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### 3.1 WHAT CRISIS MANAGEMENT MIGHT BE ALL ABOUT

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The debate surrounding crisis management and its related issues is very much up-to-date but, despite understanding on the subject becoming more commonly widespread, crisis management still remains a complex subject to deal with. The several aspects involved in this field embrace economic, legal, administrative and political dimensions, all being to a certain extent both complementary and contradictory at the same time.

Of primary relevance to such a discussion is the existing link between financial stability and crisis management. Financial stability has been dealt with and studied extensively and public authorities have developed a certain knowledge about ways in which to tackle, in theory as well as in practice, the major issues related to it. The most striking thing about it is the difficulty in determining a clear-cut definition of the term, which is usually defined in a negative sense. The most common definition used refers to the absence of shocks emanating or propagating via the financial system and its potential to have a widespread impact on the optimal level of agents' savings and investments. This way in which financial stability is commonly defined makes the link with crisis management more straightforward. Indeed, looking at crisis management in a wide sense, it is easy to subdivide the subject into three major areas: crisis prevention, crisis handling and crisis resolution, which makes the overlap between financial stability and the preventative aspect of crisis management even clearer. As a result of this overlap, it becomes difficult for the study of the one subject to be separated from the study of the other, or that authorities dealing with financial stability can be totally different from the ones dealing with crisis management. However, even if a centralisation of all functions might be seen as particularly interesting and efficient in theory, in practice things often follow different paths for different reasons.

Looking to the experiences over the last few decades, it is striking that almost every country has experienced a crisis at some point in its history. It is undoubtedly the case that all crises are of an idiosyncratic nature and that, to push the analogy even further, every crisis is so different that it has to be dealt with as a unique event. It is exactly because crises are so idiosyncratic that their impact on the economy, on the financial market and on the social agents' behaviour is perceived as being different from one country to another. As a result, looking back on all the crises the world has experienced until now, it is still justifiable to think that there is no real 'common recipe' for managing and resolving a crisis situation and that trying to learn from past experiences is also difficult.

In this context though it might be interesting to look at how different the resolution techniques were every time a crisis situation materialised because, besides the uniqueness of the crisis itself, the uniqueness of the authorities reaction to it adds to the complexity of the situation, because there is then a political dimension which comes into play. The interplay between unique crisis and unique reaction does incontestably lead to a unique situation, but a common crisis handled in a unique way might as well turn into a unique crisis. That way crisis management becomes then a field in which the source of a crisis as well as the intervening parties have a chance to influence the outcome and this doesn't simplify things.

How it might be possible to clear up views in the field of crisis management is not straightforward; knowledge and past experience is currently the most common recipe. This turns the focus firmly onto everything referring to prevention, such as crisis prevention and financial stability. But can pushing even further the research into these fields substantially add to our knowledge of how to handle a crisis in practice once we are faced with it? The answer will only be known once we have researched these subjects to their limits. A second possibility might be the setting up of best practices in the field of crisis management; practices which wouldn't be binding but would set up a common path to be followed when the real need arises. This methodology would on the one hand help by dealing with common crises in a common way, thus reducing the uniqueness of the crisis pattern, but, on the other hand, it would increase the risk of treating unique crises in a common way, a situation that could significantly impact on the outcome of the resolution process and not necessarily in the most desirable way.

Things become even more difficult if one considers the well-known chicken-and-egg problem. There are very widespread views on what comes first in the crisis situation: insolvency or illiquidity. Does an institution become insolvent, implying that its liabilities exceed assets impacting on the capital base and leading to an inability to fulfil its obligations, or does an institution become illiquid facing a maturity mismatch in its balance sheet, becoming insolvent only when the situation worsens affecting the capital base? The answer to this question would increase the clarity of the crisis management process, which could only be a beneficial outcome. Indeed, the knowledge as to what extent a crisis has its roots in illiquidity or insolvency helps *in primis* the taking up of responsibilities, as different authorities have different statutory responsibilities and can therefore only

act within their sphere of competence. Unfortunately, experience enough shows how difficult it can be to clearly define the roots of a crisis and therefore to split illiquidity from insolvency. For example, looking back on past experiences, a number of financial institutions have been rescued because they were believed to be illiquid, when in fact it was afterwards discovered that they were probably already insolvent. This raises the question that maybe insolvency and illiquidity might show up at the same point in time more often than has previously been believed, so that, recognising which symptoms refer to illiquidity and which refer to insolvency won't make much difference. As a direct implication, due to the different responsibilities authorities have, cooperation becomes even more important.

In this context, during the last few years, a number of cross-border cooperation arrangements have been established between public authorities that could be called upon should a crisis situation materialise and resolution measures be taken. More precisely central banks, banking supervisors and finance ministries of the European Union have signed a Memorandum of Understanding for co-operation in financial crisis situations coming into force the 1<sup>st</sup> July 2005. The undoubted value of such cooperation arrangements refers to their intrinsic goal: improve information sharing practices. This cooperation and information exchange is seen as a possibility to increase efficiency in crisis response, without aiming at providing for a 'common recipe' to deal with crises and leaving that way public authorities the freedom of action in their field of competence. Moreover the latter cooperation arrangements are able to touch upon conflicts of interest only with extreme difficulty, as a predefined system of ultimate responsibility might help 'sorting things out', but it might be questionable to what extent it could resolve the intrinsic cause of the existing conflicts of interest. The major difficulty comes from the statutory responsibilities assigned to each different public authority, which aren't to be overcome even under stress, unless such a possibility was to be legally incorporated into their statutes or internal rules beforehand. The setting up of cooperation arrangements lacks all allied as long as the potential conflict of interest is not addressed. The same can be argued when researching the need for assigning a coordinating role to a specific authority in a cross-border or national context for crisis management and resolution, unless the question of how to sort out statutory restriction has been fully taken into account.

In debating the aforementioned themes, what become increasingly important are the basic mechanisms seed-

ing the process according to which a crisis materialises. The roots of a crisis are usually found within certain types of institution that, to some extent at least, are considered as performing risky activities. Thus, the focus on the banking sector becomes even more intense, whilst other sectors tend to be left aside. In this context one basic question arises - to what extent other sectors might be involved in crisis development, bearing in mind that the causes of certain crises aren't necessarily linked to the core activities of the financial sector? Fraud, for example, can be counted among the sources of crises, and because fraud is unfortunately something that can occur very suddenly within all types of institution, both financial and non-financial, all sectors become theoretically potential sources of financial instability. However, despite this potentially disparate nature of crisis sourcing, what makes the banking sector still a major concern is its capability to channel the contagion effect and allow it to eventually spread to a whole economy or to cross borders. This contagion effect results mainly from the type of activities handled by banks, for example credit granting or investment strategies. The former might create contagion via the inter-bank channel, the latter via the exchange markets. Having said this, it might also be considered to what extent other sectors might be affected by a crisis as other types of institutions engage, even if to a reduced degree, in the aforementioned activities. This being such, perhaps it might be interesting researching to which extent there is a need to focus on a more functional approach rather than an institutional one in the field of crisis management.

Leaving the landscape of public authorities and their means with which to handle crises, market participants can add much complexity to the issue of crisis management. When looking at financial groups or conglomerates it is sometimes striking how complex and articulated their set up can be. Some groups achieve enormous dimensions on a consolidated basis and offer their services in a large number of different countries. As mergers and acquisitions have been of late increasing the consolidation process, this cross-country set up does not look likely to diminish in the near future, on the contrary it might even continue to grow. The cross-country set up raises a number of questions linked to crisis management. Referring to the liquidity management of financial groups for example, they tend to become more and more centralised, exploiting synergies, regardless of the cross-border structure of the group itself. This set-up might easily raise the question as to what extent this functional centralisation, coupled with a structural decentralisation, might become

an obstacle for crisis management, from a legal as well as from a political point of view. Legal obstacles can be linked to the existence of different legislations, consumer protection and bankruptcy processing, which might be conflicting; political obstacles refer to the conflict of interest underpinning national political priorities when dealing with stress situations impacting the national landscape in one way or the other. Ring-fencing practices, for example, might easily escalate the aforementioned conflict of interest, enabling the protection of local interests but impeding the possibility of implementing a global common overlooking response to a cross-border crisis. This debate increases in importance when one considers how the outlets of a cross-country financial group might represent a very different threat to the financial stability in one local market compared to another. For example, reference can be made to an outlet of a financial cross-border group being relatively small from a consolidated perspective but of fairly significant size in a specific local market. In this situation the financial group's interests at consolidated level could easily consist of trying to empty out the outlet if the latter still had enough financial resources available so as to reduce the financial distress other major parts of the group might be subject to. But the outlet, if placed under a different jurisdiction, for example, might be protected by the local authorities. This situation would lead to an escalation of the conflict of interest between cross-country authorities.

In this context, knowing the particular interest of public regulatory authorities for the prevention of systemic risk, it might be interesting to see to what extent market practitioners worry about such an issue themselves. All market participants are interested in their own survival, and so depending on to what extent their survival is linked to the survival of other market participants, it can be reasonably assumed that in one way or another they worry about systemic risk on their own. With an awareness of how this theoretical debate faces gaps in practice, the crucial point here is how to motivate market participants to avoid any free-riding practices and how to internalise even more the perception that systemic risk is an issue that touches them *in primis*. The difficulties stem back to the different conceptions authorities and market participants have of financial stability; the former defining it as a lack of stability in the financial system and the latter as a lack of profitability generalised to the whole financial sector. Continuing along this line of thinking, two basic questions arise. First, to what extent could micro-orientated profitability eventually be sufficient to ensure macro-oriented safety? The answer might probably be found in our history

of past crisis experiences - looking to see if the 'how' and the 'when' of crisis materialisation is eventually linked to economic recessions and profitability cycles. Second, how can incentives be set up to make market participants internalise systemic risk without it conflicting with their profit-driven mentality? This question is surely worth being looked at from a macro perspective. Several solutions might be envisaged in this context. One possibility could be the setting up of a plethora of strict penalty measures for all those who engage in free-riding activities, and let time do the rest.

Having gone through what is still on the agenda for public authorities in the field of crisis management and lacking yet a fully-fledged vision on how to deal with crises, the coupling of technical and political dimensions possibly becomes one of the major deals needed to sort out difficulties. In the event that more crises occur in the future, and they probably will, and if the world still lacks the necessary in-depth knowledge to be able to set up a common recipe in this field, then this coupling might represent what crisis management might be all about.

## 3.2 REPORT ON MARKET DISASTER RECOVERY IN CASE OF LARGE SCALE DISRUPTION

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### 3.2.1. Executive Summary

The present report aims at assessing the level of resilience of the Luxembourg financial centre with regard to large-scale disruptions. It concludes an initiative started at the end of 2002 by a BCL committee, and further continued by an ad hoc Task Force on Large Scale Disruption, which included representatives from the national bankers' association (ABBL), credit institutions, financial infrastructure providers (stock exchange, payment and securities settlement systems) and the banking supervisor (CSSF).

The operational continuity of the financial centre as a whole is a pre-requisite of the stability of the financial system. In all circumstances, participants have to be able to perform the operations that are necessary to meet their financial obligations. Business continuity plans (BCP) are in place but they usually have a more limited scope and concentrate on failures of individual institutions. As they are generally conceived separately and individually, i.e. without taking account of the counterparties, the suppliers and the system-wide dimension of the financial system (and its inherent interdependencies), it is questionable whether they would prove sufficient in case of large-scale operational disruption (e.g. widespread destruction or unavailability of physical infrastructures, extensive telecommunications breakdowns). The terrorist attacks of 11 September 2001 in New York City, and other events like extended black-outs in several countries, demonstrated the weakness of the fragmented approach taken so far.

Authorities of the financial sector, central banks, banking supervisors and ministries of finance, devote substantial resources to the prevention and the management of financial crises, be they liquidity crises or solvency crises. They signed memoranda of understanding to ensure the cooperation between the different authorities in particular on a cross-border level. However, although the above-mentioned large-scale operational disruptions have the potential to heavily impact the financial stability, the present report does not deal with financial crises in general, but concentrates on the physical, technical and/or operational origins of a crisis.

Hence, the main point of interest of this initiative is to ensure the continued processing of operations in Luxembourg, in particular in cases where several financial institutions and/or strategic market infrastructures have their operational capacity severely affected at the same point in time.

The Task Force conducted a stocktaking exercise of existing contingency arrangements through a questionnaire addressed to major financial institutions, market infrastructures and technical service providers. The results showed that the individual institutions are generally relatively well prepared to cope with situations in which their own operations are disrupted. The business continuity arrangements do however not explicitly address situations in which the impact of a disruption goes beyond the individual institution.

For that purpose and on the basis of the work of the Task Force, the BCL issues a set of proposals, primarily the setting up of a permanent structure for crisis prevention and management. The structure is composed in twofold.

On the one hand, a Crisis Prevention Group (CPG), which should include representatives from the central bank and the banking supervisor, market infrastructures and major financial institutions. The CPG would act as a catalyst with the aim to improve the overall resilience of the financial sector. It could in particular pick up other more specific recommendations that are made in this report and undertake a regular monitoring of the sector's operational resilience, among which the preparation and coordination of sector-wide BCP tests in the areas of communication, exchange of information, decision-making, etc.

On the other hand, the crisis structure for the financial centre would include a Crisis Management Group (CMG) whose composition would depend on the nature of the disaster and the parties involved. During a crisis, or in presence of tangible warning signs, the CMG would serve as a communication hub within and beyond the financial sector (information collection and broadcasting). Its aim would be to facilitate crisis resolution within the financial sector.

To the extent that the present report finds a positive echo, the BCL is prepared to discuss with other involved stakeholders and to implement the appropriate follow-up measures.

### 3.2.2. Introduction

The terrorist attacks of 11 September 2001, as well as other major accidental disasters, which resulted in large-scale operational disruptions, have revealed the special vulnerability of the modern financial activity. The awareness of this vulnerability had led a number of countries to make a thorough review of the existing business continuity plans with a view to enhance



the operational reliability of the financial sector. This report aims at assessing the level of preparedness of the Luxembourg financial centre vis-à-vis such large-scale operational disruptions with systemic effects and at making recommendations to improve its resilience and to enhance its recovery capabilities, in order to maintain the financial stability and the public's confidence in the financial system. The report is restricted to operational crises and does not cover financial crisis situations as such in its scope, although the effects might be quite similar in both cases. It furthermore focuses more specifically on the impact on financial wholesale markets, as the amounts at stake are considerably higher than in retail banking, and their disturbance would hence have a much more serious and far-reaching impact on financial stability. Finally, the initiative endeavours to increase awareness, not only of the financial market participants, but also awareness of other potentially involved parties, like civilian security, emergency services, public authorities, telecommunications, electricity and other services providers, as regards the specific needs of the financial sector.

The introduction (the present section) details the background of the initiative started by the Banque centrale du Luxembourg, the national banking supervisor - the Commission de Surveillance du Secteur Financier, CSSF - and representatives of the Luxembourg financial sector. Section 3.2.3 defines the scope and objectives of the initiative. The assessment of the level of preparedness of the Luxembourg financial centre to face large-scale operational disruptions is based on a stocktaking exercise (section 3.2.4), which was conducted among the major players. Section 3.2.5 puts forward recommendations to improve the present situation.

### 3.2.2.1 Background of this initiative

Given the increasing scope and the complex interconnections of automated processes, it has become more and more common practice in the financial sector to go beyond mere copies of business related data and critical information and to implement instead recovery measures that ensure the continuity of the core business processes. Whereas ordinary data backups aim at resuming operations in case data are lost or corrupted, business continuity in addition endeavours at responding to situations where IT systems (applications and/or

hardware and other equipment) are not operational anymore or more general external events prevent normal operations.

Although preparing for business continuity is usually transparent and unknown to the public, it is crucial as it enables an institution to continue its activities and to maintain its business running in spite of incidents (blackout or fire, for instance).

This is all the more important in the financial sector, which constitutes the field of this initiative. The disruption of one institution is not only likely to prevent itself from meeting its own obligations, but could also trigger the failure of counterparts, in the financial sector as well as in other areas of the economy. Hence, the business continuity of the financial sector serves the ultimate broad objectives of safeguarding the financial stability and maintaining the public's confidence in the financial system. The business continuity of the financial sector means in case of far-reaching disturbances:

- To continue processing financial transactions, by keeping financial infrastructures and markets open, if technically and physically possible;
- To facilitate, in case of a discontinuation of the activity, an early resumption of the operational activity of financial institutions and hence the early re-opening of financial infrastructures and markets.

In Luxembourg, credit institutions are therefore required by the banking supervisors to have backup solutions in place<sup>1</sup>, ideally as part of business continuity plans (BCP).

However, companies, whether financial or not, have their own and therefore often diverging views concerning priority and importance of business continuity issues. They tend to organise their business continuity without liaising with other parties (partners, competitors, authorities, etc.). Against this background, the question that arises for the financial sector is whether these individually planned and organized business continuity arrangements would prove sufficient in case of extended operational disruptions, e.g. widespread destruction of physical infrastructure or extensive telecommunications breakdowns. Do the individual business continuity plans take the system-wide dimension of the financial system and its inherent interdependencies into account?

<sup>1</sup> According to paragraph 4.5.2.1. of the circular IML 96/126 (paragraph 4.5.2. of the circular IML 96/126 is replaced by circular CSSF 05/178), credit institutions and other financial sector professionals have to operate normally in case of computer breakdown and put a backup solution in place for that purpose.



Individual BCPs have shown their limitations with the 11 September 2001 terrorist attacks, but also on other occasions: disruption of power supply or telecommunication networks, the SARS outbreak or other infectious diseases, etc. These events pointed out numerous intra- and cross-sector dependencies, as well as the core position of the financial sector in the economy.

Due to its role in monetary policy operations and in payment systems, the BCL has to rely on the resilience of its counterparties to fulfil its missions within the Eurosystem. Hence, counterparties' business continuity planning should take reasonable account of the risk of large-scale disruption.

Like similar initiatives in the major industrialised countries, the BCL together with other authorities of the financial sector and some among the most important credit institutions have started to assess the Luxembourg financial centre's level of preparedness and resilience vis-à-vis major disasters. Resilience can be regarded as the minimization of the risk of failure or interruption of the financial centre further to a shock; it is "the ability of a system to absorb the impact of a failure and continue to provide an acceptable level of service"<sup>2</sup>.

#### 3.2.2.2 International initiatives

The terrorist attacks of 11 September 2001 on the World Trade Centre in New York City have seriously impacted the financial community. The destruction and the evacuation of a high number of buildings affected the financial institutions' ability to implement their contingency plans and to continue operations. In the aftermath of the attacks, it appeared quite clearly that the financial system is highly interdependent. The capacity of the financial community to carry on business depends on each individual participant. Large market participants and market infrastructure providers (clearing banks, settlement systems, netting systems, etc.) are of critical importance in this respect.

The extensive level of integration of financial systems has shown that the discussions on business continuity of the financial system need to be considered among all relevant parties. Several financial authorities together with market participants and regulators have started to look closely at the resilience of their national financial systems towards wide-scale disruptions.

In the U.S. for instance, three federal regulatory agencies (the Board of Governors of the Federal Reserve System, the Office of the Comptroller of the Currency and Securities and Exchange Commission) issued jointly the *Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System* in April 2003. The document identifies the critical financial markets, the core clearing and settlement organizations and the firms that play a significant role in these markets. It develops on four sound practices, which apply directly to the clearing and settlement activities of the financial institutions identified as significant. Requirements, in particular in terms of recovery times, are more demanding for clearing and settlements systems than for their participants. These sound practices are developed according to three business continuity objectives agreed upon by the agencies and by the industry<sup>3</sup>.

The British financial authorities (HM Treasury, the Financial Services Authority and the Bank of England) have joined forces to support the coordination of business continuity planning within the UK's financial sector. The most obvious sign of their cooperation is their common public web site<sup>4</sup>. This site is the central point of information about the work being undertaken on business continuity in regard to the financial centre. The financial authorities work together with the private sector and with other official agencies on these issues. An emergency database, with the market important systems and institutions' contact details, has been set up.

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<sup>2</sup> Definition proposed by the Business Continuity Institute.

<sup>3</sup> The three business continuity objectives are:

- i. Rapid recovery and timely resumption of critical operations following a wide scale disruption.
- ii. Rapid recovery and timely resumption of critical operations following the loss or inaccessibility of staff in at least one major operating location.
- iii. A high level of confidence, through ongoing use or robust testing, that critical internal and external continuity arrangements are effective and compatible.

The four sound practices are:

- i. Identify clearing and settlement activities in support of critical financial markets.
- ii. Determine appropriate recovery and resumption objectives for clearing and settlement activities in support of critical markets.
- iii. Maintain sufficient geographically dispersed resources to meet recovery and resumption objectives.
- iv. Routinely use or test recovery and resumption arrangements.

<sup>4</sup> <http://www.financialsectorcontinuity.gov.uk>

The Belgian Financial Stability Committee (FSC), which is composed of the management boards of the Bank, Finance and Insurance Commission and the National Bank of Belgium, was established in July 2003. One of its priorities is the national coordination initiative on business continuity for the financial centre<sup>5</sup>. It will in particular take account of the lessons to be drawn from the events of 11 September 2001.

### 3.2.2.3 The involved parties at national level

#### **The Central Bank of Luxembourg**

The question of the operational resilience of the Luxembourg financial centre was first raised in 2002 in the Comité Système de Paiement et Règlement-Titres (CSPRT), a committee established by the BCL with the aim to strengthen the communication with financial institutions established in Luxembourg on matters relating to payment systems and market infrastructures. The members of the Committee showed a great interest in the issue of operational resilience, as it provided an opportunity to reassess the business continuity arrangements in place and, more generally, to boost the professional reputation of the Luxembourg financial centre.

The BCL decided to devote more resources to this project and set up an ad hoc "Task Force on Large-scale Disruption", which encompassed a number of the most important actors of the Luxembourg financial centre<sup>6</sup>.

Considering both its operational involvement in the Luxembourg financial sector foreseen in art. 2, art. 18 and art. 21 to 26 of the law of 23 December 1998 and its membership of the Eurosystem, the BCL has as a duty to ensure the availability of efficient communication channels to ensure its part in the execution of the missions of the Eurosystem as well as the operational resilience of its main counterparties.

The issue of large-scale disruptions touches indeed upon several of the most important missions and tasks

of central banks as defined in the Treaty establishing the European Union:

#### a) Conduct of monetary policy

The first basic task defined for the European System of Central Banks (ESCB), to which the BCL belongs, is "to define and implement the monetary policy of the Community"<sup>7</sup>. In Luxembourg, the BCL is in charge of the execution of the monetary policy, through which the Luxembourg based credit institutions have access to the Eurosystem's liquidity.

Central banks may decide in a crisis situation to inject additional liquidity in the market, as the major central banks<sup>8</sup> did in September 2001, in order to release tensions caused by the potential shortage of certain types of assets.

#### b) Financial stability

Another mission of the ESCB is to "contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system"<sup>9</sup>.

Monitoring and contributing to the operational resilience of the major infrastructures and market participants is hence an important factor of the financial stability objective pursued by the ESCB.

#### c) Payment and settlement systems

Given their importance for the exchange and the settlement of the operations, payments and settlement facilities play a core role in the financial markets. Their operational reliability is hence imperative for the stability of the financial sector.

In its capacity of member of the ESCB, the BCL has the task to "promote the smooth operation of payment systems"<sup>10</sup>. This task covers three different aspects. First, it includes a direct operational role as payment system

5 To this end, the FSC installed an ad-hoc working group on BCP. In October 2004, the FSC agreed with the set of recommendations this working group made.

6 Cf. composition in the annex 3.2.6.3

7 Treaty establishing the European Community; article 105(2)

8 In the days following 11 September 2001, the US Federal Reserve System injected billions of US dollars to avoid instability on the markets and closed currency swap agreements with the ECB, the Bank of England and the Bank of Canada for the provision of US dollars on foreign markets, cf. *Implications of 9/11 for the financial services sector*; Roger W Ferguson Jr; BIS Review 30/2002

In the two days following the power blackout of 14 August 2003 in North America, the Fed injected a few billions of US dollars as additional liquidity as it expected a rush on banks because ATM and electronic point of sale (POS) were out of order, cf. *Besoins de cash: la Fed a pris les devants*, *L'écho*, 19/08/2003

9 Treaty establishing the European Community; article 105(5)

10 Protocol on the Statute of the European System of Central Banks and of the European Central Bank, article 3

operator or settlement agent. EU central banks may provide facilities “to ensure efficient and sound clearing and payment systems”<sup>11</sup>. In this context, the BCL is the technical operator and the settlement agent for LIPS-Gross<sup>12</sup>, the Luxembourg component of the pan-European large-value real-time gross settlement system TARGET<sup>13</sup>, and maintains close operational links with Clearstream Banking Luxembourg S.A (Clearstream) as its custodian of the collateral deposited by the banks. In this capacity, the BCL has to ensure that the infrastructure it is responsible for is compliant with the applicable standards and best practice in this field.

Second, central banks have or are about to implement oversight regimes to the payment systems established in their jurisdiction, be they operated by the central bank itself or not. Thus according to article 47-1 of the law implementing the Settlement Finality Directive<sup>14</sup>, the BCL is the overseer of payment and settlement systems located in Luxembourg and in which it participates. The oversight includes in particular LIPS-Gross and Clearstream, the Luxembourg based ICSD (international central securities depository). Again, the BCL has to ensure that the systems under its oversight regime have adequate business continuity plans in place and that they can demonstrate their operational resilience.

Third, European central banks consider themselves as catalyst for technical change, i.e. assisting the private sector in the area of standardisation and technological harmonisation.

All these different points underpin the fact that the BCL has a strong interest in the operational resilience of the Luxembourg financial centre.

### **Other involved parties**

The present report has been drafted on the basis of discussions of an ad hoc Task Force<sup>15</sup>, which included representatives from the national bankers’ association (Association des Banques et Banquiers, Luxembourg – ABBL), credit institutions, financial infrastructure providers (stock exchange, securities settlement system,

payment system) and the banking supervisor (CSSF<sup>16</sup>).

The CSSF mainly focuses on the prudential supervision at individual institution level. The CSSF’s banking supervision has nevertheless the broad objective of promoting the stability of the financial sector and is hence interested in the work of the Task Force.

For the same reason, the Commissariat aux Assurances was also contacted, because the insurance sector is rather important in Luxembourg. Additionally, in the case of a disaster, insurance companies ought to be operational to prepare to respond to claims (policies details, loss inquiries, advance claims payments, etc).

In addition, the Task Force held interviews with miscellaneous organizations, which are not directly linked with the financial markets, but whose business may have a direct impact on the business continuity of the financial centre, like telecommunications providers, the telecommunications regulator, electricity providers, the civil defence (emergency services) and business continuity & recovery services providers. The purpose was to gain more insight on their activities and the way they fit in or support the objective of business continuity of the financial market players.

### **Financial stability in the European context**

Banking supervisors and central banks have signed in the recent past a number of memoranda of understanding (MoU) to ensure a proper communication and cooperation among authorities of the financial sector. In April 2001, a MoU was signed to foster cooperation between payment systems overseers and banking supervisors. On the 10 March 2003 central banks and banking supervisors signed a MoU to ensure the cooperation in situations of financial crisis management. Finally on the 18 May 2005 banking supervisors, central banks and ministries of finance signed a MoU on cooperation in financial crisis situations.

At local level however, none of the aforementioned communication and cooperation have been implemented so far.

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11 *Protocol on the Statute of the European System of Central Banks and of the European Central Bank, article 22*

12 *Luxembourg Interbank Payment System – Gross settlement*

13 *Trans-European Automated Real-time Gross Settlement Express Transfer system*

14 *Law of 12 January 2001 implementing the Directive 98/26/CE on settlement finality in payment and securities settlement systems in the modified law of 5 April 1993 relating to the financial sector and complementing the law of 23 December 1998 creating a Supervision Commission of the Financial Sector*

15 *The list of members is provided in section 3.2.6.3*

16 *Further to paragraph 4.5.2.1. in the circular IML 96/126 (paragraph 4.5.2. of the circular IML 96/126 is replaced by circular CSSF 05/178), the CSSF conducted in 2002 a survey on BCP addressed to all the institutions under its supervision.*

### 3.2.3. The scope and the objectives of the initiative

#### 3.2.3.1 The scope

Confined operational problems do generally not endanger the stability of the financial centre because market participants are prepared to cope with such situations. One expects that their individual business continuity plans are duly updated and tested<sup>17</sup>. Hence, the scope of analysis carried out by the BCL and discussed by the aforementioned Task Force does not cover operational failures at the level of a single financial institution; **its focus is instead on large-scale disruptions, which affect the operational capacity of multiple financial institutions and/or strategic infrastructure providers**. Such disruptions could have various, internal or external, origins. The effects may be either direct (the disruption can be geographically spread-out on an area, a district or even a town) or indirect (some participants are impaired by the other important participants' inability to operate).

It is however recognized that in extreme circumstances, the necessary prioritisation of the rescue activities may lead to delays in the resumption of the financial operations.

In its discussion, the Task Force came to the conclusion that it would be of little use to provide a reference list of disasters to be considered. In principle, any incident with severe operational impacts on the financial centre should be taken into account. Examples of large-scale operational disruptions are: physical deterioration of existing infrastructures, widespread problems in the telecommunication or electricity networks, appearance of an acute epidemic, severe IT bugs or viruses, terrorist attacks, etc.

The present initiative focuses on the smooth processing of the **operations that take place in Luxembourg**. These operations could be domestic from end-to-end or could be the national leg of a cross-border transaction.

#### 3.2.3.2 The objectives

The objectives of the initiative are threefold:

1. **Informing** any interested party of the status of the operational continuity of the Luxembourg financial centre and the work being done with the aim to improve it.

2. **Creating awareness** on the seriousness of the issue, not only among the major market participants, but also among the parties that are not directly concerned, i.e. other financial and credit institutions, public authorities (other than financial), utility and service providers, etc.

Business continuity and disaster recovery are issues that are regarded as important by most of the institutions. But the continuity and the recovery of the operations at a higher level, i.e. for the entire financial centre, do not receive sufficient attention. It is hence of general interest that the concerned entities are made aware of the risks and the possible consequences of such large-scale disruptions.

3. Encouraging the concerned entities to **organise** themselves and to adopt **measures** in order to increase the preparedness of the Luxembourg financial centre for extended operational breakdowns.

Although the initiative and the present document do not carry any binding nor official nature, the subsequent efforts and actions undertaken by the concerned parties would be considered as a worthwhile achievement.

#### 3.2.3.3 The methodology used

The Task Force organised the work according to the following work plan:

- Identification of the relevant factors to be taken into account when assessing the operational resilience of the financial centre;
- Stocktaking of the existing continuity arrangements and identification of major interdependencies;
- Definition of major threats, elaboration of significant scenarios and evaluation of the coordination needs;
- Proposal for an efficient management framework;
- Follow-up plans

#### Step 1: Identification of the critical markets, activities, participants and systems

The financial sector usually encompasses numerous and heterogeneous activities as well as actors of diverging weight, which are not all of relevance for the resilience of a financial centre. It was therefore considered important to single out those aspects, which are of relevance for the analysis and the assessment of the level of oper-

<sup>17</sup> The results of the CSSF survey on BCP, together with supervision considerations, were published in May 2004. Regarding testing, the survey mentions that 75% of the respondents (credit institutions and other financial sector professionals) do test their BCP. Tests either are solely IT oriented or include IT and organizational aspects.

ational resilience. Three elements were thus identified: markets, activities and market participants.

#### *Critical markets*

To start with, the markets considered as critical for the Luxembourg financial centre in terms of financial obligations were identified. These activities should be given a higher priority when it comes to disaster recovery and business continuity:

1. Money market instruments
2. Public sector securities
3. Foreign exchange
4. Commercial paper and corporate securities
5. Investment funds
6. OTC (over-the-counter) trade

#### *Critical activities*

Several activities of particular importance were also singled out, either because they are the operational support to the critical markets or important in terms of the public confidence in the financial system:

1. Funds and other financial assets transfers (using a market infrastructure)
2. Liquidity and collateral management
3. Back-office and correspondent banking
4. Custody and income collection
5. Distribution of cash (automated teller machine - ATM- and counters). Although the latter was not considered relevant in terms of financial stability, the unexpected interruption of this service could have considerable effect on the public's confidence in the financial system as a whole.

#### *Critical market participants*

Finally, the Task Force identified the important market participants. Because the initiative focuses on the stability of the Luxembourg financial centre as a whole, the analysis concentrated on those institutions whose operational failure would have a significant impact.

Two categories of market participants were looked at more closely: the financial institutions (mainly credit institutions) and the market infrastructure providers.

The importance of the *financial institutions* was assessed on the basis of their share in total aggregated value for the financial centre for the following criteria

- the balance sheet,
- the assets held for third parties and
- the value of transactions in LIPS-Gross.

Due to their central position in the financial system, *market infrastructures* such as payment systems (both the large-value and the retail systems, LIPS-Gross and LIPS-Net<sup>18</sup>), the stock-exchange and the Luxembourg based securities settlement system (i.e. Clearstream Banking), as well as the technical service provider for the market infrastructures (i.e. Cetrel<sup>19</sup>), have all been considered as being by that very fact "critical market participants".

#### **Step 2: Stocktaking exercise with regard to existing business continuity arrangements and identification of major interdependencies**

The second step was a fact-finding exercise about the business continuity plans of the "critical market participants"; more specifically about their plans for the continuity of their critical activities and about possible dependencies (counterparties, service providers, infrastructures, etc.) underlying their operations.

A questionnaire was sent to all the "critical market participants" to get more information about these specific business continuity aspects. The results of this stocktaking exercise are analysed in section 3.2.4 *The stocktaking exercise*.

#### **Step 3: Definition of major threats, elaboration of significant scenarios and evaluation of the coordination needs**

Threats of miscellaneous types were contemplated, be they accidental or wilful, human or natural, of technical, physical or operational nature. Knowing the cause (fire, flooding, nuclear accident, etc.) of the incident is not per se helpful to take the necessary remedy actions. The recovery actions depend very much on the actual operational components affected by the incident. Moreover, it is hardly possible to consider all possible cases. Hence, instead of identifying the major threats and causes right

<sup>18</sup> *The Luxembourg Interbank Payment System – Netting System is the retail payment system in the Grand-Duchy of Luxembourg.*

<sup>19</sup> *Cetrel (Centre de Transfers Electroniques) is the technical agent for LIPS-Net. It also manages POS and ATMs networks in Luxembourg.*



away, the analysis focused on the impacts of an operational problem, whatever its cause could be. Although it concentrated its approach on the critical market participants, the ongoing discussion and the result of the questionnaire clearly indicated the relevance of two additional layers: the communication networks and the public utility providers. Therefore, the Task Force based its investigation on the following four components (referred to as "key component") of particular importance for the continuous operation of the financial sector:

*Key component 1: Financial institutions*

The operational centre of the financial institutions identified under step 1 as "critical market participants".

*Key component 2: Infrastructure providers*

The operational centre of the market infrastructures providers identified under step 1 as "critical market participants".

*Key component 3: Communication networks*

The telecommunications networks used by the financial institutions and by the infrastructure providers to exchange financial information and to communicate payment and settlement transactions.

*Key component 4: Public utility providers*

The utility services (water, electricity, etc.) used by key components 1, 2 and 3.

Scenarios in which multiple components encounter simultaneously a discontinuation of their operations are particularly pertinent for the assessment of the financial centre's resilience. Disruptions of market infrastructures, communication networks and public utility provider have the potential to directly impact their customers. The impact of operational failures of credit institutions on other financial institutions is way too difficult to apprehend and depends to a large extent on the importance of their bilateral relations. Thus, large correspondent banks or global custodians have the potential to severely imperil the smooth operations of their banking customers, whereas credit institutions of more modest size may be rather independent one from another in terms of operations.

Interruptions of service or larger failures can be due to a technical breakdown or the unavailability of human resources. The issue of the availability of human resources

is relevant for each type of entity; it hence requires a special attention given the increasing dependence on cross-border commuters.

Several possible crisis scenarios requiring a collective and coordinated recovery framework were worked out. They are based on the disruption of one or more key components. For most of the scenarios, it was assumed that a coordinated recovery framework could be beneficial for the upholding of the financial centre's operations and for the financial stability. Indeed, uncertainties and the fear of instability on the markets may require some type of preparation work and coordinated intervention.

However, all the possible scenarios' combinations are not taken into consideration for this initiative. It is assumed that a situation where the disruption is very limited – in particular when a single credit institution only is concerned – remains a matter of individual continuity planning.

#### **Step 4: Proposal for an efficient crisis management framework**

Suggestions of possible preparation work, cooperation or intervention are presented as the fourth step of the work plan. These suggestions depend on the information gained from the questionnaire under step 2 compared to the scenarios elaborated in step 3; they are presented in chapter 3.2.5 *Proposals for improvement*. The aim is to ensure an efficient framework to face large-scale operational disruption.

#### **Step 5: Follow-up plans**

As a result of step 3 and step 4 the Task Force has contributed to possible follow-up measures. They will be further detailed in chapter 3.2.5 *Proposals for improvement*. Those have been elaborated by BCL after thorough assessment of the different impacts.

### **3.2.4. The stock-taking exercise**

#### **3.2.4.1 Preparatory work**

The stock-taking exercise was conducted by the way of a questionnaire sent to the "critical market participants" (24 entities) in April 2004. Answers were collected and analysed in May and June 2004. They were further completed with the respondents' reporting and reactions after the blackout on the 2<sup>nd</sup> of September 2004<sup>20</sup>.

<sup>20</sup> At approximately 4:50 p.m. on Thursday 2 September 2004 a sudden nation-wide power failure occurred in the Grand-Duchy of Luxembourg. Cegedel, the main electricity provider, could resume partly its delivery by using an alternative source by 5:24 p.m. (at 5:10 p.m. for limited areas in the Southern part of the country). Electricity was again supplied to the full extent at 8:06 p.m.

The first questionnaire aimed at obtaining information on respondents' business continuity plans, and more specifically about the interdependencies (counterparties, service providers, infrastructures, etc.) and the critical activities. Its content was defined in cooperation with the CSSF and takes into account its survey on business continuity plans of 2002.

The questionnaire dealt with four categories of questions:

- General questions on BCP
- Questions on interdependencies
- Questions on critical activities
- Questions on testing

#### 3.2.4.2 Outcome

Since the survey conducted by the CSSF, the awareness of business continuity issues seems to have increased. Indeed, some improvements for the critical market participants could be observed in between the two surveys:

- Among the respondents to our survey, the few institutions that responded in 2002 not having a BCP (or having it development) have implemented such a plan now.
- In 2002, not all BCPs included communication plans, covering both internal and external communication. For the later survey, all the respondents mentioned a communication plan as being an integral part of their BCP.
- In the earlier survey, one credit institution did not take into account the criticality of its activities. Its new BCP includes a breakdown according the criticality of the activities.
- Previously, BCPs were not regularly tested (less than once a year) or even not tested at all. At present, all the respondents carry out at least a "technical" testing (IT, electricity generator, etc) once a year.

The significant answers provided by the respondents to the present stocktaking exercise are summarized below.

#### **Physical location and access to the primary and the secondary sites**

##### (i) Staff

If all the respondents had to operate from their secondary sites, over 2000 people would need to be moved. The average number of people necessary to operate from the secondary site is 115 (per institution needs vary from 22 to 260).

##### (ii) Transportation

All respondents rely on cars (private car, company car or taxi) to move the necessary staff from the primary to the secondary site. At the same time, half of the respondents would in addition rely on public transportation. For about one fifth of the respondents, both sites are located within walking distance. Although this could facilitate the transportation, the comparatively shorter distance may imply that the two sites are located in the same area and hence dependent on the same infrastructure and environment. As a result, they may be subject to similar risk profiles.

##### (iii) Time necessary to start operations on the secondary site

One hour (from the time of decision to operate from the secondary site) is the indicated average time necessary to reach the premises of the secondary site.

Respondents expect their secondary sites to be up and running five hours (average) after the decision to operate from the secondary site is made<sup>21</sup>.

##### (iv) Secondary site sharing

Over half of the respondents (58%) are the holder of their own exclusive secondary sites.

The others rely on rented infrastructures. These are outsourced to providers specialized in recovery facilities and shared with other parties (including other credit institutions). In general, users do not know with whom they share the facility<sup>22</sup>.

21 However, the ability to operate from any of the sites is not likely to be guaranteed if the disruption is due to logical errors (database corrupted, software glitch, etc.). Primary and secondary sites are generally designed similarly; logical errors on the primary site would then have identical results on the secondary site.

22 According to their confidentiality duty, recovery facilities providers are not allowed to disclose their clients' names. Hence each user is not aware of the other users'

- priority ranking to use the facilities: availability is not 100% guaranteed to all users
- business range: a concentration risk could arise if a recovery facilities provider focuses on a certain industry
- location: a large chunk of the users of a recovery facilities provider could be from the same geographical area



(v) Geographical concentration

The information collected on the areas where the “critical market participants” are located shows an important level of geographical concentration:

- in the centre town and in the Kirchberg area for the primary sites;
- in the centre town and in the Cloche d’Or district for the secondary sites.

**Communication during an operational disruption**

All the respondents have a formal internal contact list to be used in case of operational crisis. 95% of the respondents have a centralized crisis communication process. Communication is then handled at a higher level of management. In most of the cases (90% of the respondents), plans also cover external communication (with the public at large, counterparties, providers, authorities, etc.)

**Cyber attacks**

All the respondents make use of the prevention measures (firewalls, demilitarised zones, intrusion and detections systems) to anticipate attacks on their IT infrastructures. They also report the application of additional preventions measures (patches, virus signatures updates, alerts from specialized entities and information groups) in case of new cyber attack.

Two-third of the respondents include large-scale cyber attacks in their BCP. The BCP then foresees the closure of certain services (typically web banking) or the activation of the secondary site.

A few respondents reported that their IT security policy is decided by their head offices abroad.

**Interdependencies and single point of failure**

(i) Single point of failure

The majority of the respondents (79%) reported that they are not aware of any internal single point of failure (i.e. processes, devices, procedures, etc. under their control) in their organizational structure. When acknowledged, single points of failure mainly relate to the IT backup - in particular in the area of security of the internal networks and of the IT infrastructure – and to the similarity of the risk profiles of primary and secondary sites.

When it comes to external components (i.e. processes, devices, procedures, etc. that are out of the respondent’s control), more respondents (58%) do foresee the possibility of a single point of failure.

Respondents distinguish four areas in which single points of failure may occur (decreasing number of quotes):

- 1) financial infrastructures (Clearstream, BCL, Cetrel, SWIFT);
- 2) utility services (telecommunications, road access, electricity);
- 3) main financial markets participants;
- 4) internal: staff and group companies.

To a large extent, respondents recognize their dependence on these providers and business partners. However, less than half of them do consider the possibility of the simultaneous operational disruption of the providers and partners they rely on.

The SWIFT messaging services is of a particular interest for financial institutions. Hence, in the case of a long (several days) inaccessibility to SWIFT, be it due to telecommunications or SWIFT internal operational problems, 84% of the SWIFT users would use fax, telephone or telex for the transmission of messages.

As regards the SWIFTNet telecommunications network, 38% of the users have only one link (62% rely on different providers). 70% of the latter have checked that the physical redundancy of their link is ensured. The other respondents with more than one SWIFTNet network provider have not checked that the multiplicity of providers ensures the redundancy of their SWIFTNet connection.

(ii) Telecommunications and utility services

Less than half (47%) of the respondents decided to use more than one provider for their non-SWIFT telecommunications needs (telephony, data transmission, etc.). However, only one third of them have checked the actual redundancy.

Regarding the provision of electricity, water and gas, about half of the respondents are serviced by the same provider on their primary and secondary sites. For electricity and water, 40% are serviced by different providers and 10% are not aware of their secondary sites suppliers’ name (specifically when the secondary site is outsourced to a third party).

All the respondents have their own electricity backup source (generator and no-break device) on their primary site. It allows for the functioning of business critical devices for 9 days (average). The production for a longer period requires the provision of other sources of energy (fuel). Similarly, about 95% of the respondents have their

own electricity backup source on their secondary site. On average, the production there is sufficient for 6 days. A couple of respondents plan to rent an electricity generator should the need arise on their secondary site.

Thanks to their preparedness, financial institutions and infrastructure providers were overall not seriously impacted by the blackout on 02 September 2004. None of the institutions participating in our survey had to transfer activities to the secondary site, nor did they report the invocation of their business continuity plan. Nevertheless half of the respondents indicated that the short duration of the interruption (approximately 30 minutes) and the time of the day it broke out (at 16:50, shortly before the closing time for many credit institutions) contributed in minimizing the consequences of the blackout on their operations. Indeed, the institutions with a limited generator output were still able to finish their end-of-day procedures.

### **Risk profiles**

The following factors were suggested in the questionnaire in order to assess the risk profile (the list is not exhaustive):

- Geographical proximity
- Environment (flooding risk, seismic area, nuclear site, airport neighbourhood, etc.)
- Access (roads, public transportation connections, etc.)
- Electricity supply node
- Telecommunications supply node
- Telecommunications suppliers
- Water supplier
- Gas supplier

68% of the respondents reported to have different risk profiles on their primary and secondary sites. 26% of them assessed their primary and secondary sites' risk profiles as similar. 6% of them have not answered this question. However, some respondents have reported different risk profiles although their sites are very nearby (walking distance) and are connected to the same utility providers.

According to the answers received, the events that would the most affect the continuity of their operations are (decreasing number of quotes):

- 1) Large-scale disaster: earthquake, nuclear accident, bombing, flooding, etc.
- 2) Global failure in the supply of the telecommunications services
- 3) Global failure in the provision of electricity
- 4) Critical staff loss or unavailability

### **Critical activities**

Most of the respondents (95%) do take into consideration the level of criticality of their activities in their BCP.

The Task Force suggested the list of activities it considered as critical for the financial centre. Credit institutions ranked the proposed activities as highly critical with the following ratio:

- Funds and other financial assets transfers: 79%
- Liquidity and collateral management: 79%
- Back-office and correspondent banking: 74%
- Custody and income collection: 63%
- Distribution of cash (ATM and counters): 26%

Credit institutions mentioned other activities that they regard as highly critical: clients' reception, private banking, securities clearing & settlement and IT.

For the smooth functioning of their highly critical activities, credit institutions indicated that they rely on several infrastructures and parties:

- Reuters, Bloomberg, Telekurs, SWIFT (most quoted)
- CBL, LIPS-Net, LIPS-Gross, Euroclear, Cetrel, BCL (for the banknotes distribution), Bourse de Luxembourg (quoted several times)
- EBA, CCBM, cash transporters, depositaries (one quote each)

However, hardly any respondent had planned specific contingency agreements with the main counterparties or providers. Likewise, they do not expect any single point of failure (internal nor external) that would hinder the continuity of these activities. When single points of failure are expected, they relate to electricity, telecommunications and other information services.

Credit institution reported the maximum downtime for the critical activities to be between 0 and 24 hours (the median is 4 hours). They expect to restart their critical activities within 1 and 24 hours (the median is 4 hours). The volume after the recovery of the activities is set between 25% and 100% of the usual volumes. They did not report any outsourcing for these highly critical activities.

### **Testing**

All the respondents do have a no-break device on their primary site and have it tested regularly; 84% of them perform the testing under normal working conditions. On the secondary site, 95% of the respondents did report the use of a no-break system, which is tested under normal working conditions for 84% of them.

All the respondents have an electricity generator on their primary site. 79% of the respondents mentioned testing under usual operating conditions. On the secondary site, 68% of the respondents with an electricity generator have it tested under normal working conditions.

Answers on the electricity backup on the secondary site are missing for several credit institutions that outsource their recovery site.

Respondents carry out the testing of their BCP with third parties, while these are operating at usual business conditions, with the following ratio:

- counterparties: 58%
- infrastructure providers: 79%
- suppliers: 52%

Half of the respondents test with several third parties simultaneously.

Respondents reported that they usually do not test their BCP in conjunction with a BCP test of a third party (correspondent, infrastructure provider, supplier, customer). Only one respondent conducts this type of BCP/BCP testing.

The yearly number of tests (no-break systems, generators, overall BCP) ranges usually between one and two.

As regards the credit institutions that outsource their secondary site to a recovery facilities provider, the testing status they present is not clear. On the one hand, several outsourcers did not report the execution of thorough tests with the provider, nor did they provide details on the back-up infrastructure. On the other hand, several credit institutions reported that they tested their switch-over procedure, including transfer of staff.

### **Respondents' views and expectations**

The questionnaire gave the respondents the opportunity to raise issues, to provide comments and to express their expectations regarding business continuity in general and for the financial centre in particular.

When *assessing business continuity planning*, respondents regarded the following points as important: regular review of the BCP, regular evacuation exercise, in-house backup of the data, testing with high volumes and with third parties, internal communication, full availability (number of seats, duration, etc) of the secondary site, distance between the primary and the secondary sites.

The respondent also reported the following *points as relevant for the stability* of the Luxembourg financial centre in the event of a large-scale operational disruption:

- Utilities: ensure the continuity of the provision
- Coordination: put in place pre-defined plans among major participants
- Communication: need of centralized communication with third parties
- Cross-border: allow recovery centres to operated from abroad in emergency times
- BCL/ECB: support of the financial authorities during a crisis
- Mutualisation: put in place a joint market participants' recovery infrastructure with shared costs and benefits
- Staff availability: it could be jeopardized by a strike, a severe accident or public health issues (SARS, ...)

Furthermore, respondents mentioned different *expectations* concerning the recovery arrangements for the Luxembourg finance centre:

Concerning the regulatory framework, they considered the issuance of recovery guidelines (by a financial authority), the implementation of a regulatory framework for providers specialized in recovery facilities and the assessment of the critical utility providers' resilience are of particular relevance.

Regarding the communication and coordination, they suggested the setting up a working group (with mixed members) for the analysis of the situation and the coordination of the actions and the creation of a "crisis communication centre" in order to centralize information on disaster and on recovery, to communicate with third parties and to coordinate the recovery procedures with public utility providers, financial information providers, etc.

They insisted on optimising the communication with other participants and authorities (fast and consistent information) and ensuring the coordination with critical infrastructure providers (telecommunication, financial, etc).

They also stressed the need for a leading coordination role by a financial authority and the involvement of other authorities when necessary.

Finally, some respondents made concrete recommendations, such as ensuring the compatibility among partici-

pants' systems so that other participants' systems can be used as a business continuity tool; setting up a "joint command centre" to proceed to testing with key participants; centralizing BCP plans of the financial market participants to make them available to the relevant parties (financial authorities, emergency services, etc.)

### 3.2.5. Proposals for improvement

In the aforementioned inquiry, several respondents expressed expectations that the BCL should be involved in the prevention and the management of operational large-scale disruptions when the financial sector is affected. Their expectations derive from the BCL's essential operational role in the financial sector. The BCL definitely appears in their eyes as a natural hub in the area of crisis management.

These expectations are also in line with the BCL's tasks as worded in the Luxembourg law concerning the BCL and in the European Treaty with regard to the ESCB and are related to its tasks in the area of financial stability and smooth functioning of payment systems.

It is indeed for the BCL - not only as a member of the Eurosystem but also as a public institution in charge of specific financial operations and infrastructures - of paramount importance that it remains in a position to carry out its operational duties even in cases of large-scale disruptions. Hence in the interest of the financial sector as well as in the interest of the Eurosystem, the BCL should make sure that the market infrastructure it uses as well as its main counterparties in credit operations, payment systems or in the circulation of cash have high levels of resilience, even in the examined detrimental situations.

The BCL is therefore willing to workout, together with other stakeholders, a detailed framework for the national crisis prevention and management. This framework would be at the same time the prolongation and the result of the analysis produced by the Task Force.

The BCL puts forward recommendations in three different areas: (i) the creation of a permanent crisis structure for the financial centre; (ii) testing and (iii) other issues requiring particular consideration.

#### 3.2.5.1 Crisis structure for the financial centre

Considering that one of the main objectives of this report is to make recommendations for the smooth functioning of the Luxembourg financial centre as a whole in case of large-scale operational crises, the BCL's primary recommendation is to set up a perma-

nent crisis structure dedicated to the financial centre. Indeed, the information collected so far clearly hints at the existence of gaps in the current recovery and continuity arrangements and the need for coordination to respond to large-scale operational disruptions. To address these gaps, it is important to cover both crisis prevention and crisis management in a narrow sense. According to BCL, the aforementioned structure should therefore include a permanent Crisis Prevention Group, to address issues related to crisis preparedness, and a Crisis Management Group, that would become active in case of a large-scale disruption.

#### ***Crisis Prevention Group for the financial centre***

##### (i) Mission and tasks

The Crisis Prevention Group (CPG) has the mission to carry out a reflection with the aim of fostering the operational resilience of the financial sector as a whole.

As hub for the exchange of information, the Crisis Prevention Group would carry out an on-going monitoring of the overall level of resilience and act as a catalyst for possible improvements.

In order to ensure an adequate communication with other authorities, the chair of CPG could assist the national authorities in charge of crisis prevention, under the framework of the Conseil supérieur de la Protection nationale (CSPN).

The CPG would in particular maintain an official list of contact persons in charge in their institution of business continuity plan, at management and at operational level. The list could be extended to the suppliers of critical services for the financial centre.

Although the surveys conducted by the CSSF in 2002 and by the BCL in 2004 gave some reassurance concerning the quality of the business continuity plans of the main actors, it is still advisable to monitor these activities in the future. The systemic relevance of the various actors needs to be reassessed from time to time as well as the appropriateness of their business continuity arrangements. The Group would also monitor market and technological developments and analyse their impact on operations. Through regular publications, it should also contribute to increase the awareness of the importance of the resilience.

Finally, the CPG would be in charge of organizing and coordinating financial centre wide tests. (cf. 3.2.5.2 Sector-wide testing) and contribute to draw lessons from crisis that occurred.

## (ii) Structure

Members of the Crisis Prevention Group should originate from (i) the financial authorities, i.e. the central bank, the banking supervisor; (ii) market infrastructures and (iii) major credit institutions involved in ESCB credit operations, payment systems and/or the circulation of cash. Private associations could also be included in the Group to ensure proper dissemination of the information to all the members of the Luxembourg banking community.

The members of this permanent Group should be of a sufficient seniority level so that the Group is empowered with a sufficient level of moral suasion to ensure credibility and effectiveness.

Next to the core members, other parties (telecommunication providers, electricity distributors, emergency services, other credit institutions, etc.) could be invited to participate in the discussions.

To keep this structure as efficient as possible, it is proposed to limit the number of its members to between six and ten.

The BCL agrees to take care of the secretariat and the chairmanship and host meetings. The Group should meet on a yearly basis at a minimum, to deal with the tasks to be carried out on an on-going basis.

### ***Crisis Management Group for the financial centre***

#### (i) Mission and tasks

The Crisis Management Group (CMG) would be activated when the financial sector is confronted with a large-scale disruption, but also in the presence of tangible warning signs of a crisis.

The CMG would act as coordinator for a quick resolution of the problems arising from a large-scale operational disruption with potential systemic effects.

However, when the CMG is in a situation where it has to issue proposals to facilitate the crisis resolution, its members should carefully follow a rationale of best common interest.

The CMG would in any case not have a decision making power, its proposals would hence not be binding. It will remain the responsibility of the represented institutions to take the appropriate decisions and to implement solutions or take the actions that are the most appropriate to their own situation.

In the event of a large-scale disruption, the CMG would collect the relevant information from the impacted mar-

ket participants, including the measures they consider implementing. Information will be treated as highly confidential.

Therefore, the CMG could set up crisis communication protocols to ensure the reception and the broadcast of the necessary information to the financial market participants. The CMG would also serve as central communication point with external parties, by exchanging relevant information with external parties, if any are directly or indirectly concerned.

In order to carry out its coordination mission, the CMG would analyse the information received from market participants and external parties and assess the necessity to coordinate the measures to be taken either by individual institutions, the national financial authorities or other official bodies. The CMG could also make proposals, which are then adopted by the concerned parties under their own responsibility.

Consequences of large-scale disruptions are likely not to be restricted to the financial sector; they may cause the activation of the national "Cellule de crise", which is established within the framework of the Conseil supérieur de la Protection nationale (CSPN) and chaired by the Haut-Commissaire à la Protection nationale (HCPN). Hence, in such situations, close cooperation between the "Cellule de crise" and the CMG is considered as necessary.

#### (ii) Structure

The core members of the Crisis Management Group should be the BCL together with the CSSF. Additional members (financial market infrastructures, credit institutions, service providers, etc.) could be called in according to the situation at hand. Such a flexible composition should enable the group to address in the most appropriate manner the various kinds of operational crises that may occur and to ensure a rapid resumption of the operations of the BCL, market infrastructures and systemically relevant financial institutions.

Nominees for the core members should be of top management level and have the authority to involve their institution when they mobilize resources, communicate with external parties or take other decisions.

The chairman of the Crisis Prevention Group would act as secretary for the Crisis Management Group, which would play the role of an interface between the financial sector and the HCPN.



### 3.2.5.2 Sector-wide testing

It is generally acknowledged that testing business continuity plans is of utmost importance to confirm their scope, capacity and efficiency. This duty falls under the individual responsibility of the financial institutions; by performing this kind of tests they assess their level of resilience.

At a broader level, financial market participants in Luxembourg have not carried out sector-wide tests until now. Due to practical and security reasons, teams in charge of the operations generally do not favour executing such extended tests in real operational conditions. They are however necessary to ensure that individual arrangements are not conflicting with those of counterparties and the authorities. Any initiative aiming at increasing the operational resilience of a financial community should therefore encompass sector wide-tests. At a minimum, the content of these tests should include the use of alternate physical facilities and infrastructures, communication equipments and channels, the exchange of information and contacts reaching, decision-making mechanisms and possibly business processes in deteriorated conditions.

The BCL believes that the Crisis Prevention Group or an ad hoc working party under its supervision could take the initiative to prepare for such tests, persuade the critical market participants to take part, coordinate the course of the test and report on the results. In line with the objective of maintaining the public's confidence in the financial system, positive results could be made public. Wide-tests should be carried out at regular intervals.

### 3.2.5.3 Some considerations requiring particular attention

The answers provided to the CSSF survey in 2002 and to the Task Force's questionnaires in 2004, together with the content of interviews with miscellaneous organizations (telecommunications providers, the telecommunications regulator, electricity providers, emergency services and recovery services providers), allow the BCL to present the following useful general considerations:

### **Transport and access to the sites**

In situations of severe disruptions, several market participants may have to decide to transfer staff massively, at the same time and in a short time frame. It is likely that a high number of staff (up to the thousand) would be concerned. Most of the present continuity plans are largely based on the use of individual cars. This would potentially cause an important increase in traffic and could result in bottlenecks. The geographical concentration of the critical financial institutions in a reduced number of areas and the use of outsourced and therefore shared secondary sites may cause additional access and hence availability problems in case of large-scale operational disruptions. Issues related to the transportation and the logistics of critical staff could be mitigated with the presence of operational staff on the secondary site.

Various large-scale disorders could also prevent commuters, and in particular those living abroad, from accessing their office. To measure and to mitigate this risk, major financial institutions should keep track of the residence of their critical staff.

Finally, the access to the devices and premises enabling the critical operations should be carefully planned for, so that it remains open even in abnormal conditions<sup>23</sup>.

### **Electricity supply**

Generally speaking, financial market participants appear to be fairly well prepared to cope with power cuts. Nevertheless, the problem in Luxembourg on the 2<sup>nd</sup> of September 2004 showed that there is room for improvements to ensure the smooth transition from the network supply to the backup supply, and vice versa.

Particular attention should be devoted to multiple clear-cut outages over very short intervals (minutes, even seconds) and to so-called disturbances of power<sup>24</sup>. Staff in charge of business continuity planning should also review all the devices (including the supportive ones – lighting and air conditioning apparels for instance) that are needed for the critical activities and make sure that they are connected to the no-break systems and generators. The use of generators for longer periods (several days) to produce electricity should also be checked<sup>25</sup>.

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23 *Civil defence representatives pointed out problems to access credit institutions' premises when an alarm is triggered outside the office hours.*  
24 *Next to the clear-cut outages, very short (1/10th second) voltage drops, referred to as "disturbance of power", can also disrupt the distribution of power. Inverters are put in place to control such disturbances of power. Electricity distributors in Luxembourg insist that inverters are properly configured; they have received numerous complaints due to an inappropriate set-up.*  
25 *The use of fuel or gas to produce electricity generates a lot of heat and on some occasion, the equipment was not able to withstand high temperatures for extended periods.*

### Telecommunication services

Telecommunication services are undoubtedly critical for the financial market participants' operations. It is hence important that financial institutions seek to minimize the consequences of an interruption of the telecommunications service on their critical activities. This involves a thorough checking - together with their providers - on whether and how to achieve a sufficient level of overall resilience (through redundancy, diversity and recoverability) of their critical telecommunication links<sup>26</sup>.

Redundancy involves the duplication of the network components (cable, switches, circuits, etc). Diversity is achieved through diversification of the used technologies, transmission paths, cabling routes, etc. Recoverability is the ability of a supplier to quickly restore the service after a failure has occurred.

#### **General considerations with regard to management of operational risk**

Overall, risk management concerning providers of critical goods and services should include the following action points:

- Risk assessment should focus on: analyse the risks, threats and their consequences on the business critical activities.
- Contracting should include requirements with regard to the level of service, agreed priority, redundancy and recoverability and should be as specific as appropriate concerning the "cas de force majeure" clause.
- Due diligence with the suppliers should be carried out to get detailed information on how to achieve the expected level of resilience.
- Regularly testing (and reporting on tests) of the recovery and redundancy measures that are in place.
- Monitoring of the network to insure that single points of failure are not introduced at a later stage.

### 3.2.6. Annexes

#### 3.2.6.1 Bibliography

- The Bank of England, "How financial markets can organise their contingency planning", Remarks by Bill Allen, Deputy Director, 11 March 2002
- The Bank of Japan, Business Continuity Planning at Financial Institutions, July 2003
- The Bank of Japan, Business Continuity Planning at the Bank of Japan, September 2003
- BIS, Sound Practices for the Management and Supervision of Operational Risk, Basel Committee on Banking Supervision, February 2003
- BIS, Implications of 9/11 for the financial services sector, Roger W Ferguson Jr, BIS Review 30/2002
- BIS, A supervisory perspective on disaster recovery and business continuity, remarks by Roger W Ferguson Jr., BIS Review 15/2002, 4 March 2002
- BIS, Installation of the Financial Stability Committee, Introductory talk by Mr Guy Quaden, BIS Review 34/2003, 30 July 2003
- BITS Guide To Business-Critical Telecommunications Services, November 2004
- The Board of Governors of the Federal Reserve System, Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System, April 7, 2003
- The Business Continuity Institute, Glossary of General Business Continuity Management Terms, 2002
- Comité de stabilité financière (Commission bancaire, financière et des assurances et Banque nationale de Belgique), Recommandations du Comité de Stabilité Financière en matière de business continuity planning, 20 Octobre 2004

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26 *Examples of questions to be addressed to the telecommunication services providers (Source: Good Practice Guide to Telecommunications Resilience):*

- a) Do you have a process where we could work together on business continuity planning and disaster recovery, including testing to provide assurance?*
- b) As a single Provider of a separacy/diversity service, how will you provide transparency and assurance that they will stay resilient?*
- c) How do you provide assurance that separacy/diversity services meet my requirements and how do you ensure they stay appropriate?*
- d) How can you demonstrate that you have full control and visibility of the network assets needed to provide end-to-end separation?*
- e) How can you demonstrate that you have appropriate contingency plans in place, and that they are successfully tested on a regular basis?*



- La Commission de Surveillance du Secteur Financier, Luxembourg, Plans et systèmes de continuité d'activité (BCP) - Résultats du recensement des BCP et considérations prudentielles, 1er mai 2004
- L'écho, Besoins de cash: la Fed a pris les devants, 19/08/2003
- The Federal Reserve Bank of New York, Financial Industry Summit on Business Continuity - Meeting Summary, 26 February 2002
- The Financial Services Authority, Business Continuity: Firms must keep this a priority - but FSA approach is "not rigid", 11 February 2003
- Financial Times, North America's power cut – Traders ensure it's business as usual for New York, 16-17 August 2003
- Financial Times, Plans fail to keep pace, 3 September 2003
- Financial Times, Special report on Business Continuity, 9 March 2004
- The Foreign Exchange Committee, Contingency Planning: Issues and Recommendations, 15 November 2001
- Le Gouvernement du Grand-Duché de Luxembourg, Ministère de l'Economie et du Commerce extérieur, Black-out du 2 septembre 2004 – Rapport préliminaire, 9 septembre 2004
- Le Monde, New York retrouve l'électricité après 29 heures de panne, 17-18 août 2003
- The Monetary Authority of Singapore, Consultation Paper Guidelines On Business Continuity Planning, 10 January 2003
- The Monetary Authority of Singapore, Business Continuity Management Guidelines, June 2003
- National Infrastructure Security Co-Ordination Centre, Good Practice Guide to Telecommunications Resilience, May 2004
- The Payments Risk Committee, Best Practices To Assure Telecommunications Continuity For Financial

Institutions And The Payment & Settlements Utilities, September 2004

- The Task Force on Major Operational Disruption in the Financial System, Do we need new statutory powers?, December 2003
- The Tripartite Standing Committee on Financial Stability, Financial Sector Business Continuity Progress Report, October 2004

### 3.2.6.2 Glossary<sup>27</sup>

#### **Activation / invocation of the BCP**

When business continuity procedures and plans are formally triggered, in response to an event (emergency or disaster).

#### **Backup**

A process by which data is copied in some form so as to be available and used if the original data is lost, destroyed or corrupted.

#### **Business Continuity Plan (BCP)**

A collection of procedures and information that is developed, compiled and maintained in readiness for use in the event of an emergency or disaster. The aim is to minimize the possible losses and to ensure the continuity of the organizational services in such an event. The BCP includes a comprehensive training, testing and maintenance program.

A BCP usually covers three complementary areas:

- prevention plans, standing measures put in place in order to avoid that unexpected events cause operational problems to critical systems and functions;
- emergency plans, measures to put in place as soon as possible after the incident (or when an incident is expected) to ensure the continuity of the critical systems and functions;
- recovery plans, measures to apply in order to shorten as much as possible the application of the emergency measures and to restore the entire operations as quickly as possible.

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<sup>27</sup> Sources:

- *Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System, by order of Board of Governors of the Federal Reserve System, April 7, 2003.*
- *Do we need new statutory powers?, Report of the Task Force on Major Operational Disruption in the Financial System, December 2003*
- *Glossary of General Business Continuity Management Terms, The Business Continuity Institute 2002*

### **Critical activities**

- Transfer of funds and other financial assets (using a market infrastructure): transmission/receipt of transfer details with a market infrastructure (typically a payment or settlement system);
- Liquidity and collateral management: management of cash, credits and related collaterals;
- Back-office and correspondent banking: internal management of market operations;
- Custody and income collection: securities and bonds custodian activity and related collection of income;
- Distribution of cash (ATM and counters): Provision of cash to the public.

### **Critical markets**

- Money market instruments: trade of short-term securities
- Government securities: trade of government securities
- Foreign exchange: trade of foreign currencies through a marketplace
- Commercial paper and corporate securities: trade of non-government securities and commercial papers
- Investment funds: trade activity of investment funds
- OTC (over-the-counter): markets without any physical exchange nor dedicated infrastructure. For instance, foreign exchange transactions outside the CLS services.

### **Critical market participants**

The professional participants that are important for the Luxembourg critical markets.

### **Diversity**

Use of alternative possibilities (paths, nodes, hardware, software, etc.) in order to avoid reliance on one set of structure and configuration.

### **Disruption**

Situation whereby an event reduces the operational capability of a given institution or infrastructure. Depending of the type and level of severity of the event, a disruption could lead to a partial inability to operate the critical activities or to a total discontinuation of the critical activities.

### **Key component**

Four types of operational services providers that are critical for the financial sector: financial institutions, financial infrastructures, telecommunications and utilities.

### **Large-scale operational disruption**

An event that causes a severe disruption or destruction of transportation, telecommunications, power, or other critical infrastructure components across a wider geographic area or that results in a large-scale evacuation or inaccessibility of the population.

The event results in one or several institutions' inability to continue operations for a rather long period of time (days or even weeks). It has the potential to have adverse consequences on financial stability, because it has a significant impact on the ability of the Luxembourg financial sector to maintain business operations. The event can be of accidental, natural or malicious origin. Earthquakes, nuclear accident, bombing on a high banking density area, flooding, global telecommunications supply failure, power failure, widespread computer virus contagion, important software glitches, etc. are examples of such large-scale disruptions.

### **Primary site**

The premises normally used by the institution to carry out its operations and activities. The primary site can physically be composed of one or several buildings and located in one or several places.

### **Recovery measures**

Measures aiming at the fast restoration (within the recovery time objective) of the critical activities, up to the expected recovery level. They are part of the business continuity plan.

### **Recovery time**

The amount of time elapsed from the moment an activity is severely disrupted (even before the disaster is declared and the BCP activated) until the moment the activity reaches a predetermined level of activity, generally the recovery volume.

### **Recovery volume**

It is the minimum (it may be lower than the normal business level) level of activity for the critical operations and activities to be carried out within a shortest time after the disruption's occurrence.

### **Redundancy**

Duplication of systems and the inherent functionality to enable availability of the functionality in the event of failure of the main systems, thanks to a take-over by the second system.

### **Resilience**

The ability of a system to absorb the impact of a failure and continue to provide an acceptable level of service (the recovery volume).

### **Secondary site**

The premises used by the institution to enable the continuity of its services, should its primary site not be available. The secondary site is usually equipped with all the systems and resource (possibly including operational staff) to operate as a fallback solution for the primary site. The secondary site can physically be composed of one or several buildings and located in one or several places. It encompasses the replication of multiple systems and applications.

### **Single point of failure**

The unique source of service or process whose failure would lead to the failure of a critical activity.

### **Systemic risk**

The risk that the failure of one participant to meet its obligations will cause other participants to be unable to meet their obligations. Such a process may cause significant liquidity or credit problems, or may even threaten the financial stability.

#### 3.2.6.3 Task Force on Large Scale Disruption: list of participants

The Task Force was chaired by the BCL.

The members of the Task Force on Large Scale Disruption, which contributed to this report, are:

- Association des Banques et Banquiers, Luxembourg (ABBL)
- Banque et Caisse d'Epargne de l'Etat
- Banque Générale du Luxembourg S.A.
- Bourse de Luxembourg
- CETREL s.c.
- Clearstream Banking S.A.
- Commission de Surveillance du Secteur Financier (CSSF)
- DEXIA-BIL S.A.
- DZ BANK International
- REGEN SàRL

### 3.3 RÉSUMÉ NON TECHNIQUE DU CAHIER D'ETUDES «PEUT-ON PARLER DE BULLE SUR LE MARCHÉ IMMOBILIER AU LUXEMBOURG?<sup>28</sup>»

Les interrogations autour de l'évolution des prix de l'immobilier au Luxembourg sont récurrentes. Elles sont justifiées par l'augmentation régulière des prix qui ont été multipliés par 9 depuis 1975. Même en tenant compte de l'évolution de l'indice des prix à la consommation, il s'avère que les prix immobiliers ont triplé en 28 ans. Plus récemment, l'immobilier enregistre une phase de croissance soutenue puisque depuis 1997, l'indice nominal des prix immobiliers a grimpé de 75% soit un taux de croissance annuel moyen de l'ordre de 10%. Cette évolution est tout à fait comparable à celle connue par d'autres pays pour les lesquels la question d'une bulle spéculative se pose ou s'est posée avec une forte acuité (Etats-Unis, Royaume-Uni, Irlande, Pays-Bas, Espagne et France pour ne citer que les principaux pays concernés). De plus, un classement réalisé récemment et fortement relayé par la presse nationale établit que Luxembourg est devenue la capitale européenne la plus chère d'Europe dépassant ainsi Londres, Madrid, Dublin ou Paris. Il faut néanmoins tout de suite nuancer ce type d'étude qui ne met pas en rapport le prix des logements acquis à la surface ou au niveau de vie des pays en question. Pour autant, il n'en demeure pas moins que la problématique de la présence d'une bulle spéculative sur le marché immobilier luxembourgeois est tout à fait pertinente. En outre, au-delà de l'évolution des prix, le développement des bulles spéculatives peut être préoccupant du point de vue de la stabilité financière. Une baisse soudaine de la valorisation des actifs peut effectivement mettre en difficulté les agents économiques en réduisant leur consommation mais également leur capacité d'emprunt. De plus, les actifs immobiliers sont régulièrement mis en garantie des prêts obtenus auprès du système bancaire. Celui-ci est donc particulièrement exposé au risque de krach sur le marché immobilier. Et par ce biais, c'est la stabilité du système financier dans son ensemble qui est posée.

La notion de bulle spéculative renvoie généralement à l'idée d'une évolution excessive et «anormale» du prix d'un actif. De ce fait, le constat d'une augmentation accrue des prix est loin d'être une condition suffisante à l'identification d'une bulle et toute analyse ne peut donc se faire indépendamment de la définition de ce que peut recouvrir l'évolution «normale» des prix. Par évolution «normale», on entend celle qui est dictée par les fondamentaux, c'est-à-dire un ensemble de variables économiques et financières qui sont susceptibles d'exercer une influence significative sur l'offre et la demande

et donc sur le prix de l'immobilier. Ainsi, identifier une bulle revient à mettre en évidence une évolution des prix incompatible avec celle des fondamentaux.

Deux types d'approches sont généralement retenues afin d'expliquer l'évolution des prix immobiliers. Leur différence résulte de la nature hybride du marché immobilier. D'une part, l'acquisition d'un logement peut s'apparenter à un investissement financier effectué en vue de tirer profit des revenus -loyers- générés par la détention de l'actif. D'autre part, le marché immobilier peut s'analyser comme celui des biens durables en raison des services de logement qu'il rend au cours du temps. C'est précisément cet aspect dual ou hybride du marché immobilier qui distingue les différentes théories développées afin d'expliquer l'évolution des prix immobiliers. La première valorise le prix immobilier comme un actif financier c'est-à-dire que son prix dépend de la somme des dividendes, ici les loyers, futurs actualisés et du prix auquel l'actif sera revendu ultérieurement. Sans rejeter sa dimension patrimoniale, la deuxième approche souvent qualifiée de «structurelle» prend en compte le fait que l'achat d'un bien immobilier dépend de certaines variables telles que les coûts de production, l'évolution du revenu, du taux de croissance de la population, du taux d'intérêt et de la capacité d'emprunt des ménages.

Le caractère prospectif des prix des actifs financiers est à l'origine des phénomènes de bulle spéculative qui peuvent se développer. En effet, le prix d'un actif aujourd'hui sera d'autant plus élevé que les agents anticipent qu'il continuera à augmenter. Le développement d'une bulle est donc un phénomène auto-réalisateur. Il est alors assez courant d'attribuer l'émergence, le développement et l'éclatement des bulles à des comportements irrationnels d'agents en proie à une certaine euphorie. Pourtant, il est très facile de montrer que l'existence des bulles spéculatives est totalement compatible avec l'hypothèse d'anticipations rationnelles. Les différents modèles théoriques permettant d'illustrer le rôle des fondamentaux peuvent être étendus afin de montrer qu'une solution de type bulle est envisageable. Les prix peuvent alors connaître une bulle qui s'accroît de façon exponentielle puis éclate soudainement. Des solutions plus sophistiquées permettent également de modéliser des bulles qui se forment, gonflent et éclatent à intervalles irréguliers ou même des bulles dont l'évolution est liée à celle des fondamentaux. On parle dans ce dernier cas de bulles intrinsèques.

28 Cet article est un résumé non technique d'un cahier d'étude, rédigé par Christophe Blot, en cours de finalisation, Département monétaire, économique et statistique

Si, comme nous l'avons dit, il est relativement aisé d'illustrer les bulles spéculatives à partir des modèles théoriques, leur identification pratique pose de sérieux problèmes. Plusieurs méthodes empiriques ont été développées afin de tester la présence de bulles. Indépendamment des difficultés techniques des tests économétriques, leur principal écueil est qu'ils ne consistent pas seulement à tester la présence d'une bulle mais également celle de la pertinence du modèle économique sous-jacent. Ainsi, on peut toujours avancer l'idée que si les prix apparaissent déconnectés des fondamentaux, ce n'est pas tant le fait de la présence d'une bulle mais plutôt celui d'une mauvaise spécification des fondamentaux. Parmi les différentes procédures de test, celle qui nous a toutefois semblé la plus robuste repose sur la notion de cointégration qui consiste à évaluer l'existence d'une relation de long terme entre les prix immobiliers et les variables fondamentales. En effet, si la valeur fondamentale d'un actif représente un équilibre de long terme alors les déviations entre le prix observé et la valeur fondamentale sont nécessairement transitoires ce qui revient à dire, d'un point de vue économétrique, que les prix et les fondamentaux sont cointégrés.

L'application qui est réalisée distingue les prix du secteur de l'immobilier résidentiel, de ceux du secteur non-résidentiel et du secteur des terrains non bâtis. Cette différenciation est justifiée par le fait qu'il est probable que les déterminants des prix dans ces différents secteurs ne sont pas nécessairement identiques. Concernant, les prix de l'immobilier résidentiel, les conclusions ne sont pas identiques selon la procédure de test choisie. Dans certains cas (méthode de Johansen), l'hypothèse de bulle spéculative est systématiquement rejetée alors qu'elle ne peut pas l'être lorsqu'on applique une démarche en deux temps (méthode d'Engle et Granger). Les spécifications permettant de valider l'existence d'une relation de cointégration permettent d'illustrer plus particulièrement le rôle joué par les coûts de construction, le taux d'intérêt à court terme, le produit intérieur brut (PIB) et les crédits. Le signe de ces variables est de plus conforme aux modèles théoriques structurels, puisque les coûts de construction, le PIB et les crédits exercent un effet positif sur les prix tandis que le taux d'intérêt contribue à réduire les prix de l'immobilier résidentiel. Par contre, l'effet du taux de croissance de la population est contre-intuitif puisqu'une hausse du taux de croissance réduirait les prix alors qu'on s'attend généralement à ce que la demande de logements s'accroisse avec la population. Pour le secteur non-résidentiel, toutes les spécifications testées aboutissent à la conclusion qu'aucune bulle ne peut être identifiée sur ce segment du marché. Ici, c'est l'évolution du taux d'intérêt et surtout celle des coûts de construction qui semble jouer le rôle de force de rappel pour les

prix. Finalement, il n'y a que pour les terrains non bâtis que le taux de croissance de la population constitue une référence de long terme pour les prix. L'effet est de plus conforme à la théorie puisqu'une augmentation du taux de croissance conduit effectivement à une hausse de l'indice des prix. Le PIB et le taux d'intérêt à court terme ressortent également parfois significativement.

Par ailleurs, l'estimation de modèles à correction d'erreur permet de prendre en compte la dynamique de court terme des prix immobiliers. Il s'avère alors que le taux de croissance des coûts de production ainsi que la variation du taux d'intérêt de court terme influencent significativement le taux de croissance des prix dans les secteurs résidentiel et non-résidentiel de la période suivante. Par contre, l'effet du PIB n'est pas conforme à celui espéré.

L'analyse des prix permet donc de montrer que le marché immobilier luxembourgeois ne semble pas déconnecté de l'évolution des fondamentaux. En particulier, les facteurs d'offre joueraient un rôle important dans le développement des prix sur l'ensemble de la période considérée. La politique monétaire exerce également un effet significatif puisque le taux d'intérêt de court terme est généralement significatif. Du fait de la part importante des emprunts financés à taux variable au Luxembourg, il est assez logique que l'effet du taux d'intérêt de court terme soit prépondérant. En dehors du coût de financement, d'autres variables de demande influencent la valeur d'équilibre des prix immobiliers. Ainsi, selon les spécifications retenues, les variables de crédits immobiliers et d'activité exercent un rôle significatif. Finalement, la pression liée à l'accroissement de la population ne serait effective que sur l'évolution du prix des terrains.

Si les tests qui sont menés permettent le plus souvent de montrer que les prix ne semblent pas déconnectés des fondamentaux, il faut toutefois souligner que la procédure utilisée n'est pas forcément adaptée pour détecter les bulles qui se développent et éclatent à intervalles irréguliers. On ne peut de fait pas totalement exclure le fait que le marché de l'immobilier luxembourgeois ne soit pas caractérisé par ce type de bulle, en particulier les secteurs non-résidentiels et des terrains non bâtis qui connaissent régulièrement des phases de hausses et de baisses des prix relativement fortes. En outre, le fait de montrer que le marché immobilier luxembourgeois ne semble pas caractérisé par une bulle spéculative ne signifie pour autant pas que le marché ne soit pas transitoirement surévalué. Il faut donc garder à l'esprit que les conclusions basées sur les tests d'identification de bulles spéculatives sont fragiles et que des investigations supplémentaires mériteraient sans doute d'être menées afin de confirmer ou d'infirmer ces premiers résultats.

### 3.4 RÉSUMÉ NON TECHNIQUE DU CAHIER D'ÉTUDES «LA SENSIBILITÉ DE L'ACTIVITÉ BANCAIRE AUX CHOCs MACROÉCONOMIQUES: UNE ANALYSE EN PANEL SUR DES DONNÉES DE BANQUES LUXEMBOURGEOISES»<sup>29</sup>

Cette note reflète les résultats d'une étude en phase de finalisation et qui est dédiée à l'analyse de l'impact des chocs macroéconomiques sur les performances des banques luxembourgeoises. Dans cette perspective, nous adoptons la même démarche et les mêmes spécifications économétriques que Lehmann et Manz (2005) dans leur analyse relative aux déterminants macroéconomiques de la performance des banques suisses. Ce choix s'explique principalement par la ressemblance des deux économies en matière du degré d'ouverture et de prédominance économique du secteur bancaire. Il y a lieu de noter que contrairement à Lehmann et Manz dont le modèle estimé est basé sur des données annuelles, les résultats de notre étude sont issus de l'estimation d'équations sur des données à fréquence trimestrielle. Le problème majeur de l'estimation d'un modèle sur des données à fréquence élevée est relatif à l'importance de la volatilité des données nominales des banques par rapport aux agrégats macroéconomiques. Cependant, la normalisation des variables nominales des banques par leurs actifs bilantaires respectifs s'est traduite par une volatilité moins élevée et une stationnarité de l'ensemble des séries. Notons, par ailleurs, que contrairement aux travaux de Lehmann et Manz, nous avons introduit le taux de change en tant que variable explicative dans certaines régressions. L'introduction de cette variable s'explique à la fois par le degré d'ouverture qui caractérise l'économie luxembourgeoise, mais aussi par le caractère international de sa place financière.

Quoique différents les uns des autres, la plupart des travaux empiriques modélisent les revenus intermédiaires et/ou la profitabilité des banques en fonction de déterminants à la fois internes, mais aussi externes. Les déterminants internes sont issus des documents comptables de la banque, tels que le compte de pertes et profits, le bilan et le hors bilan. Ils peuvent être qualifiés de variables managériales ou microéconomiques. Tandis que les déterminants externes reflètent les environnements économiques, financiers et légaux susceptibles d'affecter les performances des établissements bancaires. Dans ce cadre, une batterie de variables explicatives de nature interne, mais aussi externe, est proposée dans la littérature pour expliquer la variabilité de certains agrégats de performances bancaires. Les facteurs internes incluent le degré de risque pris, les stratégies opérationnelles et l'expertise managériale, tandis que les facteurs macroéconomiques se réfèrent au taux de croissance économique, au taux de chômage, au niveau des taux d'intérêt et du taux de change. Le choix de ces

derniers est dicté principalement par l'objet et la nature propres à chaque étude.

D'une manière générale, les approches empiriques dédiées à l'évaluation de l'impact de l'environnement macroéconomique sur les performances bancaires accordent une attention particulière soit à l'explication de la marge sur intérêt, soit à l'importance des provisions, soit à la profitabilité bancaire. Dans notre analyse, les différents soldes intermédiaires du compte de pertes et profits ont été modélisés de manière individuelle afin de quantifier l'impact d'un choc macroéconomique sur l'agrégat en question.

#### 3.4.1. Structure de l'échantillon

Les données individuelles des banques utilisées proviennent de la base de données de la BCL. Elles sont d'une fréquence trimestrielle. Les données macrofinancières et macroéconomiques sont issues de quatre sources. L'indice boursier Eurostoxx est extrait de la base de données de Bloomberg, tandis que le taux de change euro/dollar et les variables macroéconomiques sont issues respectivement de la base de données du Fonds monétaire international (IMF international financial statistics database), de celle d'Eurostat et du STATEC.

La période d'observation couvre les années 1994-2005. L'échantillon initial disponible est non cylindré. Il contient 235 banques et 8013 observations. Pour minimiser les effets des erreurs de mesures sur la qualité de nos estimations, un filtre est appliqué aux données permettant d'exclure les banques dont l'une des variables ne remplit pas les critères suivants:

- le taux trimestriel de la rentabilité des actifs (ROA) en valeur absolue et le taux de marge sur intérêt sont inférieurs à 5%;
- le taux de croissance trimestriel de l'actif total est inférieur à 20%;
- Le ratio trimestriel des créances à la clientèle par rapport à l'actif total est supérieur à 10%;

Ce procédé de filtrage s'est traduit par un nouvel échantillon composé de 213 banques et 7013 observations. Il y a lieu de noter que certains établissements bancaires ne sont pas observés sur toute la période; ce qui explique la divergence entre le nombre d'observations et le produit du nombre de banques par le nombre de trimestres.

De plus et afin d'éviter les biais statistiques liés aux hétérogénéités des tailles des établissements bancaires

29 Cette note est un résumé d'une étude réalisée par Abdelaziz Rouabah, Département monétaire, économique et statistique



res et de leurs processus technologiques, nous avons partagé notre échantillon en deux groupes. L'actif total médian (438,34 millions d'euros) est utilisé en tant que critère pour la classification des banques. Une banque est qualifiée de «grande» si pour un trimestre donné la taille de son actif bilantaire est supérieure à l'actif médian. Dans le cas opposé, elle est considérée comme étant de petite taille. La moyenne de l'actif total pour les petites banques est de 207,3 millions d'euros; tandis que celle des grandes banques est de 4583 millions d'euros.

### 3.4.2. Spécifications économétriques et méthodes d'estimation

Les spécifications adoptées sont de formes linéaires. Etant donné la présence de la dimension temporelle dans nos spécifications, les erreurs issues de nos estimations sont susceptibles d'être générées par un processus autorégressif. En la présence d'autocorrélation d'ordre 1, le modèle adopté s'écrit sous la forme:

$$\begin{cases} y_{it} = \beta X_t^k + \delta Z_{it}^p + u_i + \varepsilon_{it} \\ \varepsilon_{it} = \rho \varepsilon_{i,t-1} + v_{it} \end{cases} \quad (1)$$

Dans cette spécification, la variable  $Y_{it}$  représente la variable de performance de la banque (i) à l'instant (t), telle que le profit, la marge sur intérêt, les provisions, ...,  $X_t^k$  correspond à un vecteur composé de (k) variables macroéconomiques communes à l'ensemble des banques,  $Z_t^p$  est un vecteur de (p) variables internes à la banque,  $u_i$  représente l'effet spécifique propre à chaque banque, qui demeure invariable dans le temps, tandis que  $\varepsilon_{it}$  est une perturbation aléatoire dont la forme est générée par un processus auto-régressif d'ordre un et  $V_{it} \sim iid(0, \sigma_v^2)$ .

Le modèle (1) a été estimé sur des données en panel selon deux méthodologies, qui tiennent compte des caractéristiques de notre échantillon. Dans un premier temps, l'estimation est réalisée par la méthode des moindres carrés quasi-généralisés (feasible GLS) avec effet fixe préconisée par Baltagi et Wu (1999) pour les données en panel non cylindré et en présence d'autocorrélation des erreurs d'ordre 1. Dans une seconde étape, le dit modèle est estimé avec des retards de la variable endogène. L'adoption d'une spécification dynamique est censée intercepter la persistance affichée par les variables de performance bancaire et qui peut être attribuée à la structure du marché ou à des chocs macroéconomiques. Ainsi, les équations dynamiques estimées prennent la forme suivante:

$$y_{it} = \sum_m \phi_m y_{i,t-m} + \beta X_t^k + \delta Z_{it}^p + u_i + \varepsilon_{it} \quad (2)$$

Les vecteurs des variables explicatives  $X_t^k$  et  $Z_t^p$  ont la même signification que précédemment. La variable  $Y_{i,t-m}$  est la variable endogène retardée de k périodes. Nous supposons, par ailleurs, que la valeur absolue de la somme des paramètres  $\phi_m$  est inférieure à l'unité et que  $\varepsilon_{it}$  est le terme d'erreur d'espérance nulle  $E(\varepsilon_{it})=0$  et de variance  $E(\varepsilon_{it}^2)=\sigma_\varepsilon^2$ . De plus, ces perturbations stochastiques sont indépendantes des effets spécifiques ( $u_i$ ) et prises deux à deux, elles ne sont pas corrélées. En revanche, la présence d'une variable retardée rend les techniques d'estimation usuelles sur des données en panel inappropriées. Ceci est dû à la corrélation entre la variable endogène et les résidus issus de la régression ( $u_i + \varepsilon_{it}$ ). Afin de remédier à cette difficulté, nous estimons l'équation 2 par la méthode des moments généralisés (GMM) suggérée par Arellano et Bond (1991).

### 3.4.3. Résultats

#### 3.4.3.1 Sensibilité de la marge d'intérêt bancaire aux chocs du taux d'intérêt de court terme

Afin de déterminer l'impact de la variabilité du taux d'intérêt sur la marge d'intérêt des banques luxembourgeoises, nous avons estimé les spécifications dynamiques et statiques précédentes où la variable endogène à expliquer est reflétée par le ratio de la marge d'intérêt bancaire au total des créances accordées à la clientèle de chaque banque ( $m_{it}$ ). Les variables macroéconomiques explicatives sont la variation du taux euribor à 3 mois ( $\Delta i_t$ ) et une variable «semi-indicatrice» censée intercepter l'effet de l'évolution des prix de l'immobilier sur la marge d'intérêt bancaire  $Dipi_{it}$ . Durant les phases de décroissance des prix de l'immobilier, cette variable est reflétée par le ratio des prêts immobiliers à actif total bilantaire de chaque banque. Tandis que durant les périodes de progression ou de stabilité des prix de l'immobilier, elle prend la valeur zéro. Quant aux variables internes aux banques, elles sont incluses pour évaluer l'impact du risque pris sur la marge d'intérêt. Elles englobent à la fois l'importance du financement de court terme ( $finct_{it}$ ), approchée par le ratio des dépôts à vue à l'actif total; le recours à des financements de long terme, approximé par le ratio des dépôts d'épargne à l'actif total et les risques pris en matière de crédit hypothécaire. Cette dernière variable est reflétée par le rapport entre l'actif immobilisé non affecté à l'activité de la banque et l'actif total.

Fait important, les paramètres relatifs à la variation des taux d'intérêt demeurent statistiquement non signifi-



catifs dans l'ensemble des estimations, qu'elles soient dynamiques ou statiques. Ce résultat ainsi constaté laisse penser que les variations du taux du marché monétaire n'ont pas d'influence sur les marges d'intérêt nettes des banques luxembourgeoises. Il y a lieu de souligner que ce résultat est conforme à celui obtenu par English (2002) pour cinq pays de l'OCDE parmi les dix inclus dans son panel. Ainsi, il paraît donc que les banques opérant au Luxembourg ont évité de s'exposer aux taux du marché sur la période considérée. Ce constat est d'autant plus vrai que les engagements à taux variable sont plutôt une règle au Luxembourg. Autrement dit, les variations des taux des engagements font l'objet de révisions plus ou moins instantanées en réponse à une modification des taux des avoirs.

#### 3.4.3.2 Sensibilité des provisions à la cyclicité macroéconomique

La variable endogène à expliquer consiste en des provisions pour créances douteuses constituées par les établissements bancaires et inscrites dans leurs comptes de résultats trimestriels. Cette variable est normalisée par le total de créances accordées à la clientèle. Enfin, la variable dépendante adoptée est une transformation logistique du ratio précédent ( $prov_{it}$ )<sup>30</sup>. Les variables explicatives, de nature macroéconomique, englobent le taux de croissance trimestrielle du PIB réel de la zone euro ( $\Delta pib_t$ ), le taux de chômage au Luxembourg ( $\Delta u_t$ ), le niveau du taux d'intérêt Euribor à trois mois ( $i_t$ ), le niveau du taux de change euro-dollar ( $exr_t$ ) et le taux de variation de l'indice des prix de l'immobilier au Luxembourg ( $\Delta ipi_t$ ). La particularité des variables macroéconomiques considérées est de permettre de capter l'impact de la cyclicité de l'économie sur le niveau des provisions. Ainsi, la baisse du produit intérieur brut, des prix de l'immobilier, du taux de change euro/dollar, la progression du taux de chômage et des taux d'intérêt sont susceptibles d'exercer un effet stimulant sur l'ascendance des provisions pour créances.

Du côté des variables explicatives spécifiques aux banques, les éléments contribuant à la formation des provisions, à savoir les créances douteuses, les biens immobiliers obtenus par les banques et non affectés à leur activité sont supposés capter l'exposition aux risques de crédits; tandis que l'importance des profits avant la déduction des provisions et des taxes reflète le comportement des banques en matière de lissage des profits par l'intermédiaire des provisions. Le signe

attendu de cette dernière variable serait négatif dans la mesure où la constitution des provisions bancaires est contra-cyclique.

Le coefficient du PIB est précédé du signe attendu. Il est par ailleurs statistiquement significatif dans l'ensemble des spécifications dynamiques. Ceci laisse présager que la progression du produit intérieur brut de la zone serait un facteur de baisse des niveaux des provisions bancaires. Dans le modèle statique, le paramètre relatif au taux d'intérêt est négatif et statistiquement significatif pour les petites banques; tandis qu'il est positivement significatif pour des grandes banques. Cependant, il demeure non-significatif dans la régression relative à l'ensemble du panel. Autrement dit, la progression des taux d'intérêt à court terme affecte positivement le niveau des provisions pour les créances accordées par les grands établissements bancaires. La négativité de ce coefficient pour les petites banques est problématique dans la mesure où la progression des provisions est souvent associée à la progression des taux d'intérêt. Une explication potentielle à ce résultat est que la constitution des provisions dans les petites banques est plutôt contra-cyclique. La vraisemblance d'une telle explication est renforcée par le fait que les paramètres du PIB et du chômage sont statistiquement non-significatifs. En fait, la progression des taux d'intérêt est souvent en phase avec le cycle économique et un taux d'intérêt affecté d'un signe négatif serait une indication de la contra-cyclicité dans la constitution des provisions. Quant aux résultats issus du modèle dynamique, l'ensemble des paramètres afférents aux taux d'intérêt sont précédés d'un signe négatif, mais ils demeurent statistiquement non-significatifs.

Les paramètres associés au taux de change euro/dollar sont affectés d'un signe négatif et statistiquement significatifs dans les estimations afférentes aux grandes banques et à l'ensemble des banques. Par conséquent, l'appréciation du taux de change est synonyme de baisse des provisions.

Les coefficients du taux de chômage sont statistiquement significatifs dans la majorité des spécifications estimées. Cependant, ce résultat est problématique dans la mesure où le signe des paramètres est non conforme à nos attentes. Il y a lieu de noter que le chômage n'a pas d'influence directe sur le niveau des provisions, mais il est introduit dans les régressions en tant qu'indicateur du cycle économique au Luxembourg. Le taux de chô-

30 La transformation logistique  $\text{logit}(x) = \log \frac{x}{1-x}$  est souvent adoptée dans les analyses dédiées à l'explication de l'évolution des provisions pour créances douteuses. Cette transformation conduit à une relation non-linéaire, qui améliore sensiblement la qualité de l'ajustement de la régression.

mage est souvent introduit dans les estimations en tant qu'indicateur de la phase actuelle du cycle, tandis que le taux de croissance du PIB serait, plutôt, un indicateur du degré de la variation du cycle. Etant donné que l'activité bancaire de la majorité des banques luxembourgeoises est dictée par la conjoncture économique extérieure, la constitution des provisions pour les créances serait plutôt contra-cyclique par rapport au cycle dans lequel se trouve l'économie luxembourgeoise et cyclique par rapport au cycle de la zone euro<sup>31</sup>.

L'impact des prix de l'immobilier sur le niveau des provisions est négatif et significativement différent de zéro dans les estimations conduites sur l'ensemble du panel et dans celles appliquées aux données des grandes banques. Ce résultat est cohérent avec l'interprétation avancée précédemment pour la marge d'intérêt bancaire. Ainsi, durant les périodes de progression des prix de l'immobilier, le crédit bancaire est facilité et la constitution des provisions fléchit. A l'inverse, leur baisse serait un frein à l'obtention de crédits et un facteur de progression des provisions pour les crédits accordés durant les phases précédentes.

Quant aux paramètres afférents aux variables spécifiques aux banques, ils sont en grande partie, positifs et conformes aux attentes.

#### 3.4.3.3 Sensibilité des revenus de transactions et de commission aux chocs financiers et monétaires

Une autre source de revenus et de profit pour les banques sont les revenus nets dits de transactions et de commissions. Il semble que la volatilité de ces revenus s'explique principalement par les performances des marchés financiers. Les niveaux des taux d'intérêt sont susceptibles d'exercer une influence sur l'importance des revenus issue de l'activité de marché et d'intermédiation des établissements bancaires, cependant notre intérêt se porte sur l'impact de l'évolution de la valeur des indices boursiers sur le niveau des revenus nets des transactions et de commissions. Ce choix tient simplement au fait que l'augmentation des prix des actifs financiers est un facteur de stimulation des revenus de transactions et du volume des affaires génératrices de commissions. Si ce postulat est correct, la progression des cours des indices boursiers devrait se traduire par une progression des revenus issus de ces deux segments de l'activité bancaire. Afin d'évaluer l'effet des indices boursiers sur ces derniers, des régressions séparées pour chaque composante furent réalisées.

D'une manière générale, les signes des paramètres estimés sont conformes à nos attentes. Il ressort que la progression des taux de rendement de l'indice européen affecte positivement les revenus nets de transactions, tandis que la hausse des taux d'intérêt de court terme leur serait préjudiciable. Notons que les coefficients positifs relatifs à l'impact de la variation de l'indice boursier sur l'importance des revenus de transactions des grandes banques son statistiquement non-significatifs dans les deux spécifications statique et dynamique. Le coefficient de la variation des taux d'intérêt révèle un lien négatif et statistiquement différent de zéro au seuil de confiance de 5% dans toutes les régressions dynamiques. En d'autres termes, cela signifie que contrairement à la marge d'intérêt où le risque de taux est neutralisé par une gestion appropriée de l'actif et du passif bancaire, les effets de celui-ci demeurent opérationnels et affectent négativement les revenus générés à travers l'activité du marché financier. Quant aux estimations afférentes aux revenus issus des commissions, les résultats obtenus mettent en évidence un lien statistiquement significatif entre l'indice boursier et les revenus nets de commissions.

En regroupant les effets marginaux issus de ces deux estimations, il ressort qu'une baisse de 10% de l'indice boursier se traduit par une réduction moyenne des revenus nets trimestriels de transactions et de commissions des banques luxembourgeoises de près de 10%. L'impact du choc paraît plus important pour les grands établissements bancaires (31%) que pour les petites banques. L'effet de la progression des taux d'intérêt sur les revenus de transactions et de commissions, paraît relativement limité. Une progression de 100 points de base des taux d'intérêt à court terme se traduirait par une baisse moyenne des revenus nets de près de 6%. L'effet marginal individuel pour chaque catégorie de banques est moins fort. Il est limité à 3% pour les grandes banques et à près de 2% pour les petites banques. On peut donc penser que les revenus de commissions et de transactions des banques luxembourgeoises sont beaucoup plus sensibles aux chocs des marchés boursiers qu'aux chocs monétaires.

#### 3.4.3.4 Sensibilité des profits bancaires aux chocs macro-économiques

De la même manière que les soldes intermédiaires précédents, la profitabilité bancaire est supposée être expli-

31 Ce résultat soulève la problématique de la concordance entre le cycle européen et le cycle luxembourgeois. Cependant, cette problématique dépasse le cadre fixé de cette analyse.

quée par des variables de nature macro-économique et de variables endogènes ou spécifiques à chaque établissement bancaire. Dans notre analyse les variables macroéconomiques susceptibles d'expliquer la variabilité des profits bancaires sont le taux de croissance trimestrielle du PIB de la zone euro, le taux de rendement de l'indice européen DJE stoxx, le taux d'intérêt euribor à 3 mois et le taux de chômage observé au Luxembourg, tandis que les variables spécifiques sont limitées à des variables proxy des risques monétaires et financiers pris par chaque banque.

Le scénario adopté pour simuler la sensibilité de la rentabilité des banques luxembourgeoises aux chocs macroéconomiques est reflété par:

- une progression de 100 points de base des taux d'intérêt de court terme,

- une baisse du taux de croissance du PIB trimestriel de 10% par rapport au trimestre précédent,
- une baisse de 10% de l'indice boursier européen DJE Stoxx.

Les résultats de cet exercice sont affichés dans le tableau ci-dessous. Ils révèlent, par ailleurs, que l'effet de la progression des taux d'intérêt sur les profits des banques luxembourgeoises demeure négligeable. Ce fait serait synonyme d'une gestion appropriée des banques de leur risque de taux de court terme<sup>32</sup>. Par contre, les répercussions d'un fléchissement de l'activité économique et d'un choc boursier négatif sur les profits des banques luxembourgeoises semblent, dans une certaine mesure, poser un défi pour les banques.

**Tableau 39 L'effet marginal sur les profits des banques %\***

Modèle	Petites banques		Grandes banques		Ensemble des banques	
	Statique	Dynamique	Statique	Dynamique	Statique	Dynamique
$\Delta i$ : +100 pb	-0,33	-1,75	-0,01	-1,44	-0,12	-0,96
$\Delta$ PIB: -10%	-2,88	-14,31	-1,40	-5,14	-2,42	-10,6
$\Delta$ pieu: -10%	-0,49	-2,70	-19,15	-1,30	-14,56	-7,50

\* Moyenne pondérée selon la part de surplus du capital de chaque banque à l'intérieur de sa catégorie. Le surplus de capital est défini comme étant la différence entre les fonds propres éligibles et exigés. (pb) signifie points de base.

### 3.4.3.5 Conclusion

L'objectif visé dans cette analyse était de quantifier les répercussions de chocs macroéconomiques sur les performances de banques luxembourgeoises en matière de marge d'intérêt, de constitution de provisions, de commissions et de rentabilité. L'étude de Lehmann et Manz (2005) pour les banques suisses a servi de point de départ. D'une manière globale, cette analyse nous a amené à évaluer la sensibilité des banques luxembourgeoises à la fois au risque de taux de court terme, aux chocs négatifs sur le marché boursier et à une baisse de l'activité économique au sein de la zone euro. Les résultats empiriques obtenus supportent la solidité du secteur bancaire face aux changements de son environnement macroéconomique, de sorte que les risques d'une instabilité financière liée à des chocs monétaires, financiers ou de l'économie réelle sont contenus et peu probables.

32 Il y a lieu de noter que même si les rendements des actifs et du passif s'adaptent aux variations des taux de court terme, les banques ne sont pas immunisées contre les risques de la déformation de la courbe des taux dont les répercussions produisent des effets différents sur l'actif et le passif.



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## 2 LA PLACE FINANCIERE: EVOLUTION 10

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