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MACROPRUDENTIAL INDICATORS ON  
THE LUXEMBOURG BANKING SECTOR  
FOR THE YEARS 1999-2001

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## EXECUTIVE SUMMARY

In line with recent international efforts to enhance macroprudential surveillance, the Banque centrale du Luxembourg (BCL) has drawn up a set of macroprudential indicators for the Luxembourg banking sector.

The indicators basically follow the so-called CAMELS approach<sup>1</sup>. This approach involves the analysis of six groups of indicators that monitor capital adequacy, asset quality, management soundness, earnings, liquidity and sensitivity to market risk. The BCL compiles 32 indicators at this stage, with 30 of them derived from the CAMELS framework. The remaining 2 indicators assess competitive conditions. A large number of indicators contain "sub-indicators". In general, the BCL compiles the simple arithmetical average, the weighted average and the standard deviation for each indicator.

Internationally, the enhancement of macroprudential surveillance is still a recent effort and underlies an evolving process. The building of longer time series and international comparison, possibly even harmonization, could improve the pertinence of the indicators in future. In today's volatile and uncertain economic and financial environment, macroprudential surveillance represents a challenging task of particular value that the BCL vows to pursue.

The Luxembourg banking industry is characterised by its predominantly international orientation. Despite the less favourable external economic environment, the Luxembourg banking sector held up remarkably well. Overall, the banks' profitability in 2001 matched their performance in 2000.

Luxembourg banks are well capitalised. In 2001, the global capital adequacy ratio<sup>2</sup> stood at 13.7% on an aggregated basis and 26.1% on a simple average basis. The bulk of own funds is composed of tier 1 capital.

In terms of net after tax income, return on assets aggregated across banks held steady at 0.5% in 2001, while return on equity defined as return on shareholder equity improved from 36.1% in 2000 to

40.3% in 2001. On average per bank, return on assets decreased from 9.5% in 2000 to 9% in 2001, and return on equity fell from 35% to 33.3%. Although net new value adjustments in relation to own funds have increased to reflect the harsher economic environment, in aggregate from 0.9% in 2000 to 1.9% in 2001, banks have constituted less provisions against general banking risks after generous provisioning in the previous years.

Regarding the composition of income, a fall in commissions and fees earned as well as in the net results on financial operations was matched by a wider interest margin. Commissions and fees earnings have suffered from stagnation in the net value of investment funds and from a decrease in market operations on behalf of clients. Results on financial operations have been affected by the general sluggishness in financial markets. On the other hand, interest margin has benefited from an increase in balance sheet activities and from a decline in short term interest rates, which reduces funding costs. Interest margin thereby reversed its long term decline in importance in the three categories of income. Nonetheless, this reversal may be of temporary nature only.

Regarding asset quality, value adjustments on credit as a percentage of gross credit value decreased from 0.5% in 2000 to 0.4% in 2001 on an aggregated basis. Non-performing large exposures diminished from an already low 0.8% of total large exposures to 0.6% in the same period. Close to half of the credit volume to customers is backed by guarantees. Exposures towards high risk countries in terms of capital declined by 8 percentage points from 50.5% in 2000 to 42.2% in 2001. On the other hand, financial derivatives activities have expanded significantly, from 30 times the banks' aggregated own funds in 2000 to 35 times in 2001. Real lending growth to non-financial firms accelerated and exceeded both euro area and EU real GDP growth in 2001 with 9.8%, from 6.6% in 2000. The banks' exposures show a high degree of concentration towards the financial sector, which

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<sup>1</sup> See *International Monetary Fund*: "Macroprudential Indicators of Financial System Soundness" (2000), pp. 4-9.

<sup>2</sup> For the definition of the indicators mentioned in this section, please refer to the forthcoming detailed description of the indicators in the main text and in annex 2.

accounts for 70% of total exposures in value. The financial sector, in particular the European financial institutions, can be considered as the most relevant potential source of instabilities for Luxembourg's banks.

As for exposures to the more volatile real estate sector, the share of mortgage lending in total lending to private customers represented a rather modest 14% in 2001, while the percentage of mortgages in the guarantees of large exposures amounted only to close to 2%.

Exposures vis-à-vis financial markets do not seem significant. The banks' aggregated equities portfolio made up 17.6% of own funds in 2001, down from 21% a year earlier. Net open position to US dollar, the most important foreign currency exposure for the Luxembourg banking sector, equalled 10% of own funds on average for each bank in 2001.

Regarding the aggregated term structure of the balance sheet, the maturity gap between Luxembourg banks' assets and liabilities, measured by the coefficient of maturity transformation, narrowed in 2001. Assets were 2.5 times longer in maturity than liabilities in 2001, compared to 3.2 times in 2000. However, the maturity gap has widened on average per bank; the coefficient increased from 5.12 in 2000 to 6.06 in 2001. The banks' liquidity position nevertheless remains solid. Their aggregate liquid assets cover current liabilities by 63%, far above the minimum regulatory coverage requirement of 30%.

Finally, banking activities have continued to show a trend towards more concentration in 2001. The Gini coefficient for the total balance sheet climbed to 0.76 at the end of 2001, from 0.74 a year earlier. The degree of concentration is even higher for non-bank loans, with a Gini coefficient of 0.83 at the end of 2001.

# 1 INTRODUCTION

## 1.1 Globalisation and international capital flows

One distinctive feature in the world economy after the Second World War has been the drive towards liberalisation of economic activity. In a broad sense, the effort was first launched by the industrial world, taught by the lessons of the Great Depression, and spread to the developing countries in the 1980s, after their unsatisfactory experience with economic protectionism. Helped not least by technological advances, the past two decades have seen a dramatic increase in cross-border economic activity. World trade volume has consistently grown faster than world output<sup>3</sup>, but even more remarkable has been the expansion in international capital flows. In the last 25 years of the 20th century, global cross-border capital flow grew thirty-fold, while international trade expanded by 320% and global gross domestic product (GDP) by 140%<sup>4</sup>. While globalisation allows a more efficient allocation of resources and certainly has contributed to unprecedented material prosperity, it also puts considerable competitive strains on the economies.

As regards the liberalisation of the capital account and the globalisation of finance, the sheer volume of transactions has brought more volatility to the markets, making financial systems more prone to crises. Close ties between international markets has also meant that crises take place not only at the national, but increasingly also at the international or even global level. The recent past is indeed littered with financial crises, notably in emerging economies. Advanced economies nonetheless have not been spared either, as witnessed by the US Savings & Loans crisis and the Scandinavian banking crisis at the beginning of the 1990s, the crisis of the European Exchange Rate Mechanism in 1992/93, and the ongoing problems of the Japanese banking sector. Financial crises not only disrupt the smooth functioning of financial systems, they can also affect the real economy and the society at large. Damages done by past crises are well documented.

## 1.2 Towards macroprudential surveillance

Against this background, efforts have been and are being made to strengthen the international financial structure against disruptive capital flows and risks. One key element in these efforts is the building of *macroprudential indicators*, a system of indicators that measure the health of a financial system and detect its potential vulnerabilities. The International Monetary Fund has been promoting research in this area and it encourages member countries to compile and disseminate macroprudential indicators.

The Banque centrale du Luxembourg (BCL), in the execution of its mission to contribute to the smooth conduct of national policies in the fields of prudential supervision and financial stability<sup>5</sup>, has drawn up a set of macroprudential indicators for the Luxembourg financial place. This paper provides an introduction to these indicators.

## 1.3 Scope

A financial system encompasses credit institutions, other financial intermediaries (investment funds, pension funds or insurance companies for example), securities and foreign exchange markets, payment and securities settlement systems, and financial laws and regulations. It is obvious from the outset that not all aspects of a financial system can be captured by quantitative indicators, and that qualitative judgement is needed to complement the overall assessment. The appropriateness of laws and regulations, of corporate governance or of risk management and risk mitigation techniques, for example, do not lend themselves easily to quantitative measurement. A second caveat is placed by the availability of adequate data. While a wide range of data is collected on financial institutions in Luxembourg, there is less statistical information on other prudentially relevant economic actors, in particular households and firms.

<sup>3</sup> *The year 2001 was an exception, where world trade contracted by 0.2%, while world output expanded by 2.5%. See International Monetary Fund, World Economic Outlook (April 2002), pp. 157 and 185.*

<sup>4</sup> *See Deutsche Bundesbank, Monatsbericht Januar 2002, p. 16.*

<sup>5</sup> *As laid out in the Treaty on the European Union and the European System of Central Banks/European Central Bank Statute.*

Macroprudential indicators generally comprise both aggregated microprudential indicators on the health of individual financial institutions and macroeconomic variables associated with financial system stability. Aggregated microprudential indicators are primarily contemporaneous indicators that reflect the present state of financial soundness. Macroeconomic variables are leading indicators that signal economy-wide developments that could potentially affect the soundness of financial systems.

Due to the constraints placed by quantifiability and data availability, the BCL's macroprudential indicators cover only credit institutions at this stage, i.e. they provide information on the soundness of Luxembourg banks. As a rule, credit institutions established in Luxembourg<sup>6</sup> and their foreign branches are taken into account. Branches of foreign banks in Luxembourg are generally not considered. The indicators rely on banks' prudential and statistical reporting data.

#### 1.4 General methodology

The macroprudential perspective, as opposed to the microprudential approach, aims at providing an overall picture on various stability-relevant aspects of the banking sector as a whole. Macroprudential indicators are compiled by aggregating and averaging individual banks' data. They are a handy instrument for the assessment of the general soundness of a country's banking industry. In doing so, however, the underlying variability among individual banks inevitably goes lost. A healthy looking indicator could hide problems at individual institutions. In order to remedy to the loss of individual differences, at least partially, the BCL calculates both the *average* and the *standard deviation* of an indicator value. The addition of a second set of data would not complicate the structure of the indicators too much.

Regarding the calculation of the average value, two approaches are possible: the simple average and the weighted average. These two approaches essentially differ in the importance they give to small banks. In the

*simple arithmetical average*, every bank enters the calculation with the same weight. As for the *weighted average*, be the weight placed according to the value of the denominator of a calculated ratio, to the underlying bank's total assets or to any other criteria, it gives more prominence to larger banks. The weighted average reflects the overall aggregated situation and is akin to considering all underlying banks as a single bank. The weighted average generally tends to be less volatile than the simple average. However, it cannot be said from the outset which average is more relevant for the purpose of macroprudential monitoring. On the one hand, larger banks are more important for the functioning of a financial system. On the other hand, small banks could collectively have system-wide repercussions. In any case, whether problems at a credit institution will have spill-over effects on the sector at large cannot be known a priori. This depends on the nature of the problem and on the external economic and financial environment. A problem at a bank is more likely to spread to others for example in an economic downturn than in an economic upturn. The BCL compiles both the simple arithmetical and the weighted averages in the calculation of its indicators. For the weighted average, the denominator is the weight reference when the indicator is presented as a ratio.

The *simple average* is calculated as follows:

The indicator is first compiled for each bank and each reporting period (monthly or quarterly). Yearly or quarterly average figures are then derived by adding up the indicator values of the relevant reporting periods<sup>7</sup> across the banks and dividing the sum by the number of values that have entered the calculation.

The calculation of the simple average with  $m$  banks and  $n$  periods can be formulated as follows:

$$SA = \frac{\sum_{i=1}^m \sum_{j=1}^n \frac{N}{D}}{m * n}$$

<sup>6</sup> Including subsidiaries of foreign credit institutions in Luxembourg.

<sup>7</sup> Which means not only the data of the year or quarter in question, but also the data of the immediately preceding reporting period, because the credit institutions report end-of-period and not average-of-period information. The data of December 1999 for example refer to the situation on 31 December 1999. They are drawn into the calculation of the year 1999 average. But as they remain valid for 1 January 2000, they also have to be considered in the calculation of the year 2000 average.

$N$  stands for the numerator,  $D$  for the denominator of a ratio, and  $m*n$  for the total number of observations

The *weighted average* is calculated as follows:

For each reporting period, both the numerator and the denominator are summed across the banks. Care is taken to consider only those banks for which both the numerator and the denominator data for the same period are available<sup>8</sup>. The yearly or quarterly averages are obtained by averaging the relevant numerator and denominator values separately and then dividing the averaged numerator by the averaged denominator.

The formula for the weighted average with  $m$  banks and  $n$  periods can be written as follows:

$$WA = \frac{\sum_{i=1}^m \sum_{j=1}^n N}{\sum_{i=1}^m \sum_{j=1}^n D}$$

The *standard deviation* refers to the simple arithmetical average and indicates the mean deviation of the value of an individual bank from the average value. For this, the difference between the values of individual banks and the simple average of a year or a quarter are summed up in their absolute values and divided by the number of observations that have entered into the calculation of the simple average.

The formula for the standard deviation can be stated as follows:

$$SD = \frac{\sum_{i=1}^m \sum_{j=1}^n \left| \frac{N}{D} - SA \right|}{m * n}$$

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<sup>8</sup> This is not always the case when the numerator and the denominator are drawn from different reporting tables.

## 2 THE INDICATORS

One commonly used framework for assessing the health of financial institutions is the so-called CAMELS approach. It involves the analysis of six groups of indicators that monitor the following aspects: capital adequacy, asset quality, management soundness, earnings, liquidity and sensitivity to market risk.

The BCL compiles 32 indicators at this stage. 30 are derived from the CAMELS framework: *capital adequacy* comprises 1 indicator, *asset quality* 19 indicators, *management soundness* 1 indicator, *earnings* 3 indicators, *liquidity* 4 indicators, and *sensitivity to market risk* 2 indicators. The remaining 2 indicators assess *competitive conditions*. A large number of indicators contain "sub-indicators". When taking these into account, the total number of indicators rises to 70.

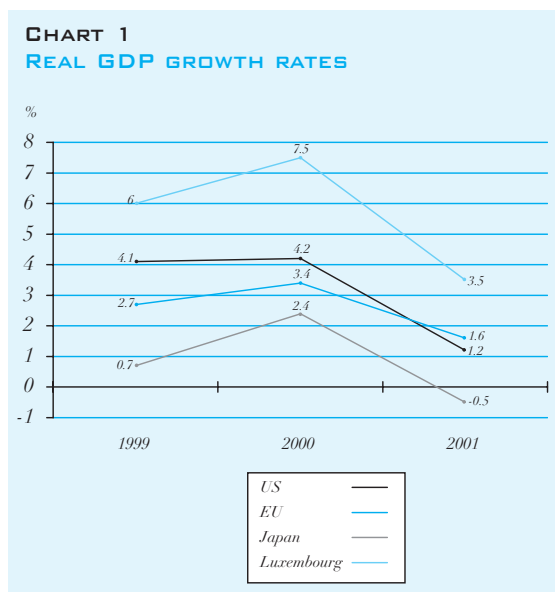
The indicators are presented in the form of ratios whenever appropriate, as relative ratios are more meaningful than absolute values. A large number of indicators are set against own funds<sup>9</sup>, as these are the ultimate guarantor of a bank's solvency.

In the following, a stability overview of the Luxembourg banking sector in the year 2001 based on the BCL macroprudential indicators is provided. The indicators are introduced afterwards one by one. The data cover the years 1999, 2000 and 2001. Annex 1 reviews the indicators in a summary table. Annex 2 provides additional explanation of the concepts and definitions of the indicators.

### 2.1 Financial stability overview

The year 2001 is marked by a notable slowdown in economic activity in the world's main economies. The US, the world's biggest economy, saw its GDP growth decelerate sharply after a decade of strong expansion. The growth rate fell from 4.2% in 2000 to 1.2% in 2001 in real terms. Japan, the world's second largest economy, tipped back into recession. Its real output contracted by 0.5% in 2001 after an expansion of 2.4% a year earlier. In the European Union (EU), economic growth decelerated too, although not to such a large extent than in the US. Its real GDP growth rate decreased from 3.4% in 2000 to 1.6% in 2001.

Luxembourg, as a small open economy, did not remain unaffected. Its real GDP growth rate, nevertheless robust in international comparison, slowed down from 7.5% in 2000 to 3.5% in 2001<sup>10</sup>.



Source: Eurostat, STATEC

The Luxembourg banking industry is characterised by its predominantly international orientation, with a strong cross-border interbank activity besides the traditional banking business of deposit taking and loan granting. The European banking sector in particular exercises a strong influence on its developments. Despite the less favourable external economic environment, the Luxembourg banking sector held up remarkably well. Overall, the banks' profitability in 2001 matched their performance in 2000.

Luxembourg banks are well capitalised. In 2001, the global capital adequacy ratio<sup>11</sup> stood at 13.7% on an aggregated basis and 26.1% on a simple average basis. Although larger banks exhibit a lower solvency level, their capital ratios remain comfortably above the 8% threshold. The ratio improved both as simple and as weighted average in comparison to 2000. Moreover, the bulk of own funds is composed of tier 1 capital.

<sup>9</sup> Throughout this document, the term « own funds » refers to the sum of tier 1, tier 2, and tier 3 capital if not otherwise specified.

<sup>10</sup> Sources: Eurostat, STATEC.

<sup>11</sup> For the precise definition of the indicators mentioned in this section, please refer to the forthcoming detailed description of the indicators and to annex 2.

In terms of net after tax income, return on assets aggregated across banks held steady at 0.5% in 2001, while return on equity defined as return on shareholder equity improved from 36.1% in 2000 to 40.3% in 2001. On average per bank, return on assets decreased from 9.5% in 2000 to 9% in 2001, and return on equity fell from 35% to 33.3%. Although net new value adjustments in relation to own funds have increased to reflect the harsher economic environment, in aggregate from 0.9% in 2000 to 1.9% in 2001, banks have constituted less provisions against general banking risks after generous provisioning in the previous years.

Regarding the composition of income, a fall in commissions and fees earned as well as in the net results on financial operations was matched by a wider interest margin. Commissions and fees earnings have suffered from stagnation in the net value of investment funds and from a decrease in market operations on behalf of clients. Results on financial operations have been affected by the general sluggishness in financial markets; in 2001, aggregated losses on financial operations amounted to 20% of aggregated gains, after 12% in 2000. On the other hand, interest margin has benefited from an increase in balance sheet activities and from a decline in short term interest rates, which reduces funding costs. Interest margin reversed its long term decline in importance and increased its share in the three categories of income from 48.4% in 2000 to 55% in 2001. Nonetheless, this reversal may be of temporary nature only.

Regarding asset quality, value adjustments on credit as a percentage of gross credit value decreased from 0.5% in 2000 to 0.4% in 2001 on an aggregated basis. Non-performing large exposures diminished from an already low 0.8% of total large exposures to 0.6% in the same period. Close to half of the credit volume to customers is backed by guarantees. Exposures towards high risk countries<sup>12</sup> in terms of capital declined by 8 percentage points from 50.5% in 2000 to 42.2% in 2001. On the other hand, financial derivatives activities have expanded significantly, from 30 times the banks' aggregated own funds in 2000 to 35 times in 2001. Real lending growth to non-financial

firms accelerated and exceeded both euro area and EU real GDP growth in 2001 with 9.8%, from 6.6% in 2000. The banks' exposures show a high degree of concentration towards the financial sector, which accounts for 70% of total exposures in value. About half of interbank loans, the main instrument of interbank relations on the balance sheet, are intra-group exposures. The financial sector, in particular the European financial institutions, can be considered as the most relevant potential source of instabilities for Luxembourg's banks.

As for exposures to the more volatile real estate sector, the share of mortgage lending in total lending to private customers represented a rather modest 14% in 2001, while the percentage of mortgages in the guarantees of large exposures amounted only to close to 2%.

Exposures vis-à-vis financial markets do not seem significant either. The banks' aggregated equities portfolio made up 17.6% of own funds in 2001, down from 21% a year earlier. Net open position to US dollar, the most important foreign currency exposure for the Luxembourg banking sector, equalled 10% of own funds on average for each bank in 2001.

Regarding the aggregated term structure of the balance sheet, the maturity gap between Luxembourg banks' assets and liabilities, measured by the coefficient of maturity transformation, narrowed in 2001. Assets were 2.5 times longer in maturity than liabilities in 2001, compared to 3.2 times in 2000. However, the maturity gap has widened on average per bank; the coefficient increased from 5.12 in 2000 to 6.06 in 2001. The banks' liquidity position nevertheless remains solid. Their aggregate liquid assets cover current liabilities by 63%, far above the minimum regulatory coverage requirement of 30%.

Finally, banking activities have continued to show a trend towards more concentration in 2001. The Gini coefficient<sup>13</sup> for the total balance sheet climbed to 0.76 at the end of 2001, from 0.74 a year earlier. The degree of concentration is even higher for non-bank loans, with a Gini coefficient of 0.83 at the end of 2001.

<sup>12</sup> See annex 2, under the heading of asset quality, for the definition and the enumeration of high risk countries.

<sup>13</sup> The Gini coefficient takes a value between 0 and 1. A value of 0 means equal distribution of the measured activity among banks. The more the value approaches 1, the more concentrated is the underlying activity.



## 2.2 Capital adequacy

A bank's own funds are the ultimate guarantor of its solvency. Capital adequacy ratios measure the level of own funds against risk-weighted assets and are the ultimate indicators of a bank's ability to withstand adverse shocks. Luxembourg has to follow EU Directives in this regard<sup>14</sup>. The level of capital must attain a minimum of 8% of the value of risk-weighted assets. In other words, at least 8% of risk-weighted assets must be backed by own funds<sup>15</sup>. Two ratios are calculated: the regulatory global capital ratio and the regulatory tier 1 capital ratio.

Luxembourg banks are well capitalised. The global capital adequacy ratio reaches 26.1% in the simple average and 13.7% in the weighted average for the year 2001. A large fraction of bank capital consists of core own funds. Moreover, both the simple and the weighted averages have been rising continuously since 1999. This is a positive development, especially in light of the less favourable and more uncertain economic and financial environment the banks currently face. Table 1 displays the ratios with reference to the threshold of 8%; the ratios with reference to the threshold of one are put between brackets.

**Table 1** Regulatory capital adequacy ratios

	1999	2000	2001
<b>Global regulatory ratio</b>			
Simple average	24.6% (3.08)	25.2% (3.15)	26.1% (3.26)
Weighted average	12.9% (1.62)	13.1% (1.64)	13.7% (1.71)
Standard deviation	34.1%	32.6%	39.4%
<b>Tier 1 regulatory ratio</b>			
Simple average	23.7% (2.97)	24.4% (3.05)	24.9% (3.12)
Weighted average	10.4% (1.30)	11.0% (1.38)	11.4% (1.43)
Standard deviation	35.3%	33.9%	38.8%

Source: BCL

A noteworthy feature is the distinctly higher level of the simple average compared to the weighted average. The difference may imply that smaller banks are better capitalised than larger ones. Indeed, this is shown in table 2, which breaks down the simple average global regulatory capital ratio according to the underlying banks' total balance sheet. The table draws on the data of end 2001 and puts the 123 banks that are considered in that period's calculation of the capital ratio into six size categories. The smallest banks with a balance sheet of less than 100 million euros exhibit a remarkably high capital ratio. The ratio then declines consistently as the size of banks grows.

**Table 2** Distribution of the global regulatory capital ratio in December 2001

Range of total balance sheet (mio EUR)	Under 100	[100; 500[	[500; 1000[	[1000; 5000[	[5000; 10000[	Over 10000
(Simple) average ratio	111.4% (13.9)	26.9% (3.4)	19.4% (2.4)	15.1% (1.9)	14.8% (1.8)	13.3% (1.7)
Number of banks	14	33	22	28	11	15

Source: BCL

<sup>14</sup> The EU Directives are themselves in line with the guidelines set out by the Basle committee on banking supervision.

<sup>15</sup> Alternatively, this ratio can be expressed in terms of a ratio whose minimum required level is one, as set out in the Luxembourg banking regulations. For this purpose, the numerator of the ratio must be multiplied by a factor of 12.5.

## 2.3 Asset quality

Risks to the solvency of credit institutions often derive from an impairment of assets. It is therefore important to monitor indicators of asset quality. This area constitutes with 19 indicators the bulk of the current set, and these can be divided into the following categories: value adjustments in assets (3 indicators), level of guarantees (1), large exposures (5), credit growth (2), sectoral exposure (3), real estate exposure (2), country risk (1), exposure towards related entities (1) and exposure in financial derivatives (1). The indicators under the heading of value adjustments gauge the extent of actual asset impairment, while all other asset quality indicators relate to potential impairment risks.

### 2.3.1 Value adjustments in assets

Value adjustments are made in response to specific risks on the balance sheet. Two indicators capture the "stock" aspect and one indicator gauges the "flow" aspect of value adjustments.

- Value adjustments in relation to own funds

This indicator measures the extent of specific provisions on the entire balance sheet of a bank by setting them in relation to the bank's own funds.

**Table 3 Value adjustments to own funds**

	1999	2000	2001
Simple average	23.4%	21.0%	19.4%
Weighted average	24.6%	21.6%	17.9%
Standard deviation	41.7%	29.2%	25.2%

Source: BCL

Value adjustments are on average about 20% of banks' own funds. The weighted average shows a level similar to the simple average. Both averages have declined continuously for the past three years. Moreover, the underlying variation of the ratio has fallen since 1999.

- Value adjustments on credit to total gross credit

This indicator focuses on the quality of a bank's credit portfolio, traditionally an important, but also a more vulnerable component of a bank's assets<sup>16</sup>. The value adjustments are set against the gross value of the credit portfolio to gauge the extent of its impairment. Three indicators are compiled, to measure first the value adjustments for the credit portfolio as a whole, then for a breakdown of the portfolio according to bank and non-bank counterparts.

As shown in table 4, value adjustments make up only a small fraction of the total gross credit value and exhibit an overall declining tendency. Interestingly, the weighted average lies below the simple average and hints at a lower proportion of value adjustments in the credit portfolio of larger banks. Moreover, value adjustments for credits to non-bank counterparts are higher than value adjustments for credits to bank counterparts.

**Table 4 Value adjustments on credit to total gross credit values**

	1999	2000	2001
<b>Global</b>			
Simple average	0.8%	0.8%	0.7%
Weighted average	0.7%	0.5%	0.4%
Standard deviation	4.0%	5.0%	4.7%
<b>To credit institutions</b>			
Simple average	0.7%	0.7%	0.6%
Weighted average	0.3%	0.2%	0.1%
Standard deviation	5.1%	5.6%	5.5%
<b>To customers and on leasing transactions</b>			
Simple average	1.7%	1.3%	1.4%
Weighted average	1.4%	1.2%	1.0%
Standard deviation	4.6%	4.0%	4.0%

Source: BCL

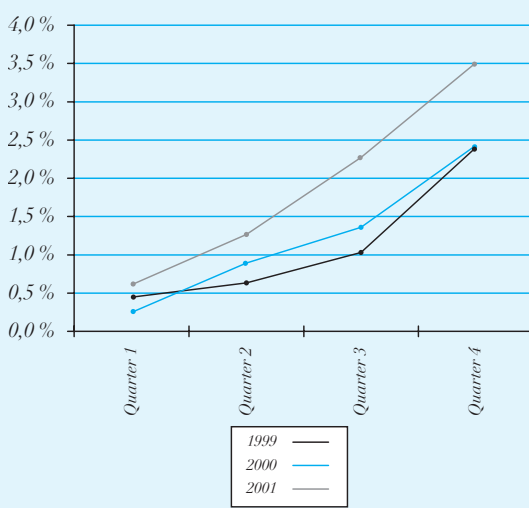
<sup>16</sup> The credit portfolio includes loans and advances to credit institutions, to customers and leasing transactions.

- Net new value adjustments in relation to own funds

The indicators above take a “stock” approach. They assess the extent to which assets are covered by value adjustments. This approach does not necessarily reflect the present judgement a bank forms on the quality of its assets<sup>17</sup>. To this end, it is useful to refer to net new value adjustments constituted against specific risks. Setting them against own funds allows an assessment of their impact on the bank’s solvency.

Table 5 refers to end-of-quarter total net constitution of value adjustments, cumulated in the year. These are set against average own funds in the year until the quarter in question. The average net constitution of value adjustments declined from 1999 to 2000, but increased from 2000 to 2001 to reflect worsened business conditions. Chart 2 illustrates the cumulated quarterly evolution of the simple average ratio in the past three years.

**CHART 2**  
CUMULATED NET NEW VALUE ADJUSTMENTS TO OWN FUNDS – SIMPLE AVERAGE



Source: BCL

**Table 5** Cumulated net new value adjustments to own funds

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
<i>1999</i>				
Simple average	0.4%	0.6%	1.0%	2.4%
Weighted average	0.5%	0.8%	1.2%	1.7%
Standard deviation	1.4%	4.2%	4.0%	5.5%
<i>2000</i>				
Simple average	0.2%	0.9%	1.4%	2.4%
Weighted average	0.4%	0.6%	0.8%	0.9%
Standard deviation	2.1%	2.7%	3.7%	5.2%
<i>2001</i>				
Simple average	0.6%	1.3%	2.3%	3.5%
Weighted average	0.1%	0.4%	0.9%	1.9%
Standard deviation	1.2%	2.7%	6.7%	8.8%

Source: BCL

<sup>17</sup> For example, it is permitted under the so called “Beibehaltungsprinzip” to retain a value adjustment in respect of a security made previously by the “lower of cost or market” method even if it does not correspond to a reduction in the value of the underlying asset any longer.

### 2.3.2 Level of guarantees

Asset guarantees need to be taken into account when assessing asset quality. In general, they reduce the risk of the underlying asset. The extent of risk reduction depends however on the soundness of the guarantee itself in practice.

- Share of credit backed by guarantees

For reasons stated earlier, we focus on the credit portfolio<sup>18</sup> and look at its cover by guarantees. The guarantees are set against their respective gross values. Similarly to the value adjustments on credit, the global indicator can be broken down according to bank and non-bank counterparts of the credit portfolio.

About 15% of Luxembourg banks' credit portfolio is backed by guarantees. This global ratio however masks sharp differences between credit granted to banks on the one hand, and credit granted to non-bank customers and leasing transactions on the other. Only a small fraction of inter-bank loans and advances are guaranteed, in contrast to close to half of loans and advances to customers and leasing transactions. This might in part be due to the fact that interbank credit generally displays a shorter maturity than other credits and so is considered less risky. The percentage of guaranteed inter-bank loans and advances has moreover been declining continuously over the past three years. Lastly, the difference between the simple average and the weighted average indicates that those banks that are more heavily involved in credit activity may have a larger guarantee cover in relation to their gross credit value.

**Table 6** Share of credit backed by guarantees

	1999	2000	2001
<b>Global</b>			
Simple average	14.9%	14.5%	14.7%
Weighted average	16.7%	17.4%	16.7%
Standard deviation	17.0%	16.1%	16.5%
<b>To credit institutions</b>			
Simple average	2.0%	1.6%	1.2%
Weighted average	2.9%	2.2%	1.7%
Standard deviation	8.3%	6.1%	5.1%
<b>To customers and on leasing transactions</b>			
Simple average	48.9%	45.5%	47.2%
Weighted average	47.0%	48.3%	47.6%
Standard deviation	35.1%	35.1%	34.8%

Source: BCL

### 2.3.3 Large exposures

A reliance on a limited number of business counterparts implies a concentration of counterpart risk and could be indicative of higher vulnerability of a bank. It is therefore useful to monitor large exposures as exposures to a same counterpart that exceed a certain threshold. This threshold can be an absolute value, a percentage of own funds, or else. According to Luxembourg banking regulations, large exposures are defined as exposures above 10% of own funds or above 6.2 million euros or its equivalent amount. Five indicators are compiled in this category.

<sup>18</sup> Loans and advances to credit institutions, to customers and leasing transactions.

- Large exposures to total exposures

The first indicator traces the importance of large exposures by setting them against total exposures<sup>19</sup>. As table 7 shows, exposures that exceed the above mentioned thresholds typically constitute more than 80% of exposures in value incurred by banks.

**Table 7 Large exposures to total exposures**

	1999	2000	2001
Simple average	83.1%	82.5%	82.3%
Weighted average	94.0%	94.6%	94.6%
Standard deviation	24.0%	24.7%	25.1%

Source: BCL

- Large exposures to own funds

A second measure compares large exposures to own funds and confirms their relevance as already shown by the previous indicator. Total large exposures are on average ten times bank's capital. It seems that larger banks take on proportionately more large exposures than smaller banks.

However, it should be cautioned against reading these figures at face value. This indicator as well as the indicator above sum up the total amount of large exposures across counterparts. They will tend to overstate the incurred risk, as the diversification of the underlying debtors means that their individual risks are not likely to correlate and that their total riskiness is probably less than their sum.

**Table 8 Large exposures to own funds**

	1999	2000	2001
Simple average	1030%	998%	1025%
Weighted average	1293%	1272%	1251%
Standard deviation	1036%	1082%	1314%

Source: BCL

<sup>19</sup> Defined as granted exposures, whether or not utilised. Exposures to other credit institutions with a remaining maturity of less than one year are omitted, as these are excluded from the banks' reporting tables.

<sup>20</sup> Defined as utilised exposures. For exposures to other credit institutions with a remaining maturity of less than one year, the available data allow to take into account only exposures that exceed 10% of own funds.

- Non-performing large exposures to total large exposures

To gauge the quality of large exposures, the third indicator looks at the percentage of non-performing large exposures in total large exposures<sup>20</sup>. The quality of exposure is judged by the banks themselves on the basis of own internal criteria. Those considered by the bank to be problem debts must be identified as non-performing. The other exposures are classified as performing.

The level of non-performing large exposures in Luxembourg banks is not significant, with on average 1.4% and on aggregate 0.6% of the total large exposures value in 2001. Both ratios show a declining trend over the years. This indicator confirms the solidity of the banks' credit book as already conveyed by the indicators on value adjustments. Nonetheless, the standard deviation value indicates that the level of non-performing exposures can vary substantially among credit institutions.

**Table 9 Non-performing large exposures to total large exposures**

	1999	2000	2001
Simple average	3.6%	1.8%	1.4%
Weighted average	1.5%	0.8%	0.6%
Standard deviation	14.9%	10.7%	10.5%

Source: BCL

- Share of mortgages and securities in guarantees

Guaranteed assets do not necessarily mean that they are safe from risks. The quality of guarantees matters as well as the quality of the underlying assets. Luxembourg banking regulations require banks to distinguish four types of guarantees within the reporting framework of large exposures: securities, (other) financial assets, mortgages and personal guarantees. Of these, real estate and securities are particularly volatile in value and could more likely induce an insufficient guarantee cover ex post. The following two indicators look at the part of mortgages and securities in the guarantees of utilised credits in the context of large exposures.

**Table 10** *Share of mortgages and securities in guarantees*

	1999	2000	2001
<b>Mortgages</b>			
Simple average	1.3%	1.2%	1.0%
Weighted average	2.5%	2.6%	1.9%
Standard deviation	5.1%	4.4%	4.1%
<b>Securities</b>			
Simple average	8.6%	7.5%	7.2%
Weighted average	3.0%	3.0%	3.1%
Standard deviation	20.4	18.0%	17.6%

Source: BCL

Mortgages are less used as guarantees than securities. Their shares in total guarantees are nevertheless minor and add up to less than 10%. The remaining guarantees are either other financial assets or personal guarantees.

### 2.3.4 Credit growth

Credit growth that far exceeds the expansion of the domestic product might hint at looser lending standards and warrant a closer check. The non-financial corporate sector<sup>21</sup> and the Luxembourg household sector<sup>22</sup> are singled out for monitoring. Due to limited data, foreign households cannot be investigated. The financial corporate sector and the public sector are left out too, as they are less sensitive to conditions in the external economy and their credit growth rates more difficult to interpret. Four indicators are compiled in this area: yearly and quarterly real<sup>23</sup> credit growth towards the non-financial corporate sector respectively towards the Luxembourg household sector<sup>24</sup>. As the simple average time series is very volatile due to the variations in small banks' data, it does not provide a meaningful picture. Only the weighted average is shown.

In view of the predominantly international character of the Luxembourg banking sector, it seems most appropriate to compare credit growth to the non-financial corporate sector to GDP growth in the euro area and in the EU. As for credit growth to the Luxembourg household sector, it is compared to the growth rate of the Luxembourg gross domestic product, keeping in mind that Luxembourg GDP includes substantial contribution of non-resident workforce. A better alternative reference is unfortunately not available.

<sup>21</sup> Non-financial corporations and quasi-corporations in the private and public sectors.

<sup>22</sup> Physical persons who have their residence in the Grand Duchy of Luxembourg, including Luxembourg non-profit making organisations which serve households and which are not separate legal entities.

<sup>23</sup> The growth rates are deflated with the Harmonised Index of Consumer Prices.

<sup>24</sup> To gauge credit activities of the Luxembourg banking sector as a whole in a geographical sense, all Luxembourg banks including foreign branches are taken into account, while foreign branches of Luxembourg banks are excluded.

- Real credit growth towards the non-financial corporate sector

The annual time series shows considerable volatility even on the aggregated level. In all the three years examined, real credit growth has exceeded real GDP growth both in the euro area and in the EU by a large margin. The quarterly growth rate is roughly one fourth the annual growth rate.

**Table 11 Real credit growth towards the non-financial corporate sector**

	1999 <sup>25</sup>	2000	2001
<b>Annually</b>			
Weighted average	18.7%	6.6%	9.8%
<b>Quarterly</b>			
Weighted average	3.9%	1.9%	2.5%
<b>Memo: annual real GDP growth</b>			
Euro area	2.6%	3.4%	1.5%
EU	2.7%	3.4%	1.7%

Source: BCL

- Real credit growth towards the Luxembourg household sector

The annual credit growth towards Luxembourg households has also been volatile in the past three years. Interestingly, its trend is opposite to the trend displayed by the credit growth rate towards non-financial corporations. In both 2000 and 2001, credit towards Luxembourg households grew at a faster pace than domestic output. The quarterly growth rate is again roughly one fourth the annual growth rate.

**Table 12 Real credit growth towards the Luxembourg household sector**

	1999	2000	2001
<b>Annually</b>			
Weighted average	5.5%	18.5%	6.5%
<b>Quarterly</b>			
Weighted average	1.3%	4.2%	1.6%
<b>Memo: annual real GDP growth in Luxembourg</b>	6.0%	7.5%	3.5%

Source: BCL

### 2.3.5 Sectoral exposure

A large concentration of credit activity in an economic sector may signify a high reliance of banking revenues on few sources and could imply an important vulnerability of the banking industry to the soundness of this specific sector. It is therefore meaningful to investigate the degree of diversification in the banks' exposures. Due to the limited ventilation of the available data, only broad sectoral categories can be distinguished. The BCL looks at exposures vis-à-vis Luxembourg households and vis-à-vis private and public corporations. The latter are then further broken down into financial and non-financial corporations. The sectoral exposure is examined first on a broad definition of credit. In a second step, loans and advances and leasing transactions, respectively debt securities are monitored separately.

<sup>25</sup> For data availability reasons, the 1999 growth rate compares only the second semester of 1999 to the second semester of 1998.



- Sectoral exposure distribution – overall exposure

The overall sectoral exposure distribution is heavily tilted towards the corporate sector, in particular financial corporations. These account for 70% of banks' counterparts and are therefore the most important potential source of vulnerabilities for Luxembourg banks. Non-financial corporations, on the other hand, account for little more than 10% of total exposure. The difference between the simple and the weighted averages hints at a more significant exposure towards the financial sector by smaller credit institutions. Luxembourg households play only a small role as banks' exposure counterpart. Last but not least, the relatively modest standard deviation figures suggest that, in the broad, these characteristics are quite common among Luxembourg banks.

- Sectoral exposure distribution - loan exposure

When narrowing the focus of analysis to loans, advances and leasing transactions, the sectoral exposure maintains the same patterns as for the more broadly defined overall exposure. The percentage shares of each examined sector are however higher. Corporate counterparts make up 90% of bank loans, of which more than four fifth are accounted for by financial corporations.

**Table 13** Sectoral exposure distribution – overall exposure<sup>26</sup>

	1999	2000	2001
Luxembourg households			
Simple average	0.4%	0.5%	0.5%
Weighted average	1.2%	1.3%	1.3%
Standard deviation	1.7%	1.8%	1.9%
Corporate sector			
Simple average	82.9%	84.6%	85.2%
Weighted average	80.6%	82.2%	83.5%
Standard deviation	15.9%	13.8%	14.2%
-Financial corporations			
Simple average	73.1%	75.1%	74.5%
Weighted average	67.6%	68.4%	69.5%
Standard deviation	19.7%	17.7%	19.0%
-Non-financial corporations			
Simple average	9.9%	9.4%	10.6%
Weighted average	13.0%	13.8%	14.0%
Standard deviation	13.6%	12.7%	14.6%

Source: BCL

**Table 14** Sectoral exposure distribution – loan exposure<sup>27</sup>

	1999	2000	2001
Luxembourg households			
Simple average	0.6%	0.6%	0.7%
Weighted average	1.6%	1.7%	1.7%
Standard deviation	2.4%	2.4%	2.5%
Corporate sector			
Simple average	89.7%	89.6%	89.6%
Weighted average	88.9%	89.4%	89.9%
Standard deviation	13.2%	11.2%	11.2%
-Financial corporations			
Simple average	79.3%	80.0%	78.9%
Weighted average	73.1%	73.4%	73.7%
Standard deviation	20.3%	18.0%	19.0%
-Non-financial corporations			
Simple average	10.4%	9.6%	10.7%
Weighted average	15.8%	15.9%	16.1%
Standard deviation	15.1%	13.8%	15.3%

Source: BCL

<sup>26</sup> The percentages do not add up to 100%. Non-Luxembourg households, the public sector and central banks are not included.

<sup>27</sup> The percentages do not add up to 100%. Non-Luxembourg households, the government sector and central banks are not included.



- Sectoral exposure distribution - debt securities

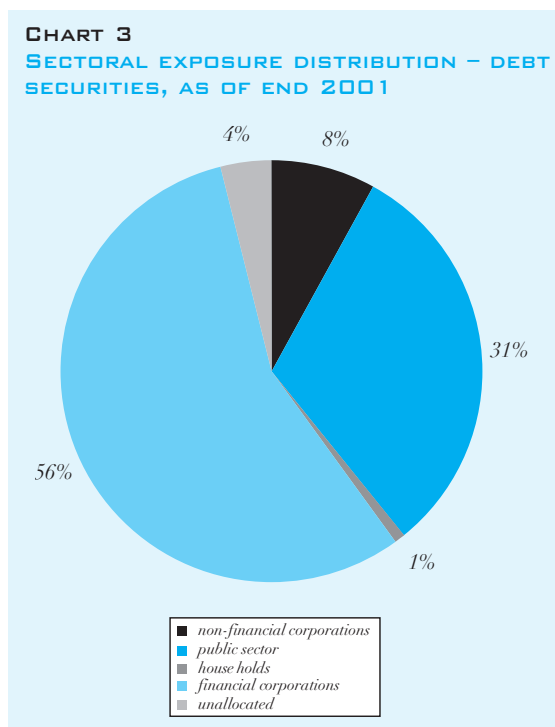
Shifting the focus to debt securities, the exposure characteristics differ more markedly from those of the overall exposure. Corporations still represent the most important counterpart sector, but with only two thirds of total exposure. Financial corporations also still largely exceed non-financial corporations in importance, as is the case for the overall exposure. However, the difference between the simple and the weighted averages is reversed, suggesting a bigger role for financial corporations as debt securities counterparts for larger banks.

**Table 15** Sectoral exposure distribution – debt securities<sup>28</sup>

	1999	2000	2001
<b>Corporate sector</b>			
Simple average	57.5%	61.2%	65.5%
Weighted average	58.2%	63.1%	66.0%
Standard deviation	34.1%	34.3%	34.4%
<b>-Financial corporations</b>			
Simple average	49.1%	53.0%	54.4%
Weighted average	52.5%	55.1%	57.9%
Standard deviation	33.6%	34.7%	35.6%
<b>-Non-financial corporations</b>			
Simple average	8.4%	8.1%	11.1%
Weighted average	5.7%	8.0%	8.1%
Standard deviation	17.8%	17.9%	21.7%

Source: BCL

Chart 3 below illustrates the sectoral exposure distribution as regards debt securities at end 2001. Five categories are distinguished: the two monitored sectors, i.e. financial corporations and non-financial corporations, plus the government sector, the household sector, and unallocated exposure. The government sector accounts for the bulk of the unmonitored debt securities exposure with a share in total exposure of 31%.



Source: BCL

- Exposure breakdown

Finally, table 16 shows the shares of loans and debt securities in total exposure. The percentages have remained constant over the last three years. Loans account for roughly three quarters of total exposure.

**Table 16** Exposure breakdown

	1999	2000	2001
Loans	73%	73%	73%
Debt securities	27%	27%	27%

Source: BCL

<sup>28</sup> The percentages do not add up to 100%. The government sector, households and central banks are not included.

### 2.3.6 Real estate exposure

Past experience has shown that risks to financial system stability often arise from the real estate sector, in particular from exposure to real estate companies themselves and from exposure to changes in the value of mortgages and real estate guarantees. Real estate assets seem to be more prone to be affected by price bubbles than other kinds of assets. They are therefore more likely to hurt the robustness of the exposed bank, especially when the real estate market is in a downturn. Based on available data, two indicators that cover lending backed by mortgages and lending for residential purposes are calculated below. Another related indicator, the extent of real estate in the guarantees of large exposures, is monitored under the heading "large exposures".

- Share of mortgage lending in total lending

This indicator shows how much a bank's loans and advances to private customers are backed by mortgages. The first time series looks at private customers globally, the second and the third break down and examine the components of "private customers" separately, i.e. legal entities (private firms) and natural persons (households).

In general, the share of mortgage lending in total lending is not material, with 5% on average per bank and 14% on aggregate for the banking sector as a whole in 2001. The percentage of mortgage lending is however significantly higher for loans to households than for loans to private firms. In addition, the calculations show that the simple average is less than half the weighted average in all three time series. Larger banks seem to engage more heavily in mortgage lending than smaller banks.

**Table 17** Share of mortgage lending in total lending

	1999	2000	2001
<b>To private customers</b>			
Simple average	6.4%	5.5%	5.2%
Weighted average	10.7%	13.3%	14.2%
Standard deviation	17.0%	15.2%	14.9%
<b>-to firms</b>			
Simple average	4.1%	4.6%	4.3%
Weighted average	5.3%	9.1%	10.8%
Standard deviation	13.1%	14.9%	14.3%
<b>-to households</b>			
Simple average	11.0%	9.7%	9.2%
Weighted average	27.9%	25.6%	23.6%
Standard deviation	23.8%	23.0%	22.7%

Source: BCL

- Loans to households for residential purposes in total loans to households

This second indicator monitors the share of loans granted for the construction or renovation of household residences in total loans to households<sup>29</sup>. Due to the limited coverage of the underlying reporting table, only counterparts within the European Monetary Union are covered. For the same reason, but also in order to gauge the overall demand for residential loans irrespective of a bank's legal status, all Luxembourg banks including foreign branches are included in the analysis; foreign branches of Luxembourg banks are excluded.

Table 18 displays a distinctive difference between the simple and the weighted averages. While a bank typically makes 10% of residential loans in its total loans to households, the banking sector on a whole makes 30% on an aggregated basis. This hints at a much more important role of residential loans in the household lending of larger banks.

<sup>29</sup> Loans are defined here as loans and advances that are either not evidenced by a document or evidenced by a non-negotiable document. Households comprise physical persons and individual enterprises.

**Table 18** *loans to households for residential purposes in total loans to households*

	1999	2000	2001
Simple average	11.1%	10.3%	10.2%
Weighted average	37.5%	30.8%	30.9%
Standard deviation	24.7%	24.4%	24.3%

Source: BCL

### 2.3.7 Country risk

Past experience also shows that adverse impact on financial system stability can arise, via contagion effects, from exposure towards countries that suffer a financial crisis. The BCL looks at the amount of the total balance sheet engaged in high risk countries as defined by regulatory rules<sup>30</sup> and compares it with the banks' own funds. The exposure figures should however be interpreted with caution, because countries with high credit risk vary over time and cannot be captured accurately by one indicator that investigates exposure towards a predefined set of countries.

Table 19 shows that Luxembourg banks' exposure to these high-risk countries amounts to 33% of own funds in the simple average and 42% of own funds in the weighted average in 2001. The ratio has fallen substantially over the past three years, for more than 15 percentage points. Nevertheless, the high standard deviation value suggests that the ratio varies widely among individual banks. Furthermore, the higher level of the weighted average in comparison to the simple average hints at a heavier engagement of systemically more important banks towards high risk countries.

**Table 19** *assets towards high risk countries in relation to own funds*

	1999	2000	2001
Simple average	51.0%	38.6%	32.7%
Weighted average	58.8%	50.5%	42.2%
Standard deviation	182.7%	104.9%	97.7%

Source: BCL

<sup>30</sup> See Cssf Circular 2000/23.

<sup>31</sup> It can be argued to exclude items that do not have a related-entities aspect from the analysis, for instance cash or public sector securities. However, these items notwithstanding, the concrete structure of the balance sheet, and therefore also the share of related-entities assets in total assets, is essentially at the discretion of the bank. It is therefore not inappropriate to use the total balance sheet as the underlying basis.

<sup>32</sup> Stricto sensu, the total balance sheet does not correspond to the total amount of assets, as the former includes prepayments and accrued income. However, as these items will sooner or later become "real" assets, it is not inappropriate to include them in the analysis.

### 2.3.8 Exposure towards related entities

Another source of risk can arise from activities with entities that belong to the same group as the credit institution. Those activities might be subject to looser standards than activities with unrelated entities. Besides, a high proportion of connected assets points to a lack of diversification and a concentration of risk inside the group. Creditor default is potentially more damaging to the bank in case the creditor is an affiliated entity than in case it is not. The BCL investigates related-entities activities at two levels. First, to gauge the overall extent of exposure of a bank towards affiliated entities, the amount of the total balance sheet connected with affiliated undertakings is compared to the gross amount of the total balance sheet<sup>31</sup>. The total balance sheet acts as a proxy for total assets<sup>32</sup>. Second, acknowledging the importance of interbank activities for the Luxembourg banking industry, connected exposure is monitored for loans and advances to credit institutions specifically.

**Table 20** *Assets towards related entities in relation to total assets*

	1999	2000	2001
Total assets			
Simple average	31.6%	31.1%	33.0%
Weighted average	27.3%	27.7%	29.2%
Standard deviation	28.2%	27.9%	28.7%
Interbank loans			
Simple average	47.8%	47.9%	48.8%
Weighted average	47.0%	49.2%	52.8%
Standard deviation	36.6%	37.2%	38.4%

Source: BCL

As most Luxembourg banks are affiliated to a foreign-based credit institution, a large share of their balance sheet is accounted for by activities within the same group. Table 20 shows that the proportion is about 30%. Smaller banks seemingly show a slightly higher dependency to their group. When the focus is narrowed to loans and advances to credit institutions only, the principal channel of interbank relations on the balance sheet, the share of connected activities rises to about 50%.

### 2.3.9 Exposure in financial derivatives

Lastly, in the final category concerning asset quality, the BCL examines off balance sheet exposure arising from a bank's financial derivatives operations. Exposure in financial derivatives is measured both in its total amount and in its main components: operations linked to interest rates, operations linked to currency exchange rates, and operations linked to other market rates (share and commodity prices for example). Due to the lack of data on the market value of financial derivatives, their nominal value is measured against own funds.

As table 21 shows, the gross nominal exposure is typically many times a bank's capital. The high standard deviation value indicates that the level of exposure varies considerably among individual banks. Moreover, the difference between the simple and the weighted average suggests that larger banks are more heavily involved in financial derivatives operations than smaller banks. The level of nominal exposure has risen notably in 2001.

Table 22 shows the breakdown of financial derivatives by types of operation. Interest rate operations are the most important type of derivatives on an aggregated basis, with nearly 20 times the banking sector's capital. On a bank-average basis, interest rate operations are on a par with exchange rate operations, with close to 10 times banks' own funds. Other derivatives operations rank third on both bases, although their importance has risen significantly in 2001. Their rise even accounts for the bulk of the increase in gross derivatives exposure in 2001 observed previously. Moreover, the extraordinarily high standard deviation value indicates that the role of other derivatives operations varies widely among banks. As this last category groups a disparate range of derivatives operations, the increasing level and variation of exposure hint at a possible divergence in the types of derivatives risks individual banks are facing. Chart 4 provides an illustration of the relative importance of the three types of financial derivatives operations with reference to the weighted average at the end of 2001.

**Table 21** Total gross exposure in financial derivatives in relation to own funds

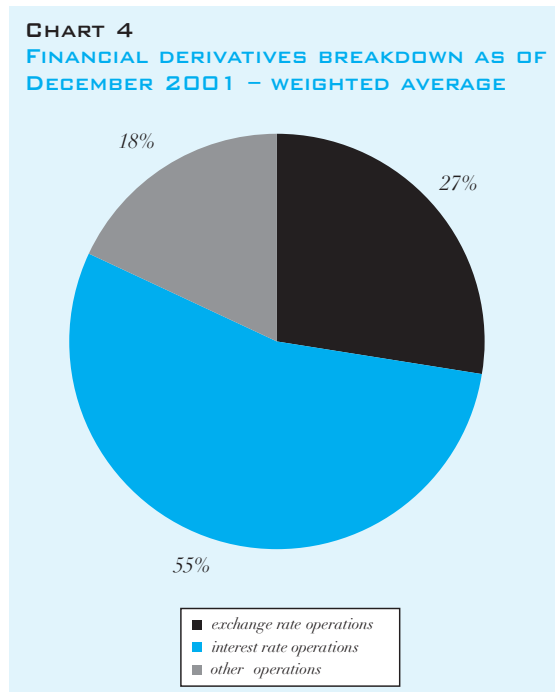
	1999	2000	2001
Simple average	1846%	1817%	2199%
Weighted average	3160%	2988%	3492%
Standard deviation	3123%	3058%	4867%

Source: BCL

**Table 22** Exposure in financial derivatives in relation to own funds – breakdown

	1999	2000	2001
<b>Interest rate operations</b>			
Simple average	975%	898%	831%
Weighted average	1994%	1817%	1817%
Standard deviation	2343%	2062%	1773%
<b>Exchange rate operations</b>			
Simple average	771%	784%	876%
Weighted average	1026%	1015%	1009%
Standard deviation	1088%	1552%	1616%
<b>Others</b>			
Simple average	99%	134%	492%
Weighted average	140%	150%	662%
Standard deviation	563%	1026%	4041%

Source: BCL



Source: BCL

## 2.4 Management soundness

Sound management is key to credit institutions' performance. However, the evaluation of management practices is still primarily a qualitative exercise and cannot easily be quantified. The BCL calculates one indicator in this category, the ratio of operating costs to total gross income. It compares general administrative expenses to total gross income from banking activity<sup>33</sup> and can give an indication as to how efficiently a bank operates. The level of efficiency of a bank, however, is not necessarily entirely derived from the soundness of its management.

**Table 23** *Operating costs to total gross income*

	1999	2000	2001
Simple average	53.3%	55.5%	57.9%
Weighted average	40.5%	40.4%	40.8%
Standard deviation	55.5%	73.3%	71.7%

Source: BCL.

Table 23 shows that operating costs amount to more than 50% of a bank's total gross income on average. On an aggregated basis, the ratio is markedly lower. The difference between both ratios has widened continuously from 1999 onwards. These findings suggest that, not only does the cost to income ratio appear to be higher for smaller banks than for larger banks, but the divergence seems to have grown in recent years. The hypothesis of divergence is further supported by the increase of the standard deviation value.

Following the example of the capital adequacy ratio, table 24 shows a breakdown of the operating costs to total gross income ratio according to the size of the bank's balance sheet. It confirms that larger banks generally exhibit a smaller ratio. The high ratio for the banks with a total balance sheet below 100 million euros is due to the fact that costs exceed gross income in the case of several banks.

**Table 24** *Distribution of the operating costs to total gross income ratio in December 2001*

Range of total balance sheet (mio EUR)	Under 100	[100; 500[	[500; 1000[	[1000; 5000[	[5000; 10000[	Over 10000
(Simple) average ratio	136.3%	55.0%	60.3%	46.5%	35.0%	35.3%
Number of banks	13	33	22	28	12	17

Source: BCL.

<sup>33</sup> Banks with a negative total gross income are excluded from the analysis, as they do not yield a meaningful ratio. End-of-year operating costs are compared to end-of-year gross income.

## 2.5 Earnings

Low profits or even losses might signal the existence of problems at the reporting credit institution. Unusually high earnings might indicate excessive risk taking and warrant more attention too. Two indicators are commonly followed in the area of banking revenues: return on assets and return on equity.

- Return on assets

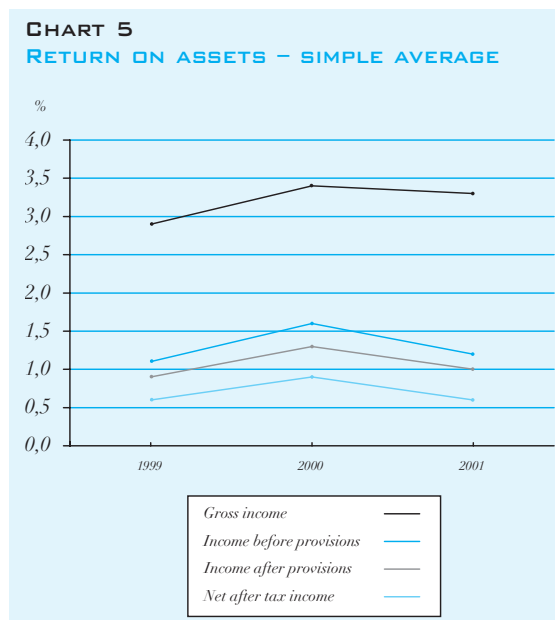
By showing the yield per unit of asset, return on assets measures how productive the bank's assets are in terms of generated income and profits. In other words, return on assets indicates how efficiently the bank's assets are put into use. Return, the numerator of the ratio, can be calculated with a variety of income measures. The BCL monitors four: gross income, income before provisions, income after provisions and net after tax income.

Table 25 shows the development of the various income to assets ratios in the past three years<sup>34</sup>. In 2001, Luxembourg banks generated 3.3 euros in gross income per 100 euros of assets on average, and 1.4 euro in gross income per 100 euros of assets on an aggregated basis. The return has declined in comparison to 2000, but it is still superior to the performance attained in 1999. The other three income ratios show similar characteristics to those exhibited by the gross income ratio. General administrative expenses, which make up the difference between gross income and income before provisions, have the greatest impact on banks' profitability. For all income ratios, the simple average is distinctively higher than the weighted average, which suggests that smaller banks generate relatively more revenues than larger banks. Moreover, the weighted average remains quite stable over time. Chart 5 illustrates the development over time of the various income ratios in the simple average.

Table 25 **Return on assets**

	1999	2000	2001
<b>Gross income</b>			
Simple average	2.9%	3.4%	3.3%
Weighted average	1.4%	1.6%	1.4%
Standard deviation	5.1%	6.2%	6.1%
<b>Income before provisions</b>			
Simple average	1.1%	1.6%	1.2%
Weighted average	0.7%	0.8%	0.8%
Standard deviation	2.6%	3.6%	3.4%
<b>Income after provisions</b>			
Simple average	0.9%	1.3%	1.0%
Weighted average	0.7%	0.7%	0.7%
Standard deviation	2.6%	3.6%	3.6%
<b>Net after tax income</b>			
Simple average	0.6%	0.9%	0.6%
Weighted average	0.4%	0.5%	0.5%
Standard deviation	2.0%	2.4%	3.0%

Source: BCL.



Source: BCL.

<sup>34</sup> End-of-year income divided by average assets value in the year.



- Return on equity

The second frequently used earnings indicator is return on equity. It measures how profitable the bank's own funds are used and ultimately determines what the bank's shareholders receive from their investment. As the denominator is more narrowly defined, return on equity will display a higher value than return on assets. However, a high return on equity ratio may result not only from high profitability, but also from low capitalisation, which makes an interpretation of the figures more difficult. The BCL looks at two measures of return: income after provisions and net after tax income, and set them against the bank's shareholder equity, i.e. subscribed or endowment capital<sup>35</sup>. Net after tax income corresponds to net profits than can be distributed to shareholders.

Table 26 displays return on equity with reference to the two income measures. Due to the extremely high ratio displayed by one bank with an extraordinarily low level of endowment capital, the simple average becomes difficult to interpret. A second "corrected" simple average series which leaves out this one bank is calculated and shown.

**Table 26** Return on equity

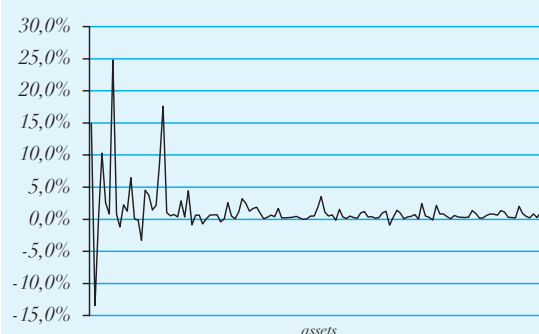
	1999	2000	2001
<b>Income after provisions</b>			
Simple average	39.9%	51.1%	47.6%
Weighted average	49.8%	50.3%	52.9%
Standard deviation	44.8%	74.5%	83.2%
<b>Net after tax income</b>			
Simple average	26.3%	35.0%	33.3%
Weighted average	33.4%	36.1%	40.3%
Standard deviation	28.9%	49.3%	57.9%

Source: BCL

Contrary to return on assets, the yield showed a more contrasted development in 2001. It has decreased in the simple average, but increased in the weighted average. Overall, the simple average is more volatile than the weighted average. The high standard deviation value implies a large variation among the underlying banks. Moreover, it has widened significantly from 1999 onwards. Also, in contrast to the picture conveyed by return on assets, the difference between the simple and the weighted average is no longer clear-cut. In 2001, the weighted average even surpasses the simple average by a rather substantial margin. This result suggests that, in terms of return on equity, larger banks tend to outperform smaller banks.

To summarise, Luxembourg banks' performance improved markedly in 2000 over 1999, then levelled off in 2001. The simple average is higher than the weighted average for return on assets, while the reverse is true for return on equity in 2001. Charts 6 and 7 draw on 2001 data and illustrate the distribution of income after provisions to assets and to equity respectively<sup>36</sup>. Return on assets is volatile for smaller banks. Return on equity fluctuates generally between 0% and 200%, except for one case of overshooting at the lower equity range. The value reaches the 200% mark more frequently at the higher equity end.

**CHART 6**  
DISTRIBUTION OF RETURN ON ASSETS IN 2001 – INCOME AFTER PROVISIONS

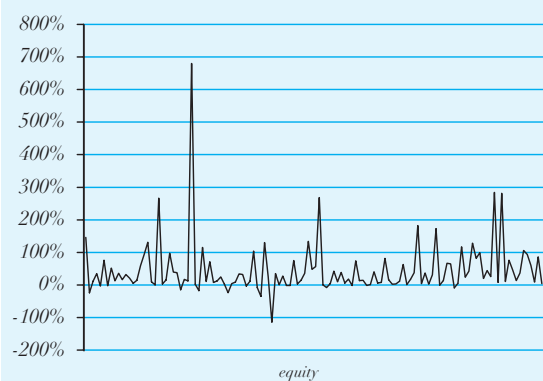


Source: BCL

<sup>35</sup> End-of-year income divided by average equity value in the year.

<sup>36</sup> On the X-axis, the value grows from the left to the right.

**CHART 7**  
**DISTRIBUTION OF RETURN ON EQUITY IN**  
**2001 – INCOME AFTER PROVISIONS**



Source: BCL

- Income structure

To get a clearer picture of the sustainability of earnings, and of the extent of possible risk-taking by banks, it is useful to look at the composition of their income. Three main meaningful categories can be distinguished: net interest income, net commissions and fees income and net results on financial operations. Other operating incomes and charges are excluded from the analysis<sup>37</sup>.

**Table 27** *Income structure*

	1999	2000	2001
<b>Net interest income</b>			
Simple average	54.0%	48.9%	50.9%
Weighted average	52.0%	48.4%	55.0%
Standard deviation	29.7%	24.6%	24.4%
<b>Commissions and fees</b>			
Simple average	39.3%	42.7%	40.4%
Weighted average	37.8%	43.2%	37.3%
Standard deviation	24.4%	24.6%	24.1%
<b>Results on financial operations</b>			
Simple average	8.8%	8.4%	8.7%
Weighted average	10.2%	8.4%	7.7%
Standard deviation	7.5%	8.9%	8.4%

Source: BCL

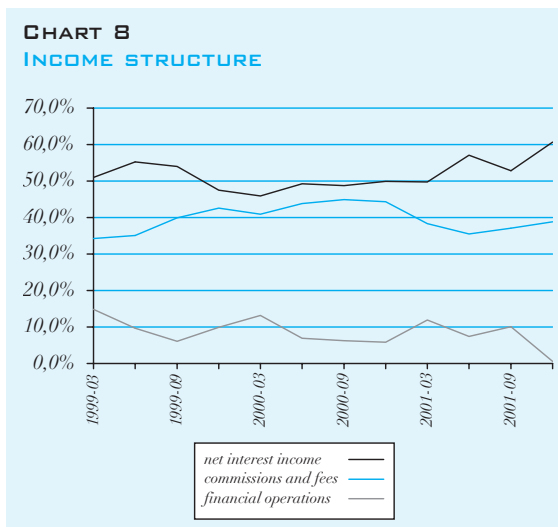
Table 27 shows end-of-year results. Net interest income is the most important category of revenue with a share of around 50%. Commissions and fees earnings rank second with roughly 40%. Income from financial operations amounts to a share of close to 10%. This structure seems to be quite common among banks, as suggested by the small difference between the simple and the weighted averages and the relatively modest standard deviation value.

Chart 8 shows the evolution of the income categories over time. The data used are quarterly, non cumulative figures. From 1999 to 2000, the importance of net interest income decreased, while the share of commissions and fees income increased. In 2001, the trend reversed, the importance of net interest income reaching 60% in the last quarter of 2001. The share of the results on financial operations is more volatile; it dipped at the end of 2001 to only 0.5%.

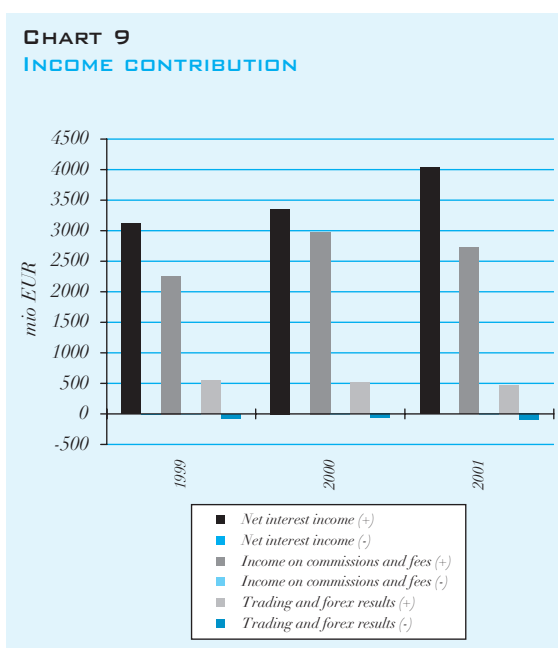
It should be noted that the percentages attributed to the various income categories above are based on absolute values. They indicate the impact of each income category on the banks' revenues, but do not reveal whether a category contributes to the bank's revenues as a profit or as a loss. To obtain this information, the banks' end-of-year results in the three income categories are separated and summed according to their positive or negative signs. Chart 9 displays the findings. While net interest income and commissions and fees income almost always contribute positively to the banks' profits, the role played by income from financial operations is more ambiguous. In 2001, aggregated losses from financial operations amounted to 20% of aggregated gains.

<sup>37</sup> Each income category is taken in its absolute value and measured against the sum of the absolute values of the three income categories in order to avoid possible distortions resulting from the compensation of negative categories with positive ones.





Source: BCL



Source: BCL

## 2.6 Liquidity

### • Liquidity ratio

The management of liquidity belongs to the key skills of the banking business. It is also an important aspect of prudential concern, as liquid assets must be maintained at an adequate level to meet creditor withdrawal. Luxembourg banking regulations<sup>38</sup> impose on credit institutions the observance of a liquidity ratio: current liabilities should be covered to at least 30% by assets deemed to be liquid.

Due to the contribution of small banks, the simple average liquidity ratio and the standard deviation values are both very high and volatile over time. They do not allow a useful analysis. Instead, the BCL monitors the number of times a bank has fallen below the requirement of 30% in the investigated periods. The number refers to the frequency of insufficient monthly reported ratios. It is not equivalent to the number of banks that have not observed the requirement over the investigated period.

The liquidity ratio on an aggregated basis shows a remarkably constant level over time, amounting to a little above 60%, more than twice the regulatory requirement. However, the ratio sometimes falls under 30% for individual banks. In 2001, 30 monthly ratios below 30% were signalled, close to twice as many as in 2000.

Table 28 **Liquidity ratio**

	1999	2000	2001
Weighted average	62%	61%	63%
Frequencies of monthly ratios below 30%	23	17	30

Source: BCL

38 Institut Monétaire Luxembourgeois (IML) Circular 93/104.

- Central bank liabilities in total liabilities

An increasing percentage of central bank liabilities in relation to total liabilities<sup>39</sup> could signal potential liquidity problems at the underlying credit institution. It appears therefore useful to monitor the evolution of a bank's refinancing activities with the central bank<sup>40</sup>. The extent of central bank liabilities itself in relation to total liabilities is however more difficult to interpret. Refinancing activities with the central bank by themselves do not mean that the bank cannot obtain funds from the market. These are often embedded in the bank's overall refinancing strategy, taking for instance funding interest rate differentials or diversification aspects into consideration.

As table 29 shows, funds provided by central banks show an increasing importance for Luxembourg banks over time, although they still account for only 1.4% of a bank's liabilities on average in 2001. It seems that larger banks use central bank funds more heavily than smaller banks. Moreover, the standard deviation value hints at a rather large and increasing degree of variation in the central bank funding of individual banks.

**Table 29** *Central bank liabilities in total liabilities*

	1999	2000	2001
Simple average	0.8%	1.0%	1.4%
Weighted average	2.5%	3.1%	3.7%
Standard deviation	2.5%	3.1%	4.4%

Source: BCL

- Coefficient of maturity transformation

While the liquidity ratio focuses on the relation between short term liabilities and liquid assets, the coefficient of maturity (duration) transformation analyses the term structure of the whole balance sheet of a bank. A coefficient above one signifies that the bank's assets

have a longer average duration than its liabilities; a coefficient below one means that the bank's liabilities have a longer average duration than its assets. Traditionally, banks perform a maturity transformation function, which implies a longer average duration on their assets side than on their liabilities side.

The coefficient of maturity transformation is presented in table 30. The figures confirm the maturity transformation function that banks are supposed to perform. In 2001, the duration of banks' assets is on average six times longer than the duration of their liabilities. Aggregated across banks, assets are only two and a half times longer than liabilities. This difference suggests that larger banks have a significantly smaller maturity difference between the assets side and the liabilities side than smaller banks. The relatively high standard deviation value indicates that the coefficient varies considerably among individual banks. In addition, the simple and weighted averages have evolved in opposite directions.

**Table 30** *Coefficient of maturity transformation*

	1999	2000	2001
Simple average	5.07	5.12	6.06
Weighted average	3.46	3.16	2.50
Standard deviation	6.02	6.09	10.07

Source: BCL

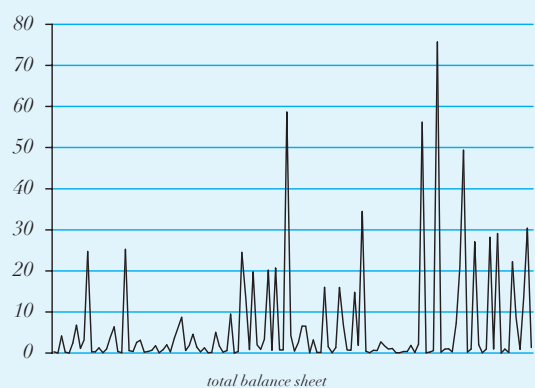
Chart 10 relates the coefficients of maturity transformation to the total balance sheet of the underlying banks for end 2001<sup>41</sup>. The diagram confirms the high degree of variation in the maturity structure of individual banks. However, contrary to what was implied by the difference between the simple and the weighted average observed above, larger entities display a high coefficient more frequently. At this stage, it is worth exploring whether this finding can be traced to a difference in the maturities of assets and liabilities between large and small banks.

<sup>39</sup> Total liabilities are defined as the total balance sheet minus accruals and deferred income.

<sup>40</sup> Not only the home central bank, but all central banks are considered for this indicator.

<sup>41</sup> On the X-axis, the total balance sheet grows from the left to the right.

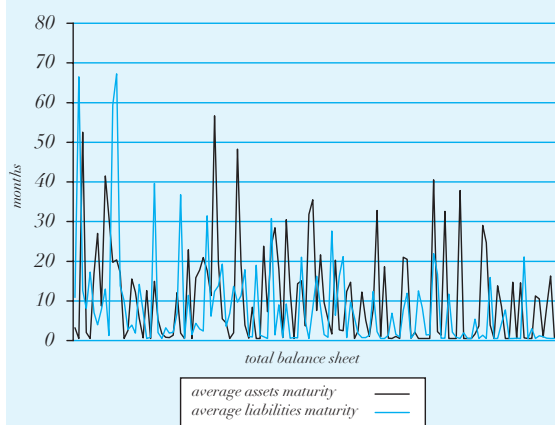
**CHART 10**  
**DISTRIBUTION OF THE COEFFICIENT**  
**OF MATURITY TRANSFORMATION –**  
**DECEMBER 2001**



Source: BCL

Chart 11 breaks down the coefficient of maturity transformation in chart 10 into the average assets and liabilities maturities. The average maturity of assets does not show a distinctive pattern. The average maturity of liabilities is more volatile at the lower range of the total balance sheet and tends to fall towards the higher end. The ensuing divergence between the average assets and liabilities maturities explains the pattern in chart 10.

**CHART 11**  
**DISTRIBUTION OF AVERAGE ASSETS AND**  
**LIABILITIES MATURITIES – DECEMBER 2001**



Source: BCL

- Ratio of non-bank loans to non-bank customer funds

The ability of a bank to meet creditor demand depends not only on the amount of its liquid assets, but also on its ability to raise additional funding. This ratio compares non-bank loans to non-bank customer funds. A high ratio states a large volume of non-bank loans in relation to non-bank customer funds. It might indicate a good potential of the bank to recruit additional deposits, but could however also hint at a possible liquidity stress at the credit institution.

**Table 31** *Ratio of non-bank loans to non-bank customer funds*

	1999	2000	2001
Weighted average	0.56	0.58	0.57

Source: BCL

Due to the contribution of small banks, both the simple average and the standard deviation series are very volatile in time and do not permit a meaningful analysis. On an aggregated basis, the ratio is close to 0.6 and is quite constant over time.

## 2.7 Sensitivity to market risk

As a bank not only grants loans, but also invests in marketable instruments, it is vulnerable to market risks, i.e. fluctuations in interest rates, foreign exchange rates, securities prices and commodities prices. Due to data constraints, the BCL analyses equities risk and foreign exchange risk only.

- Equities portfolio in relation to own funds

This indicator measures a bank's portfolio of shares and other variable-yield securities against its own funds<sup>42</sup>. Luxembourg banks do not have significant equities exposure overall, with an amount of less than 20% of their own funds in 2001. The importance of the equities portfolio has moreover been continuously reduced over the past three years. Some individual banks nevertheless have a substantial equities to own funds ratio, as indicated by the relatively high standard deviation value.

<sup>42</sup> Securities which are held as participating interests and shares in affiliated undertakings are excluded.

**Table 32 Equities portfolio to own funds**

	1999	2000	2001
Simple average	20.1%	16.1%	15.5%
Weighted average	25.1%	21.1%	17.6%
Standard deviation	66.8%	45.2%	43.2%

Source: BCL

- Net foreign currency position in relation to own funds

Foreign exchange risk is less straightforward to capture. As there is not one single foreign currency, but multiple currencies whose exchange rates with the home currency do not correlate with each other, the risk cannot be captured by one single indicator. A set of sub-indicators needs to be calculated in this regard. In order to gauge the importance of currency exposures, net foreign currency positions are measured against the banks' own funds<sup>43</sup>.

Those foreign currencies that are most relevant to the Luxembourg banking sector are singled out for monitoring: the Swiss franc (CHF), the British pound (GBP), the Japanese yen (JPY) and the American dollar (USD)<sup>44</sup>. These four currencies together account for more than 90% of Luxembourg banks' foreign currency exposure.

The findings are presented in table 33. The net open foreign currency positions are on the whole not substantial as a percentage of own funds. The high standard deviation value however points to large exposure differences among individual banks. The American dollar is the most important foreign currency for Luxembourg banks by a large margin, in funding as well as in investment. The Japanese yen plays a more important role in funding than in investment. Interestingly, smaller banks may be more likely to have more significant foreign currency exposures than larger banks.

**Table 33 Net foreign currency position in relation to own funds**

	1999	2000	2001
<b>CHF – positive net position</b>			
Simple average	1.8%	2.8%	5.0%
Weighted average	1.3%	1.5%	1.7%
Standard deviation	4.9%	11.9%	27.5%
<b>CHF – negative net position</b>			
Simple average	-9.7%	-7.6%	-2.3%
Weighted average	-3.4%	-2.5%	-1.7%
Standard deviation	49.2%	43.6%	8.7%
<b>GBP – positive net position</b>			
Simple average	1.2%	2.1%	0.8%
Weighted average	1.1%	2.0%	1.6%
Standard deviation	3.8%	13.5%	2.5%
<b>GBP – negative net position</b>			
Simple average	-1.4%	-3.1%	-3.3%
Weighted average	-0.9%	-1.5%	-1.5%
Standard deviation	3.0%	25.0%	24.2%
<b>JPY – positive net position</b>			
Simple average	2.4%	3.6%	1.5%
Weighted average	1.0%	1.8%	2.1%
Standard deviation	25.0%	28.2%	10.6%
<b>JPY – negative net position</b>			
Simple average	-9.9%	-5.8%	-4.4%
Weighted average	-2.7%	-2.2%	-3.0%
Standard deviation	50.5%	21.8%	18.8%
<b>USD – positive net position</b>			
Simple average	9.0%	10.5%	10.5%
Weighted average	5.6%	9.6%	7.4%
Standard deviation	36.0%	38.1%	45.0%
<b>USD – negative net position</b>			
Simple average	-26.0%	-17.7%	-10.0%
Weighted average	-9.2%	-8.0%	-5.1%
Standard deviation	105.3%	88.7%	61.2%

Source: BCL

<sup>43</sup> Only banks that have a foreign currency position are considered. Note also that the maturity aspect is absent from this indicator. The indicator therefore offers only a gauge of currency mismatch and not the maturity mismatch in the context of foreign currency exposure.

<sup>44</sup> The 12 national currencies which constitute the euro are considered as home currencies.

## 2.8 Competitive conditions

The competitive environment in the banking industry can have considerable impact on the performance of banks. A tight environment with a large number of competitors might put pressure on profit margins, while a high concentration of banking activities in a few banks might result in lesser efficiency and thus higher vulnerability to adverse shocks. The BCL looks at the distribution of assets and the spread between lending and deposit interest rates in this context. All indicators monitor the concentration of Luxembourg banking activities in a geographical sense, i.e. including Luxembourg branches of foreign banks, but excluding foreign branches of Luxembourg banks.

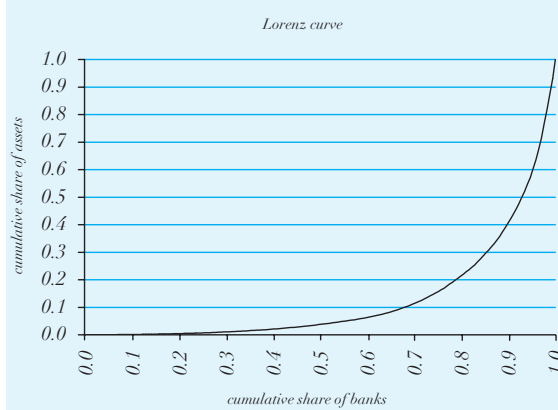
- Distribution of assets

The degree of concentration of banking activities can be investigated by looking at their distribution among credit institutions. This indicator first focuses on the size of the banks' total balance sheet, a good proxy for their overall activity. It then looks into the distribution of loans and advances to customers<sup>45</sup>, a traditionally important banking activity, and finally the distribution of loans and advances to credit institutions, as interbank activity is a distinctive feature of the Luxembourg banking industry. The Gini coefficient is calculated to measure the concentration of these three activities<sup>46</sup>.

Table 34 covers the development of the Gini coefficient from 1996 onwards. It displays the degree of concentration at the end of each year. The concentration in non-bank loans is higher than in interbank loans. The coefficients for the distribution of

total assets, of non-bank loans and of interbank loans have all risen steadily since 1997. They point to increasing concentration of banking business in Luxembourg. This trend could, at least partially, be a consequence of the diminution in the number of credit institutions established, mainly through mergers and acquisitions initiated by their parent companies abroad. The number of registered credit institutions decreased by 32 units in the years 1997 - 2001, from 221 to 189. Chart 12 provides an illustration of the degree of concentration of assets at the end of 2001 with the help of the Lorenz curve. A straight diagonal line from the point (0;0) to the point (1;1) signifies equal distribution of assets among banks. The more the curve is skewed towards the outer end of the X-axis, the more concentrated is the distribution<sup>47</sup>.

**CHART 12**  
**DISTRIBUTION OF ASSETS - DECEMBER 2001**



Source: BCL

**Table 34** *Distribution of assets (end of year) – Gini coefficient*

	1996	1997	1998	1999	2000	2001
Total balance sheet	0.73	0.72	0.73	0.74	0.74	0.76
Non-bank loans	0.80	0.80	0.82	0.82	0.83	0.83
Interbank loans	0.72	0.71	0.71	0.71	0.71	0.75
Number of banks	221	215	209	210	202	189

Source: BCL

<sup>45</sup> Leasing transactions included.

<sup>46</sup> The Gini coefficient takes a value between 0 and 1. A value of 0 means equal distribution of the measured activity among banks. The more the value approaches 1, the more concentrated is the underlying activity.

<sup>47</sup> The Lorenz curve graphically illustrates the Gini coefficient. The Gini coefficient represents the surface between the diagonal line and the Lorenz curve in relation to the surface below the diagonal line. The X-axis measures the cumulative percentage of banks placed in ascending order of their assets. The Y-axis measures the cumulative percentage of assets.

- Spread between credit and debit interest rates

Another useful indicator of competitive conditions is the spread between lending (credit) and deposit (debit) interest rates. A narrowing of the spread might hint at a more competitive environment for banking activities<sup>48</sup>. Various credit and debit interest rates are averaged. The interest rate spread is then obtained by subtracting the calculated average debit rate from the calculated average credit rate. Only the simple average and the standard deviation are calculated. The weighted average is not compiled, because the volume of credit and of deposit at each interest rate is not known.

The so calculated interest rate spread amounts to a little more than 1 percentage point. It has narrowed since 1999 on average, while the variation among banks has increased.

**Table 35** *Interest rate spread*

	1999	2000	2001
<b>Simple average</b>	1.79	1.13	1.13
<b>Standard deviation</b>	1.58	1.78	1.91

*Source: BCL*

<sup>48</sup> Other factors could play a role too, e.g. changes in the refinancing rate of the European Central Bank.

### 3 CONCLUSION

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The BCL has created an extensive set of macroprudential indicators for the Luxembourg banking sector. The framework will enhance the quality of its macroprudential surveillance. Nevertheless, the following constraints should be borne in mind.

Firstly, the indicators cover credit institutions only and do not extend to all areas relevant to financial stability. In particular, financial intermediaries other than credit institutions, securities and foreign exchange markets, and financial laws and regulations are left out. This is due partly to limited data, partly to difficulty of quantifiability. Secondly, useful macroeconomic data, especially information on the indebtedness of households and firms, are not available. Thirdly, not all stability-relevant aspects of credit institutions are quantifiable, at least for the time being. The indicators need to be complemented by qualitative assessment. Fourthly, due to the limited availability of long time series and the ever-evolving nature of financial systems, it is partly difficult to interpret the values of the indicators as regards their relevance for financial stability. Moreover, the indicators are not “safely”

comparable across countries, not only because of lack of harmonisation in their compilation, but also because of country-specific characteristics. Lastly, the quality of the indicators depends on the quality of the underlying data. Accuracy and timeliness of the reporting data of the banks are crucial to ensure the reliability of the indicators.

The building of macroprudential indicators lies within international trends towards the enhancement of macroprudential surveillance. The building of longer time series and international comparison, possibly even harmonization, could improve the pertinence of the indicators in future. Other useful sources of information, like monetary policy data, the rating of a bank, or the yield development of its bonds, could also be drawn into consideration.

Internationally, the enhancement of macroprudential surveillance is still a recent effort and underlies an evolving process. In today's volatile and uncertain economic and financial environment, it represents a challenging task of particular value that the BCL vows to pursue.

## Annex 1: summary table

	1999		2000		2001	
	SA**	WA**	SA	WA	SA	WA
<b>CAPITAL ADEQUACY</b>						
Global regulatory capital ratio	24.6%	12.9%	25.2%	13.1%	26.1%	13.7%
Tier 1 regulatory capital ratio	23.7%	10.4%	24.4%	11.0%	24.9%	11.4%
<b>ASSET QUALITY</b>						
<i>Value adjustments in assets</i>						
Value adjustments to own funds	23.4%	24.6%	21.0%	21.6%	19.4%	17.9%
Value adjustments on credit to total gross credit						
- global ratio	0.8%	0.7%	0.8%	0.5%	0.7%	0.4%
- credit to credit institutions	0.7%	0.3%	0.7%	0.2%	0.6%	0.1%
- credit to customers and leasing transactions	1.7%	1.4%	1.3%	1.2%	1.4%	1.0%
Net new value adjustments to own funds*	2.4%	1.7%	2.4%	0.9%	3.5%	1.9%
<i>Level of guarantees</i>						
Share of credit backed up by guarantees						
- global ratio	14.9%	16.7%	14.5%	17.4%	14.7%	16.7%
- credit to credit institutions	2.0%	2.9%	1.6%	2.2%	1.2%	1.7%
- credit to customers and leasing transactions	48.9%	47.0%	45.5%	48.3%	47.2%	47.6%
<i>Large exposures</i>						
Large exposures to total exposures	83.1%	94.0%	82.5%	94.6%	82.3%	94.6%
Large exposures to own funds	1030%	1293%	998%	1272%	1025%	1251%
Non-performing large exposures to total large exposures	3.6%	1.5%	1.8%	0.8%	1.4%	0.6%
Share of mortgages in guarantees	1.3%	2.5%	1.2%	2.6%	1.0%	1.9%
Share of securities in guarantees	8.6%	3.0%	7.5%	3.0%	7.2%	3.1%
<i>Credit growth</i>						
Real credit growth towards the non-financial corporate sector						
- annually	-	18.7%	-	6.6%	-	9.8%
- quarterly	-	3.9%	-	1.9%	-	2.5%
Real credit growth towards Luxembourg households						
- annually	-	5.5%	-	18.5%	-	6.5%
- quarterly	-	1.3%	-	4.2%	-	1.6%



Annex 1: summary table (suite)

	1999		2000		2001	
	SA	WA	SA	WA	SA	WA
<i>Sectoral exposure</i>						
Overall exposure to						
- Luxembourg households	0.4%	1.2%	0.5%	1.3%	0.5%	1.3%
- the corporate sector	82.9%	80.6%	84.6%	82.2%	85.2%	83.5%
- financial corporations	73.1%	67.6%	75.1%	68.4%	74.5%	69.5%
- non-financial corporations	9.9%	13.0%	9.4%	13.8%	10.6%	14.0%
Loan exposure to						
- Luxembourg households	0.6%	1.6%	0.6%	1.7%	0.7%	1.7%
- the corporate sector	89.7%	88.9%	89.6%	89.4%	89.6%	89.9%
- financial corporations	79.3%	73.1%	80.0%	73.4%	78.9%	73.7%
- non-financial corporations	10.4%	15.8%	9.6%	15.9%	10.7%	16.1%
Debt securities exposure to						
- the corporate sector	57.5%	58.2%	61.2%	63.1%	65.5%	66.0%
- financial corporations	49.1%	52.5%	53.0%	55.1%	54.4%	57.9%
- non-financial corporations	8.4%	5.7%	8.1%	8.0%	11.1%	8.1%
<i>Real estate exposure</i>						
Share of mortgage lending in total lending to private customers	6.4%	10.7%	5.5%	13.3%	5.2%	14.2%
- firms	4.1%	5.3%	4.6%	9.1%	4.3%	10.8%
- households	11.0%	27.9%	9.7%	25.6%	9.2%	23.6%
Loans to households for residential purposes in total loans to households	11.1%	37.5%	10.3%	30.8%	10.2%	30.9%
<i>Country risk</i>						
Assets towards high risk countries to own funds	51.0%	58.8%	38.6%	50.5%	32.7%	42.2%
<i>Exposure towards related entities</i>						
Total assets	31.6%	27.3%	31.1%	27.7%	33.0%	29.2%
Interbank loans	47.8%	47.0%	47.9%	49.2%	48.8%	52.8%
<i>Exposure in financial derivatives</i>						
Total gross exposure to own funds	1846%	3160%	1817%	2988%	2199%	3492%
- interest rate operations	975%	1994%	898%	1817%	831%	1817%
- exchange rate operations	771%	1026%	784%	1015%	876%	1009%
- other operations	99%	140%	134%	150%	492%	662%
<b>MANAGEMENT SOUNDNESS</b>						
Operating costs to gross income*	53.3%	40.5%	55.5%	40.4%	57.9%	40.8%

Annex 1: summary table (suite)

	1999		2000		2001	
	SA	WA	SA	WA	SA	WA
<b>EARNINGS</b>						
Return on assets - gross income*	2.9%	1.4%	3.4%	1.6%	3.3%	1.4%
- income before provisions*	1.1%	0.7%	1.6%	0.8%	1.2%	0.8%
- income after provisions*	0.9%	0.7%	1.3%	0.7%	1.0%	0.7%
- net after tax income*	0.6%	0.4%	0.9%	0.5%	0.6%	0.5%
Return on equity - income after provisions*	39.9%	49.8%	51.1%	50.3%	47.6%	52.9%
- net after tax income*	26.3%	33.4%	35.0%	36.1%	33.3%	40.3%
<b>Income structure</b>						
Share of - net interest income	54.0%	52.0%	48.9%	48.4%	50.9%	55.0%
- commissions and fees	39.3%	37.8%	42.7%	43.2%	40.4%	37.3%
- results on financial operations	8.8%	10.2%	8.4%	8.4%	8.7%	7.7%
<b>LIQUIDITY</b>						
Liquidity ratio	-	62%	-	61%	-	63%
Central bank liabilities in total liabilities	0.8%	2.5%	1.0%	3.1%	1.4%	3.7%
Coefficient of maturity transformation	5.07	3.46	5.12	3.16	6.06	2.50
Ratio of non-bank loans to non-bank customer funds	-	0.56	-	0.58	-	0.57
<b>SENSITIVITY TO MARKET RISK</b>						
Equities portfolio to own funds	20.1%	25.1%	16.1%	21.1%	15.5%	17.6%
<b>Net foreign currency position to own funds</b>						
CHF - positive net position	1.8%	1.3%	2.8%	1.5%	5.0%	1.7%
- negative net position	-9.7%	-3.4%	-7.6%	-2.5%	-2.3%	-1.7%
GBP - positive net position	1.2%	1.1%	2.1%	2.0%	0.8%	1.6%
- negative net position	-1.4%	-0.9%	-3.1%	-1.5%	-3.3%	-1.5%
JPY - positive net position	2.4%	1.0%	3.6%	1.8%	1.5%	2.1%
- negative net position	-9.9%	-2.7%	-5.8%	-2.2%	-4.4%	-3.0%
USD - positive net position	9.0%	5.6%	10.5%	9.6%	10.5%	7.4%
- negative net position	-26.0%	-9.2%	-17.7%	-8.0%	-10.0%	-5.1%
<b>COMPETITIVE CONDITIONS</b>						
<b>Distribution of assets - Gini coefficient</b>						
Distribution of the balance sheet total*	0.74		0.74		0.76	
Distribution of non-bank loans*	0.82		0.83		0.83	
Distribution of interbank loans*	0.71		0.71		0.75	
Interest rate spread	1.79	-	1.13	-	1.13	-

Notes: - All figures are yearly averages, except for those marked with \*, which are end-of-year data.

- \*\* SA: simple average; WA: weighted average.

- For the definition and the methodology used in the calculation of the indicators, see the main text and annex 2.

## Annex 2: the indicators – concepts and definitions

### Capital adequacy

#### Regulatory capital adequacy ratios

The capital adequacy ratio (in %) is calculated with the following formula:

$$\frac{\text{Eligible own funds}}{\text{Risk-weighted assets}} \geq 8\%$$

Eligible own funds are made up of original own funds (tier 1 capital), additional own funds (tier 2 capital) and super-additional own funds (tier 3 capital), subject to the application of certain limits and deductions. Tier 1 capital consists of permanent shareholders' equity and disclosed reserves. Tier 2 capital comprises undisclosed reserves, revaluation reserves, general provisions and loan-loss reserves, hybrid debt-equity capital instruments and subordinated long-term debt with a maturity of over 5 years. Tier 3 capital consists of subordinated debt with a maturity between 2 and 5 years.

Risk-weighted assets are the risk-adjusted values of a bank's assets. All bank assets are assigned to one of five risk-weighting categories, ranging from 0% to 100%, depending on the credit risk of the borrower<sup>1</sup>.

The regulatory global capital ratio and the regulatory tier 1 capital ratio are both calculated in the same way described above. The global capital ratio takes tier 1, tier 2 and tier 3 capital into account while the tier 1 capital ratio considers only tier 1 capital. The latter focuses on the cover of capital requirement by permanent shareholders' equity and disclosed reserves (core own funds). It is more stringent than the global capital ratio.

According to the Luxembourg banking regulations, the capital adequacy ratio is calculated with the following formula:

$$\frac{\text{Eligible own funds}}{\text{Overall capital requirement}} \geq 1$$

*Overall capital requirement* corresponds to the sum of the capital requirements to cover different risk categories (credit risk, foreign exchange risk, interest rate risk, etc.)<sup>2</sup>.

### Asset quality

#### Value adjustments in assets

*Value adjustments* are adjustments to take account of reductions in the value of individual assets. Value adjustments considered here refer only to those made in response to risks specifically related to assets items on the balance sheet. Those that refer to off balance sheet items, those created pursuant to Article 62 of the law on the accounts of banks and lump-sum provisions are not included. Value adjustments on assets are fully provided for on the liabilities side of the balance sheet. The published accounts show the net adjusted assets values after value adjustments and not the gross values of assets before value adjustments.

#### Level of guarantees

For real guarantees, no geographical distinction is made. For guarantees other than real guarantees, only those pledged by so-called "zone A" central governments, central banks and credit institutions are considered. "Zone A" encompasses member states of the European Union, member states of the Organisation for Economic Cooperation and Development, and countries that have concluded special lending agreements or are party to General Lending Agreements with the International Monetary Fund. "Zone A" thus includes the following 32 countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Japan, South Korea, Liechtenstein, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Saudi Arabia, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

<sup>1</sup> See *Commission de Surveillance du Secteur Financier (Cssf) Circular 2000/10 for a description of the assets risk categories and their corresponding risk weights.*

<sup>2</sup> See *Cssf Circular 2000/10 for a detailed description.*

## Large exposures

Luxembourg banking regulations define large exposures as exposures above 10% of own funds or above 6.2 million euros or their equivalent amount. Large exposures cover on- as well as off-balance-sheet items, in particular amounts due from bank counterparties, loans and advances to non-bank counterparties, leasing operations, securities, participating interests, lines of credit, guarantees granted and currency exchange and interest rate contracts<sup>3</sup>.

## Credit growth

*Credit* is defined here as loans and advances which are not evidenced by a negotiable instrument or evidenced by a non-negotiable instrument. In the main, it comprises loans and advances to credit institutions, loans and advances to customers and leasing transactions.

Data on credit growth is available on a quarterly basis. The *annual* growth rate is obtained by comparing the level of credit in the period in question to the level of credit in the same period one year ago. For annual periods, the average level of credit in a given year is derived from the data of its four quarters and compared to the average level of credit in the previous year.

The *quarterly* growth rate is obtained by comparing the level of credit in the period in question to the level of credit in the precedent period. For annual periods, the average of its four quarters is compared to the average of the fourth quarter of the previous year plus the first three quarters of the year in question.

## Sectoral exposure

Exposure in this context encompasses in the main loans and advances to credit institutions, loans and advances to customers, leasing transactions and debt securities other than equities and money market papers.

The economic sectors are defined as follows:

- *Luxembourg households*: Physical persons who have their residence in the Grand Duchy of Luxembourg, including Luxembourg non-profit making

organisations which serve households and which are not separate legal entities.

- *Other households*: Non-Luxembourg households as defined above, non-profit-making institutions serving households which are separate legal entities and sole traders.
- *The corporate sector*: the financial and the non-financial corporate sectors.
- *The non-financial corporate sector*: Non-financial corporations and quasi-corporations in the private and public sectors.
- *The financial corporate sector*: Credit institutions including multilateral development banks, undertakings for collective investment and other financial intermediaries, financial holding companies, insurance companies, pension funds and activities ancillary to financial intermediation and insurance activities.
- *The government sector*: the central, federal state and local governments, plus social security funds, postal cheques and central banks.

## Country risk

The BCL monitors the high risk countries as defined by regulatory rules<sup>4</sup>. These countries are Algeria, Argentina, Armenia, Azerbaijan, Belarussia, Bosnia-Herzegovina, Bulgaria, Bolivia, Brazil, Chile, Colombia, Costa Rica, Croatia, Cuba, Estonia, Ecuador, Georgia, Indonesia, Iraq, Ivory Coast, Kazakhstan, Kirgizia, North Korea, South Korea, Latvia, Lithuania, Macedonia, Malaysia, Moldavia, Morocco, Mexico, Nigeria, Peru, the Philippines, Poland, Romania, Russia, Slovenia, South Africa, Tadjikistan, Thailand, Turkey, Turkmenistan, Ukraine, Uruguay, Uzbekistan, Venezuela and Yugoslavia.

## Management soundness

### Operating costs to total gross income

*Operating costs* are made up of staff costs and other general operating costs and expenses incurred by the

<sup>3</sup> See Institut Monétaire Luxembourgeois (IML) Circular 94/108 for a more detailed definition of "large exposures".

<sup>4</sup> Cssf Circular 2000/23.

bank in its daily operations. *Total gross income* corresponds to the sum of net interest income (interest receivable and similar income plus income from securities minus interest payable and similar charges), net commissions income (commission receivable minus commission payable), net result on financial operations and net other operating income (other operating income minus other operating charges).

## Earnings

### Return on assets and return on equity

- *Gross income* corresponds to total gross income defined above.
- *Income before provisions* is arrived at by deducting general administrative expenses from gross income.
- From income before provisions to *income after provisions*, net value adjustments in respect of assets, amortisation of the positive difference arising from the application of the equity method<sup>5</sup>, net value adjustments in respect of loans and advances and provisions for contingent liabilities and commitments, net value adjustments in respect of transferable securities held as financial fixed assets, participating interests and shares in affiliated undertakings, net constitution of funds for general banking risks and net transfers to “special items with a reserve quota portion”<sup>6</sup> are subtracted.
- Finally, *net after tax income* is obtained by deducting net extraordinary income and taxes from income after provisions.

*Assets*, the denominator of the ratio “return on assets”, are arrived at by subtracting prepayments and accrued income from the total balance sheet.

*Equity*, the denominator of the ratio “return on equity”, equals shareholder equity, i.e. subscribed or endowment capital.

## Income structure

Three income categories are examined: net interest income, net commissions and fees income and net results on financial operations. They correspond to the main constituents of total gross income already defined for the indicator “operating costs to total gross income”. *Net interest income*, also known as interest margin, is the net sum of interest receivable and similar income plus income from securities minus interest payable and similar charges. *Net commissions and fees income* corresponds to commission receivable subtracted by commission payable.

## Liquidity

### Liquidity ratio

According to Luxembourg banking regulations, current liabilities should be covered to at least 30% by assets deemed to be liquid.

$$\frac{\text{Liquid assets}}{\text{Current liabilities}} \geq 30\%$$

*Current liabilities* is essentially made up of amounts owed to banks and customers and debts evidenced by certificates. *Liquid assets* include cash, bills eligible for refinancing with the central bank, loans and advances to other credit institutions payable on demand or with a remaining maturity of less than one year and fixed income securities issued by public bodies or credit institutions.<sup>7</sup>

### Coefficient of maturity transformation

Both the assets and the liabilities side of a bank’s balance sheet are broken down into different categories of remaining maturities (duration): on demand and up to one month, one to three months, three to six months, six months to one year, one to two

<sup>5</sup> According to article 76 of the law on the accounts of banks.

<sup>6</sup> These are amounts which may be eligible for fiscal exemption. The exemption covers in particular gains arising from the transfer, conversion or loss of an asset realised in accordance with articles 53, 54 and 54bis of the income tax law.

<sup>7</sup> See IML Circular 93/104 and Part IV of Banking Regulations for a detailed description of the calculation of the liquidity ratio.

years, two to five years, five to seven years, and more than seven years. Assets and liabilities without maturity are not considered. The average maturity of both the assets and the liabilities sides is then calculated. For each maturity category, its relative share in the total of all maturities is multiplied with a reference maturity. The reference maturity corresponds to the average maturity of the category<sup>8</sup>. Finally, the division of the average maturity of assets through the average maturity of liabilities yields the coefficient of maturity transformation.

#### **Ratio of non-bank loans to non-bank customer funds**

*Non-bank loans* are made up of loans and advances to customers and leasing transactions. *Non-bank customer funds* comprise amounts owed to private customers and debts evidenced by certificates other than interbank market securities and negotiable credit certificates.

#### **Sensitivity to market risk**

##### **Net foreign currency position in relation to own funds**

Foreign currency liabilities are subtracted from foreign currency assets to obtain net positions for each bank. On as well as off balance sheet positions are taken into consideration to obtain the net unhedged exposure.

The banks are then sorted in each reporting period according to their positive or negative net positions. Finally, the two sub-sets of figures are aggregated separately to calculate their respective averages and standard deviations.

#### **Competitive conditions**

##### **Spread between credit and debit interest rates**

For the *credit (lending) rate*, an average from the interest rates on mortgage credit and consumer loans is calculated. As for the *debit (deposit) rate*, interest rates on time deposits (with maturities of one month, six months, one year and more than one year), on saving accounts (with minimum locked-in periods of less than one month, between one month and one year, between one and five years and more than five years) and on deposit receipts (with maturities of one month, six months, one year and more than one year) are sampled. The overall interest spread is then obtained by subtracting the calculated average debit rate from the calculated average credit rate. It should be noted that the calculation is constrained by the interest rates available from the reporting framework of the banks. The calculated average rates do not correspond to real world interest rates anymore, but should be considered as fictive representative rates for the purpose of this exercise.

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<sup>8</sup> For instance, the reference maturity of the maturity category “on demand and up to one month” is 0.5 month, the reference maturity for the category “one to three months” is two months, and the reference maturity for “three to six months” is 4 months and a half. The reference maturity for the category “more than seven years” is defined as seven years.