent problem of deciding whether also "low-probability but high-impact" should be included. These disturbances would represent a real "stress test" of the banking sector stability, but could be deemed too implausible to be considered by policy makers. As potential

shocks can come from unforeseen sources or be of unforeseen intensity, considering a range of scenarios is appropriate as noted above. Another difficulty is to account duly for the correlation among the sources of risks and interrelations between macroeconomic and financial variables. For instance, foreign exchange or stock price shocks will have consequences for output developments, and several financial market shocks could occur simultaneously, as markets are interrelated. The MPIs and analytical approaches developed for this part of the analysis are described in Section 5. Given the broadening scope of the potential risks to banks (as argued in Section 2), these indicators need to encompass all major sources of risk, not only the traditional sources of credit risk.

The final part of the analysis deals with the resiliency of banks vis-à-vis the different combined sources of risk. Indeed, also in line with the definition of financial stability adopted at the ECB, the analysis of the impact of the risks on banks' financial condition, or more formally banks' default risk, is the ultimate objective of the macro-prudential analysis. While the assessment of the condition of banks provides a measure of banking sectors' aggregate capital buffer as the first step, it needs to be complemented with analysis that captures the "transmission mechanism" of common shocks to the banking sector. Ideally, one would also like to include the "feedback" effects from the banking sector. Few models are, however, available for this purpose.<sup>28</sup> Recent developments in devising default risk indicators from market prices on firms' securities also promise useful progress in constructing indicators reflecting the failure risk in the banking sector (as well as in other financial sectors) in a manner, which captures the multitude of potential risks. Section 6 describes the approaches adopted at the ECB for this last part of the analytical framework.

### 3.3 THE SCOPE OF THE ANALYSIS

The macro-prudential analysis of the EU banking sector has to take into account many different levels (see Exhibit 2). First, the EU level analysis aims at evaluating banking developments relevant for financial stability from the perspective of the Single Market. Second, there is also a need to pay specific attention to the euro area banking sector due to increasingly common area-wide macro-economic factors, foremost monetary and liquidity conditions and common wholesale financial markets in euro, which can act as a channel of contagion. Third, given the significant structural differences between the old and new EU Member States, and the need to acquire an adequate information base, there is also interest to study separately the new Member States. The collection of MPIs allows the construction of aggregates for all these three country groupings.

The fourth identified category relates to the analysis on individual countries. This is necessitated by still prevailing differences in banking and other financial market structures across EU countries and country-specific sources of risk (which can create spill-over effects to other countries). At times this is also a practical necessity when the data comparability does not allow aggregation across countries. This can foremost be the case when ad hoc indicators are analysed outside the set of regularly collected MPIs.

Finally, there is also interest in looking at institution level data. There can be important differences between institutions of different size, ownership structure etc., which cut across countries, and looking at the variance across institutions can reveal important "weak spots" in the banking system, which would remain unnoticed when only aggregates are monitored. The set of largest EU or euro area banking institutions also constitutes a set of relevance from the overall systemic stability perspective and is regularly monitored for this reason.

<sup>28</sup> See, e.g., Drehmann et al. (2004).

**Exhibit 2 Different levels in ESCB banking sector analysis***EU level*

- Integration of financial markets (Single Market).

*Euro area*

- Increasingly common area-wide macro-economic factors, foremost monetary and liquidity conditions and common wholesale financial markets in euro.

*New EU Member States*

- Specific conditions and risks.

*National level*

- Differences in banking and other financial market structures.

*Institution level*

- Differences between institutions of different size, business structure, ownership structure etc.

The starting point for the analysis is the data from national supervisory authorities. The key set of MPIs is built from this data set and complemented with other statistical sources and data available from financial markets. The national information on banks is enriched with data on banks financial statements and market indicators capturing banks' default risk (see Section 6.1). While national supervisory data are made available at an annual frequency, publicly available financial statement data, and especially market data, have higher frequency than supervisory data. The market data cover major institutions of relevance for financial stability. However, they do not provide the comprehensive picture available from the supervisory data;<sup>29</sup> for instance, publicly owned banks and small banks may not disclose frequently their financial statements to the market or may do so only with a long delay and market indicators are available only for listed banks.

The picture is completed with qualitative information from the authorities participating in the BSC, and to some extent with views from

market participants. Interviews with major institutions are helpful in providing the market participant's views, particularly when assessing the potential future market movements, and are occasionally conducted through national authorities. In general, having access to national experience and information of national authorities operating close to their institutions is a major benefit of the committee setting. Though the main purpose is not national analysis, a relatively detailed view is needed to understand the heterogeneity of developments, possible risk concentrations and contagion channels. Qualitative statements are particularly important when quantitative indicators provide conflicting signals. Such information is typically collected using questionnaires directed to national authorities and sometimes to banks.

In sum, the financial stability analysis conducted within the ESCB is more than just a set of MPIs. It is based on an amalgam of different pools of

<sup>29</sup> The BSC annual data collection covers close to 100% of the EU banking sector.

quantitative data, authorities' insight, market indicators and views, and continuously improving set of analytical tools. Tools are continuously developed, in co-operation with national authorities and international bodies.

#### 4 FINANCIAL CONDITION OF THE BANKING SECTOR

This Section describes the part of the macro-prudential analysis, which is aimed at assessing the most recent developments in the financial condition (profitability, solvency, asset quality, and liquidity) of the EU banking sector and reviews the MPIs collected to this end. This analysis aims at capturing possible signs of deterioration in the medium term profitability, asset quality and solvency trends

to make an initial backward-looking assessment of the resilience of the sector. Assessment of the financial condition requires good understanding of the economic and financial market developments, as well as internal banking sector developments (such as loan and balance sheet growth), since these are the underlying driving factors behind banking sector performance.

The MPIs used in this part of the analysis provide a view of how the banking system performed under the past economic and financial market conditions. They cover the main developments in banks' income statement (efficiency, profitability, income developments), capital adequacy and balance sheet conditions (asset quality and liquidity). This approach follows some practices in the

### Exhibit 3 Macro-prudential indicators regularly monitored by the ECB

#### I. INTERNAL FACTORS

##### 1. Profitability, balance sheet quality and capital adequacy

###### *Income – cost developments and profitability*

###### *Income composition*

Net interest income per operating income  
Income from securities (dividends) per total operating income  
Net non-interest income per total operating income  
Commissions (net) and fees per total operating income  
Trading and forex results per total operating income  
Other operating income per total operating income

###### *Cost composition*

Staff costs per total costs  
Other administrative expenses per total costs  
Other operating charges (excl. value adjustments and specific taxes) per total costs  
Value adjustments and specific taxes per total costs

###### *Efficiency*

Operating cost (excl. value adjustments and specific taxes) per total operating income  
Number of banks with cost-to-income ratio above 80%  
Asset share of banks with cost-to-income ratio above 80%  
Range of cost-to-income ratio

###### *Profitability indicators*

Profits II (after provisions, before tax and extraordinary items) per own funds (ROE II)  
Profits II (after provisions, before tax and extraordinary items) per total assets (ROA II)  
Profits III (after provisions, tax and extraordinary items) per own funds (ROE III)

Profits III (after provisions, tax and extraordinary items) per total assets (ROA III)

Distribution of ROE III: number of banks in each ROE category

Distribution of ROE III: share of assets of banks in each ROE category

Number of banks below ROE III of 5%

Share of banks below ROE III of 5% in total assets

Endowment effect as % of total profit before tax

###### *Income and costs as percent of total assets*

Net interest income per total assets  
Interest receivable per total assets  
Interest payable per total assets  
Net non-interest income per total assets  
Commissions and fees per total assets  
Trading and forex results per total assets  
Other operating income per total assets  
Staff costs per total assets  
Other administrative expenses per total assets  
Other operating charges (excl. value adjustments and specific taxes) per total assets  
Total operating expenses per total assets  
Net value adjustments per total assets  
Fund for general banking risks per total assets  
Extraordinary profit or loss per total assets  
Tax charges per total assets

**Balance sheet***Coverage:*

Total assets of the banking sector  
Total assets of the reporting institutions per total assets of the banking sector

*Asset composition*

Cash and balances per total assets  
Treasury bills per total assets  
Loans and advances to credit institutions per total assets  
Loans and advances to customers per total assets  
Debt securities per total assets  
Shares and participating interests per total assets

*Liability composition*

Amounts owed to credit institutions per total assets  
Amounts owed to customers (deposits) per total assets  
Debts evidenced by certificates per total assets  
Funds for general banking risks per total assets  
Provisions (stock) per total assets  
Subordinated liabilities per total assets  
Equity capital per total assets

*Off-balance sheet items*

Contingent liabilities  
Commitments  
Derivatives (market values)

*Capital adequacy*

Total capital ratio  
Tier 1 capital ratio  
Own funds requirement under CAD (trading book)  
Risk-weighted balance sheet items  
Risk-weighted off-balance sheet items  
Number of banks with risk based capital ratio below 9%  
Share of banks with risk based capital ratio below 9% in total assets  
Distribution of risk-based capital ratio: number of banks in each category  
Distribution of risk-based capital ratio: share of risk weighted assets of banks in each category  
Distribution of tier 1 ratio: number of banks in each category

*Asset quality*

Total non-performing and doubtful loans (net of provisions) per total loans and advances  
Total non-performing and doubtful loans (net of provisions) per total own funds  
Range of non-performing and doubtful loans (net of provisions) per capital  
Range of non-performing and doubtful loans (net of provisions) per total loans and advances  
Provisioning (stock) per total non performing and doubtful loans

*Flow of provisions*

Net value adjustments and fund for general banking risks (provisioning) per own funds  
Net value adjustments and fund for general banking risks (provisioning) per total operating income  
Net value adjustments and fund for general banking risks (provisioning) per loans and advances

**2. Demand and supply (competitive) conditions**

Interest receivable per total loans and advances, treasury bills and debt securities  
Interest payable per amounts owed to credit institutions, customers (deposits), debts evidenced by certificate and subordinated liabilities

Average margin on new lending  
Average margin on new lending to households  
Average margin on new lending to non-bank corporations  
Average margin on retail deposits  
Overall margin

**3. Risk concentrations***Credit growth and sectoral concentration**Aggregate lending*

Total lending  
Loans to residents  
Loans to other MUMs  
Loans to the rest of the world

*Aggregate new lending*

Total lending  
Loans to residents  
Loans to other MUMs  
Loans to the rest of the world

*Lending to non-MFI private sectors*

Total lending  
Loans to residents  
Loans to other MUMs  
Loans to the rest of the world  
Lending to households  
Lending to non-bank non-financial corporations  
Lending to non-bank financial corporations  
Residential mortgage lending to households  
Commercial mortgage lending

*Industry exposures*

Exposure to construction  
Exposure to real estate  
Exposure to TMT  
Exposure to Tourism  
Exposure to Energy  
Exposure to Airline  
Exposure to Insurance

*Composition of other assets**Aggregate fixed income securities holdings*

Total  
Issued by residents  
Issued by other MUMs  
Issued by rest of the world

*Aggregate equity holdings*

Total  
Issued by residents  
Issued by other MUMs  
Issued by rest of the world

*Aggregate balance sheet*

Total  
Claims on residents  
Claims on other MUMs  
Claims on rest of the world

*Currency and maturity structure of domestic lending*

Share of less than one year lending to non-MFIs  
Share of lending in foreign currency

*Global credit exposures*

Aggregate lending to non-bank customers  
Aggregate securities holdings  
Aggregate balance sheet total  
Aggregate credit equivalent of off-balance sheet items

#### **Liquidity risk**

Ratio of non-bank deposits to M2  
Ratio of total loans to non-bank deposits  
Share of foreign short-term liabilities  
Spread between the unsecured deposit rate and EONIA swap rate  
Spread between the unsecured deposit rate and secured repo rate  
Ratio of liquid assets to total assets

#### **Exposures of EU15 to new EU member countries**

Aggregate gross credit exposure to central and eastern Europe

#### **Exposures towards emerging and developing countries**

Aggregate total gross credit exposure  
Aggregate gross credit exposure to Asian countries  
Aggregate gross credit exposure to Latin American countries

#### **Market risk exposures**

Value-at-risk (VaR)  
Interest rate VaR  
Equity VaR  
Ratio of VaR to Tier I

#### **4. Market assessment of risks**

All bank share price index vs. all share price index  
Average yield spread between bank bonds and government bonds  
Average yield spread between interbank CDs and treasury bills  
Range of spreads between bank bonds and government bonds  
Number of bank rating downgrades within the observation period  
Distance to default of major EU banks  
Credit default swap spreads  
Range of interbank and CD rates

### **II. EXTERNAL FACTORS**

#### **5. Financial fragility**

Aggregate total debt to equity ratio in the (non-bank) corporate sector  
Ratio of household total debt to household financial (and real) assets  
Household savings ratio  
Ratio of corporate debt servicing payments to corporate net earnings

Ratio of private households' debt servicing costs to disposable income  
Number of arrears  
Number of bankruptcies

#### **Median expected default frequencies (EDFs) for key industries**

Basic goods and construction (BaC)  
Consumer cyclicals (Ccy)  
Consumer non-cyclicals (CNC)  
Capital goods (Cap)  
Financial (Fin)  
Technology and telecommunications (TMT)  
Energy and utilities (EnU)  
Residual category (Oth)

#### **6. Asset price developments**

General stock index  
Euro STOXX index  
US stock index  
Commercial real estate prices  
Residential real estate prices

#### **7. Cyclical and monetary conditions**

Rate of real GDP growth  
Rate of nominal GDP growth  
Rate of growth in real aggregate investment  
Rate of growth in real private consumption  
Rate of growth of unemployment rate  
Rate of change in M2  
Rate of change in the money market interest rate (3 month)  
Rate of change of long-term real interest rate (10 yr. govt. bond)  
Rate of change in the exchange rates (EUR, DKK, GBP, GRD and SEK)  
Rate of change in the consumer price index

### **III. CONTAGION FACTORS**

#### **8. Interbank markets**

Share of interbank liabilities in total liabilities  
Share of assets of the three banks with largest exposures (separately for each counterparty country) vis-à-vis total banking sector assets  
Share of assets of the five banks with largest exposures (separately for each counterparty country) vis-à-vis total banking sector assets

micro-prudential field, for instance, the CAMEL supervisory ratings assigned by US authorities.<sup>30</sup> These MPIs are built through aggregation of micro-prudential figures. Exhibit 3 presents the list of core MPIs regularly monitored (including also MPIs used in the other parts of the analysis).

The analysis is usually conducted over a 3-5 year period in order to assess the persistency of trends in banks' performance and balance sheet structure<sup>31</sup>. The analysis is conducted using both the annual data provided by supervisory national authorities as well as on the quarterly

data collected from individual institutions' financial statements.<sup>32</sup> As discussed further in Sections 7 and 8, the analysis needs to be based on fully consolidated data covering banks' all relevant activities. This requires cross-border as well as cross-sector consolidation.

30 CAMEL = Capital adequacy, Asset quality, Management (=efficiency), Earnings, Liquidity. See also Evans et al. (2000) for a discussion of the aggregation of micro-prudential indicators.

31 Major changes in regulations (Basel II) and accounting standards may complicate or hinder comparisons as they may cause large breaks in the series.

32 The MPIs discussed below apply to both data sets unless otherwise mentioned.

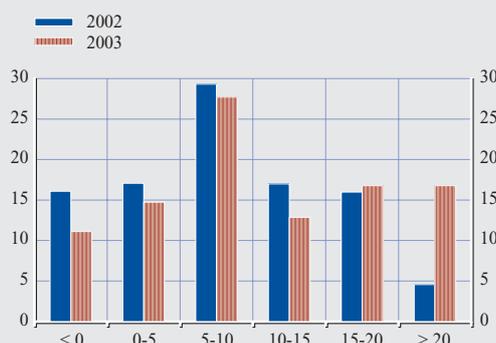
## Box 1

## DISTRIBUTION INDICATORS USED IN THE ESCB MACRO-PRUDENTIAL ANALYSIS

A number of distribution indicators are collected to measure variation in the key indicators of the EU banking sectors. For the consolidated banking data produced by the national authorities, key ones are the distributions of the ROE as well as total capital and Tier 1 ratios. These distributions are expressed as share of total assets of the sample (see e.g. the chart below) and /or number of banks.

## Asset share of EU-15 banks in each ROE category

(percentages, measured against total assets in the sample)



total solvency ratio below 9% is collected while in the case of CI, the number and asset share of banks with cost-to-income ratio above 80% is collected.

The sample of 50 largest EU banks is used to complement the consolidated national banking data. In this sample, distributions as well as tail information are used. Using a smaller sample where key indicators are available for all banks, correlations between different key indicators can be studied to see if same banks appear in distribution tails of a number of indicators. In the tails analysis, attention is usually directed to both lowest and highest 5% of the distribution.

## 4.1 PROFITABILITY INDICATORS

The first set of internal factors contains the measures of the financial condition of banks. As noted, indicators are applied at the aggregated EU/euro area and national levels on the basis of mostly weighted averages in order to account for differences in bank sizes. The total banking sector view is enriched also by constructing indicators separately for sectors of large, medium-size, and small banks. Owing to the importance of these indicators, distribution information across individual banks is also

Since full distributions of all key indicators are burdensome to produce, in certain sub-samples burden is limited by using information just on the lower tails. This allows monitoring the fatness of the lower tails as well as movements in the tails over time. For example, while full distributions are collected for the whole sample of banks reported by the national authorities, only tails information is collected on sub-samples of small, medium and large banks with reduced burden of data compilation. Key indicators include total solvency ratio and cost-to-income ratio (CI). For each size group, number and asset share of banks with

collected for the full banking sector. Box 1 describes how these distribution indicators are constructed. Information on the number and share of assets of banks in each ROE (and also capital ratio, see below Section 4.2) category provides a view to possible fragilities in the banking sector. Additional market information from a sample of systemically important institutions is also used to enrich the analysis.

Key profitability indicators in this analysis are “return on equity” (ROE) and “return on assets” (ROA). ROE provides a useful measure of the

profitability of equity investment in banking, while ROA provides the return on total assets of banks. The numerator of both indicators is calculated using data from banks' income statements and typically evaluated after tax and extraordinary items in order to assure comparability with the approach followed usually by market analysts. Profitability is, however, also computed before these items (and also before provisions) in order to assess banks' underlying operating profitability, unaffected by national differences in taxation, or windfall gains or losses.

It is important to note that neither the ROE nor the ROA provides a view of the level of risk involved in generating the income. Since higher returns are usually possible when engaging in operations with higher risks, it is important also to study the reasons behind very high values of these indicators.

Indicators providing information on income and cost structure (income composition measured against total income and cost composition measured against total costs), as well as income and cost growth and efficiency can provide some initial indication whether the level of profitability reflects sound operations. This analysis is also needed to see if occasional losses are due to fundamentally weak performance. Growth of income broken down by income source together with composition of income can reveal potential vulnerabilities in income sources. For example, if banking sector is moving towards more volatile pro-cyclical income sources (high growth rates and increasing share of these items of the total income), this is likely to cause major fluctuations in income at the downward phase of the economic cycle or depressed financial market conditions.

Changes in total operating costs, and in the breakdown between staff and non-staff costs, indicate potential changes in strategy of banks, for instance decreasing costs indicate cost containment. However, careful analysis of costs vis-à-vis income is required as large cost

cuts can impair banks' ability to generate income in the future. Combining cost data with qualitative information on strategic measures taken by banks gives a view to driving forces behind changes in costs. Since cost information on P&L accounts combine price information with quantities, the actual assessment of efficiency of the banking sector is difficult.<sup>33</sup> As a proxy for efficiency, cost-to-income ratio is mainly used, which is a widespread practice amongst banking sector analysts.

In addition to financial and operating costs, loan loss provisions are typically a major factor affecting banks' profitability. Thus they are an integral part of the profitability as well as asset quality analysis (see below Section 4.3).<sup>34</sup>

#### 4.2 SOLVENCY INDICATORS

Key indicators for measuring capital buffers are regulatory solvency ratios (such as "total capital ratio" and "Tier1 ratio"). Current regulatory Tier 1 equity ratio and full capital ratio are relatively weakly risk-sensitive measures, which renders them basically backward-looking measures of banks' financial soundness. Currently, the ratios are computed using rough risk buckets, which assign different weights for different assets depending on the risks involved. But since the buckets are very wide, these measures are insensitive to credit risk. However, on the positive side it needs to be recognised that the current ratios are relatively comparable across countries. In addition to total capital ratio, it is important to monitor the Tier 1 as well in order to gauge the amount of high-quality equity, which has the greatest ability to absorb losses. There is also interest in monitoring the straight (non-weighted) equity to total assets ratio for banks in order to gauge potential major shifts in banks' balance sheet structure towards higher failure risk (see further Section 6).

33 This would require information on quantities of produced services and used resources.

34 It should be noted that the treatment of provisions will change from 2005 onwards owing to application of IAS on listed banks.

Basel II will introduce considerably more risk-sensitivity in the requirements for banks' capital adequacy based on banks' internal risk assessments (rating systems) or external ratings. This will affect especially the capital requirements on corporate sector credit risks. Basel II will bring regulatory capital measures closer to economic capital, which also increases the information content of these indicators for financial stability analysis. However, comparability between banks could become more difficult as the capital adequacy ratios can be affected by differences in banks' internal systems on which their measurement will be based.

Profitability and solvency measures together provide a rough estimate of banks' condition. Low profitability combined with regulatory solvency ratios close to required minimums will signal severe weakness in the banking sector and points to low ability to absorb adverse disturbances. In addition to the levels of these indicators, their changes are also important in analysing the condition of banks. Rising ROE and solvency indicators are a positive sign, while falling profitability but rising solvency may indicate that banks are increasing their capital buffers to prepare for lower profitability.

### 4.3 ASSET QUALITY AND LIQUIDITY INDICATORS

Information on non-performing and doubtful assets presents a backward-looking view to credit quality. High values for the key ratios, such as non-performing and doubtful assets to total loans and advances or to equity capital reflect the aggregate low quality of bank loans. Information on non-performing and doubtful assets is particularly useful if breakdowns by industries are available (which is unfortunately not the case for most EU countries). Coverage ratios of non-performing assets to the provision reserves are used for describing the ability of the banking system to prepare for possible losses. At the moment, it is important to note that EU wide analysis of non-performing and doubtful assets and provisioning stocks suffer

from large differences in the definitions between countries.

Data on provisions on the income statement provide a view to the changes in asset quality. This flow of information contains new provisions for losses on credits (negative item) as well as cancellations of past provisions and income from collateral sales (positive items). Under adverse conditions, with deteriorating asset quality, banks' results can quickly weaken with increased provisions. On the other hand, first signs of improved conditions are often reflected in provisioning which often decreases before the pick-up in income. This reflects firms' balance sheet improvements before new investments (improving banks' income via increased lending) take place.

Provisioning practices and rules vary quite widely between different EU countries. However, in general it is important to note that forward-looking features in provisioning are relatively limited owing to strict accounting and taxation rules. In most European countries, provisions reflect already realised or relatively certain losses in the near future, which means that provisioning is mostly pro-cyclical.<sup>35</sup>

Write-offs and write-downs of other assets also impact banks' profitability. Even though these measures have a negative impact on banks' profitability, they are welcome from the point of view of the analysis as they contribute to better transparency of banks' financial condition via reduction of hidden losses.

Balance sheet indicators can reveal structural liquidity problems as well. For instance, the indicators of liquid assets to total assets ratios indicate the availability to cover liquidity outflows, and the liability-side indicators cover the dependency on particular funding sources (see also Section 5.4 for further discussion on liquidity risk indicators).

<sup>35</sup> The statistical provisioning system introduced in Spain or dynamic provisioning in France constitute major exceptions, as in these cases provisions include a charge for future expected credit losses as well.

#### 4.4 DRIVERS OF BANK PROFITABILITY

The analysis of banks' past profitability developments relies on information on major external economic and financial sector developments. In the set of regularly reviewed MPIS, the data on cyclical and monetary conditions and asset price developments is helpful for this purpose. This information is complemented with data on financial market activity volumes, foremost issuance of bonds and equity and syndicated loan market volumes from commercial databases, as these developments increasingly affect banks' income development (through investment banking and asset management activity) (see Section 2). These external developments also affect banks' balance sheet items (structure and growth of specific items). Profitability developments are usefully assessed using longer time series data on the key balance sheet items, as current profitability reflects past activities of banks.

Growth rates in interest bearing assets and liabilities and banks' margins are the key drivers of banks' net interest income. Balance sheet ratios and growth rates are collected from

national authorities on consolidated basis. In addition, as explained in detail in Section 7, credit growth rates based on unconsolidated money and banking statistics (MBS), and price and margin information on funding and lending by banks (demand and supply conditions) based on banks' interest rate statistics (MIR) are regularly analysed.<sup>36</sup>

Deposits and overall margins, as well as margins on new lending are regularly computed to assess changes in the margins earned by banks driven by competitive pressure. In addition to competitive conditions, this provides a view to the changes in banks' risk premiums on the lending side (see Box 2). The euro area bank lending survey, regularly conducted by the ECB, provides useful additional information on supply and demand conditions, including credit standards.<sup>37</sup>

<sup>36</sup> The non-consolidated MBS data provided by national authorities to the ECB for monetary policy purposes take into account the reclassification and revaluation items necessary for "clean" growth rates. As mentioned above, these items are currently not available for consolidated balance sheet data. See Section 7 for statistical issues.

<sup>37</sup> Available from the ECB web-site: [www.ecb.int/stats/money/lend/html/index.en.html](http://www.ecb.int/stats/money/lend/html/index.en.html).

#### Box 2

##### DERIVATION OF INTEREST MARGINS

###### *Calculation of interest rates:*

Four aggregated national MFI interest rates have been calculated for each euro area country individually, and also for the euro area as a whole, using the respective outstanding balance sheet items (BSI data) as weights. The four national rates are:

1. Aggregated deposit rate: Weighted average of the interest rates on deposit rates with agreed maturity up to one year, over one and up to two years and over two years maturity for both households and non-financial corporations.
2. Aggregated lending rate: Weighted average of the interest rates on lending to households for consumption, house purchases and other purposes and to non-financial corporations with an amount below EUR 1 million and an amount over EUR 1 million. Floating rates or rates with an agreed maturity up to one year, over one and up to five years, and over five years maturity for both households and non-financial corporations are included in the weighted average.

3. Aggregated lending rate to households: Weighted average of the interest rates on lending to households for consumption, house purchases and other purposes. Floating rates or rates with an agreed maturity up to one year, over one and up to five years, and over five years maturity are included in the weighted average.
4. Aggregated lending rate to non-financial corporations: Weighted average of the interest rates on lending to non-financial corporations with an amount below EUR 1 million and an amount over EUR 1 million. Floating rates or rates with an agreed maturity up to one year, over one and up to five years and over five years are included in the weighted average.

All rates and corresponding amounts used for weighting are based on new lending.

#### *Calculation of margins:*

The overall margin is the difference between the aggregated lending rate and the aggregated deposit rate.

With regard to the margin calculations on lending and deposits, ideally, loan and deposit rates would be contrasted with market rates of exactly the same maturities, taking into account whether the loans are variable or fixed rate loans. This reference rate represents the corresponding yield on an alternative investment. This is not possible when dealing with aggregated statistics. Rather than choosing a single reference rate for calculating the lending and deposit margins, a reference rate is constructed separately for each of the three lending rates and the deposit rate, hence taking into account the different underlying maturity structures in different countries.

As a result of this procedure, one-year rates seem to be appropriate as the reference rate for deposits and lending to non-financial corporations. One year rates are also used as reference rates for lending to households in Finland, Spain, and Sweden, the three-year rate is used in Greece, five year rates are used for Austria, Germany, Ireland, Italy and the Netherlands, and ten-year rates are used in Belgium, France and Luxembourg. For Portugal even shorter rates are appropriate for loans and also deposits, owing to a high degree of dependency on short-term money market rates in banks' variable rate businesses.

Interest rate swap rates were deemed to be the most appropriate basis for the reference, since they provide the common reference base for different maturities needed for the analysis. The swap rates are usually close to the money market rates and government bond yields, which are typically reference rates in this context. However, potential changes in the swap-to-government bond spreads may affect the comparisons over time to some extent, as the swap rates are not risk-free.

## 5 IDENTIFICATION OF SOURCES OF RISK

This Section describes the approaches used to identify sources of risk to which banks are exposed from potential common shocks or from idiosyncratic failures that create contagion in the system.<sup>38</sup> In other words, this part of the analysis combines the intelligence on possible

adverse developments with information on banks' exposures in order to focus on relevant sources of risk to banking sector stability.

The analysis of the potential sources of risk naturally extends the backward-looking

<sup>38</sup> The analysis of contagion risks is covered in Section 6.

analysis of the main drivers of bank profitability and solvency described above by introducing forward-looking elements, including economic forecasts. As discussed in Section 2, the analysis of actual or potential sources of risk for the banking sector stability should be broad-based. At the moment, credit, market and liquidity risks are covered through quantitative indicators, while (the increasingly relevant) operational risks are based on qualitative assessment by supervisory authorities.<sup>39</sup> While the separate analysis of different risks is useful in identifying key potential weaknesses, a number of factors driving the crystallisation of different risks could materialise simultaneously. This is why an encompassing view to risks is required, taking into account the possible correlations among them.

### 5.1 SOURCES OF CREDIT RISK

Shocks generated by real economic developments may hit banks via numerous channels, most importantly via credit risk (but not exclusively as there can be an impact on financial market factors). This, combined with general weakness in banks' income generation in subdued economic conditions, may eventually erode capital buffers to the extent that banking system faces crisis. Indeed, at the most aggregated level, the health of banks' credit portfolios depends on the overall economic conditions.<sup>40</sup> Hence, potential relevant disturbances can be based on available economic forecasts and deviations from baseline forecasts can be formally constructed from probability distributions underlying the forecast macroeconomic variables in order to generate downside scenarios of relevance for the financial stability assessment.

In order to assess the future potential losses generated by the lending behaviour of banks, detailed information on the existing credit exposures (backward-looking data) is needed. This is provided by the overall exposures to these sectors, particularly to households and non-financial firms, and to specific industries

(see Exhibit 3 for the MPIs on risk concentrations). The more detailed the information is, the more accurate the assessment. However, only relatively aggregated information, comparable across countries, is available on different industries. In addition, data on geographical breakdowns of banks' lending are needed. Since shocks can easily spread from relatively volatile emerging markets, information on the lending to these markets is particularly useful. Additional information on the amount of guarantees and other risk mitigation and off-balance sheet exposures may be collected on an ad hoc basis from national supervisory authorities in order to have a better view of banks' net credit exposures.

Credit growth rates help assess the potential vulnerabilities in the future, conditional on economic developments, since a problem loan starts materialising usually 2-3 years after the loan has been granted. In addition, a thorough assessment of the condition of borrower sectors based on indicators of borrowers' financial condition and default risk is indispensable. Macroeconomic data (e.g. income vs. debt developments) can be used as a starting point. This, as well as data on sovereign bond spreads (in case of emerging market borrowers), is also useful in analysing the condition of borrower countries.

Concerning the corporate sector, the analysis is enriched by indebtedness data from Financial Accounts, data on payment arrears, bankruptcy information and different confidence indicators. In addition, sectoral output and income growth forecasts are necessary for the assessment. Furthermore, forward-looking industry-specific default risk indicators, such as expected default frequencies (EDFs) are utilised in conjunction with bank exposure data collected from national authorities to draw conclusions on exposures at risk (see Table 1). This latter analysis is

<sup>39</sup> The implementation of Basel II might provide in the future quantitative indicators also for the use of the banking sector stability analysis also as regards operational risks.

<sup>40</sup> See Borio (2003) and the literature cited therein.

Table I Credit exposures at risk in the banking sectors of seven euro area countries

	BaC	EnU	Cap	CCy	TMT	CNC	Fin
(EUR billions), end-2003	675,965.0	144,767.0	246,045.5	1,421,957.8	117,700.0	608,620.7	2,316,379.5
Sectoral EDF (as of May 2003)	1.04	0.26	1.85	1.465	4.95	0.89	0.19
Sectoral EDF (as of June 2004)	0.83	0.18	1.375	0.81	2.875	0.65	0.18
Change in exposure at risk (EUR billions)	-144,363.5	-128,61.1	-132,921.4	-1,179,063.7	-303,640.0	-151,512.3	132,740.8
% change in exposure at risk, 2002-2003	-20.5	-33.0	-28.2	-50.6	-47.3	-27.7	46.7

Sources: Banking Supervision Committee, Moody's KMV and ECB calculations.

Note: The data are provided by Belgium, Germany, Spain, France, Italy, Austria and Finland. The sectors are basic and construction (BaC), consumer cyclicals (CCy) and non-cyclicals (CNC), capital goods (Cap), energy and utilities (EnU), financial (Fin), and technology and telecommunications (TMT). The expected default frequency is computed by multiplying the exposure to a sector by the EDF of this sector.

especially useful in highlighting risky and relevant borrower sectors.<sup>41</sup>

In the case of households, lending for housing purchase forms the most important category of loans in EU on aggregate. Information on household sector indebtedness, loan servicing costs, fixed versus floating rate loans information, loan-to-value ratios, payment arrears etc. are important in assessing banks' risks. All of these indicators are not regularly collected due to the large burden, but monitored on a less frequent basis or covered in special reports (see ECB, 2000). Additionally, information on housing price developments is needed to assess the potential real estate market fragility and is regularly collected. Banks' exposure to mostly unsecured consumer lending is also regularly monitored.

Finally, information is increasingly collected on banks' off-balance sheet activities in order to gauge the amount of contingent credit risk exposures and exposures to counterparty credit risks through derivatives activities. Off-balance sheet items are broken down to contingent liabilities, commitments and derivatives. Derivatives are marked-to-market. While off-balance sheet information is generally very heterogeneous, hindering aggregation, information on notional net credit risk transfer from reports available from markets are used as a proxy to track the development in some segments of these markets.<sup>42</sup>

It is important to note that if banks' risk management is up to date, banking crisis caused by deteriorating credit quality should not take place. Very few disturbances, perhaps with the exception of market liquidity crisis, can result in major losses in the banking system without internal weakness in the sector. For this reason, qualitative information from national supervisors on banks' risk management practices is an important part of the analysis.

It can not be excluded that external shocks may be augmented by national structural biases e.g. distortions in national banking markets or overly large exposures to certain industries, including other financial entities. As discussed above under assessing banks' condition with backward-looking data, information on competitive conditions, including information on margins can also be used to assess the soundness of the pricing of credit risk. Margin information is also compared with comparable bond spreads to indicate possible pricing differences between banking markets and capital markets. Under excessive competition, there is a danger that risk premiums are cut to

<sup>41</sup> It should be noted that even though the full cross-sector consolidated view internalises most of the risks, induced by exposures of the banking sector to other financial institutions, in many cases insurance sector risks are still excluded. Challenges in this area are well recognised and further work to improve the analysis is on the way.

<sup>42</sup> See for example FitchRatings (2003a and 2003b) and Standard & Poor's (2003).

win over market shares. This can create major fragilities into the banking system.

## 5.2 RISKS FROM FINANCIAL MARKETS

The concept of financial market risks reaches beyond that of market risks on trading book of banks. In the discussion below, the impact from market developments on banks' investment book is also considered (see e.g. interest rate and exchange rate risks).

The assessment of financial market related risks is complicated by the fact that shocks to financial market variables cannot be generally forecast. However, this shortcoming is reduced by the ability to obtain some views of market expectations from implied volatility measures or Risk Neutral Densities (RND) obtained from option prices (see e.g. Karampatos et al. 2003). The latter can be used to gauge the probabilities market participants' address to certain market movements. The potential risks to market prices are also gauged from more traditional indicators, such as price-earnings ratios. These indicators are regularly used in financial stability analysis.

In the context of the ESCB, in line with the increased relevance of market-related risks, more and more quantitative indicators are being compiled and more are planned for the future. However, qualitative information from national supervisory authorities, such as information on banks' hedging practices, continues to form an important input for the analysis.

The most widely used form of assessing market risk exposure on the trading book is represented by the Value-at-Risk (VaR) methodology. During the last couple of years regulators have allowed financial institutions to use their internal risk models to measure market risk and to allocate economic capital. For these purposes, VaR has become the most common concept. It measures the potential portfolio loss that may be endured as a result of adverse market price moves.<sup>43</sup> Market risks related to banks' trading book activities are

regularly assessed using information on large institutions' VaR indicators. Total VaR figures for all market risks together are collected and contrasted to banks' equity (Tier 1) capital in order to evaluate banks' risk absorption capability. Breakdowns into equity and interest rate risk VaRs are also collected, to the extent available. When using VaRs in the analysis it is important to note that there may be major differences in construction and modelling of VaRs between banks which may make comparisons difficult between institutions.

In order to assess the risks related to assets, which are not marked to market (e.g. banks' investment books), balance sheet values are collected. Due to the relative importance of banks in the European financial system, specific attention has been recently given to foreign exchange risks and overall interest rate risks which in terms of banks' balance sheet assets seem to be more relevant at the moment than trading book risks. These risks are analysed on the basis of input from national supervisors while regular indicators are being considered. Data used for the analysis includes aggregate fixed income securities holdings, aggregate equity holdings and currency structure of the balance sheet.

Foreign exchange risks at the banking group level can come from two different sources. First, (unhedged) group level mismatches in asset/liability positions (including off-balance-sheet items) denominated in the volatile currency and/or mismatches of respective income and cost streams can produce negative valuation and profitability effects. These risks are most material for large EU banking groups with significant global

<sup>43</sup> VaR is more precisely defined as the maximum loss that will not be exceeded with a certain probability (95% or 99%) during a holding period of one or ten days (ten days for regulatory purposes). The greatest difficulty in VaR is the modelling of the loss distribution of a portfolio. The most convenient of distributions, namely normal distribution, is an inadequate proxy as loss distribution should have a "fat tail". Usually, past data are used to model the distribution. Depending on the phase of the cycle covered by data as well as length of the period from which data is collected, this can result in too high or too low risk estimates.

trading and investment banking operations. These groups can have significant amounts of assets and income related to these operations denominated for example in USD, while their liabilities – and especially cost – can be denominated in euro or sterling (Continental-European or London-based operations). Second, even if the group level positions and income/cost flows were balanced in the currency in question (e.g. foreign subsidiaries that are fully funded in the local currency) there are translation effects which materialise when profits from foreign operations are consolidated into parent banks' accounts. This is the negative effect on the group's profits stemming from (unhedged) conversion of the profits of these operations denominated in the depreciating currency into the group's accounting currency (i.e. euro or sterling in the case of major EU banking groups).<sup>44</sup>

As regards the overall interest rate risk, work is under way to consider the collection of duration gap information, or alternative indicators based on e.g. maturity gap analysis. Duration measures the sensitivity of assets (or liabilities) to changes in interest rates. Duration gap is defined as the difference between the weighted average durations of assets and liabilities, where the weights of the two durations are assigned according to the relative value of interest-bearing assets and liabilities in a bank balance sheet.<sup>45</sup> Duration gap gauges the impact of changes in interest rates on bank capital while maturity gap can be used to measure the impact of changes in interest rates on bank's interest income.

In addition, compilation of banks' stress test information is being considered. This could also cover a wider spectrum of risks in addition to interest rate risks. Sensitivity stress tests focusing on the effects of a single risk factor change on banks' income or capital are the simplest form of stress testing. Interest rates seem to be the most common theme among these tests, which indicates that banks are comfortable controlling their interest rate risk with sensitivity tests rather than scenario

analysis (see below).<sup>46</sup> However, sensitivity stress tests perform basically the same function as duration gap and VaR analyses as they essentially only stress a single risk factor (or a set of closely related risk factors, such as a yield curve changes).<sup>47</sup> Simple sensitivity stress tests cannot capture risks due to correlated shocks in the environment. For this purpose, stress test scenarios are devised, which are based on potential market events with simultaneous impacts on a large set of variables. Such stress tests in principle allow analysing the effects of combination of correlated disturbances, including interest rate shocks, on banks' balance sheets. These events can be presented through various balance sheet projections, together with several funding and hedging solutions. Simulations can be based on modelling of the balance sheet, which is likely to vary from bank to bank, and the relevant margins. Though complex to construct, such complete stress test scenarios would clearly represent a useful complement for the simple maturity gap or duration analysis.

### 5.3 OPERATIONAL RISKS

At the moment, no consistent quantitative measures are available to form aggregate indicators of operational risk. In the context of the EU/euro area, analysis relies on qualitative information provided by the national authorities.

44 The currency mismatches in specific operations or at overseas subsidiaries can be offset by opposite trading positions (and consequently opposite valuation effects and trading gains) at the group's centre. However, this strategy requires full currency matching of the asset and earnings positions at the group level. An alternative or complementary risk mitigation strategy is hedging via currency derivative contracts. The marked to market values of the hedges are booked in the banking groups' centres and valuation changes will have an impact on banks' profitability.

45 Duration is the weighted average term to maturity of a financial instrument on the basis of its future cash flows.

46 For stress test types and development see CGFS (2001).

47 There can be also other reasons why risks are inadequately captured by statistical risk measures like VaR: a lack of historical price data, a tendency of markets to gap, illiquidity, or difficulties in estimating the highly non-linear exposures from options dealing. For these reasons, sensitivity stress tests may offer an alternative to VaR (see the CGFS report op. cit.)

Measurement of operational risk will improve with adoption of Basel II regulatory framework as this risk is included in allocation of capital, together with credit and market risks. The new capital adequacy regime introduces three risk-sensitive options for measuring operational risk. These are the Basic indicator approach, Standardised Approach and Advanced Measurement Approach. These approaches vary in sophistication with the most advanced one requiring banks to use their internal loss data in the estimation of required capital. The analysis conducted in the context of the ESCB is likely to benefit greatly from the new well defined framework. Collection of detailed solvency information will help to construct aggregate indicators for the EU and euro area banking sectors in order to measure also operational risk.

#### 5.4 LIQUIDITY AND CONTAGION RISKS

Liquidity and contagion risks are closely linked, as discussed in Section 2. Severe liquidity crises in one financial market segment can easily spread to other market segments. If markets lose confidence on the solvency of an institution, this will first show up as lack of short term funding in interbank markets to this institution.

In the case of liquidity risk, it is particularly important to have both the system wide view as well as the view to the condition of individual institutions. It is a well-recognised fact that EU banking system is tiered i.e. smaller locally oriented banks relying on liquidity provision from larger internationally oriented banks. There are also clear financial centres in EU where key market players provide liquidity to the rest of the EU via interbank markets (see e.g. Cabral et al., 2002). This “tiering” emphasises the importance of identifying and analysing liquidity and solvency of the systemically important institutions. For this purpose measuring banks’ relevance as counterparties is needed.

While there is no one agreed measure for systemic importance of an institution, a large

set of possible proxies are available from market sources. For instance, bookrunner lists on different financial market segments, such as OTC derivatives markets, can be used.<sup>48</sup> Owing to continued global integration of financial markets, it is important to recognise that institutions outside the EU may also be systemically relevant for the stability of the EU/euro area banking systems. Many of the large global banks act as relevant counterparties for EU institutions. In addition, as discussed above, the possible systemic importance of non-bank financial institutions should be regularly assessed. For instance, the increased hedge fund activity has raised interest globally towards these funds. While their share of total assets held by financial institutions is still relatively small their importance in daily trading can be significant.<sup>49</sup>

In order to monitor banks’ access conditions to money markets, interbank market spreads are monitored continuously at the level of market averages and individual major banks. Since the spread between interbank deposits and repo contracts summarises the total premium for liquidity and (perceived) credit risk in the interbank money market charged on a bank, it seems most natural in the context of financial stability to monitor this spread. If the liquidity premium can be considered to remain constant, the movements in the depo-repo spread only reflect the credit risk premium. Spreads with different maturities may also have different interpretations. While a widening of the depo-repo spread at longer maturities of around one year implies that it may be difficult for banks to cover their structural long-term liquidity deficits, a widening of very short maturity spreads, at one week or one month maturities, may be indicative of the more urgent vulnerability that banks cannot raise the very short-term liquidity they need to carry out their payments.

Particularly useful for contagion risk analysis are data on, and market concentrations in,

<sup>48</sup> See e.g. Bank of England (2003).

<sup>49</sup> See e.g. ECB (2004b) and (2004c).

different market segments, particularly in the interbank markets. A thorough analysis of potential contagion would require detailed information (including names of individual institutions) on connections between banks in order to map the full interbank network. This would enable stress testing of the resilience of the network of banks. However, as these data are usually confidential, less complete analysis can also be used. General information of concentrations, major market players and volumes of interbank deposits and liabilities are useful in this regard. Work is also ongoing in analysing spillover effects of very large shocks among EU banks using e.g. distance-to-default measure (see below Section 6.1).<sup>50</sup>

A set of MPIs includes the so-called contagion factors. This aims to capture the interbank market linkages between banks from different countries at the aggregated level. These indicators measure the concentration of interbank assets and liabilities at the country level.<sup>51</sup> The more concentrated the liabilities, for instance, the greater is the risk of contagion of solvency problems from banks of this country. The more concentrated the assets, the greater the risk of transmission of liquidity shortages, should these banks withdraw their lending activities in the market. These concentration indicators are confidential and are infrequently updated to alleviate reporting burden. On the other hand, interbank market structures do not seem to change very frequently.

## 6 RISK ABSORPTION CAPABILITY OF THE BANKING SECTOR

The final part of the analysis is perhaps the most analytically challenging as it tries to measure the actual impact of possible disturbances identified on the banking system as a whole. There are recent advances in the literature, which also provide tools to quantify the impact. These papers focus on one or more of the three main aspects in this field: default risk indicators for banks from financial markets, links between macro-economic developments and banks'

condition and stress testing.<sup>52</sup> It is beyond the scope of this paper to review these contributions in detail. This Section rather concentrates on the tools so far adopted within the ESCB for the macro-prudential analysis of the banking sector.

### 6.1 MARKET-BASED INDICATORS OF BANKING SECTOR DEFAULT RISK

The recent development of market-based indicators of default risk offers some clear benefits for assessing banking sector fragility. Market indicators are forward-looking (as they are based on prices in efficient securities markets) and they are available at a high frequency. Most importantly, they should be all encompassing, i.e. they should reflect different sources of risk, interactions between banks and they should take into account banks' capital buffers to withstand risks. Gropp (2004) argues that this is the inherent advantage of market indicators and an analytical approach to financial stability assessment based on them rather than on various indicators trying to capture the dynamics of a traditional lending – asset price cycle. Given the discussion in Section 2, this is important as the risks to banking sector stability can come from various sources outside the traditional lending-asset price boom paradigm. Hence, these indicators offer a direct assessment of the default risk (or true capitalisation in economic terms) of the banking sector.

The results in Gropp et al. (2004) imply that one particular indicator, the distance-to-default, is able to predict individual bank fragility with considerable lead-time.<sup>53</sup> It can

<sup>50</sup> See ECB (2004c).

<sup>51</sup> Data on interbank assets and liabilities suffers from some shortcomings. They are non-consolidated i.e. they include intragroup transactions. This clouds the view to actual risks that exist between non-related banks. In addition, for full contagion analysis, data on netting and collateral agreements would also be needed which is currently not available.

<sup>52</sup> See e.g. Drehmann et al. (2004), Elsinger et al. (2004), Virolainen (2004), Foglia et al. (2003), and Pain and Vesala (2004).

<sup>53</sup> Distance-to-default equals the number of asset value standard deviations above the default point. It is calculated from observable equity capital market value, historical equity volatility and balance sheet leverage, using the "Merton options pricing formula".

### PROPERTIES OF MARKET INDICATORS OF DEFAULT RISK

Formal analysis of default risk varies according to the size of the entity under consideration. For (larger) obligors having quoted securities outstanding it is possible to infer individual default risk from observable market data, while for (smaller) obligors the analysis is by and large constrained to traditional balance sheet analysis (e.g. credit scoring and discriminant analysis). The main benefits of market indicators compared with balance sheet indicators is that they are forward-looking and available at much higher frequency. This Box evaluates the main types of market indicators available and their basic properties.

In assessing default risk, four market indicators are increasingly looked at: equity returns, historical or implied equity volatility, corporate bond spreads, and distance-to-default. These indicators may be evaluated for banks, other financial firms or non-financial firms, of which banks are a special case owing to the specific characteristics of the industry.

Equity returns are typically approximated by stock price changes. Corporate bond spreads are computed as the yield to maturity of a corporate bond minus the yield at a corresponding point on the risk-free yield curve. Closely associated with bond spreads are credit default swaps (CDSs), which, although different as they are based on credit derivative pricing, move very closely with bond spreads owing to the close arbitrage between the two securities which harmonises the pricing of credit risk. Implied volatility inverts the call option pricing formula to infer a market estimate of the underlying volatility of the underlying asset from the observed call price. The advantage of the implied volatility over the historical measure is that it is forward-looking. Finally, distance-to-default (*dd*) can be drawn from equity market and balance sheet data using a standard Merton-inspired structural model based on options pricing, such as that used in Moody's KMV expected default frequencies (EDFs). More specifically, the *dd* represents the number of asset-value standard deviations that the firm is from the default point. The implied probability of default (PD) is the point on the probability distribution corresponding to the *dd*. Since the implied PD (or EDF) is a monotonic transformation of the *dd*, it has the same basic properties.

For market indicators to be useful as gauges of default risk, they should satisfy at least three properties: they should be "appropriate" measures of default risk in the sense that they correctly measure increased risk and yield easily and unambiguously interpretable signals; they should have a high signal-to-noise ratio; and they should be sensitive to both systemic and idiosyncratic risk. This evaluation largely draws on the standard model of firm valuation developed by Merton and Scholes, and summarised e.g. in Merton (1990). The seminal work of Black and Cox (1976) is drawn upon in the valuation of debt instruments.

#### Appropriate indicators

For an indicator to be appropriate, it must give a signal of increased default risk when:

1. the firm's (unobservable) asset value (or earnings expectations) declines, given the face value of debt;
2. its (unobservable) asset value (or earnings) volatility increases; and
3. its nominal level of debt grows, such that there is an increase in economic leverage.

In light of these properties, the stock price return is not “appropriate” since it does not satisfy the second and third conditions. The value of equity grows when the asset risk increases, and equity returns do not necessarily decrease as leverage increases, in line with the Modigliani-Miller theorem, which predicts that the value of the firm is unaffected when equity is substituted with debt. The other indicators can be shown to satisfy these properties by deriving them from the Merton model framework.

### Signal-to-noise ratio

Empirically, all market indicators produce noisy signals (see e.g. Bongini et. al., 2001). A useful indicator of default risk should have a sufficiently high signal-to-noise ratio. Theoretically, this is related to the efficiency of the indicator in producing a signal of increased default risk throughout the asset quality spectrum, i.e. it should not only react very close to default when the default risk is already very high. It can be shown that the market-based indicators are predicted to differ with respect to the strength of their reaction to a shock moving the firm closer to the default point. Because the value of debt is an increasing and concave function of the asset value,  $V$ , the corporate bond spread is a convex and decreasing function of  $V$ . This implies that the part of the spread due to credit risk remains rather stable for large intervals of changes in  $V$ , and a significant reaction of the spread is only measurable close to the default point. In other words, credit risk becomes a major determinant of the spread only relatively close to default, as can be witnessed in huge jumps in spreads once market perception has turned against the obligor. In practical terms, bond spreads are neither easily observed nor constructed as there can be many issues with possibly conflicting signals for the same entity or liquidity of individual issues may be too low (see Hancock and Kwast, 2000). One complication is that corporate bond markets may be thin and illiquid, which does not allow for the construction of indicators for a large number of firms. In addition, a large proportion of bonds issued by firms may have option features, such as the right to call the bond. It has been shown that spreads may be difficult to compare, even for different issues of a single firm.

The non-linear property of spreads in capturing default risk is in contrast to the  $dd$ , and thus also the implied PD, which are direct default risk indicators and show a reaction that is also much further away from default over the entire asset quality spectrum. This greater leading property of the signal is also supported by empirical research. On the other hand, the main limitation of the volatility measures (either historical or implied) in terms of noise in their information is that they are erratic unless very strong smoothing methods are used, whose selection is basically ad hoc. In addition, the horizon of the implied volatility is the same as the time to maturity of the call option, which may be rather short, whereas in the implied PD calculation this can be adjusted (as per Moody’s KMV). A further issue is that its observance depends on call options actually being adequately traded on firm stocks, which is often not the case.

### Sensitivity to all drivers of risk

Finally, indicators of default risk should reflect all relevant factors affecting the risk, i.e. both systematic and idiosyncratic ones. Nevertheless, when aggregating indicators or extracting systemic information from firm-level indicators, the importance of the idiosyncratic factors could decline. Although more research could be usefully conducted on this point, there is

already some evidence that bond spreads largely reflect changes in systemic market factors, while *dd* and implied PD also capture idiosyncratic factors (see Hoggarth, 2001). This could be related to the feature that bond spreads react relatively little to credit risk changes, unless they are close to default.

### *Overall assessment*

On the basis of the above considerations and empirical evidence, the two most promising indicators are potentially bond spreads/CDSs and *dd*/implied PD (see Tudela and Young, 2003, and Vassalou and Xing, 2002). The second family of indicators has in general higher leading properties: it appropriately reflects default risk everywhere in the asset quality spectrum; it therefore promises to have a reasonable signal-to-noise ratio, which is the best among the alternatives; and it should reflect both systematic and idiosyncratic risk factors. At the same time, bond spreads/CDSs should not be overlooked as a complementary source of information, because they signal the risk of default very clearly closer to the moment of default, possibly more so than *dd*, and can thus be powerful “red flags”. For banks, the expectation of external financial support can dilute the responsiveness of bond spreads, but the *dd* should always reflect the default risk factors irrespective of this caveat for bond spreads. There is empirical evidence that this hypothesis holds true for European banks (see Gropp et. al., 2004) and for U.S. banks (see Krainer and Lopez, 2003).

also be shown that the indicator has appropriate and desirable theoretical features to function as an explicit default risk indicator (see Box 3).

One might be able, through aggregating the indicators for individual banks, to obtain a useful indicator for the entire banking system (or more precisely the group of large banks, for which equity prices can be obtained). While the individual distances-to-defaults reflect a combination of idiosyncratic and systemic risk, the aggregation, as long as it is done across a sufficient number of banks, should remove the idiosyncratic component of risk.<sup>54</sup> The available sample, which is determined by the availability of equity prices in the EU, consists of some 40 banks. While relative to the population of banks these numbers seem small, their market share is above 50% of total banking system assets in almost all EU countries.

The asset-weighted and the simple average distance-to-default indicators are used regularly to monitor banking system stability in the ECB macro-prudential analysis (see Chart 6). The two indicators move together for most of the sample

period. However, the asset-weighted distance-to-default is consistently below the simple average, suggesting that larger banks were weaker. Conceptually, weighting by assets makes some sense, as in the spirit of Borio (2003), the analysis should focus on assets “at risk,” rather than number of banks “at risk”. The indicators have also been found to react strongly at the time of the Russia default/LTCM crisis and the attacks of September 11.

Even more closely corresponding to Borio’s (2003) notion of “setting acceptable tail losses for the portfolio as whole”, one can plot the proportion of banking assets (or banks) that are below a certain threshold distance to default (see Chart 7).<sup>55</sup> Using such “threshold indicators” may significantly improve the precision of the

<sup>54</sup> While this is true, if there is contagion, the aggregated indicator will reflect cases, in which individual banks are hit by an idiosyncratic shock, which then is transmitted (through e.g. money market or payment system exposures, or ownership links) to other banks. In fact, one potential use of market indicators may be to use them to detect such links (see Gropp and Moerman, 2004, and Gropp and Vesala, 2004).

<sup>55</sup> One should interpret the following as x% of large publicly traded banks’ assets are below a certain threshold. See also ECB (2003).

signal on the fragility of the banking system. For instance, the proportion of banking assets below investment grade quality (threshold less than 2.71) was increasing in the year before Russia's default. After Russia's default, the increase quickened, reaching a peak of around 90% of assets from November 1998 to September 1999. The decline during the following several months is equally steep as the ascent.<sup>56</sup>

In addition to the distance-to-default (and its variants), the regularly monitored market indicators include banks' subordinated bond and credit default swap spreads. These indicators provide usefully complementary views to the distance-to-default. However, analyses suggest that spreads in particular may be much less suited as systemic indicators of bank fragility (see Box 3). The signals have been substantially more volatile and they tend to be lagging the systemic events identified above. This could reflect the fact that the pricing of bonds reflects many other factors than default risk, such as liquidity conditions, especially far away from the default point. Pricing in bank bond markets may also be affected by changes in conditions in overall corporate bond markets, which makes the interpretation of the signals difficult.

Finally, banks' ratings (both normal bond ratings and "financial strength ratings",

measuring the financial condition of banks irrespective of any forthcoming support from the government) are regularly reviewed in the banking sector stability analysis. This also includes a review of rating outlooks and the reports offered by rating agencies.

## 6.2 STRESS TESTING SYSTEMS' SENSITIVITY

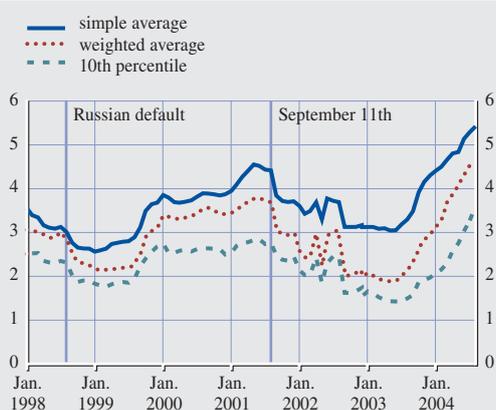
While indicators based on market information provide a view of the full set of risks faced by banks, they suffer from the downside that they reflect the most likely outcome in the near future. Consequently, assessment of the sensitivity of banks' operations to severe shocks with low probability of realisation, but high costs will have to be conducted separately.

Stress testing is a useful tool to test how a realisation of numerous adverse disturbances simultaneously would affect banks' performance.<sup>57</sup> Different scenarios can be produced either based on historical or invented events. The system can be shocked using different combinations of disturbances. However, it would be preferable to have a clear

<sup>56</sup> We have conducted similar analyses for spreads but found that spreads may be much less suited as systemic indicators of bank fragility. The signals were substantially more volatile and they tend to be lagging the events that we have identified.

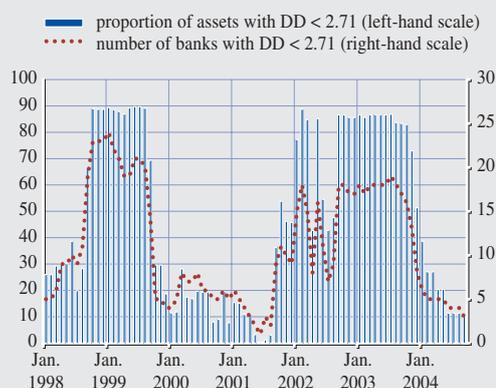
<sup>57</sup> For general references to the development of stress testing tools see Jones et al. (2004) and Drehmann et al. (2004).

**Chart 6 Distance-to-default of 37 large EU banks (Jan. 1998 – Sep. 2004)**



Sources: Thomson Financial Datastream, Bankscope, ECB calculations.

**Chart 7 Threshold indicators based on distance-to-default of 37 large EU banks (Jan. 1998-Sep. 2004)**



Sources: Thomson Financial Datastream, Bankscope, ECB calculations.

plausible relationship between disturbances, based on actual links between different factors, rather than produce ad hoc scenarios which cannot, in reality, take place.

A separate question is how the impact of a combination of disturbances is transmitted to the banking system and how it travels within the system. Eventually, the aim of the analysis is to assess if banks' solvency positions would weaken, following the combination of shocks, to the extent that they would threaten financial stability. In addition, drastic liquidity squeeze in the banking system would also be considered as a sign of financial instability, owing to the important liquidity-provisioning role of banks.

Stress testing the materialisation of a number of different risks is currently quite demanding in the context of a large financial system, such as the EU. The major constraint is usually the lack of detailed data. Comparable, homogenous indicators on, for example, interest rate risk are still under development, while liquidity and contagion risks would require detailed information on interbank markets, which is usually confidential, limiting the scope and usefulness of stress testing within the banking system to a large extent. Meaningful analysis would also require relatively long time series, which are not available on banks. Owing to these shortcomings, credit risk is still the usual candidate for stress testing.

A "bottom-up" approach to stress testing is to ask banks to run impact studies of specific scenarios on their portfolio outcomes, using their own stress testing tools. This approach is followed e.g. by the IMF in its financial sector assessments (see Jones et. al. 2004). The "top-down" approach runs models at the aggregated level, which are aimed at quantifying the link between macroeconomic and financial market variables and banks' financial condition and enabling the conduct of analyses of the sensitivity of banks' condition to changes in these variables.

The traditional approach to establish the link between macroeconomic variables and banks' asset quality indicators is the "single equation approach", which estimates a model regressing banks' loan loss provisions (or non-performing loans) on macroeconomic and other variables.<sup>58</sup> Box 4 describes the model used at the ECB to link banks' loan loss provisions to macroeconomic variables. While this analysis can produce useful first estimates of high-level aggregated relations, the results so far indicate a relatively weak or quantitatively small link between provisions and macroeconomic developments. These results could be due to the fact that the nature of the link between default risk and the business cycle is not necessarily straightforward. It is not clear that models, which

<sup>58</sup> See Greenawalt and Sinkey (1991), de Lis et al. (2001), Pain (2003), and Bikker and Metzmakers (2004).

#### Box 4

##### LOAN LOSS PROVISIONING IN THE EU OVER THE BUSINESS CYCLE

Loan loss provisioning (LLP) by banks often tends to increase during recessions and to decrease during expansions (Chart A). This can create pro-cyclicality in banks' earnings, which may entail undesirable macroeconomic consequences, for example, leading to credit rationing when economic conditions deteriorate, thereby possibly aggravating economic downturns. As can be seen from Charts B to D, provisions (as a percent of total lending volume) move negatively with EU GDP growth and with the spread between long and short-term interest rates, and positively with the real interest rate.

This Box reports the summary results of an empirical study on loan loss provisioning (LLP) of the EU-15 countries' banking sectors and of major individual EU banks.

In order to shed light on loan loss provisioning policies, the effects and relative importance of macroeconomic, financial market and behavioural (bank or sector-specific) factors can be tested. The LLP of the EU-15 countries' banking sectors were analysed econometrically over the period 1979-2001, considering several variables. Among the variables included were the EU-wide and country-specific GDP growth rates, the EU short-term real interest rate and the EU term spread, as well as the country or bank-specific lending growth, capital ratio and income margin.

The results of the empirical analysis suggest an increase in LLP of about 10 basis points following a 1% decrease in the EU GDP growth rate. A rise in short-term real rates of 100 basis

Chart A EU-wide LLP (% loans, % income)

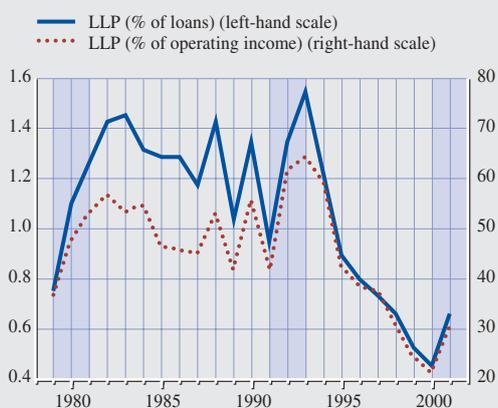


Chart B EU-wide LLP and real GDP growth

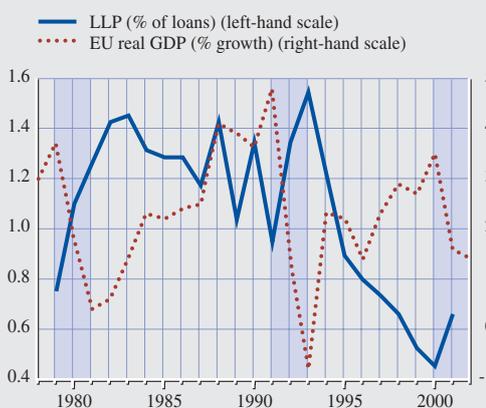


Chart C EU-wide LLP and EU short-term real rate

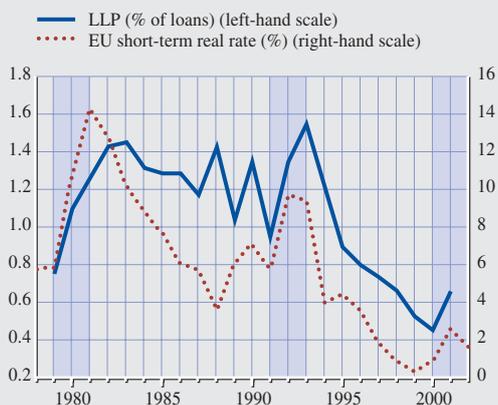
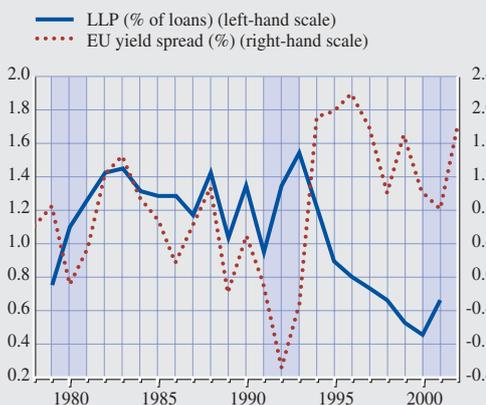


Chart D EU-wide LLP and EU yield spread



points tends to be followed by a rise in LLP of 10 basis points in the following year. A 25 basis points reduction tends to occur when the term spread increases by 100 basis points, possibly reflecting an improving GDP growth outlook.

In a next stage, the model can be used to analyse the sensitivity of average LLP to different levels of the explanatory variables (see the table below). For example, a scenario of 1% growth at the EU level, a long-term interest rate of 4% and a term spread of 2%, as of late 2002, implies average LLP of 0.95%. If the long-term interest rate were to increase by 200 basis points, ceteris paribus, LLP would increase by 16 basis points to 1.11%. Similarly, a weakening of economic growth to 0% would, ceteris paribus, increase LLP by 10 basis points to 1.05%.

**Level of loan loss provisions (% of loans) under different macroeconomic and financial market developments**

Yield spread (%)	Long-term interest rate (%)	EU real GDP growth (%)				
		-2	-1	0	1	2
0	2	1.77	1.66	1.56	1.45	1.35
	4	1.93	1.83	1.72	1.62	1.51
	6	2.09	1.99	1.88	1.78	1.68
	8	2.25	2.15	2.05	1.95	1.85
1	2	1.43	1.33	1.22	1.12	1.01
	4	1.59	1.49	1.38	1.28	1.18
	6	1.75	1.65	1.55	1.45	1.34
2	8	1.91	1.81	1.71	1.61	1.51
	2	1.09	0.99	0.89	0.78	0.67
	4	1.25	1.15	1.05	0.95	0.84
3	6	1.41	1.32	1.21	1.11	1.01
	8	1.57	1.48	1.38	1.28	1.17
	2	0.76	0.65	0.55	0.44	0.34
4	4	0.92	0.82	0.71	0.61	0.50
	6	1.08	0.98	0.88	0.78	0.67
	8	1.24	1.14	1.04	0.94	0.84

Source: ECB.

Note: The figures denote scenarios for LLP given the 2002 figures for lending growth = 2.7%, capital/asset ratio = 4.6%, income margin = 0.9%.

start off by choosing specific macroeconomic variables as driving factors, will uncover the “true model”. There might be some other common factors, which induce correlation across firms’ default risk, but which do not affect observable macroeconomic factors, or do so only very weakly. In fact, there is no apparent consensus in the broader literature linking default risk indicators directly to macroeconomic variables.

Secondly, as noted by Altman and Saunders, it is important to distinguish ex post realisations of credit problems from changes in the ex ante loss distribution arising from different macroeconomic conditions. Exhibit 4 illustrates

this issue. If point A is a bad ex post realisation on a stable loss distribution 1, then the ex ante risk exposure is not affected by systematic risk factors. If, however the amount of loss is represented by point B on loss distribution 1 during good economic times and point A on loss distribution 2 during bad economic times, then there is an ex ante pro-cyclical shift in risk exposure. That is, the entire distribution of losses shifts in response to macroeconomic factors. Since point A lies on both loss distributions, it is empirically difficult to disentangle ex ante shifts in risk from mere ex post realisations. To address this identification problem ideally requires a forward-looking indicator of default tendency, as opposed to one

based on actual loss experience such as loan loss provisions (or realised defaults). It is then possible to assess whether the likelihood of default is materially affected by different macroeconomic conditions.

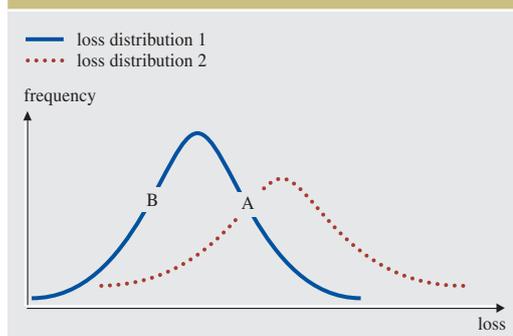
The VAR-model developed at the ECB, linking Moody's KMVs EDFs with macroeconomic variables, follows this idea, as EDFs are forward-looking default risk indicators (see Alves, 2004 and ECB, 2003b). This analysis at the industry level also allows to sharpen the analysis compared with the aggregated "single equation approach", as it loses less information through aggregation. It also incorporates correlations between borrower sectors and industries, which is an important part of the stress testing of credit exposures. If adequate breakdowns of loan losses or other indicators on default probability of different industries and sectors are not available, correlations between industries to various shocks are not possible to estimate. In this case, rough approximations can be achieved by studying how aggregate loan losses are impacted by a combination of disturbances.<sup>59</sup> Further work is ongoing in addressing the co-movement of sectoral risks and effects of credit portfolio diversification by resorting in developing stress testing to credit risk modelling approaches (see Pain and Vesala, 2004).

## 7 STATISTICAL ISSUES IN THE COMPILATION OF MPIs

### 7.1 INTRODUCTION

As noted in Section 3, the MPIs are divided into three subsets of indicators: 1) internal factors, 2) external factors and 3) contagion factors (see Exhibit 3). The statistical requirements in the field of macroprudential analysis are addressed through combining the use of existing available data drawn from EU harmonised monetary statistics (and other macroeconomic statistics) with supervisory and commercial data sources. Some of the harmonised monetary statistics are adapted for the purpose of macro-prudential

Exhibit 4 Two credit loss distributions



analysis and the transmission of these data by NCBS to the ECB is reflected in an ECB Guideline, which is addressed to euro area NCBS.<sup>60</sup>

Currently, the production of a number of MPIs is derived from the existing prudential supervision collection systems, guided by the EU regulatory framework, most importantly the Bank Account Directive (BAD). The advantage of this approach is that it is straightforward in terms of cost-effectiveness and relevance for financial stability purposes.

The data collection from supervisory authorities is based on information that was originally designed to assess the condition of individual institutions rather than with the intention of consistently collecting data suitable for aggregation. This is contrary to data collected in the macroeconomic field, which is based on rigorous statistical requirements that are developed over a long period of time with a focus to aggregation of data into long time series.

Given the rapid development in the macro-prudential analysis, the related statistical requirements are being further improved, in particular the data quality aspects. The data quality needed to effectively support the policy makers has several dimensions

<sup>59</sup> See e.g. ECB (2003b), Box 3.

<sup>60</sup> See the Guideline ECB/2003/2, as amended.

### Exhibit 5 Data sources of macro-prudential indicators<sup>1)</sup>

DATA ITEM	SOURCE <sup>2)</sup>	NOTES
<b>I. INTERNAL FACTORS</b>		
1. Profitability, balance sheet quality, capital adequacy	SUP	Transmitted through statistical channels and stored in a statistical database
Income–cost development and profitability	SUP	
Balance sheet	SUP	
Asset quality	SUP	
Capital adequacy	SUP	
2. Demand and supply (competitive) conditions	STAT	
3. Risk concentrations	SUP/STAT	
Credit growth and sectoral concentration	SUP/STAT	STAT except commercial mortgage lending
Currency and maturity structure of domestic lending	STAT	
Global credit exposures	SUP	
Liquidity risk	STAT	
Exposure of EU15 to new EU member countries	STAT	
Exposures towards emerging and developing country	STAT	BIS framework
4. Market assessment of risks	SUP/MKT	SUP: eg. no. of bank rating downgrades in period, distance to default measures MKT: eg. Datastream
<b>II. EXTERNAL FACTORS</b>		
5. Financial fragility	STAT/SUP/ MKT	STAT: Financial Accounts. SUP: Admin. National data MKT: KMV EDF
6. Asset price developments	MKT	Commercial providers e.g. Datastream. For real estate prices, patchy data from BIS. Most sources of private statistics with different concepts.
7. Cyclical and monetary conditions	STAT	Balance sheet items / Financial Accounts / HICP
<b>III. CONTAGION FACTORS</b>		
8. Contagion factors	STAT/SUP	STAT: share of interbank liabilities SUP: large exposures
<p>1) For a complete list, see Exhibit 3.</p> <p>2) STAT= harmonised statistical data sources; SUP = national supervisory data sources; MKT = commercial data providers; HICP = Harmonised index of consumer prices. BIS = Bank for International Settlements. KMV EDF = Expected default frequencies of KMV</p>		

(concerning timeliness, coverage, reliability, comparability, accessibility, etc.) that need to be carefully assessed.<sup>61</sup>

In the following, the data sources of the various MPIs are reviewed. The following Sections 8 and 9 then provide an overview of data quality aspects of the MPIs currently collected in the ESCB context, outline the way forward to overcome remaining problems as well as discuss the development of indicators for financial stability purposes in other foras.

## 7.2 DATA SOURCES

As shown in Exhibit 5, most MPIs are compiled either from national supervisory sources or through harmonised macroeconomic statistical sources. The number of market-based indicators is still relatively low but it is constantly growing.

<sup>61</sup> For background information on data quality frameworks, see OECD (2003) and the IMF data quality reference site (<http://dsbb.imf.org/Applications/web/dqrs/dqrs/home/>)

A large number of MPIs is compiled by aggregation of national supervisory series. In particular, MPIs on profitability, balance sheet quality and capital adequacy (so-called “consolidated banking data”) represent one of the key tools of the analysis. For this data set, the underlying definitions of most variables describing banks financial condition are drawn from the BAD. Consolidated own funds data (Tier 1 equity capital and supplementary Tier 2 capital) and the solvency ratios follow the supervisory standards as stipulated by the Basel Committee on Banking Supervision and introduced in the EU via the specific Directives. The current international accounting principles for asset and liability valuations are used, i.e. traded financial assets and liabilities are recorded at marked to market (or “fair”) value, while non-traded assets and liabilities are recorded at historical cost. Since most of the series are collected not only as aggregates but also broken down into three size groups (large, medium and small credit institutions), the total number of the series is large.

The consolidated banking data are collected through a full set of income statement and balance sheet information (i.e. the underlying values rather than ratios). This enables the users to compute those indicators deemed most useful for the analysis and to use a large variety of different ratios. Hence, even though the used set of indicators may vary, the core data remains roughly stable. This approach minimises the reporting burden and improves the availability of long time series.

This data set is collected on an annual frequency, with reference to the situation as at end-December, starting from end-May of the following year. The timeliness is not strictly fixed as it depends on national data availability constraints. The reporting population for consolidated banking data consists of all EU-registered credit institutions (CIs). The coverage of the reporting population is comprehensive, close to 100%. The data are

transmitted to the ECB through statistical channels and stored in a statistical database.

Amongst harmonised macroeconomic data sources, money and banking statistics (MBS) also provide an important contribution.

MBS is a statistical framework designed for the analysis of monetary developments in the euro area on the basis of balance sheet information of the so-called “money-issuing sector”.<sup>62</sup> This framework consists of three main elements: 1) a definition of which institutions are to provide balance sheet data; 2) the method of aggregation and consolidation of the information and 3) a specification of the data breakdowns to be delivered. Concerning the first element, the Monetary Financial Institutions (MFIs) have been identified as the reporting population for MBS. Concerning the second element, the aggregated balance sheet of the MFI sector is the sum of the harmonised balance sheets of all the MFIs resident in the euro area. The consolidated balance sheet of the MFI sector is obtained by netting the aggregated balance sheet positions between MFIs in the euro area. The consolidated balance sheet provides the basis for the regular analysis of euro area monetary aggregates and counterparts. Concerning the last element, the balance sheet information is broken down by instrument, (original) maturity and sector.<sup>63</sup>

Some of the MBS data are specifically adapted for macro-prudential analysis. Two main data sets can be separately identified: the balance sheet data on credit institutions (Area 3) and the

<sup>62</sup> The money-issuing sector consists of those financial institutions (termed ‘Monetary Financial Institutions’ or MFIs) which issue liabilities with a high degree of moneyiness to non-MFIs located in the euro area (excluding central government). MFIs are central banks, resident credit institutions as defined in Community law, and other resident financial institutions whose business is to receive deposits and/or close substitutes for deposits from entities other than MFIs and, for their own account (at least in economic terms), to grant credits and/or make investments in securities. (See also [www.ecb.int/stats/pdf/money/mfi/mfi\\_definitions.pdf](http://www.ecb.int/stats/pdf/money/mfi/mfi_definitions.pdf))

<sup>63</sup> For background information on the three main elements of MBS, see Bull (2004).

bank retail interest rates (Area 2).<sup>64</sup> The first data set has been produced through the development of a reporting scheme specifically designed to cover balance sheet statistics that NCBs already collect from CIs as a sub-set of the MFI population<sup>65</sup> under the statistical Regulation ECB/2001/13. Data on credit institutions are currently separately reported to the ECB by those Member States where the population of money market funds (MMFs) is significant. Stock and flow data are reported at a quarterly frequency, with a timeliness of 28 working days.

The second MBS data set required for macro-prudential analysis concerns bank retail interest rates (Area 2).<sup>66</sup> For macro-prudential purposes, this data is used for instance to calculate the overall margin for the main business of banks, i.e. the spread between deposit taking activity and lending. Until recently, the provision of retail interest rate data had followed an approach based on already existing but unharmonised national interest rate statistics (RIR data), which suffered from some limitations. However, by means of a dedicated Regulation, the ECB is now collecting harmonised statistics on interest rates applied by MFIs (MIR). With these statistics, the macro-prudential analysis is exploiting comparable and accurate data on both new business and outstanding amounts.

Harmonised macroeconomic statistics are also used to compile MPIs concerning the external factors. In particular, financial fragility indicators (area 5) rely on MBS as well as on financial accounts statistics.<sup>67</sup> Moreover, indicators on cyclical and monetary conditions (area 7) include macro economic indicators such as the rate of real GDP growth, the rate of change in M2, corporate and household indebtedness.

Forward looking MPIs, information on the set of large EU banks as well as data on general financial market developments are obtained from commercial and publicly available data sources. Market data is very important for the analysis as it provides means to assess banks'

income generation dependent on financial market developments (both trading and investment books) as well as asset quality (investment book). It also provides a view to market expectations and the key forward looking elements in assessing banks' ability to withstand disturbances (see discussion above on market indicators).

### 7.3 CONSOLIDATION CONCEPTS

When banking data are collected for financial stability purposes, it is increasingly recognised that a fully consolidated approach is needed, implying consolidation of all relevant cross-border and cross-sector operations of banking groups. Exhibit 6 below, drawn from the IMF Compilation Guide on Financial Soundness Indicators (FSIs), provides a schematic presentation of levels of consolidation in terms of control and domestic versus cross-border orientation of deposit taking institutions.<sup>68</sup> The consolidation approach recommended by the IMF is the so-called "domestically controlled, cross-border consolidated data", which is in line with the so-called "home country" principle (i.e. including foreign branches according to the residency of the parent companies) (blocks 1a, b, and c in Exhibit 6). The home country principle is reflected in the division of responsibilities of banking entities between supervisory authorities in home and host countries according to the First Banking Co-ordination Directive. However, it should be noted that the IMF approach only covers deposit-taking institutions and excludes other

64 The two data sets are used also for other purposes. For example, the first data set is used by Eurostat to complement its financial services statistics.

65 The MFI balance sheet data are not sufficient for the purposes of macro-prudential analysis for those countries where the reporting population of other MFIs consists of both credit institutions and money market funds (MMFs) and where the impact of the latter is significant. The reporting scheme for credit institutions is currently included in annex V of the MBS Guideline ECB/2003/2, as amended.

66 This data set is needed, in the first instance, for monetary policy purposes, e.g. for monitoring the transmission mechanism.

67 On the use of financial accounts data, see Sahel and Vesala (2001) and Mink and Silva (2003).

68 The IMF FSI Guide is further described in Section 9.

financial institutions belonging to a banking group.

To accommodate the need for full coverage of risks for the purpose of the ESCB macro-prudential analysis, the consolidation is broader than the one recommended by the IMF as it includes cross sector consolidation (not shown in the Exhibit), i.e. subsidiaries of deposit taking institutions in other financial sectors, excluding the insurance sector.

Profitability ratios (e.g. ROE), growth in banks' credit exposures and liquidity, banks' off-balance-sheet activities (credit lines, derivatives),<sup>69</sup> banks' overall exposures by specific industry sectors are examples of indicators to be monitored on a consolidated basis. Consequently, an important set of MPIs is based on consolidated banking data from national supervisory authorities.

In the context of the ESCB, cross-border cross-sector consolidated data are reported to the

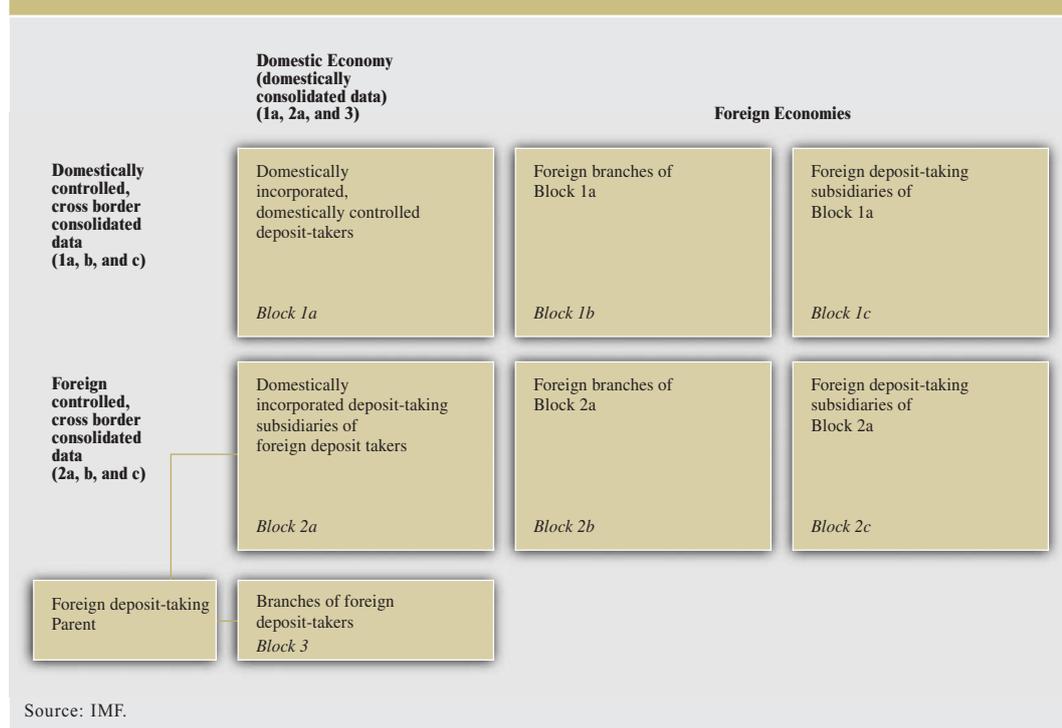
ECB by the responsible home supervisory authority (or the central bank) of the parent bank. All EU countries are presently able to provide fully cross-border consolidated banking sector data for the ECB macro-prudential analysis and significant efforts have been made to avoid double counting and have clean EU-wide aggregates.<sup>70</sup> In particular, the objective is that data on foreign branches and subsidiaries are reported only once by the home country authority of the parent company and not by the host countries of these institutions in order to avoid double counting.

Cross-sector consolidation follows from the same principle as cross-border consolidation. Full view to all risks faced by a bank requires information of important activities conducted

69 This data collection has been recently refined to include data on few core off-balance sheet items from credit risk perspective (off-balance sheet items are broken down into contingent liabilities, commitments and derivatives).

70 This applies also to the New Member States (NMS). After a transition phase (year 2004), they start reporting consolidated banking data in 2005.

Exhibit 6 Schematic presentation of levels of consolidation



in the non-bank financial institutions, which are part of the banking group. Preferably, risks in “bancassurance” structures should also be included, though owing to differences in national practices this is not fully the case at the moment in the context of the ESCB. Progress is underway to implement full cross-sector consolidation, the insurance sector providing the biggest obstacles, as banking groups do not yet consolidate their insurance operations in the EU.

The macro-prudential analysis also makes extensive use of the harmonised macroeconomic statistics (e.g. MBS) collected on a non-consolidated basis for “domestic economy” (Blocks 1a, 2a and 3 of Exhibit 6) as described in the previous sections. These data allow for addressing risks in specific geographic regions and countries, and to identify possible financial imbalances causing risks to banking sector stability. These statistics are based exclusively on the so-called “host country” principle.<sup>71</sup> The reporting population for monetary policy purposes comprises 1) institutions incorporated and located in the territory, including resident subsidiaries of those parent companies that are located outside that territory and 2) resident branches of institutions that have their head office outside that territory.

#### 7.4 LEVELS, DIFFERENCES AND MEASURES FOR DATA DISPERSION

Quantitative data should be constructed to include information on changes over time as well as the levels of the key indicators. From the point of view of the stability analysis, which is conjunctural in nature, indicators are often presented as changes rather than as levels as they can be directly linked to the dynamics of the rest of the economy.

In order to calculate accurate data on changes, the simple comparison of end-of-period levels is not always sufficient. Indeed, in the case of MPIs based on consolidated balance sheet or assets quality information, the levels may change due e.g. to price or foreign exchange

reevaluations, rather than to new business. In principle, data on the actual new business (flow data) that has occurred during the period would be needed as this would permit a better representation of the difference in levels brought about by the acquisition of financial assets or the incurrence of financial liabilities. Alternatively, flow data can be calculated by adjusting the difference between end-of-period levels for the effect of non-transactions-related factors. For MBS purposes, for instance, the latter option is followed.

Flow data on consolidated banking data are currently not available. Therefore, the ECB calculates growth rates on the basis of differences in stocks. However, work to improve the MPIs is ongoing. For instance, a standard adjustment for exchange rate changes should be possible. As and when data availability improves, flow data should be derived from reclassifications, revaluations and other adjustments. Revaluations arise from changes in the price and/or foreign exchange rates of the underlying financial asset or liability. Reclassifications include any business relating to CIs that have been classified to a different size class compared to the previous observation or to CIs that join/leave the population. For off-balance sheet variables, only reclassifications data would be required, as it is assumed that these items are recorded at nominal value (e.g. guarantees) or at notional value (e.g. derivatives).

In addition to aggregate system wide data, the ECB collects data enabling analysis on national banking sectors. Information on foreign controlled institutions operating in a country enables to have a view to possible differences in performance between domestic and foreign banks. Aggregating data on foreign-controlled branches/subsidiaries with data on domestic banks also enables analysis on the national banking markets. This is particularly important in the EU where the

<sup>71</sup> According to this principle, a resident MFI means an MFI that is resident in the economic territory of a given country.

integration process between banking systems is still ongoing and hence aggregate data may hide large differences between countries. It should be noted that country-specific information is important from the system stability point of view, particularly when it reflects the conditions of major, systemically important institutions in the EU. Information on the distributions of some key variables is also collected to assess the dispersion around the averages.

The size groups improve the analysis of dispersion within the banking system and allow better identification of fragilities in the banking sector. The size groups are defined as follows: banks with total assets over 0.5% of total consolidated EU banking sector assets are considered large whereas small banks have assets less than 0.005% of total consolidated EU banking sector assets. The flexible definition based on relative rather than absolute size allows for the asset growth in the banking sector and ensures that e.g. the group of large banks continuously captures the major institutions. It also avoids large structural breaks in the data over time.

As noted above, in addition to aggregate information and size groups, individual publicly available financial statement data are also collected separately on the largest EU banks. This information is normally available in a more timely manner than the banking system-wide data and complements that information by enabling detailed analysis for the best and worst performing institutions.

## 8 INTEGRATION OF INFORMATION FROM DIFFERENT DATA SOURCES

This Section reviews some remaining statistical issues regarding the integration of data sources for macro-prudential analysis. These issues concern 1) the combined use of financial macro-statistics and aggregated micro-prudential data; 2) differences in the underlying reporting systems; and 3) the

differences between the frameworks in terms of coverage, residency principle, consolidation rules and maturity concepts. Finally, the main challenges ahead are summarised.

### 8.1 THE COMBINED USE OF DIFFERENT SOURCES OF STATISTICAL INFORMATION

As described above, the sources of statistical information used for the purpose of prudential supervision at the macro level can be divided into two categories: financial macro-statistics and aggregated micro-prudential data. As macro-prudential analysis needs to cover a large variety of issues, it is natural that different sources of data are used, which can also be compiled on different statistical bases. When data from the different sources are used for different purposes (and not used to calculate single ratios, for instance), this does not necessarily hamper the analysis. However, improved consistency between different sources, enabling the calculation of ratios using different data sets, would allow a more effective, easier and wider use of the information.

Financial macro-statistics comprise harmonised frameworks (MBS, Financial Accounts, Balance of Payments) where data are organised into comprehensive overviews of the condition and transactions of the financial sector and its key components. These data can thus provide indicators of the activity and operation of the financial system as a whole.<sup>72</sup> Aggregated micro-prudential data, in turn, consists of mostly supervisory information on the condition of individual banks. These aggregations may provide indications of the overall condition of the financial sector. As such, aggregated micro-prudential data may suffer from limitations in terms of statistical accuracy and international comparability, which may limit their use.

Although both financial macro-statistics and micro-prudential data are drawn from similar

<sup>72</sup> See IMF (April 2000).

sources, differences between their compilation methods can impair the joint use of these data sets to calculate single indicators.<sup>73</sup> It is important to have available metadata that carefully explain the definitions and possible limitations in the data set referred to.<sup>74</sup>

The comparability of micro-prudential data can be improved through adherence to internationally agreed supervisory, statistical and accounting standards. In fact, both financial macro-statistics and aggregated micro-prudential data are derived from individual banks' balance sheets and other detailed financial information. The two types of data can be integrated in two directions. Integration could, firstly, be achieved by applying standard statistical concepts (such as definitions of residency, sectors, and financial instruments) when compiling aggregate micro-prudential data. It could also be achieved by enhancing financial macro-statistics with additional breakdowns of MIR and MFI balance sheet statistics (such as memo items on non-performing loans, syndicated loans, sector exposures and subordinated debt), as well as with timely, detailed and harmonised data on banks' consolidated balance sheets, profitability and capital adequacy.

Convergence in supervisory practices will provide benefits to the compilation of MPIs which are comparable cross-border, besides leading to more cost-effective reporting by financial institutions. In the EU, the convergence in supervisory practices is in particular facilitated by the establishment of specific supervisory committees within the so-called "Lamfalussy framework". The involvement of central banks in this process can also potentially contribute to the overall consistency of the various reporting requirements for both supervisory and monetary policy purposes.

At the country level, where an NCB is also the competent national authority in the field of banking prudential supervision, it is more likely to maintain a single integrated reporting

system between monetary statistics and supervisory returns. Hence, in these countries, the integration of the two data sets is facilitated, also at the level of the reporting population, since consolidated banking data may be collected from well-identified reporting agents that normally represent a subset of the MFI list. This may allow articulating more easily the consolidated balance sheet formats of these reporting agents within the MBS balance sheet format or in separate modules but linked through consistency checks. Suitably integrated or at least compatible reporting requirements could also minimise the reporting burden of banks.

Exhibit 7 below summarises the main differences amongst national statistical and supervisory collection systems and the degree of independence between statistical and financial accounting rules. The cost-effectiveness increases from right to left and statistical dependence on financial accounting rules from bottom to top.

## 8.2 MAIN DIFFERENCES BETWEEN MONETARY AND SUPERVISORY DATA

ECB financial macro-statistics are primarily designed for monetary policy purposes. As mentioned above, the statistical requirements in the field of monetary policy (including those needed for operational purposes) have been prioritised against other requirements. These monetary data are therefore tailored to specific needs and do not always meet the requirements for macro-prudential analysis. The differences between the requirements for macro-prudential analysis and those for monetary policy purposes are summarised in Exhibit 8 below.<sup>75</sup>

<sup>73</sup> For instance, profitability indicators such as RoE (Return on Equity = net profit/capital & reserves) and RoA (Return on Assets = net profit/total assets) cannot be calculated using the balance sheet figures from the existing monetary statistics (MBS data), since they are unconsolidated and follow the host country approach, while the profit figures are consolidated and follow the home country approach.

<sup>74</sup> See, for instance, Wharmby (2001) and Debbage (2002) for discussion of possible inconsistencies.

<sup>75</sup> This table represents a further elaboration of the one presented in Grande and Stubbe (2002).

**Exhibit 7 Integration of collection either systems and dependence on commercial accounting rules in the EU-15**

Increasing independence of accounting and statistical rules	Decreasing integration in reporting systems	Statistical and supervisory reporting		
		Largely integrated	Partly integrated	Separate
Local accounting rules used in statistics		BE, ES, FR, IE, IT, FI, SE, UK	DE	LU, NL, PT
Of which adjustments applied to meet statistical requirements		BE, FR, FI, UK		
Separate valuation rules for statistical purposes			GR	AT, DK

Source: ECB's Statistics Committee.

Concerning the requirements in terms of geographical coverage, while for monetary policy purposes the focus is on the euro area, macro-prudential analyses covers both the euro area and the EU. The reporting population for financial macro statistics consists only of monetary financial institutions (MFIs i.e. mainly credit institutions and money market funds). This differs from the view of micro and macro-prudential analysis. Here the focus is broader. The full view to banking risks requires that the business of non-bank subsidiaries of banking groups is covered, including insurance companies. These entities currently fall outside the scope of the reference population for monetary policy purposes. In addition, contrary

**Exhibit 8 Main differences between statistical requirements for monetary policy vs. supervisory purposes**

Requirement	Monetary policy purposes	Prudential supervision purposes
Geographical Coverage	Euro area	EU/euro area
Reporting population	Monetary Financial Institutions (and OFIs other than insurance companies and pension funds)	Credit Institutions and other financial institutions belonging to a group (or subgroup) controlled by a Credit Institution
Reporting coverage	95% minimum (de minimis threshold); data grossed up to 100%	As close as possible to 100%
Residency	Host country approach	Primarily home country approach complemented with host country approach
Geographical consolidation	Unconsolidated	Primarily consolidated complemented with unconsolidated
Institutional consolidation	Unconsolidated <sup>1)</sup>	Consolidated, including other financial institutions belonging to the same group.
Valuation	Market value	Market value/book value
Instrument Breakdown	Basic (currency, deposits, debt securities, MMF shares, capital, remaining liabilities)	Detailed (e.g. syndicated loans, subordinated debt, e-business, etc.)
Maturity	Original maturity	Residual maturity

1) Consolidation is however permitted under certain conditions within the national territory, hence an MFI can, for statistical reporting purposes, consolidate its domestic offices, but not its offices located outside the country.

to monetary policy analysis, disaggregation in terms of size of an institution is often used in macro-prudential analysis as large institutions are systemically important.

As mentioned above, one major difference between the two data sets results from the applied institutional and geographical consolidation criteria. For monetary/operational purposes, data are made available on an unconsolidated basis (i.e. all intra-MFI business should be reported on a gross basis, without netting out, including the business of an MFI with its foreign branches) and follow the host country principle.<sup>76</sup> This host country data can be useful when tracking sources of risk that emanate from a certain country. However, these data can only complement, but not substitute, the full cross-border and cross-sector consolidated data which is key for macro-prudential analysis (see Section 7.3).

Another difference lies in the degree of detail of the balance sheet instrument breakdown, which is much greater in the supervisory statistics, reflecting the need to monitor the risk, liquidity and capital adequacy profiles of the individual supervised entities. This is also needed in macro-prudential analysis.

Finally, in terms of the maturity concept, while for monetary/operational purposes data should be broken down by original maturity, an analysis of the liquidity condition of banks from a micro and macro-prudential perspective requires breakdowns by residual maturity.<sup>77</sup>

### 8.3 CHALLENGES AHEAD

Although the supervisory data pooled so far for the ESCB macro-prudential analysis are the best available in terms of timeliness and degree of detail, there are certain data quality issues to be addressed to ensure that the consolidated banking data can be collected within a consistent statistical framework. The ECB, together with the BSC and the STC, aims at promoting further improvements of the statistics for banking stability, particularly

concerning the coherence of the definitions of the basic prudential aggregates, the application of consolidation methods, the consistency of the reporting population and the appropriate consistency with other data sets. In particular, work is on-going in order to achieve a minimum “common platform” consensus, to be developed on the basis of concepts and definitions stemming from EU Directives.<sup>78</sup>

As the BAD and other EC Directives are important references for statistical balance sheet information, an assessment needs to be made of the degree of harmonisation with these definitions at the national level. Another useful reference for the collection of profitability data is the Regulation on Structural Business Statistics (see section 9). In the medium term, certain improvements might derive from international development efforts such as the legal enforcement of International Accounting Standards (IAS) in the EU accounting legislation, which should improve aggregation of consolidated banking data.<sup>79</sup> However, it is recognised that the establishment of a harmonised macro-economic statistical framework concerning consolidated banking data will require a significant effort, both conceptually and in terms of its implementation. The overall strategy is to meet immediate needs on the basis of the available data and resources, but at the same time to promote, in the medium to long-term, the consistency across different data sets.

The following objectives are currently pursued:

– *The coherence of the definitions of the basic prudential aggregates.* In particular, the

<sup>76</sup> According to this principle, a resident MFI means an MFI that is resident in the economic territory of a given country.

<sup>77</sup> Along these lines, see for instance IMF (November 2001).

<sup>78</sup> Most definitions are contained in the Bank Accounts Directive (86/635/EEC), the Capital Adequacy Directive 93/6/EEC), Directive 2000/12/EC relating to the taking up and pursuit of the business of credit institutions, the 2nd Banking Directive 89/646/EEC and the 7th Council Directive 83/349/EEC.

<sup>79</sup> Steps are being made to co-ordinate the IAS accounting techniques regarding provisioning of loans with those recommended by the Basel Committee.

development of a reporting framework for consolidated banking data relies on the layout and accounting definitions provided by the Bank Accounts Directive (BAD) and other EC Directives. These directives are important references for statistical balance sheet information. Moreover, work will continue towards convergence in definitions of some important variables such as non-performing loans and off-balance sheet items. In this respect, the statistical community is discussing a possible update of the relevant statistical standards in order to ensure the macro-financial statistics keep track of non-performing loans.<sup>80, 81</sup> While the ESCB framework strives towards defining non-performing loans as soon as loan payment delays are equivalent to 90 days, work is ongoing in order to achieve a minimum “common platform” consensus for the medium term.

- *The application of consolidation methods.* Work will continue to further ensure that the implementation of consolidation methods is uniform across countries. In particular, the work should aim at a consolidation on a cross-border basis (country dimension) and across all the sectors of the financial system (sector dimension). Concerning the sector dimension, the consolidation of the business of insurance companies is particularly challenging. The impact of any deviation is being assessed and monitored.
- *The consistency and homogeneity of the reporting population.* To ensure that consistent data are available for aggregation, it is important that the reporting population is defined in the same way in all countries. In addition, to avoid data duplication, it is important to correctly allocate the subsidiaries of foreign banks, following the host country approach. A consistency check will be conducted regularly to ensure a link with the existing MFI population.

- *The establishment and maintenance of a survey of national supervisory practice and prospects.* It is recognised that not all requirements can be met. In particular, those that have a marginal impact on the data can remain just “recommendations” rather than strict requirements. The work in the context of the ESCB will continue also to ensure that deviations from the recommended practice are recorded and monitored. This is important also because financial innovation or regulatory changes may suddenly require that “recommended” data become requirements.
- *The convergence with the IMF standards.* As explained below, it is important that the development of MPIs for the euro area and the EU and the standards recently established by the IMF are closely aligned. In this regard, for the EU the frequency of reporting (on a quarterly basis rather than annually) and the consolidation method (the cross-sector dimension) are the main challenges.

## 9 COMPARISONS WITH OTHER INITIATIVES

In this work, it is important to bear in mind similar initiatives carried out by international agencies, in particular the IMF, but also the OECD, Eurostat, the BIS as well as market analysts.

From the perspective of macro-prudential indicators, the IMF work is probably the most interesting because it aims for developing international standards for the compilation of financial soundness indicators, to which the ECB is contributing. These standards may

<sup>80</sup> The IMF has established an Electronic Discussion Group (EDG) at the recommendation of the Intersecretariat Working Group on National Accounts (ISWGNA). The purpose is to work towards an acceptable treatment for nonperforming loans in macroeconomic statistics (cf. [www.imf.org/external/np/sta/npl/eng/discuss/index.htm](http://www.imf.org/external/np/sta/npl/eng/discuss/index.htm)).

<sup>81</sup> For proposals to compile data on non-performing loans within the macroeconomic statistics framework, see Bloem and Gorter (2001), Krueger (2002) and ECB (2004b).

represent a benchmark for the future. For this reason, the IMF case is described in a separate sub-section.

The work conducted in the OECD and Eurostat is of interest for their attempts to collect statistics on banks' consolidated balance sheets, profitability, assets quality and capital adequacy. The experience of the BIS is important due to its international banking statistics, which are used to analyse the international exposure of banks. From a methodological point of view, it is interesting to note that the BIS statistics face the same problems (regarding consolidation, coverage and consistency of the reporting population) which are currently being addressed by the ECB. The experiences of these international organisations are reviewed in the next sub-section.

### 9.1 IMF FINANCIAL SOUNDNESS INDICATORS

The work of the IMF to strengthen the financial system includes the recommendation to compile Financial Stability Indicators (FSIs) as a tool to enhance crisis prevention. The work originated with a survey conducted amongst compilers and users of FSIs in mid-2000.<sup>82</sup> Eventually, in June 2001 the IMF Executive Board issued a press release with an endorsed list of FSIs. Subsequently, the IMF developed a Compilation Guide as the international statistical standard for the definition and calculation of the FSIs. A draft of this Guide was released for public comments earlier this year and has now been finalised.<sup>83</sup>

Resulting from this process, the IMF is requesting some member countries to compile and publish the FSIs. Reflecting differences in priority and ease of calculation, a distinction is made between a *core* and an *encouraged set* of indicators. While the core indicators mainly focus on generally available indicators relating to banks, the encouraged set of indicators focus more on the non-bank financial sector, the corporate and household sectors, and real estate markets. The IMF recommends that the

FSIs calculated as aggregated series should be complemented by additional series that measure dispersion, peer group analysis and the results of stress tests.

The FSIs are already used in the Financial Sector Assessment Program, in Article IV consultation reports and in publications such as the quarterly Global Financial Stability Report. The IMF Executive Board also had preliminary discussions on the possible inclusion of these indicators in the Special Data Dissemination Standards, most recently in June 2003. The IMF Executive Board has agreed on a project to develop an operational database of FSIs within the IMF and *to conduct, with the assistance of other international agencies, a co-ordinated compilation exercise for supervisors and statisticians after the finalisation of the Guide.*<sup>84</sup>

The IMF Compilation Guideline for FSIs currently represents the international standard for the definitions, concepts, data sources and techniques used in the compilation of FSIs. By recognising the data availability problems as well as the different national supervisory and accounting regimes and financial market structures, the Guide is rather flexible in permitting compilation of FSIs according to different approaches. In the short-term, availability of information is the primary objective, while harmonisation is seen as a longer-term objective. The Guide then provides a "benchmark" against which to measure progress towards full harmonisation. Given the rather far-reaching nature of the proposals, this is an ambitious objective.

82 In April 2000, the IMF also issued an Occasional Paper on "Macprudential indicators of financial system soundness" (see Evans et al. 2000)), providing a conceptual background on the uses and sources of these statistics. In particular, chapter VI on "measurement issues" provides a clear overview of the statistical problems related to FSIs. Most of these problems have been discussed earlier in this paper.

83 After a meeting of experts to finalise the Guide in autumn 2003, the Guide has been published in summer 2004.

84 The IMF Board will review progress on FSIs after two years.

A rather new feature is the fact that the IMF foresees not only the compilation of aggregated indicators, but also various analyses making greater use of individual institution data – peer group and dispersion analysis. This implies a need to ensure that harmonisation relates to the level of individual reporting agents and coverage reaches 100%. In addition, the Guide makes recommendations not simply in respect of the indicators, but also concerning the statistical frameworks (financial statements) within which these indicators should be compiled for each economic sector.

#### 9.1.1 DIFFERENCES BETWEEN THE ESCB AND IMF APPROACHES

There are some key differences between the ESCB and the IMF approaches. First of all, it is important to recognise that the focus of the Guide is on the compilation of FSIs at a national level. The ESCB framework, however, compiles indicators also at the European level and the euro area level depending on which is deemed most useful for the analysis.

The IMF core set of indicators for macro-prudential analysis is less detailed than the corresponding ESCB MPI set, which is intended to provide a broad and timely picture of issues affecting banking stability within the EU.<sup>85</sup> However, this is fully justified by the fact that the FSIs of the IMF represent a minimum global standard for an assessment of financial stability.

In some respects, the IMF approach can be seen as more ambitious than the ESCB approach. In particular, in the EU context the planned quarterly frequency for the full set of FSIs and for complete national sectors will take some time, given the current limited availability of data at the moment.

One of the key conceptual differences between the ESCB and the IMF approaches lies in the consolidation method.<sup>86</sup> In the Guide, the consolidation is limited to domestically controlled banks on a cross-border basis. The ECB's clear priority is on the consolidated data

of domestically controlled banks and other financial intermediaries on a cross-border basis, because this gives an indication of the full income potential and financial condition of the institutions concerned. In Europe, most supervisory data also rely on this form of consolidation. Omitting operations of group entities that are not banks themselves would lead to a very incomplete view.

#### 9.1.2 DETAILED COMPARISON BETWEEN THE ESCB AND IMF SETS OF INDICATORS

When comparing the two sets of indicators it can be seen that the ESCB's MPIs Indicators match around two thirds of the IMF's FSIs. Furthermore, in respect of the core set of 12 FSIs with the larger ESCB set (see Exhibit 9 below), it appears that all these indicators are broadly matched by equivalent ESCB indicators. From these ESCB indicators, 5 make use of MBS data. Furthermore, as the intended coverage of the ESCB exercise is the EU area, where banks have a predominant role in the financial system, the core set of IMF indicators is almost fully covered in the ESCB set.<sup>87</sup>

Concerning the IMF encouraged set of 26 FSIs (see Exhibit 10 below), 15 of the encouraged indicators are broadly matched by ESCB indicators. Out of these 15 indicators, 5 of the ESCB indicators are constructed using MBS data and 3 indicators use financial accounts

<sup>85</sup> More specifically, the ESCB analysis is deeper in certain aspects, as it is structured to cover seven risk areas and includes additional indicators (e.g. on other dimensions of risk concentrations, on competitive conditions and on cyclical and monetary conditions) that do not belong to the FSI framework.

<sup>86</sup> While traditional macroeconomic statistical approaches follow an unconsolidated approach, the IMF is attempting to bridge the accounting/supervisory approach with the traditional statistical approach. For a proposal to reconcile the two systems, see Laliberté (2004).

<sup>87</sup> An advisory group of experts recommended the IMF to drop two indicators from the list and to downgrade indicator 6 to the encouraged set. Subject to endorsement by the IMF Executive Board, the list of core indicators is then reduced from 15 indicators to 12. The three indicators dropped from the core set relate to the duration of assets and liabilities (removed altogether) and to large exposures to capital (added to the encouraged set). None of these three indicators is presently compiled by the ESCB.

## Exhibit 9 Is the ESCB compiling the IMF Core Financial Soundness Indicators?

N.	Core Financial Soundness Indicators	Match with ECB
1	Regulatory capital to risk-weighted assets	Yes
2	Regulatory Tier I capital to risk-weighted assets	Yes
3	Non-performing loans to total gross loans	Yes
4	Non-performing loans net of provisions to capital	Yes
5	Sectoral distribution of loans to total loans	Partly <sup>1)</sup>
6	Return on assets (net income to average total assets)	Yes
7	Return on equity (net income to average equity)	Yes <sup>2)</sup>
8	Interest margin to gross income	Yes
9	Non-interest expenses to gross income	Yes
10	Liquid assets to total assets (liquid asset ratio)	Yes
11	Liquid assets to short-term liabilities	Partly <sup>3)</sup>
12	Net open position in foreign exchange to capital	Partly <sup>4)</sup>

1) The IMF recommends the sector breakdown into banks, government, other financial corporations, non-financial corporations, households and NPISH, and non-residents. However, the ECB list of MPIs does not cover “loans to government”. Moreover, instead of calculating the indicator “loans to banks”, the ECB compiles an indicator on the “share of interbank assets to total assets”.

2) The ECB compiles also indicators on the distribution of RoE.

3) Two ECB indicators (“Ratio of non-bank deposits to M2” and “Ratio of total loans to non-bank deposits”) provide an indication of the liquidity risk in the banks’ balance sheets, but do not match exactly with the core IMF indicator.

4) The ECB ratio covers only loans, not the net open position, as recommended by the IMF. Moreover, the denominator is presently not “capital”, but “total loans”.

data. The indicators not yet covered by the ESCB MPIs relate to data on the corporate sector, on OFIs and on banks’ exposure in financial derivatives.

It should be noted that some of the FSIs currently not compiled by the ESCB can be calculated on the basis of available data. Moreover, some of the ESCB indicators that are broadly, but not exactly in line with the corresponding FSIs can be fine-tuned to follow more strictly the IMF guidelines. For instance, the core FSI “Net open position in foreign exchange to capital” is currently partly matched by a macro-prudential indicator of the ESCB list, the “share of lending in foreign currency”. The ESCB ratio covers only loans, not the overall net open position, as recommended by the IMF. To calculate the FSI in question, the net open position can be derived from MBS data as most balance sheet items (BSI) are broken down by currency. The denominator “capital” is also separately available in the current BSI data set.

The main involvement of the ECB in the IMF work in the field of FSIs can be summarised as follows. First, the ECB, together with a number of other national and international agencies, has provided assistance to the IMF in the finalisation of the Compilation Guide. The ECB shows full support to the IMF initiative as compliance to the IMF standards would enhance international comparability of FSIs compiled in the EU and anticipate the possible requirement for these statistics as part of the SDDS framework. At the same time, however, due consideration should be given to the specific features of the European financial system.

### 9.2 OTHER DATA PROVIDERS

There are only a few potential sources of data on banks’ consolidated balance sheets, profitability, assets quality and capital adequacy.

Among the potential sources is the *OECD*, which publishes banks’ profitability data. OECD statistics provide information on

## Exhibit 10 Is the ESCB compiling the IMF Encouraged Financial Soundness Indicators?

N.	Encouraged Financial Soundness Indicators	Match with the ESCB
<i>Deposit-taking institutions</i>		
1	Capital to assets	Yes
2	Large exposures to capital	No
3	Geographical distribution of loans to total loans	Partly <sup>1)</sup>
4	Gross asset position in financial derivatives to capital	No
5	Gross liabilities position in financial derivatives to capital	No
6	Trading and forex gains/losses to total income	Yes
7	Personnel expenses to noninterest expenses	No
8	Spread between reference lending and deposit rates	Yes
9	Spread between highest and lowest interbank rate	Yes
10	Customer deposits to total (non-interbank) loans	Partly <sup>2)</sup>
11	FX-denominated loans to total loans	Yes
12	FX-denominated liabilities to total liabilities	No
13	Net open position in equities to capital	No
<i>Market liquidity</i>		
14	Average bid-ask spread in the securities market	Yes
15	Average daily turnover ratio in the securities market	No
<i>Nonbank financial institutions</i>		
16	Assets to total financial system assets	No
17	Assets to GDP	No
<i>Corporate sector</i>		
18	Total debt to equity	Yes
19	ROE (earnings before interest & taxes to average equity)	No
20	Earnings before interest & taxes to interest and principal expenses	No
21	Net FX exposure to equity	No
22	Number of applications for protection from creditors	Yes
<i>Households</i>		
23	Household debt to GDP	Yes
24	Debt service and principal payments to income	Yes
<i>Real estate markets</i>		
25	Real estate prices	Yes
26	Residential real estate loans to total loans	Yes
27	Commercial real estate loans to total loans	Yes

1) The geographical classification proposed by the IMF does not fully coincide with the ECB breakdown. For instance, the IMF does request positions viz Latin America, which are covered by the ECB, while the latter does not identify positions viz Africa, which are recommended by the IMF.

2) The ratio is inverted. Moreover, the numerator of the ECB ratio is gross of interbank loans.

financial statements of banks in all OECD member countries.<sup>88</sup> Data are produced on an annual basis, they are reported with a long, irregular lag of 15-18 months, and they are complemented by some balance sheet and capital adequacy data. As admitted by the OECD itself, these statistics are not

harmonised and country comparisons are difficult due to differences in coverage, accounting practices and reporting methods.

<sup>88</sup> See OECD (2002). See also the standard framework for the collection of statistics by country ([www.oecd.org/dataoecd/50/44/2373422.pdf](http://www.oecd.org/dataoecd/50/44/2373422.pdf)).

As regards indicators compiled by the *BIS*, it publishes quarterly statistics on global consolidated claims of banks in 24 major reporting countries on selected individual debtor countries. These data are relevant in analysing the international bank indebtedness towards developing countries and Eastern European countries. They provide information on counterparties of the individual national banking systems the regarding country exposures. The *BIS* publishes both the worldwide aggregates of country risk exposures vis-à-vis individual countries and data on the exposures of most individual reporting banking systems.

The *BIS* consolidated banking statistics cover all claims on individual countries, which are not part of the reporting area, i.e. which are not one of the 18 OECD reporting countries. While currently 24 major countries provide data on country risk exposures, the world-wide consolidation of individual banks' balance sheet claims means that in practice the claims of a large number of banking offices located outside the principal reporting area are also covered. In addition to the full geographical breakdown of claims, the *BIS* consolidated data provide breakdowns by nationality of the reporting banks and by residual maturity distribution (up to an including one year / over one year up to two years / over two years) and sector distribution (banks / public sector / non-bank private sector) of exposures.

The *BIS* consolidated banking data are currently in the process of being considerably enhanced with the aim to provide more detailed and comprehensive data on country risk exposures on an ultimate risk basis, i.e. on risk positions reallocated to the country where the final guarantor of a financial claim resides. The enhanced statistics are scheduled to go live by the end of 2004.<sup>89</sup>

The *BIS* case is interesting because it integrates similar statistics following different residency criteria. Within its International Banking Statistics, the *BIS* compiles and

publishes locational banking statistics following the host country principle, whereas its consolidated banking statistics follow the home country principle. The reporting population of the consolidated banking statistics only cover banking institutions, which broadly correspond to the EU definition of credit institutions.

Regarding the principles of consolidation, the *BIS* has not issued any guidelines on whether or not the consolidated reporting should only include affiliates that belong to the same economic sector as that of the reporting institutions. The practice of consolidation is therefore left to national discretion. A recent survey revealed that only in 5 of the 27 reporting countries reporting banks include non-financial affiliates in their consolidated banking data<sup>90</sup>. In addition, in 13 of the 27 reporting countries, and in two additional countries in the future, reporting banks include other non-bank financial affiliates in their consolidated banking data although in most cases the impact on the data is not significant (with the notable exception of the US and Canada).

The institutional coverage of consolidation recommended by the IMF (see sub-section above) comprises credit institutions only. This implies that the IMF recommendation is currently followed by 14 of the 27 countries that participate in the *BIS* consolidated banking statistics. The other 13 countries do not follow this approach and two additional countries have plans to deviate from the proposed institutional coverage in the future because consolidation rules in the *BIS* consolidated banking statistics are left to national discretion and follow differing national practices.

Additional information on banks' profitability is collected by *Eurostat* in the context of the Regulation concerning structural business

<sup>89</sup> See *BIS* (2003).

<sup>90</sup> In most cases the impact of the inclusion of non-financial affiliates is probably insignificant.

statistics.<sup>91</sup> Although the data collection starts with the reference year 2001, Eurostat has collected, on a voluntary basis, back series since 1997. These data are still not available with the necessary frequency as Eurostat collects these statistics on credit institutions on an annual basis, with a delay of 10 months. In addition, the degree of detail and timeliness are not adequate for the purpose of the ECB macro-prudential analysis.

Data on banks' income and expenditure belong, in principle, to the category of macro-financial statistics. Indeed, the *National Statistical Institutes* (NSIs) normally use these data to calculate the banking sector contribution to GDP and to the current account of the balance of payments. However, these statistical data are compiled on a host country basis (i.e. are not consolidated) and are neither sufficiently detailed nor timely enough to meet the requirements for macro-prudential analysis.

Finally, *commercial data providers* and rating agencies also compile and publish their own variables for many of the indicators considered in the analysis of banking sector health. In doing so they follow many different compilation methods, which can give rise to different values for the same variable. For instance, the profitability indicators compiled using financial statements data are not always comparable. Taking the example of the RoE, it can be seen how the use of different methodologies to calculate ratios gives rise to different results. For example, RoE published by market sources may describe profitability before or after taxes, extraordinary items, or the capital used in the denominator may be defined differently. This can be seen from often different profitability ratios for the same bank published in different sources.<sup>92</sup> These examples show that there is a need to specify clearly the different methodologies used. Certainly, there is no single way of defining RoE and other key indicators. Provided that data sources are complemented with sufficient metadata on the definitions used, the analysis can benefit from the necessary flexibility.

91 Regulation (EC) No 2056/2002 of 5 November 2002 amending Regulation (EC, Euratom) n. 58/97.

92 The same issue of possibly different definitions can also occur in official data sources. For instance, the ECB report on the EU banking sector stability shows that the RoE of EU banks in the year 2000 was 12.44% (see ECB, 2003a). The value of the same variable is 10.9% according to Eurostat (see Eurostat, 2002). While Eurostat uses a pure accounting concept of "capital & reserves" (which includes subordinated debt), the ECB uses the prudential supervision concept of "Tier 1" capital, which is the sum of capital and reserves excluding subordinated debt, less standard deductions (own shares and immaterial assets).

## REFERENCES

- Allen, F. and D. Gale (1998). "Bubbles and crises", Wharton Financial Institutions Center Working Paper, (August).
- Allen, F. and R. Herring (2001). "Banking regulation versus security markets regulation", Wharton Financial Institutions Center Working Paper, (July).
- Allen, F. and A. Santomero (2001). "What do financial intermediaries do", *Journal of Banking and Finance*, 25, pp. 271-294.
- Altman, E. (1968). "Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy", *Journal of Finance*, 23, pp. 589-609.
- Alves, I. (2004). "Sectoral dynamics of credit risk", mimeo, European Central Bank.
- Baerle L., Ferrando A., Hördahl P., Krylova E. and C. Monnet (2004). "Measuring financial integration in the euro area", ECB Occasional Paper 14, (May).
- Banca d'Italia (1994). "The monetary and financial statistics of the Bank of Italy", (March).
- Bank of England (2003). "Financial Stability Review, December 2003", Issue No. 15.
- BCBS (Basel Committee on Banking Supervision) (2003). "Markets for bank subordinated debt and equity in Basel Committee member countries", Working Paper 12.
- Bikker J. and P. Metzmakers (2004). "Bank provisioning behaviour and procyclicality", mimeo, DE Nederlandsche Bank, (April).
- BIS (2003). "Guide to the international financial statistics", BIS paper No 14 (February).
- Black F. and J. Cox (1976). "Valuing corporate securities: Some effects of bond indenture provisions", *Journal of Finance* 2, pp. 351-367.
- Black F. and M. Scholes (1973). "The pricing of options and corporate liabilities", *Journal of Political Economy* 3, pp. 637-654.
- Bloem, A. and C. Gorter (2001). "The treatment of nonperforming loans in macroeconomic statistics", IMF working paper (WP/01/209). ([www.imf.org/external/pubs/ft/wp/2001/wp01209.pdf](http://www.imf.org/external/pubs/ft/wp/2001/wp01209.pdf))
- Board of Banking Supervisors (1995). "Report of the Board of Banking Supervision inquiry into the circumstances of the collapse of Barings.
- Bongini P., Laeven L., and G. Majnoni (2001). "How good is the market at assessing bank fragility? A horse race between different indicators", mimeo, World Bank, (January).
- Borio C. and P. Lowe (2002). "Asset prices, financial and monetary stability: Exploring the nexus", BIS Working Paper 114, (July).

- Borio, C. (2003). "Towards a macro-prudential framework for financial supervision and regulation", BIS Working Papers 128, (February).
- Bull, P. (2004). "The development of statistics for economic and monetary union", ECB. ([www.ecb.int/pub/pdf/other/developmentstatisticsemu200406en.pdf](http://www.ecb.int/pub/pdf/other/developmentstatisticsemu200406en.pdf))
- Cabral I., Dierick F. and J. Vesala (2002). "Banking integration in the euro area", ECB Occasional Paper 6, (December).
- CGFS (Committee on the Global Financial System) (2001). "A survey of stress tests and current practices at major financial institutions", (April).
- Crockett, A. (2000). "Marrying the micro- and macro-prudential dimensions of financial stability", BIS speeches, (21 September).
- Davis, E. (1999). Financial data needs for macroprudential surveillance – what are the key indicators of risks to domestic financial stability?" CCBS, Bank of England.
- Debbage, S., (2002). "Compiling financial stability indicators from national accounts and prudential data: A central bank's practical experience", Bank of England. ([www.econ.nyu.edu/iariw/papers/debbage.pdf](http://www.econ.nyu.edu/iariw/papers/debbage.pdf)).
- Degryse, H. and G. Nguyen (2004). "Interbank exposures: An empirical estimation of systemic risk in the Belgian banking sector", mimeo, Central Bank of Belgium.
- Dierick F. and J. Vesala (2004). "What effects is EMU having on integration in financial services", in Grande M., Berg J. and F. Mongelli (eds.), "Elements of the euro area: integrating financial markets", Ashgate (forthcoming).
- Dierick F. (2004). "The supervision of mixed financial services groups in Europe", ECB Occasional Paper 20, (August 2004).
- Drees B. and C. Pazarbasioglu (1998). "The Nordic banking crises: Pitfalls in financial liberalisations", IMF Occasional Paper 161.
- Drehmann, M., Hoggarth G., Logan, A. and L. Zicchino (2004). "Macro-stress testing UK banks", mimeo, Bank of England, (June).
- Goodhart C., Hartmann P., Llewellyn D., Rojas-Suarez L. and B. Weisbrod (1998). "Financial regulation, why, how and where now?", Routledge, London and NY.
- Grande, M. and Stubbe, M. (2002). "Macroeconomic and prudential information as a source of financial stability indicators. Conceptual and practical issues from an EU perspective" ([www.econ.nyu.edu/iariw/papers/mauro.PDF](http://www.econ.nyu.edu/iariw/papers/mauro.PDF)).
- Greenawalt M. and J. Sinkey (1991). "Loan loss experience and risk taking behaviour at large commercial banks", Journal of Financial Services Research 5, pp. 43-59.

- Gropp, R. (2004). "Bank market discipline and indicators of banking system risk: The European evidence", in Borio C., Hunter W. and G. Kaufman (eds.), "Market discipline across countries and sectors", MIT Press, (September).
- Gropp R. and G. Moermann (2004). "Measurement of contagion in bank equity prices", *Journal of International Money and Finance*, (forthcoming).
- Gropp R., Vesala J., and G. Vulpes (2004). "Equity and bond market signals as leading indicators of bank fragility", *Journal of Money Credit and Banking*, (forthcoming).
- ECB Monthly Bulletin (April 2002). Article on "Enhancements to MFI balance sheet and interest rate statistics".
- ECB Monthly Bulletin (August 2002). Article on "Recent developments and risks in the euro area banking sector".
- ECB (2000). "Asset prices and banking stability", (April). ([www.ecb.int/pub/pdf/other/assetpricesen.pdf](http://www.ecb.int/pub/pdf/other/assetpricesen.pdf))
- ECB (2003a). "EU banking sector stability", (February). ([www.ecb.int/pub/pdf/eubksectorstabilityen.pdf](http://www.ecb.int/pub/pdf/eubksectorstabilityen.pdf)).
- ECB (2003b). "EU banking sector stability", (November). ([www.ecb.int/pub/pdf/eubksectorstability2003en.pdf](http://www.ecb.int/pub/pdf/eubksectorstability2003en.pdf)).
- ECB (2003c). "Structural analysis of the EU banking sector: Year 2002", (November). ([www.ecb.int/pub/pdf/eubksectorstructure2003en.pdf](http://www.ecb.int/pub/pdf/eubksectorstructure2003en.pdf)).
- ECB (2004a). "Credit risk transfer by EU banks: activities, risks and risk management" (September). (<http://www.ecb.int/pub/pdf/creditrisktransfer200405en.pdf>)
- ECB (2004b). "EU banking sector stability", (November).
- ECB (2004c). "Financial stability review", (December).
- ECB Directorate General Statistics (2004b). "Review of international statistical standards. Valuation and recognition of loans", published in the IMF Electronic Discussion Group on the treatment of nonperforming loans, (August) (<http://www.imf.org/external/np/sta/npl/eng/2004/080704.pdf>)
- Eichengreen B. and R. Portes (1987). "The Anatomy of financial crises", in Portes R. and A. Swoboda (eds.), "Threats to international financial stability", Cambridge, Cambridge University Press, pp. 10-58.
- Elsinger H., Lehar A., Summer M. and S. Wells (2004). "Using market information for banking system risk assessment", mimeo, Bank of England, Austrian Central Bank and University of Vienna.

- European Banking Monitor (2003), "Benchmarking the benchmarks", p. 28, (February) ([www.bankecon.com](http://www.bankecon.com)).
- Eurostat (2002). "Statistics in focus" n.26/2002.
- Evans O., Leone, A., Gill, M. and P. Hilbers (2000). "Macro-prudential indicators of financial system soundness", IMF Occasional Paper 192, (April) ([www.imf.org/external/pubs/ft/op/192/OP192.pdf](http://www.imf.org/external/pubs/ft/op/192/OP192.pdf)).
- Fisher, I. (1932). "Booms and depressions", New York, Adelphi.
- Fisher, I. (1933). "The debt deflation theory of great depressions", *Econometrica*, 1, pp. 337-357.
- FitchRatings (2003a), "Global Credit Derivatives: Risk Management or Risk?", (March).
- FitchRatings (2003b), "Global Credit Derivatives: A Qualified Success", (September).
- Foglia A., Chionsini G. and P. Marullo Redeedt (2004). "Bank mergers, diversification and risk", mimeo Banca d'Italia.
- Furfine C. (2003). "Interbank exposures: Quantifying the risk of contagion", *Journal of Money Credit and Banking* 35, pp. 111-28.
- Hancock D. and M. Kwast M (2000). "Using subordinated debt to monitor bank holding companies: Is it feasible?", mimeo, Board of the Governors of the Federal Reserve System.
- Herring, R. and S. Wachter (1999). "Real estate booms and banking busts: An international perspective", The Wharton School Financial Institutions Center Working Paper 99-27.
- Hoggarth G. and V. Saporta (2001). "Costs of banking system instability: Some empirical evidence", *Bank of England Financial Stability Review* 10, Article 5, (June).
- Hoggarth, G. (2001). "Market indicators of bank risk", mimeo Bank of England.
- Houben, A., Kakes, J. and G. Schinasi (2004). "Toward a framework for safeguarding financial stability", IMF Working Paper 04/101, (June).
- IMF (2001). External debt statistics: guide for compilers and users, (November).
- Jayanti S. and A. Whyte (1996). "Global contagion effects of the continental illinois failure", *Journal of International Financial Markets, Institutions and Money* 6, pp. 87-99.
- Jones M., Hilbers P. and G. Slack (2004). "Stress testing financial systems: what to do when the Governor calls?", IMF Working Paper 04/127, (July).
- Kaminsky, G. and C. Reinhart (1996). "Banking and balance-of-payments crises: Models and evidence", Board of Governors of the Federal Reserve Working Paper, Washington D.C.

- Kaminsky, G. and S. Lizondo, et al. "Leading indicators of currency crises", IMF staff papers, 45, (1), pp. 1-48, Washington D.C.
- Karampatos, D., N. Tarashev and K. Tsatsaronis, (2003). "Investors' attitude toward risk: What can we learn from options?", BIS Quarterly Review, (June).
- Kindleberger, C. (1978). "Manias, panics and crashes", New York, Basic Books.
- Krainer J. and J. Lopez (2003). "Forecasting bank supervisory ratings using securities market information", Journal of Money, Credit and Banking, (forthcoming).
- Laeven L. and G. Majnoni (2003). "Loan loss provisions and economic slowdowns: Too much, too late?", Journal of Financial Intermediation 12, pp. 178-97.
- Laliberté, L. (2004). "Relationship between macroeconomic statistical guidelines and accounting standards" (IMF papers). ([www.iariw.org/papers/lali.pdf](http://www.iariw.org/papers/lali.pdf))
- deLis F., Martinez P. and J. Saurina (2001). "Credit growth, problem loans and credit risk provisioning in Spain", in BIS Papers 1, "Marrying the macro- and micro-prudential dimensions of financial stability", pp. 331-53.
- Logan, A. (2001). "The United Kingdom's small banks' crisis of the early 1990s: What were the leading indicators of failure?", Bank of England Working Paper.
- Kerry, W. and D. Wallace (March 2001). "UK banks' income and expenditure", Bank of England, Monetary and Financial Statistics.
- Krueger, R. (July 2002). "International standards for impairments and provisions and their implications for Financial Soundness Indicators (FSIs)", IMF ([www.imf.org/external/np/sta/npl/eng/2002/rk0702.pdf](http://www.imf.org/external/np/sta/npl/eng/2002/rk0702.pdf))
- McAndrews, J. and S. Potter (2002). "Liquidity effects of the events of September 11, 2001", mimeo Federal Reserve Bank of New York.
- Merton R. (1990). "Continuous time finance", Blackwell: Oxford and Malden.
- Mink, R. and N. Silva (2003). "The use of financial accounts in assessing financial stability", OECD Working Party on Financial Statistics, (October) (<http://www.oecd.org/dataoecd/35/4/13606879.doc>).
- Minsky, H. (1977). "A theory of systematic financial fragility", in Altman E. and A. Sametz (eds.), "Financial crises: Institutions and markets in a fragile environment, New York, Wiley, pp. 138-152.
- Minsky, H. (1991). "The financial instability hypothesis: A clarification", in M. Feldstein (ed.), "The risk of economic crisis", The University of Chicago Press, pp. 158-170.
- Nakaso, H. (2001). "The Financial Crisis in Japan during the 1990s", mimeo Bank of Japan.

- OECD (2002). “Bank profitability – Financial statements of banks”.
- OECD (2002). “Bank profitability – Methodological country notes”.
- OECD (2003). “Quality framework and guidelines for OECD statistical activities”.
- Padoa-Schioppa, T. (2000). “Licensing banks: Still necessary?”, William Taylor Memorial lecture delivered in Washington, 24 September 1999, Group of Thirty, Washington.
- Padoa-Schioppa T. (2002). “Central banks and financial stability: Examining a land in between”, paper presented at the Second ECB Central Banking Conference, “The transformation of the European financial system”, (October). ([www.ecb.int/home/conf/cbc2/tps.pdf](http://www.ecb.int/home/conf/cbc2/tps.pdf)).
- Padoa-Schioppa T. (2004). Introductory Remarks. Symposium concluding two years of the ECB-CFS research network on “Capital Markets and Financial Integration in Europe” Frankfurt, (May). ([www.ecb.int/press/key/date/2004/html/sp040511.en.html](http://www.ecb.int/press/key/date/2004/html/sp040511.en.html)).
- Pain D. (2003). “The provisioning experience of the major UK banks: a small panel investigation”, Bank of England Working Paper 177.
- Pain D. and J. Vesala (2004). “Driving factors of credit risk”, mimeo European Central Bank, (June).
- Rajan, R. and L. Zingales (2003). “Banks and markets: The changing character of European finance”, a paper presented at the Second ECB Central Banking Conference, “The transformation of the European financial system”, (October). ([www.ecb.int/home/conf/cbc2/tps.pdf](http://www.ecb.int/home/conf/cbc2/tps.pdf)).
- Sahel, B. and J. Vesala (2001). “Financial stability analysis using aggregated data”, BIS paper, No. 1 ([www.bis.org/publ/bispap01f.pdf](http://www.bis.org/publ/bispap01f.pdf)).
- Santillán J., Bayle M. and C. Thygesen (2000). “The impact of the euro on money and bond markets”, ECB Occasional Paper 1, (July).
- Schwartz, A. (1986), “Real and pseudo financial crises”, in Capie F. and G. Woods (eds.), “Financial crises and the world banking system”, London, Macmillan, pp. 11-31.
- Sheldon G. and M. Maurer (1998). “Interbank lending and systemic risk: An empirical analysis for Switzerland”, Swiss Journal of Economics and Statistics, 134(2), 685-704.
- Standard & Poor’s (2003). “Demystifying Banks’ Use of Credit Derivatives”, (December).
- Tudela M. and G. Young (2003). “A Merton-model approach to assessing the default risk of UK public companies”, Bank of England Working Paper 194.
- Upper C. and A. Worms (20002). “Estimating bilateral exposures in the German interbank market: Is there a danger of contagion?”, Deutsche Bundesbank Discussion Paper 9, (February).

- Wharmby S. (2001). "Recent developments in statistical requirements for financial stability, and in their use. The perspective of a central bank of a developed country", IFC Bulletin n. 9, (July).
- White L. (1991). "The S&L debacle", Oxford University Press.
- Vassalou M. and Y. Xing Y (2002). "Default risk in equity returns", Journal of Finance, (forthcoming).
- Virolainen, K. (2004). "Macro stress testing with a macroeconomic credit risk model for Finland", mimeo Bank of Finland, (June).

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