



LEASEUROPE

## Recovery Rates in the Leasing Industry

by

Mathias Schmit and Julien Stuyck<sup>1&2</sup>

### *Abstract*

This paper is devoted to a range of issues concerning leasing recovery rates and is the first study based on such a wide set of data providing empirical results at the European market level. We have calculated recovery rates from a database comprising 37,259 defaulted lease contracts issued between 1976 and 2002 by 12 major European financial institutions. The recovery rates are estimated for three types of assets and are segmented according to the maturity and the age of the lease contracts. Furthermore, we compare our results with recovery rates for bonds and bank loans presented by seniority class. We have also tested the independence of recovery rates from economic conditions. This study provides useful information on the current Basel Capital Proposal, which considers recovery rates as a major input into its advanced Internal Rating-Based Approach.

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<sup>1</sup> Leaseurope  
Avenue de Tervueren, 267  
B-1150 Brussels.  
Email: m.schmit@leaseurope.org

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## ***- Executive Summary -***

In spite of the importance of leasing as a mean of financing, little is known empirically about its credit risk. In view of the challenges that financial institutions and supervisors are facing in the context of the New Basel Capital Accord, this study aims to provide useful empirical and quantitative information about recovery rates for defaulted lease contracts. This should contribute to further developing a credit risk model for leasing businesses and lead to a fair treatment of the leasing sector under the New Basel Capital Accord.

Data were collected with the support of a working group set up by LEASEUROPE and comprising members of various European companies that undertook to provide data concerning defaulted contracts in the European leasing sector. As a result of this collaboration, our sample consists of a unique set of 37,259 individual defaulted leasing contracts issued between 1976 and 2002 (most of them between 1990 and 2000) and originating from 12 major European companies in six different countries.

The analysis is carried out for three types of assets: automotive (car, trucks, busses, etc.), industrial and business equipment, and real estate. The approach chosen for the estimation of recovery rates in these three segments can be called conservative. Indeed, rates are discounted at a 10% yearly rate of return in order to appraise the time lag between the date of default and the date of recovery from resale as well as other recovery dates. Moreover, rates are weighted on the basis of the outstanding amounts at default. These rates tend to be lower than the unweighted ones as the latter are strongly affected by high recovery rates.

In addition to the analysis by type of asset, more detailed analyses were conducted per country, taking into account maturity, default year, original value of the leased asset and age of contract.

As far as the **automotive segment** is concerned, it appears that rates vary greatly even though they are generally high. When considering only recoveries from leased asset sales, recovery rates vary between 45.9% (in France) and 84.3% (in Austria). When other kinds of recovered amounts are taken into account, the rates range from 64.8% (Italy) to 96.4% (Austria). The share of the leased asset sales in the total recovery value is often very large, ranging from 63.5% (France) to 99.8% (Sweden). The results of a more detailed analysis tend to show that, except for Austria, recovery rates increase with the age of contracts (up to a certain point after which they decrease sharply) and that they are independent of the default date (except for France). It therefore appears that recovery rates are generally not influenced by economic cycles.

For the **industrial and business equipment segment**, results are more heterogeneous and considerable differences are found between countries: when we consider recoveries from asset sales only, the average recovery rates vary between 14.6% (Austria) and 72.9% (Sweden). Recovery rates taking into account all recoveries are of course higher, ranging from 44.7% (Italy) to 73.8% (Sweden). The impact of asset sales on

total recoveries thus ranges from 29.4% (Austria) to 98.9% (in Sweden). It should be noted that a large proportion of these differences among countries could be explained by the type of asset included in companies' leasing portfolios. However, further research is required to reveal the full extent of these differences. As regards the automotive segment, detailed analysis shows that losses given default tend to decrease with the age of the contract. In the equipment segment, the results do not appear to be sufficiently significant to establish whether or not recovery rates are influenced by the economic environment.

The results given for the **real estate segment** should be regarded only as indicative because of the lack of sufficient data (only 108 defaulted contracts). Recovery rates for this segment vary between 53% (Austria) and 93.6% (Belgium) when asset sales only are taken into account, and between 56.1% (France) and 94.7% (Belgium) when all recoveries are included. This means that the share of the leased asset sales in the total recovery value ranges from 76.8% (Austria) to 94.7% (Belgium).

The comparison of the recovery rates estimated in this study with the recovery rates for corporate bonds and loans shows that leasing is a safer financial product. Indeed, the rates for the automotive and real estate segments are comparable with those for the best senior secured bonds while the rates for the equipment segment, though lower, are still above those for senior unsecured bonds.

## ***1) Introduction***

In 2001, the volume of *new business* in the leasing sector rose to more than €193 billions, which represents an 8.5% increase in real terms in comparison with the previous year. *Real estate* leasing accounted for more than €34 billions (i.e. 24% more than in 2000) while *equipment leasing* rose to more than €159 billions (i.e. 9% more than in 2000). It should be noted that between 1994 and 2001 the leasing sector experienced a good cycle of development, with yearly growth rates averaging 13%.

On the basis of LEASEEUROPE's figures, the estimated penetration rate of leasing in comparison with total investments in fixed assets (i.e. the share of investment expenditure financed by leases) reached 12%. When we consider equipment expenditure only, the equipment leases/equipment expenditure ratio lies above 15%. Leasing is currently a significant source of finance, especially for small and medium-sized companies.

In spite of the importance of leasing as a means of financing, little is known empirically about credit risk although as a financial activity, leasing falls within the scope of the Basel Committee's proposals for measuring the appropriate capital requirement to achieve protection against systemic risk.

A consultative document (New Accord) released in June 1999 by the Basel Committee aimed to provide a number of approaches that would be more comprehensive and more sensitive to risks than the 1988 Accord. The new proposal seeks to ensure that capital requirements reflect the underlying risks more adequately. A second detailed document (called Consultative Paper 2 - CP2) was released in January 2001 and a third consultative paper is expected to be published early in 2003. It is expected that the New Accord will replace the old Accord (1988) as from 31 December 2006.

CP2 comprises three kinds of approach: the Standardised Approach, the Internal Rating-Based (IRB) Foundation Approach and the Advanced IRB Approach. In the Standardised Approach, risk-weight for capital adequacy is evaluated on the basis of the credit rating from agencies; in the other two approaches, financial institutions choose to use their own rating systems. The main differences between the IRB Foundation Approach and the Advanced Approach are the calculations of loss given default, maturity and exposure at default. In the Foundation Approach, only the probability of default by borrowers has to be reliably estimated (other parameters are set by regulators) whereas, in the Advanced Approach, loss given default, exposure at default and maturity have to be estimated additionally by banks.

However, the final update of the Accord should be preceded by a discussion about the level of capital holdings enabling the desired trade-off between protection against systemic risk, on the one hand, and the dynamism and welfare of the financial sector, on the other. Indeed, while it is essential to set high standards in order to ensure the stability of financial services in a global market, the specificity of the leasing industry needs to be taken into account.

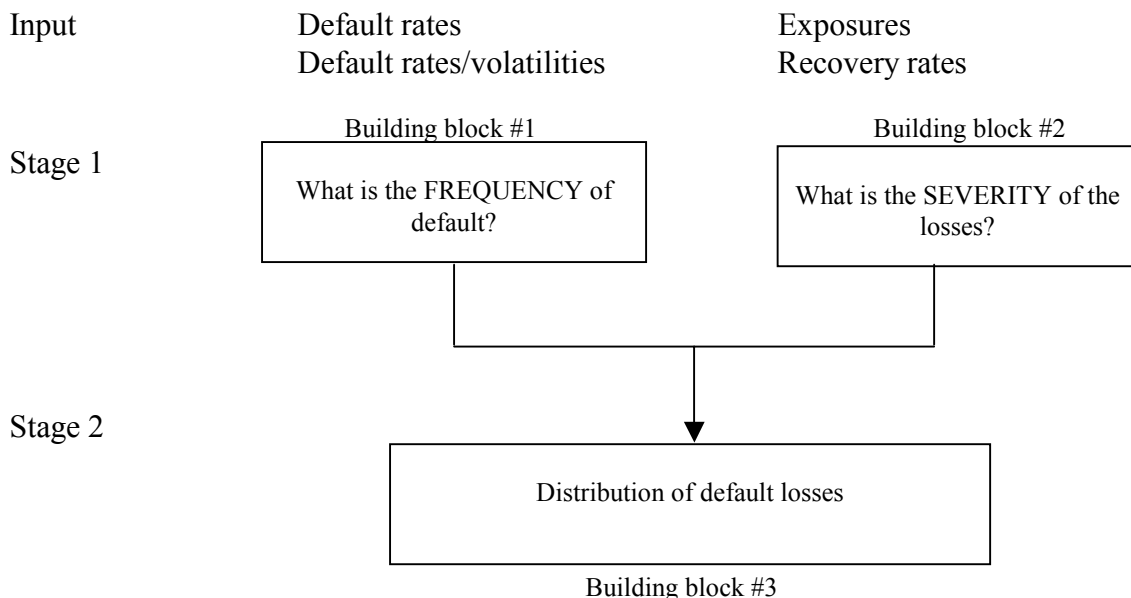
This study aims to provide a comprehensive research report on recovery rates (which represent one of the two major inputs into the IRB Advanced Approach) in the leasing business at European level.

We seek to gather useful quantitative information about recovery rates in defaulted lease contracts, with a view to ensuring a fair treatment of the leasing sector under the New Basel Capital Accord. This research is intended to be a first step towards providing significant empirical and quantitative results that could be used for the further development of an effective credit risk model for leasing business. Considering the challenges that financial institutions and supervisors are facing, it seems essential to collect more reliable data for model calibration and to refine the validation techniques for assessing model accuracy<sup>3</sup>.

Figure 1 schematises the different steps followed to estimate loss distributions on a lease portfolio. It shows that a limited number of inputs are needed so as to estimate the frequency of default and the severity of the losses (stage 1). These estimations in turn lead to the determination of the distribution of default losses (stage 2), which drives significant attention in the context of the New Basel Accord.

This study concentrates on Building block #2. Indeed, it analyses recovery rates in order to assess the severity of losses (Building block #2) taking into account a series of factors that can have an impact on the calculation of losses given default (and therefore on the distribution of default losses – Building block #3). More specifically, these factors include the term-to-maturity, the age and the default date of the contract.

Figure 1: CreditRisk+<sup>TM</sup> risk measurement framework (source: CreditRisk+<sup>TM</sup>)



<sup>3</sup> Beverly, J. et al. 2001, "Using Credit Risk Models for Regulatory Capital: Issues and Options", Federal Reserve Bank of New York Economic Policy Review, March;

The following Section outlines the background to existing studies on the issue. This is followed by Section 3, which explains our methodology to evaluate recovery rates in the various countries studied for different types of asset. Section 4 describes our data while Section 5 provides empirical results. Section 6 compares these results with those estimated for bonds and bank loans. Lastly, we draw some conclusions.

## ***2) Background to existing studies on the issue***

The role of leasing as a means of financing has been the subject of many academic studies, the key question being why companies finance their assets with leasing instead of debt. Leasing is often presented as the only available source of finance for companies facing a “credit crunch”, especially in the case of companies with low returns but considerable growth opportunities. Leasing plays a key role in reducing agency costs for such companies (e.g. see Sharpe and Nguyen (1995); Lasfer and Levis (1998))

Although many studies have been conducted recently in order to measure credit risk and assess the implications of the Basel Committee’s proposals concerning capital requirements, the leasing industry, in spite of its economic importance, has until last year not been the subject of any research to assess the severity of losses in the event of default. In general, past surveys have not considered the peculiarities of the leasing segment. It seems essential, therefore, to gather Europe-wide data on the leasing industry, including, in particular, the recovery rates per category of asset, and to analyse this information with a view to contributing to the debate on capital adequacy.

Two studies have recently been conducted on these aspects. De Laurentis and Geranio (2001) have shown that leasing benefits from a high recovery rate in the event of default, and Schmit (2002) has devoted a study to credit risk modelling issues, focusing on key characteristics of lease portfolios: large size, ownership of the leased assets by the lessors, and limited availability of information about the lessees’ financial situation. Schmit estimates the probability density function of losses and VaR measures in a portfolio of 35,861 automotive leases issued between 1990 and 2000 by a major European financial institution. The results suggest that the current Basel Capital Proposal leads to excessively conservative capital requirements for automotive leasing businesses.

In spite of their interesting results, however, we must keep in mind certain limitations of both studies. Indeed, the first one, by De Laurentis and Geranio (2001), analyses the European market through different segments of assets but is based on a relatively small amount of data and does not consider recovery rates relative to the age of the contract, term-to-maturity and default date. The second study, by Schmit (2002), is limited to the Belgian market and concerns only one company, even though the sample comprises a very large number of data. Moreover, the study concentrates almost exclusively on the automotive segment.

Therefore, more comprehensive and detailed research is required on the European market – examining several companies and using an extensive set of defaulted contracts in several leasing segments – in order to obtain results that would be of greater use to

regulators. Note that this study analyses only one input and that further research should also take probability of default into account to estimate credit risk.

### ***3) Research methodology***

LEASEEUROPE set up a working group of experts from different companies that had agreed to provide data on defaulted contracts in the European leasing sector.

Following the observations of this working group and wishing to contribute to the debate on a capital adequacy framework, LEASEEUROPE decided to conduct some broad-based research on the severity of losses in the leasing industry. A questionnaire, including a set of guidelines to complete it, was therefore sent to companies in order to collect data systematically (please see Appendix 1).

In LEASEEUROPE's survey, a leasing contract is defined as an agreement whereby the lessor conveys to the lessee, in return for a payment or series of payments, the right to use an asset for an agreed period of time. All lease contracts have one thing in common: the lessor retains the legal ownership of the leased asset during the entire period of the lease.

Averages and volatilities of recovery rates are calculated on the basis of individual defaulted lease contracts. A lease contract is defined as defaulted when the company has unilaterally cancelled the agreement because the lessee has failed to make the scheduled rental payments (interests and/or principal). Default does not refer to an interruption of the contract due to any other reason. If the lessee were to surrender the lease, the lessor would recover the leased good. As for other unfulfilled obligations, the lessor would be treated like other creditors as far as any economic loss, unpaid rentals, unpaid fees, and the loss of potential earnings on rentals are concerned.

The recovery rate is calculated as the discounted amounts recovered in comparison with the outstanding amount on the date of default. The discounting, at a (conservatively chosen) 10% yearly rate of return, is done in order to allow for time lags between the date of default and the date of recovery from resale as well as other recoveries dates.

In our research, a segment includes all leases with the same underlying type of assets and a given age. Taking these variables into account is essential since the recovery rate and the exposure at default vary depending on the asset type and the time elapsed since the issuance of the contract.

Moreover, the recovery rates (given in the tables below) are weighted by the outstanding at default except under particular conditions (mentioned as appropriate). The levels of weighted average recovery rates are below those observed for the unweighted data since they are strongly affected by high recovery rates (when the amounts to be recovered are small or when the age of the contract at the time of default is close to maturity). Recovery rates higher than ten times the outstanding value are excluded from our analysis in order to enhance coherence by avoiding extreme values.

In addition to a general investigation into recovery rates in Europe per type of asset, more detailed analyses are conducted per country, taking into account maturity, the default year and the age of the contract.

Several different measurements of the average recovery rates have been calculated, drawing a distinction between recovery from resale only and recovery from resale plus other recovered amounts (such as guarantees, collaterals, debtor's net liquidation and late payments):

RR1nd	recovery rate (not discounted) from resale only
RR1	recovery rate from resale only, discounted at 10% yearly
RR2nd	recovery rate (not discounted) from resale and other recoveries
RR2	recovery rate from resale and other recoveries, discounted at 10% yearly
WRR1nd	recovery rate (not discounted) from resale only, weighted by the outstanding at default
WRR1	recovery rate from resale only, discounted at 10% yearly and weighted by the outstanding at default
WRR2nd	recovery rate (not discounted) from resale and other recoveries, weighted by the outstanding at default
WRR2	recovery rate from resale and other recoveries, discounted at 10% yearly and weighted by the outstanding at default

All amounts are given VAT excluded and the currency used is exclusively the euro.

#### **4) Data**

Our database consists of a unique set of 37,259 individual defaulted lease contracts issued between 1976 and 2002, originating from 12 companies in six European countries and comprising three different kinds of assets: automotive (cars, trucks, busses, etc.), industrial and business equipment, and real estate. A contract number (and/or subcontract number) identifies each contract. The database contains all the relevant information concerning the leases throughout their life. The available variables include the following: the cost and type of asset, the origination, default, recovery and charge off dates of the contract, the maturity of the lease, the value of the outstanding at default, the recovery values (from resale and other sources) and the age of the contract.

Descriptive statistics of the sample are shown in Table 1. Panel A presents the sample by country and type of asset as well as the number of companies that supplied data. Panels B, C, D and E provide descriptive statistics and the frequency distribution, respectively by the issuance date of the lease contract, the cost of the leased asset, the term-to-maturity of the lease, and the age of the contract.



Table 1: Descriptive statistics characterising the sample of 37,259 defaulted lease contracts over the period from 1976 to 2002.

Panel A: Data per country and kind of asset

Country	No. of companies	AU	% of total	EQ	% of total	RE	% of total	Total
Austria	4	3753	10.1%	309	0.8%	50	0.1%	4112
Belgium	1	4639	12.5%	1796	4.8%	3	0.0%	6438
France	2	4515	12.1%	18648	50.0%	18	0.0%	23181
Italy	2	936	2.5%	1815	4.9%	37	0.1%	2788
Luxembourg	1	268	0.7%	121	0.3%	0	0.0%	389
Sweden	2	193	0.5%	158	0.4%	0	0.0%	351
<b>Total</b>	12	14304	38.4%	22847	61.3%	108	0.3%	37259

Panel B: Frequency distribution by issuance date of the lease

Date of issuance	Number of leases	% of total	Cumulative percentage
1976 to 1986	179	0.5%	0.5%
1986	283	0.8%	1.2%
1987	488	1.3%	2.5%
1988	1013	2.7%	5.3%
1989	1652	4.4%	9.7%
1990	3307	8.9%	18.6%
1991	3387	9.1%	27.7%
1992	3021	8.1%	35.8%
1993	2653	7.1%	42.9%
1994	2828	7.6%	50.5%
1995	3484	9.4%	59.8%
1996	3820	10.3%	70.1%
1997	3537	9.5%	79.6%
1998	3266	8.8%	88.3%
1999	2572	6.9%	95.3%
2000	1373	3.7%	98.9%
2001	385	1.0%	100.0%
2002	11	0.0%	100.0%
<b>Total</b>	37259	100.0%	100.0%

Panel C: Frequency distribution by cost of the leased asset

Cost of the asset in €	Number of leases	Percentage of total	Cumulative percentage
0 to 25 000	10577	72.0%	72.0%
25 001 to 50 000	2461	16.8%	88.8%
50 001 to 100 000	1044	7.1%	95.9%
100 001 to 200 000	346	2.4%	98.3%
200 001 to 300 000	71	0.5%	98.7%
300 001 to 400 000	32	0.2%	99.0%
Over 400 000	153	1.0%	100.0%
<b>Total</b>	14684	100.0%	100.0%

NB: Most data for France are not available in this panel.

Panel D: Frequency distribution by term-to-maturity of the lease

<b>Term-to-maturity in months</b>	<b>Number of leases</b>	<b>Percentage of total</b>	<b>Cumulative percentage</b>
0 to 11	251	0.7%	0.7%
12 to 23	752	2.0%	2.7%
24 to 35	1990	5.3%	8.0%
36 to 47	7853	21.1%	29.1%
48 to 59	11871	31.9%	61.0%
60 to 71	12963	34.8%	95.8%
Over 71	1579	4.2%	100.0%
<b>Total</b>	<b>37259</b>	<b>100.0%</b>	<b>100.0%</b>

Panel E: Frequency distribution by age of the lease

<b>Age of the contract in months</b>	<b>Number of leases</b>	<b>Percentage of total</b>	<b>Cumulative percentage</b>
0 to 11	5743	15.4%	15.4%
12 to 23	10529	28.3%	43.7%
24 to 35	9961	26.7%	70.4%
36 to 47	6138	16.5%	86.9%
48 to 59	3075	8.3%	95.1%
60 to 71	919	2.5%	97.6%
Over 71	894	2.4%	100.0%
<b>Total</b>	<b>37259</b>	<b>100.0%</b>	<b>100.0%</b>

Our sample concerns contracts with a date of issuance between 1976 and 2002. Nevertheless, about 89% of the data are concentrated between 1990 and 2000. Furthermore, as regards the original value of the leased asset, 72% of contracts show an initial cost below €25,000 (and 88.8 % below €50,000). Such a high percentage can be explained by the fact that 38.4% of all contracts consist of automotive contracts. 66.7% of contracts have a term-to-maturity between 48 and 71 months. A lease contract with a 0-month term-to-maturity is originated for stock financing purposes. Panel E gives the frequency distribution by age of the lease (the number of months between the start date and the default date of the contract). 86.9% of contracts have an age below 48 months.

It should also be pointed out that less data are available for 2001 and 2002, since our database consists only of written off contracts (when the contract is cancelled from the lessor's books and no further recovery is expected).

The highest figures for the original value of the asset, the term-to-maturity and the age of the contract are respectively €65,594.119, 999 months and 259 months. These high values are exceptional and concern real estate or aviation assets.

## **5) Results**

In analysing the results, we proceeded by segment. For each segment, we firstly analysed the characteristics per country and then studied recovery performance.

## 5.a) Automotive segment

### 5.a.i) Segment characteristics

The characteristics examined for different countries as regards the automotive sector are given in Table 2. The high figures for Italy and France (e.g. in comparison with Sweden) in respect of the average original value of the leased asset are due to the fact that these data include more contracts for other kinds of automotive (trucks, busses, etc.) whose original value is typically higher than that of cars. The outstanding at default/original asset value ratio (see Table 2) ranges from 40.6% in Austria to 72.9% in Sweden. The differences are thus quite high and imply that the amount to be recovered compared to the original value of the asset is lower in Austria than in Sweden.

The average term-to-maturity varies between 34.6 months in Italy and 50.9 months in Austria. Belgium, France and Luxembourg show fairly similar values for the average term-to-maturity and age of contract. Furthermore, default generally seems to occur towards the halfway point of the term-to-maturity. The average time between default and charge off date shows the lag between the default date and the charge off date (when the contract is cancelled from the lessor's book and no further recovery is expected). The differences between countries are considerable but might be due, in part, to different accounting practices in the companies studied.

Table 2: Characteristics of the automotive segment per country

Country	Average leased asset original values in €	Outstanding at default/original asset value ratio	Average term-to-maturity in months	Average age of contract in months	Average time between default and charge off date in months
Austria	18,471	40.6%	50.9	24.1	20.8
Belgium	22,319	71.7%	49.3	25.4	9.8
France	29,009 <sup>4</sup>	53.2% <sup>5</sup>	49.6	28.2	13.6
Italy	27,151	54.3%	34.6	27.8	14.0
Luxembourg	26,419	60.7%	42.5	23.6	8.9
Sweden	16,743	72.9%	38.0	18.4	2.6

### 5.a.ii) Recovery rates

#### 1) Overall performance

The two following tables show recovery rates per country in the automotive segment. Rates are not discounted in Table 3 while they are in Table 4. It appears immediately that rates vary greatly even though they are generally high. When we consider only recoveries from leased asset sales, the ratio (in Table 3) varies between 48.6% (France) and 85.8% (Austria). When other kinds of recovered amounts are taken into account, recovery rates lie between 69.2% (Italy) and 98.5% (Austria).

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<sup>4</sup> This figure for France is based on 111 data only.

The last column, showing the WRR1nd/WRR2nd ratio, represents the share of the leased asset sales in the total recovery value. This share ranges from 63.5% (France) to 99.8% (Sweden). In other words, other kinds of recoveries (guarantees, collaterals, debtor's net liquidation and late payments) have a greater impact on recovery rates in France than in Sweden, where this impact seems almost negligible. Note that these empirical results should be crosschecked by means of further inquiries.

Volatility, as represented by the standard deviation, is lowest in Sweden (23.9% for WRR1nd) and highest in Austria (112.3% for WRR1nd). This high level is due to the fact that there is a wide dispersion of rates in Austria, with notably quite a large number of data showing a recovery rate above 100%.

Table 3: Average recovery rates per country weighted by the outstanding value

Country	N	WRR1nd (not discounted)		WRR2nd (not discounted)		WRR1nd/WRR2nd
		AVG	STD	AVG	STD	
Austria	3753	85.8%	112.3%	98.5%	106.0%	87.1%
Belgium	4639	72.6%	41.4%	90.7%	47.6%	80.1%
France	4159	48.6%	41.5%	76.5%	47.1%	63.5%
Italy	936	51.3%	40.8%	69.2%	45.6%	74.2%
Luxembourg	268	77.5%	25.5%	91.8%	24.1%	84.4%
Sweden	193	82.8%	23.9%	82.9%	23.9%	99.8%

WRR1 includes the recovery value from resale only.

WRR2 contains the previous rate plus other types of recovery such as guarantees and collaterals.

In order to take into account the time lags between the default date and the recovery date, the next table (Table 4) shows the discounted amounts at a 10% yearly rate. Comparison with Table 3 enables us to assess the impact of time lags in the recovery procedure.

The order between countries remains the same in both tables and for both rates. Furthermore, the WRR1/WRR2 ratio (showing the share of the asset resale in the total recovery value) is similar to that in Table 3. We will work therefore only with the discounted recovery rates since they take into account the time lag between the default and recovery dates.

Table 4: Average recovery rates per country, discounted at 10% yearly and weighted by the outstanding value

Country	N	WRR1		WRR2		WRR1/WRR2
		AVG	STD	AVG	STD	
Austria	3753	84.3%	110.3%	96.4%	104.3%	87.4%
Belgium	4639	69.7%	40.4%	85.6%	45.2%	81.3%
France	4159	45.9%	39.8%	69.8%	41.6%	65.8%
Italy	936	48.7%	39.4%	64.8%	42.6%	75.2%
Luxembourg	268	77.0%	25.6%	91.3%	24.8%	84.3%
Sweden	193	81.5%	23.9%	81.6%	24.0%	99.9%

It appears immediately that recovery performance is generally high. It is important to note that WRR2 is always higher than 64% (the lowest value is 64.8% in the case of Italy). In both tables and for recovery from resale only (WRR1), the lowest rate is found

in France (45.9%) and the highest in Austria (84.3%). However, France partly offsets this difference by showing a better rate when all types of recoveries are included (WRR2), thus overtaking Italy. Moreover, the French data on WRR2 comprise procedure costs, which tend to underestimate WRR2 slightly. If we eliminate the impact of such procedure costs, we would obtain a WRR2 = 77.9%, i.e. closer to the values for Belgium and Sweden.

## 2) Recovery rates and age of the lease

A more detailed analysis of these rates is desirable since the outstanding value as well as the resale value of the asset decrease over the term of the lease. To take this aspect into account, we must examine the possible correlation between the rates and the age of the contract. Thus, following the general opinion of managers, we split our sample into three different groups: the first includes leases with a maturity of less than one year (stock financing), the second includes leases with a maturity between 12 and 48 months, and the third consists of leases with a maturity over 48 months. For each group, we observe how the recovery rate varies depending on the age of the contract. Such a detailed analysis is possible thanks to the large number of data available.

Table 5: WRR1 by country, relative to the age of the contract and term-to-maturity

Term-to-maturity in months	Age of the contract	Austria		Belgium		France		Italy		Luxembourg		Sweden	
		N	WRR1	N	WRR1	N	WRR1	N	WRR1	N	WRR1	N	WRR1
0 to 11	0 to 11	27	1.1%	3	91.4%	6	78.2%	43	64.5%	2	96.1%	0	-
12 to 48	0 to 11	496	96.5%	502	64.7%	308	48.5%	44	30.3%	48	80.2%	69	84.2%
	12 to 23	585	93.2%	909	70.6%	908	44.8%	251	52.6%	73	75.2%	65	80.8%
	24 to 35	413	99.5%	806	74.1%	998	52.5%	279	56.5%	60	77.5%	30	77.4%
	36 to 47	204	80.2%	333	83.0%	532	69.5%	116	47.1%	27	67.5%	11	97.7%
	48 to 59	42	64.8%	62	76.9%	35	86.6%	14	5.6%	7	40.0%	0	-
Over 48	0 to 11	373	82.5%	268	67.7%	124	35.5%	7	42.9%	4	80.8%	0	-
	12 to 23	562	81.7%	554	65.6%	351	39.6%	33	35.3%	17	67.7%	7	60.7%
	24 to 35	454	72.4%	510	68.5%	354	44.7%	16	44.8%	12	92.6%	2	107.4%
	36 to 47	297	73.4%	357	76.4%	279	49.3%	27	38.9%	8	82.0%	2	66.8%
	48 to 59	184	77.6%	220	84.3%	195	55.6%	33	40.2%	7	55.4%	6	81.4%
	60 to 71	103	73.6%	49	48.3%	25	12.6%	10	31.8%	2	89.8%	1	91.8%
	Over 71	7	91.6%	8	61.3%	37	2.1%	14	9.9%	0	-	0	-
<b>Total</b>		3747	84.3%	4581	69.7%	4152	45.9%	887	48.7%	267	77.0%	193	81.5%

Several aspects of Table 5 should be remarked. Firstly, the amount of data for Luxembourg and Sweden is not large enough to be fully relevant. Secondly, as regards the first term-to-maturity group (stock financing contracts), we should note that there are few contracts but also that recovery rates are generally high (except for Austria). Thirdly, when we examine the other two term-to-maturity groups (12 to 48 months and over 48 months), it appears that rates tend to increase with the age of the contract. This rise is obvious until a certain point (around 36 to 47 months for the second term-to-maturity group, and 48 to 59 months for the third group), then the recovery rates decrease sharply (but this decline concerns few data compared to the previous age

groups). On the other hand, this trend is not apparent in Austria; its rates do not seem to increase with the age of the contract (in spite of being high for each segment studied).

In other words, Table 5 shows that the amount to be recovered in the event of default drops faster than the resale value of the leased asset. As shown in Schmit (2002), this will affect marginal total losses (and thus capital requirement), which diminish with time after origination since the probability that the amount recovered exceeds the outstanding at default increases (in such a case, WRR1 is higher than 100%).

Table 6: WRR2 by country, relative to the age of the contract and term-to-maturity

Term-to-maturity	Age of the contract	Austria		Belgium		France		Italy		Luxembourg		Sweden	
		N	WRR2	N	WRR2	N	WRR2	N	WRR2	N	WRR2	N	WRR2
0 to 11	0 to 11	27	61.9%	3	90.4%	6	96.0%	43	69.5%	2	102.7%	0	-
12 to 48	0 to 11	496	110.8%	502	77.0%	308	77.1%	44	38.2%	48	92.8%	69	84.2%
	12 to 23	585	108.2%	909	85.6%	908	73.6%	251	66.5%	73	93.6%	65	81.1%
	24 to 35	413	110.5%	806	93.6%	998	73.0%	279	74.4%	60	92.6%	30	77.4%
	36 to 47	204	89.5%	333	119.0%	532	70.6%	116	70.8%	27	97.9%	11	97.7%
	48 to 59	42	64.8%	62	121.4%	35	47.1%	14	8.2%	7	101.8%	0	-
Over 48	0 to 11	373	95.5%	268	81.8%	124	59.0%	7	51.6%	4	93.7%	0	-
	12 to 23	562	94.6%	554	81.5%	351	62.7%	33	43.4%	17	72.8%	7	60.7%
	24 to 35	454	85.0%	510	81.5%	354	70.0%	16	69.3%	12	99.0%	2	107.4%
	36 to 47	297	79.4%	357	91.3%	279	70.8%	27	59.5%	8	93.9%	2	66.8%
	48 to 59	184	81.2%	220	110.9%	195	70.1%	33	74.9%	7	102.0%	6	81.4%
	60 to 71	103	73.6%	49	160.1%	25	47.6%	10	81.1%	2	105.9%	1	91.8%
	Over 71	7	91.6%	8	80.1%	37	35.0%	14	63.4%	0	-	0	-
<b>Total</b>		3747	96.4%	4581	85.6%	4152	69.8%	887	64.8%	267	91.3%	193	81.6%

The behaviour of WRR2 in Table 6 is quite similar to that of WRR1 in Table 5. In fact, the rates grow with the age of the contract until a “limit” is reached as in Table 5, but this trend is not apparent in Austria. It should also be noted that the recovery rate for less-than-one-year contracts (stock financing) in Austria is by far better than in the previous table; other types of recovery compensate for the weak value of recovery from resale.

We may also assess the impact of other kinds of recoveries as we did in Tables 3 and 4: on average, the share of other kinds of recoveries in the total recovery ranges from 0.1% (Sweden) to 36.5% (France). Furthermore, the calculated WRR2 is above 100% in some segments in Austria, Belgium and Luxembourg.

### 3) Does the recovery rate depend on the default date?

The resale value of the leased asset as well as secondary markets might be influenced by economic conditions. In order to check this hypothesis, we performed a **Kruskal-Wallis test** for each country.

In the presence of several independent samples, the Kruskal-Wallis test is extremely useful for deciding whether or not the samples originate from different populations. It is

one of the most powerful non-parametric tests (which assume neither homogeneity of variance nor a normal distribution). It tests the hypothesis (called the null hypothesis) that the samples originate from the same population by examining the ranks of the observations (the observations of the samples are categorised from the smallest to the highest value). Indeed, if the groups do originate from the same population, they will have the same distribution and their rank distributions will be similar. When the significance level of the test is weak (in our case, below 5%), the null hypothesis that the samples have the same distribution will be rejected.

In our case, the null hypothesis means that recovery rates are independent of the default date over the period under consideration. Each sample represents a year of default. According to the null hypothesis, recovery rates should be relatively similar for each of the samples.

As it was done when studying recovery rates in relation to the age of the contract, we will here proceed by splitting the sample into the same three term-to-maturity groups (0 to 11, 12 to 48, and over 48 months). We performed the test for each age group inside those three groups. This procedure eliminates the influence of age and maturity on recovery rates and allows us to focus mainly on the impact of the default date.

The results of the Kruskal-Wallis test<sup>5</sup> seem to show that in general we cannot reject the null hypothesis (at a probability  $\alpha = 5\%$ ) even if it should be rejected for some segments. In other words, recovery rates do not seem to depend on the default date. Nevertheless, it seems necessary to reject the null hypothesis in the case of France.

As we need more results to reach a conclusion, we decided to try a different approach: we separated the 1992-2000 period into two shorter periods, corresponding respectively to a rather difficult economic environment (1992 to 1996) and a period of average economic growth (1997 to 2000). We then performed the Kruskal-Wallis test once again to determine whether recovery rates were influenced by downturns or better times.

The test was performed only for Austria, Belgium and France<sup>6</sup> because other countries did not have default dates falling within the first period (1992-1996). In the case of Austria and Belgium, the results confirm the first test, suggesting that we cannot reject the null hypothesis (at a probability  $\alpha = 5\%$ ). However, the situation is more ambiguous in the case of France: the results of the test would lead us to reject the null hypothesis for RR1 (recovery rate from resale only) and to retain it for RR2 ( $RR2 = RR1 + \text{other recoveries}$ ). We drew a graph showing the evolution of RR1 and RR2 (for the automotive segment) in relation to default dates and economic growth in France<sup>7</sup> to appraise the situation more clearly. It appears that while RR2 is relatively constant during the studied period (1990-2000), RR1 shows a continuing improvement over time. Considering that the data for France come mainly from one company, the evolution of RR1 is explained by an improvement in the effectiveness of the company's recovery policy.

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<sup>5</sup> See the six tables (one per country) in Appendix 2.

<sup>6</sup> The three relevant tables are shown in Appendix 3.

<sup>7</sup> See Appendix 4.

In conclusion, despite the reservations we expressed in the case of France, it appears that recovery rates on automotive leases are generally *not* influenced by economic cycles since both of the Kruskal-Wallis tests performed by us tended to confirm the null hypothesis over the studied period.

### 5.a.iii) Recovery rates above 100%

Some results show recovery rates above 100%. Although this may seem counter-intuitive, such rates are not irrelevant since they are due to the fact that the resale value of the leased asset can sometimes be higher than the outstanding amount at default. The frequency of these 100%+ rates depends on the country studied. In some countries (basically Austria and Belgium) such rates are relatively frequent and in others very rare. Different recovery policies and procedures explain these discrepancies between countries.

However, we examined the behaviour of these rates (when their number was large enough) and strove to establish whether they followed the same pattern as other recovery rates.

Table 7 shows the recovery rates that exceed 100% in the automotive segment. In other words, the WRR1 shown here is calculated from contracts with a discounted asset resale value higher than the outstanding at default while WRR2 comprises data with an *overall* recovery (discounted asset resale value plus other recoveries) higher than the outstanding at default.

It is noteworthy that the highest values for both WRR1 and WRR2 are found in Austria (206.7% and 206.1 respectively), while the lowest for WRR1 is found in Luxembourg (106.9%) and the lowest for WRR2 in France (100.8%). The fourth column in the table represents the proportion of contracts (out of the total number for each country) with WRR1 above 100% while the last column represents the proportion with WRR2 above 100%. We note immediately that the proportion of leases with both rates above 100% is much higher in Austria (48,6%) and Belgium (19,8%) than in France (0,7%). The small number of contracts with rates above 100% in France can be explained by the fact that, as previously mentioned, the French WRR2 data take into account procedure costs and this may lead to an underestimation of WRR2.

Table 7: Recovery rates above 100%

Country	WRR1		% of contracts with WRR1>100%	WRR2		% of contracts with WRR2>100%
	AVG	STD		AVG	STD	
Austria	206.7%	140.7%	48.6%	206.1%	140.5%	48.7%
Belgium	126.3%	52.3%	19.8%	126.8%	57.5%	38.8%
France	138.6%	62.5%	0.7%	100.8%	4.6%	2.1%
Italy	130.6%	57.1%	9.9%	126.1%	48.7%	24.9%
Luxembourg	106.9%	28.1%	11.9%	106.0%	12.8%	59.0%
Sweden	108.9%	38.2%	16.6%	108.9%	38.2%	16.6%



It should be noted, furthermore, that the proportion of contracts with only WRR2 above 100% appears to be much larger than the WRR1+2 ratio (especially for Belgium and Luxembourg) but remains relatively unchanged in the case of Austria, France and Sweden.

The standard deviation varies greatly and is particularly high in Austria (140.7% compared with 28.1% in Luxembourg for WRR1). This can be explained by the wide dispersion of rate values in Austria, some of them reaching extremely high levels (we limited the values used in this study to ten times the outstanding at default).

Table 8 shows the evolution of rates above 100% in relation to the term-to-maturity and the age of the lease. Column N1 comprises all the contracts showing both rates (WRR1 + WRR2) over 100%, and N2 the contracts with only WRR2 above 100%. Yet, while the data for Belgium suggest a positive correlation of recovery rates with age (as most countries did when we previously observed all rates), it is difficult to conclude anything about Austria, which benefits from high rates across all the studied categories.

Table 8: WRR1 and WRR2 over 100% relative to the term-to-maturity and the age of the lease

Maturity in months	Age in months	Austria				Belgium			
		N1	WRR1	N2	WRR2	N1	WRR1	N2	WRR2
0 to 11	0 to 11	0	-	0	-	1	165.1%	1	132.3%
12 to 48	0 to 11	284	226.0%	285	225.4%	47	125.2%	112	126.6%
	12 to 23	261	245.4%	262	245.1%	153	112.1%	325	115.2%
	24 to 35	217	213.5%	217	213.5%	255	135.6%	418	135.2%
	36 to 47	101	230.5%	102	225.9%	132	172.3%	236	162.2%
	48 to 59	22	214.3%	22	214.3%	23	255.4%	41	254.5%
Over 48	0 to 11	195	200.0%	196	198.6%	14	109.6%	56	115.0%
	12 to 23	273	185.9%	274	185.5%	36	115.7%	132	121.2%
	24 to 35	205	170.5%	205	170.5%	60	114.6%	142	122.8%
	36 to 47	121	176.9%	121	176.9%	95	122.9%	161	124.6%
	48 to 59	94	195.8%	94	195.8%	84	154.6%	140	151.9%
	60 to 71	48	222.5%	48	222.5%	13	185.0%	24	349.9%
	Over 71	3	597.7%	3	597.7%	1	737.7%	2	420.1%
Total		1824	206.7%	1829	206.1%	914	126.3%	1790	126.8%

## 5.b) Equipment

### 5.b.i) Segment characteristics

The equipment segment is by far more heterogeneous than the automotive segment. It comprises a wide range of assets, including aviation assets, furniture and computer equipment. This variety explains the differences observed between countries (as shown in Table 9 below), particularly as regards the original value of the leased asset. We observe values ranging from €32,288 (Luxembourg) to €190,159 (Austria). Similarly, the outstanding at default/original asset value ratio varies a great deal (between countries as well as between the automotive and equipment segments), the lowest recorded value being the one for Luxembourg (45.9%) and the highest the one for Belgium (81.4%).

The average term-to-maturity and the average age of the contract lie between 39.1 and 53.3, and 20.8 and 32.4, respectively. These lags are not very different from those observed for the automotive segment. The average time between default and the charge off date varies considerably (between 3 months for Sweden and 22 months for France), as found previously for the automotive segment. Different accounting policies and conventions in the European countries examined in the study may partly explain these differences.

Table 9: Characteristics of the equipment segment per country

Country	Average leased asset original value in €	Outstanding at default/ original asset value ratio	Average term-to-maturity in months	Average age of the contract in months	Average time between default and charge off date in months
Austria	190,159	65.5%	49.4	24.7	15.8
Belgium	58,508	81.4%	49.2	25.5	10.7
France	35,586 <sup>8</sup>	68.8% <sup>9</sup>	53.3	29.8	22.1
Italy	42,687	60.7%	46.8	32.4	14.0
Luxembourg	32,288	45.9%	39.1	25.8	6.0
Sweden	49,383	56.3%	42.3	20.8	3.3

## 5.b.ii) Recovery rates

### 1) Overall performance

The recovery rates, both non-discounted and discounted at 10% yearly, are shown in Tables 10 and 11. It is immediately apparent that they are lower than those observed for the automotive segment. This is compatible with the prevailing view in the leasing industry.

However considerable differences can be observed between countries. In fact, Austria shows a rate of only 15.1 % while, at the opposite end, Sweden boasts 73.9 %. Except for Belgium and Sweden, all countries have a WRR1nd below 50%. An explanation for the low WRR1nd observed may lie in the fact that several kinds of equipment lose their value more quickly than cars or are made for a highly specific use and, therefore, the recovery from resale is lower than for the automotive segment.

WRR2nd is much higher than WRR1nd and exceeds 50% in every country; the worst rate is indeed 52.1% (Austria) and the best 88.5% (France).

The WRR1nd/WRR2nd ratio allows us to assess the impact of other recoveries on overall recovery. This impact appears to be very important in several countries since the share of asset resale in the total recovery is only 29% in Austria and 30.7% in France. On the other hand, asset resale accounts for 98.8% of overall recovery in Sweden and for 81.2% in Belgium. There are thus enormous differences in the importance of other recoveries in this segment compared with the automotive segment (where the lowest share of asset resale is 63.5%).

<sup>8</sup> For France, this figure is calculated from 477 data only.

Volatility, as represented by the standard deviation, ranges from 32.6% (WRR1nd) and 32.8% (WRR2nd) to 54.8% (WRR1nd) and 58.4% (WRR2nd). In the case of Austria, we find that volatility in this segment is by far lower than in the automotive segment. The fact that there are fewer recovery rates above 100% might explain this lower level of volatility.

Table 10: Average recovery rates per country weighted by the outstanding value

Country	N	WRR1nd (not discounted)		WRR2nd (not discounted)		WRR1nd/WRR2nd
		AVG	STD	AVG	STD	
Austria	309	15.1%	39.6%	52.1%	39.4%	29.0%
Belgium	1796	60.7%	54.8%	74.9%	58.4%	81.2%
France	13100	27.2%	32.6%	88.5%	32.8%	30.7%
Italy	1815	33.1%	32.6%	48.8%	40.7%	67.8%
Luxembourg	121	40.8%	43.9%	58.6%	48.6%	69.7%
Sweden	158	73.9%	41.2%	74.8%	41.0%	98.8%

WRR1 includes the recovery value from resale only.

WRR2 contains the previous rate plus other types of recovery such as guarantees and collaterals.

The discounted rates (see Table 11) enable us to appraise the influence of recovery lags. For example, WRR2 in France drops from 88.5% to 70.1% when discounted. Furthermore, as we already explained in relation to the automotive segment, French data on WRR2 include procedure costs, and this leads to an underestimation of WRR2. If we eliminate the impact of the procedure costs, we obtain a WRR2 of 72.5%.

Table 11: Average recovery rates per country discounted at 10% yearly and weighted by the outstanding value

Country	N	WRR1		WRR2		WRR1/WRR2
		AVG	STD	AVG	STD	
Austria	309	14.6%	39.0%	49.5%	38.1%	29.4%
Belgium	1796	58.4%	53.9%	70.6%	55.9%	82.7%
France	13100	22.7%	29.4%	70.1%	29.7%	32.3%
Italy	1815	31.0%	31.0%	44.7%	36.7%	69.3%
Luxembourg	121	39.5%	42.1%	56.1%	46.7%	70.4%
Sweden	158	72.9%	41.5%	73.8%	41.2%	98.9%

## 2) Recovery rates and age of the lease

As in the case of the automotive segment, we conducted a detailed analysis to assess the impact of the age of the contract on recovery rates. We split the sample into seven age groups (see Tables 12 and 13) in order to determine whether recovery rates follow the same pattern as in the automotive segment, i.e. whether they increase with the age of the contract.

Some aspects of Table 12 call for comment. Firstly, the data available for Luxembourg and Sweden are not numerous enough to be fully relevant. Secondly, it appears that WRR1 tends to increase with the age of the contract. However, in this respect, Italy and Luxembourg differ from other countries.

Results of Table 12 also show that the amount to be recovered in the event of default drops faster than the resale value of the leased asset. This will affect marginal total losses since such losses decrease with time after origination so that the amount recovered can even exceed the outstanding at default (in such a case, WRR1 is higher than 100%).

Table 12: WRR1 by country, relative to the age of the contract

Age of the lease in months	Austria		Belgium		France		Italy		Luxembourg		Sweden	
	N	WRR1	N	WRR1	N	WRR1	N	WRR1	N	WRR1	N	WRR1
0 to 11	52	14.1%	315	42.9%	1575	16.0%	222	36.2%	18	66.8%	46	57.9%
12 to 23	113	12.7%	606	58.6%	3611	18.7%	477	29.2%	40	23.6%	54	62.3%
24 to 35	66	40.4%	473	50.0%	3742	26.5%	464	32.0%	36	33.8%	35	83.2%
36 to 47	48	17.9%	234	74.6%	2395	26.1%	327	26.7%	23	66.4%	15	97.8%
48 to 59	22	44.5%	127	131.6%	1339	33.4%	157	28.8%	3	10.2%	7	70.4%
60 to 71	1	0.0%	30	85.8%	282	53.2%	85	21.0%	1	0.0%	1	100.0%
Over 71	1	0.0%	11	28.4%	156	31.2%	83	5.0%	0	-	0	-
<b>Total</b>	<b>303</b>	<b>14.60%</b>	<b>1796</b>	<b>58.40%</b>	<b>13100</b>	<b>22.7%</b>	<b>1815</b>	<b>31.00%</b>	<b>121</b>	<b>39.50%</b>	<b>158</b>	<b>72.90%</b>

Table 13 confirms the positive correlation between recovery rates and the age of the contract. It is apparent that WRR2 behaves like WRR1 and that it is generally high in all countries. Furthermore, WRR2 is much higher than WRR1 (except for Sweden); this results from the fact that other kinds of recoveries account for a large share of overall recovery (the WRR1nd/WRR2nd ratio is 29% in Austria and 30.7% in France).

Table 13: WRR2 by country, relative to the age of the contract

Age of the lease in months	Austria		Belgium		France		Italy		Luxembourg		Sweden	
	N	WRR2	N	WRR2	N	WRR2	N	WRR2	N	WRR2	N	WRR2
0 to 11	52	55.6%	315	57.7%	1575	71.3%	222	42.8%	18	74.1%	46	58.2%
12 to 23	113	48.7%	606	65.0%	3611	73.4%	477	42.2%	40	38.4%	54	65.1%
24 to 35	66	66.2%	473	71.0%	3742	61.3%	464	46.1%	36	55.6%	35	83.2%
36 to 47	48	50.6%	234	87.3%	2395	80.9%	327	46.4%	23	100.6%	15	97.8%
48 to 59	22	54.9%	127	146.0%	1339	79.2%	157	62.5%	3	101.1%	7	70.4%
60 to 71	1	0.0%	30	124.6%	282	90.1%	85	61.2%	1	0.0%	1	100.0%
Over 71	1	53.8%	11	49.7%	156	52.7%	83	36.5%	0	-	0	-
<b>Total</b>	<b>303</b>	<b>49.5%</b>	<b>1796</b>	<b>70.6%</b>	<b>13100</b>	<b>70.1%</b>	<b>1815</b>	<b>44.7%</b>	<b>121</b>	<b>56.1%</b>	<b>158</b>	<b>73.8%</b>

### 3) Does the recovery rate depend on the default date?

As in the case of the automotive segment, we set out to establish whether recovery rates depended on the default date, and whether economic conditions had an impact on secondary markets and on the resale value of the leased asset. In order to check these hypotheses, we again performed a **Kruskal-Wallis test** for each country.

In our case, the null hypothesis means that recovery rates are independent of the default date over the period studied. Each sample represents a year of default. According to the

null hypothesis, recovery rates should be relatively similar for each sample. We classed the leases in the same seven age groups and performed the Kruskal-Wallis test<sup>9</sup> on each group.

The results are not clear-cut. For some countries (Belgium, France) the test would lead us to reject the null hypothesis (at a probability  $\alpha=5\%$ ) while it appears that we should retain the hypothesis for Luxembourg and Sweden. Furthermore, we cannot reach any meaningful conclusions about Italy and Austria. Therefore, as we did previously for other variables, we performed a second test: we grouped the default dates into two periods corresponding respectively to a rather difficult economic environment (1992-1996) and a period of economic growth (1997-2000).

The results of the test did not provide any additional evidence to help us reach a conclusion: while the results would lead us to retain the null hypothesis for Austria, they are uncertain in the case of Belgium and suggest we should reject the hypothesis in the case of France<sup>10</sup>.

In conclusion, further research is required to determine whether or not recovery rates in the equipment segment are influenced by the economic environment. Indeed, while the automotive segment appears to be fairly independent of the default date (probably thanks to a combination of factors, including well-organised secondary markets, the homogeneity of the assets in this segment, and good knowledge of the assets by leasing specialists), the wide range of goods included in the equipment segment and, possibly, the fact that their resale value might decrease more rapidly, do not allow us to establish conclusively that recovery rates were independent of economic conditions over the period studied.

### **5.b.iii) Recovery rates above 100%**

Table 14 shows the recovery rates that exceed 100% in the automotive segment. The WRR1 shown here is calculated from contracts with a discounted asset resale value higher than the outstanding at default while WRR2 comprises data with an *overall* recovery (discounted asset resale value plus other recoveries) higher than the outstanding at default. It should be remarked that the highest WRR1 value is found in Austria (467.5%) and the lowest in Luxembourg (105.1%). As regards WRR2, the highest and lowest values are observed respectively in Austria (150.7%) and France (103.1%).

The fourth column in the table represents the proportion of contracts (out of the total number) with both WRR1 and WRR2 above 100% while the last column represents the proportion with only WRR2 above 100%. It is immediately apparent that the proportion of contracts with both rates above 100% is much higher in Sweden (26.6%) than in France (0.7%) and Italy (2.5%). As previously mentioned, the small number of contracts with rates above 100% in France can be explained by the fact that the French

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<sup>9</sup> The tables of the Kruskal-Wallis test are given in Appendix 5

<sup>10</sup> The three relevant tables are shown in Appendix 6

WRR2 data take into account procedure costs and this may lead to an underestimation of WRR2.

As observed in the case of the automotive segment, the proportion of contracts with only WRR2 above 100% is much larger than the WRR1+2 ratio for Belgium and Luxembourg but remains relatively stable for Austria, France and Sweden.

As regards volatility, the standard deviation is significantly lower than in the automotive segment, especially for Austria (40.9% compared with 140.6%). The explanation for this may lie in the fact that rates are more concentrated in this segment in Austria, with less extreme values.

Table 14: Recovery rates above 100%

Country	WRR1		% of contracts with WRR1+2>100%	WRR2		% of contracts with WRR2>100%
	AVG	STD		AVG	STD	
Austria	467.5%	40.9%	12.0%	150.7%	40.9%	12.0%
Belgium	122.1%	61.3%	11.4%	124.9%	63.9%	26.1%
France	129.7%	66.7%	0.7%	103.1%	16.2%	2.6%
Italy	566.4%	42.4%	2.5%	116.5%	40.0%	12.2%
Luxembourg	105.1%	41.3%	9.1%	105.4%	31.6%	19.8%
Sweden	535.9%	43.0%	26.6%	106.8%	42.9%	27.2%

## 5.c) Real Estate

### 5.c.i) Segment characteristics

We analysed the real estate segment in order to highlight a number of important aspects, though the results must be considered purely indicative since the data are insufficient.

Table 15 shows several interesting aspects: the original value of assets is considerable, especially for Austria (€8,624,778), in spite of large differences between countries. Italy presents quite a short average term-to-maturity (64.6 months) compared with the other countries (e.g. Austria) but a fairly long average age of contract (54.1 months). Thus, default occurs relatively late in the case of Italy.

Table 15: Characteristics of the real estate segment per country

Country	N	Outstanding at default over original asset value	Average term-to-maturity in months	Average age of the contract in months	Average time between default and charge off date in months
Austria	50	133.1%	290.2	74.8	7.9
France	18	78.1%	169.3	43.6	40.2
Belgium	3	79.6%	168.0	35.7	9.7
Italy	37	67.4%	64.6	54.1	19.5

The results concerning the average time between default and the charge off date also show considerable differences. The value for France is indeed very high (40.2 months).

This could be due to an extremely long recovery procedure (in our sample, all recovery dates for France are in 2000, whatever the default date).

### 5.c.ii) Recovery rates

#### 1) Overall performance

The rates given below are calculated on the basis of few data (hardly 50 in Austria and only 3 in Belgium). However, WRR1nd is quite high and WRR2nd (recovery from resale plus other recoveries) is superior to 71% in every case.

The WRR1nd/WRR2nd ratio allows us to assess the importance of asset resale as a proportion of overall recovery and we may note that it appears to be relatively high (77.3% for Austria, 98.6% for Belgium and 88.9% for Italy), especially in comparison with the equipment segment.

Table 16: Average recovery rates per country weighted by the outstanding value

Country	N	WRR1nd (not discounted)		WRR2nd (not discounted)		WRR1nd/WRR2nd
		AVG	STD	AVG	STD	
Austria	50	55.1%	44.7%	71.3%	30.2%	77.3%
France	18	-	-	75.9%	45.8%	-
Belgium	3	99.3%	1.7%	100.7%	4.4%	98.6%
Italy	37	64.0%	68.5%	72.0%	66.0%	88.9%

From Table 17 (which shows the discounted recovery rates) we can assess the impact of time lags between the default and recovery dates. It is immediately apparent that France is seriously “penalised” by its longer recovery procedure: compared with the previous table, the WRR2 value falls from 75.9% (the second best result) to 56.1% (the worst result). Nevertheless, the rates remain high, above 53% in the case of WRR1 and above 56% in the case of WRR2.

Table 17: Average recovery rates per country, discounted at 10% yearly and weighted by the outstanding value

Country	N	WRR1		WRR2		WRR1/WRR2
		AVG	STD	AVG	STD	
Austria	50	53.0%	43.3%	68.9%	29.7%	76.8%
France	18	-	-	56.1%	34.5%	-
Belgium	3	93.6%	4.5%	94.7%	1.8%	98.8%
Italy	37	58.2%	63.4%	64.8%	60.9%	89.8%

#### 2) Does the recovery rate depend on the default date?

Real estate is exposed to the economic environment and, therefore, recovery rates might vary over time. To clarify the situation, we performed the **Kruskal-Wallis**<sup>11</sup> test to determine whether recovery rates were dependent on the default date. Since we did not have a large number of data available, only two countries were included in the test.

<sup>11</sup> For more information about the Kruskal-Wallis test, see above.

Table 18: Kruskal-Wallis test over the 1996-2001 period

Country	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
Austria	41	5	10.6	5.9%	5.6	34.5%
Italy	37	4	3.0	55.5%	2.1	70.9%

The results of the test suggest that the null hypothesis is correct (at a probability  $\alpha=5\%$ ). In other words, recovery rates in the real estate segment are probably independent of the default date over the period studied, at least for contracts originating from Austria and Italy. However, it should be stressed once again that the data available for this segment are insufficient to be fully relevant.

## 6) *Leasing versus corporate bonds*

Although it is difficult to compare the recovery rates for leases with those for corporate bonds or loans, even a tentative comparison might be useful to get an idea of the recovery performance of the lease industry in relation to other means of financing. Table 19 presents some empirical results from recent studies. The recovery rates for U.S. public issued debt range from approximately 67% for senior secured debt to 31% for subordinated debt (Altman and Kishmore, 1996; Hamilton, 2002). Hamilton (2002) found that the recovery rates for European corporate bond issuers varied between 72% for senior secured debt and 13% for subordinated debt. The average recovery rate is 22% in Europe and 43% for U.S. issuers. Nevertheless, the results given for Europe are based on a small sample of observations (34).

Furthermore, the second part of Table 19 shows the recovery assumptions – both for loans and bonds – developed by Standard & Poor's in the U.S., the U.K. and Ireland, and Continental Europe. Benchmark recovery assumptions were first developed in the U.S. asset markets on the basis of two factors: empirical recovery data on defaulted bond and loan recoveries; and differences in transaction structures, including post-default liquidation timing and management constraints.

Standard & Poor's assumes that the upper recovery rate for defaulted senior loans will be higher than the recovery rate for senior bonds. In fact, bank loans benefit from tighter covenant restrictions and closer scrutiny by the lenders, including reviews of quarterly covenant compliance statements and collateral reports, which provide a good picture of a borrower's ability to meet his financial obligations. Bank loans also show flexible restructuring, presumably because of the ongoing dialogue between the lenders and the borrowers, and other favourable aspects of the lender-borrower relationship.

When we compare these results with the recovery rates we calculated for the leasing industry, it is apparent that leasing shows better rates. Looking at the automotive and real estate segments, WRR2nd (which seems to be the most coherent rate for the purposes of comparison with the data of Tables 19 and 20) is never below 69% (when considered per country) and is therefore quite similar to the recovery rate for the best senior secured bank loans, and even higher than the latter in most countries. For its part,



the equipment segment presents lower rates but WRR2nd is still higher than the values for senior unsecured bonds. Moreover, when we consider the average recovery rate for corporate bonds in Europe (22%), WRR2nd appears to be much higher for each segment in every country.

The recovery time given in Standard & Poor's survey (2002) allows us to compare the impact of time lags in the recovery procedure with those observed in the lease industry. While corporate bonds show a fairly short recovery time, loans appear to require a longer recovery period than in the leasing sector (where the average time between default and charge off date is generally less than 24 months, except for France in the real estate segment).

Table 19: Recoveries for corporate bonds and loans by seniority class

Data	Hamilton (2002)		Altman & al.('96)		Standard & Poor's (2002)		
	Europe	US	US	US	UK & Ireland	Continental Europe	Recovery Time
Count	34	1.416	697				
BONDS							
<i>Senior Secured</i>	55%	57%	58%	40-55%	45-60%	40-55%	1 year after default
<i>Senior Unsecured</i>	21%	50%	48%	25-44%	25-41%	25-40%	1 year after default
<i>Senior Subordinated</i>	24%	33%	34%				
<i>Subordinated</i>	13%	31%	31%	15-28%	10-15%	15-25%	1 year after default
LOANS							
<i>Senior Secured</i>	72%	67%		50-60%	55-65%	45-60%	2-3 years a.d.
<i>Senior Unsecured</i>				25-50%	25-50%	25-50%	2-3 years a.d.
<i>Subordinated</i>				15-28%	10-15%	15-28%	2-3 years a.d.
<b>Average</b>	<b>22%</b>	<b>43%</b>	<b>41%</b>				

## 7) Conclusion

This paper presents the first empirical results on the recovery performance of leases, calculated on the basis of a wide set of defaulted contracts and taking into account the available data for three types of assets in Europe.

Apart from generally confirming the results of the study conducted by De Laurentis and Geranio (2001), the recovery rates calculated in this research are compatible with prevailing views in the leasing industry: the loss in the event of default is quite low, and automotive leasing shows better recovery rates than the equipment segment.

Furthermore, our study considers the variability of the recovery rate in relation to the original maturity and age of the leases. It was shown that losses given default tend to decrease when the age of the contract is far from the origination date of the lease and that recovery rates can exceed 100%. The Basel Committee has not yet taken these facts into account formally.

It was found, furthermore, that useful comparisons of loss given default could be made between the situation where we considered only recoveries from leased asset sales and the situation where all kinds of transactions for recoveries were taken into account.

For obvious reasons, the fact that the leased asset remains the property of the lessor entails less risk than if the same asset were used simply as collateral. Moreover, leasing specialists have a good understanding of the secondary markets and of the assets themselves. They are therefore well placed to repossess the asset and to maximise the return on its disposal. These factors combine to facilitate recoveries by credit institutions and suggest that leasing is less risky than other comparable means of financing.

Similarly, the comparison of leasing recovery rates with the results of studies on recovery for bonds and bank loans leads to the conclusion that leasing benefits from high recovery rates in spite of certain differences between segments of assets (equipment being the riskiest segment) as well as between countries.

Lastly, the Kruskal-Wallis tests performed for each type of asset and each country suggest that leasing recovery rates are independent of the default date for the automotive segment. For other types of assets, the results are more mitigated.

It can be concluded that more attention should be given to the peculiarities of the leasing industry in order to define more adequately the capital requirements under the New Basel Capital Accord. This study could be helpful in reaching a fair trade-off between the protection against systemic risk, on the one hand, and the dynamism and welfare of the financial sector, on the other.

Note that Leaseurope has undertaken further research, which take into account the different types of assets for estimation of their credit risk.

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## **Appendix 1**

### **GUIDELINES TO COMPLETE THE QUESTIONNAIRE**

#### **General rules**

1. The company should ideally take a date from which data to be supplied can be given for all defaulted contract. Ideally, data covering a minimum of 5 years are requested according to the Basel Committee recommendation.
2. All the field of the questionnaire should be filled in. If for a contract all variables cannot be supplied, the contract should be not entered in the database.
3. One should consider only the contracts that have been charged off: (i) the defaulted contract has been charged off from the lessor's books and (ii) no more recovery will be done anymore.
4. "Defaulted" is defined as the unilateral resolution (according to the company's policy) of the contract by the lessors due to the failure to honour some payments by the lessee.
5. The time of default is the time of unilateral resolution by the lessor.
6. All amounts are required V.A.T. excluded
7. All amounts should be given in Euros.

#### **Instruction to complete the questionnaire: description of each cell**

1. Insert the name of the company
2. Insert a progressive number to identify the contracts inserted by a lessor (each lessor starts from 1)
3. If possible, insert your own contract identification number (in order to find quickly the contract if necessary)
4. Insert 'AU' for 'Automobiles and Trucks', 'EQ' for 'Equipment' and 'RE' for 'Real Estate'
5. Optional. If possible, a more precise segmentation of the type of asset can be provided. The following option is given 'AUC' for 'cars', 'OAU' for 'other types of rolling stock', 'IT' for 'Office Equipment and Computers', 'ME' for 'Medical Equipment', 'OEQ' for 'Other Equipment' and 'RE' for 'Real Estate'. Nevertheless, if the company wishes to give its own segmentation, it is welcome to do so with a maximum of 10 classes.
6. Insert the original value of the leased asset in Euro (without decimal), V.A.T. excluded
7. Insert the month (from 1 to 12) and the year (for digits i.e. 1999) when the contract started.
8. Insert the original length of the contract (in months).
9. Optional. Insert 'Y' if the contract is subject to a 'buy back' commitment from the lessor to the supplier of the asset commitment, in case of contract resolution, otherwise insert 'N'.

10. Insert the month (from 1 to 12) and the year (for digits i.e. 1999) when the contract was resolved by the lessor as the consequence of the lessee default in scheduled payments.
11. Insert the amount of the outstanding amount remaining at the default date net of interest on arrears and V.A.T. excluded.
12. Insert the time to default in months: length between the date of default and the starting date (namely (9)-(7)).
13. Insert the month (from 1 to 12) and the year (for digits i.e. 1999) when the lessor resale its asset. If the payments are done on different dates, insert the date of the last payment.
14. Insert the amount recovered by selling the asset. Do not consider recoveries from other sources (i.e. guarantees, collaterals, etc.). If the amount recovered by selling the asset is collected through several payments then insert the sum of the different payments recovered (V.A.T. excluded).
15. Insert the month (from 1 to 12) and the year (for digits i.e. 1999) when the lessor recovered amounts from other sources (i.e. guarantees, collaterals, etc.) than selling the asset. If the payments are done on different dates, insert the date of the last payment.
16. Insert the amount recovered from other sources (i.e. guarantees, collaterals, etc.) than selling the asset. If the amount recovered is collected through several payments then insert the sum of the different payments recovered (V.A.T. excluded).
17. Insert the month (from 1 to 12) and the year (for digits i.e. 1999) when the contract was charged off (cancelled from the book of the lessors and no recovery will be done anymore).
18. Insert the time from default to charged-off date in months (namely (16)-(9)).

CONTRACT INFORMATION									
Company name (1)	Contract ID(2)	Internal CIN (3)	Type of Asset (4)	Type of Asset (option.) (5)	Original value (6)	Start date of the contract (7)		Leasing period (8)	Buy Back Engag. (option.) (9)
Lessor	Number	Number	Symbol	Symbol	Amount	month	year	N. of months	Y/N
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								

		DEFAULT				RECOVERY FROM RESALE			OTHER RECOVERY			CHARGE-OFF		
Company name (1)	Contract ID(2)	Default date (10)		Outstanding at default (11)	Time to default (12)	Recovery date (13)		Recovery value (14)	Date of the last Recovery (15)		Recovery value (16)	Charge-off date (17)		Time from default to Charge-off (18)
Lessor	Number	month	year	Amount	N. of month	month	year	Amount	month	year	Amount	month	year	N. of month
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	9													
	10													
	11													
	12													
	13													
	14													
	15													
	16													

## Appendix 2

### AUTOMOTIVE SEGMENT

#### Kruskal-Wallis test 1: independence of recovery rates from the default date

##### Belgium (Period: 1992-2000)

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	3	1	0	100,0%	0	100,0%
12 to 48	0 to 11	391	8	24,5	0,2%	21,7	0,5%
	12 to 23	700	8	12,8	11,9%	6,6	58,6%
	24 to 35	608	8	5,9	66,3%	14,5	7,0%
	36 to 47	266	7	15,2	3,4%	10,8	14,6%
	48 to 59	46	6	4,8	57,6%	5,5	48,5%
Over 48	0 to 11	202	8	7,2	51,1%	19,8	1,1%
	12 to 23	423	8	15,8	4,5%	6,0	64,6%
	24 to 35	375	8	6,1	63,6%	4,7	78,9%
	36 to 47	258	8	18,6	1,7%	21,7	0,6%
	48 to 59	148	6	12,7	4,9%	7,1	31,3%
	60 to 71	33	5	3,8	58,5%	4,3	50,3%
	Over 71	3	1	0,0	100,0%	1,5	22,1%

##### Austria (Period: 1993-2000)

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	6	2	2,4	30,1%	2,4	30,4%
12 to 48	0 to 11	386	7	18,6	1,0%	17,5	1,5%
	12 to 23	417	7	14,2	4,8%	14,1	5,0%
	24 to 35	318	7	11,2	13,1%	9,4	22,8%
	36 to 47	170	7	12,0	9,9%	7,0	42,7%
	48 to 59	38	7	6,7	46,5%	6,7	46,5%
Over 48	0 to 11	261	7	4,8	68,7%	6,5	48,4%
	12 to 23	414	7	11,0	13,8%	10,6	15,9%
	24 to 35	319	7	20,1	0,5%	21,4	0,3%
	36 to 47	237	7	20,7	0,4%	21,4	0,3%
	48 to 59	159	7	7,1	42,3%	7,9	34,1%
	60 to 71	92	7	4,0	78,2%	4,0	78,2%
	Over 71	7	3	4,6	20,3%	4,6	20,3%

##### France (Sample A - Period: 1992-2000)

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	6	2	3,6	16,8%	2,3	32,1%
12 to 48	0 to 11	218	8	46,9	0,0%	28,7	0,0%
	12 to 23	700	8	37,8	0,0%	43,5	0,0%
	24 to 35	791	8	52,3	0,0%	84,3	0,0%
	36 to 47	467	8	41,0	0,0%	69,1	0,0%
	48 to 59	27	8	12,7	12,4%	14,6	6,8%
Over 48	0 to 11	84	8	30,3	0,0%	15,9	4,4%
	12 to 23	262	8	32,7	0,0%	25,2	0,1%
	24 to 35	267	8	50,6	0,0%	28,7	0,0%
	36 to 47	231	8	25,4	0,1%	16,1	4,1%
	48 to 59	165	8	6,7	57,2%	19,0	1,5%
	60 to 71	23	5	5,2	39,6%	6,0	31,1%
	Over 71	37	2	1,4	50,3%	2,3	31,1%



**France (Sample B - Period: 1995-2000)**

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	6	2	3,6	16,8%	2,3	32,1%
12 to 48	0 to 11	167	5	13,2	2,1%	15,4	0,9%
	12 to 23	404	5	15,6	0,8%	25,8	0,0%
	24 to 35	410	5	5,6	35,2%	24,3	0,0%
	36 to 47	230	5	1,5	90,8%	8,2	14,5%
	48 to 59	17	5	7,6	17,9%	6,6	25,6%
Over 48	0 to 11	72	5	14,9	1,1%	8,7	12,1%
	12 to 23	201	5	23,3	0,0%	23,0	0,0%
	24 to 35	194	5	13,1	2,2%	20,4	0,1%
	36 to 47	150	5	14,4	1,3%	8,2	14,8%
	48 to 59	109	5	3,5	61,8%	6,7	24,7%
	60 to 71	20	4	2,8	59,4%	5,3	26,2%
	Over 71	37	2	1,4	50,3%	2,3	31,1%

**Italy (Period: 1997-2000)**

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	42	2	4,6	10,0%	3,2	20,0%
12 to 48	0 to 11	39	3	4,2	23,9%	2,3	50,8%
	12 to 23	236	3	4,2	24,5%	5,7	12,6%
	24 to 35	262	3	2,1	54,5%	11,7	0,8%
	36 to 47	114	3	13,0	0,5%	17,6	0,1%
	48 to 59	14	2	4,0	13,4%	3,0	22,6%
Over 48	0 to 11	3	2	2,1	34,4%	2,1	34,4%
	12 to 23	28	3	6,8	7,9%	3,9	27,2%
	24 to 35	14	3	6,2	10,2%	3,2	35,6%
	36 to 47	23	3	13,4	0,4%	10,3	1,6%
	48 to 59	29	3	5,9	11,7%	4,2	24,0%
	60 to 71	9	3	3,3	34,3%	1,2	76,4%
	Over 71	12	3	5,3	15,3%	4,8	18,9%

**Sweden (Period: 1996-2002)**

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	0					
12 to 48	0 to 11	69	4	10,6	3,1%	10,6	3,1%
	12 to 23	65	4	4,6	32,9%	4,5	34,8%
	24 to 35	30	5	7,5	18,6%	7,5	18,6%
	36 to 47	11	3	3,3	35,0%	3,3	35,0%
	48 to 59	0					
Over 48	0 to 11	0					
	12 to 23	7	1	0,5	47,1%	0,5	47,1%
	24 to 35	2	1	1,0	31,7%	1,0	31,7%
	36 to 47	2	1	1,0	31,7%	1,0	31,7%
	48 to 59	6	2	0,4	80,7%	0,4	80,7%
	60 to 71	There are not enough cases to be performed					
	Over 71						

**Luxembourg (Period: 1998-2002)**

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	2	1	1,0	31,7%	1,0	31,7%
12 to 48	0 to 11	48	3	6,7	8,1%	5,9	11,5%
	12 to 23	73	3	3,5	31,5%	3,5	31,5%
	24 to 35	60	3	5,9	11,9%	4,8	18,3%
	36 to 47	27	3	1,6	65,2%	6,0	11,4%
	48 to 59	7	2	2,6	27,0%	0,6	74,8%
Over 48	0 to 11	4	3	3,0	39,2%	3,0	39,2%
	12 to 23	17	3	6,1	10,5%	9,6	2,2%
	24 to 35	12	3	2,6	45,1%	6,0	11,3%
	36 to 47	8	3	4,8	18,4%	1,4	69,5%
	48 to 59	7	2	5,2	7,5%	4,5	10,5%
	60 to 71	There are not enough data to be performed					
	Over 71						

## Appendix 3

### AUTOMOTIVE SEGMENT

**Kruskal-Wallis test 2: independence of recovery rates from the default date.**

**2 periods considered: 1990-1996 and 1997-2000**

#### Belgium (Period: 1992-2000)

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	There are not enough cases to be performed					
12 to 48	0 to 11	391	1	0,1	74,9%	6,4	1,2%
	12 to 23	700	1	3,0	8,3%	0,5	49,6%
	24 to 35	608	1	0,3	60,8%	3,8	5,2%
	36 to 47	266	1	8,2	0,4%	0,3	56,1%
	48 to 59	46	1	0,2	67,4%	0,6	42,5%
Over 48	0 to 11	202	1	0,9	33,9%	5,3	2,1%
	12 to 23	423	1	4,3	3,9%	0,2	63,8%
	24 to 35	375	1	0,1	80,5%	0,0	99,0%
	36 to 47	258	1	5,8	1,6%	1,2	27,6%
	48 to 59	148	1	3,1	8,0%	3,3	7,0%
	60 to 71	33	1	2,8	9,4%	0,8	37,8%
	Over 71	There are not enough cases to be performed					

#### Austria (Period: 1993-2000)

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	6	1	1,2	27,3%	0,0	100,0%
12 to 48	0 to 11	402	1	0,1	71,0%	0,1	74,0%
	12 to 23	453	1	0,0	97,1%	1,9	16,5%
	24 to 35	337	1	0,0	83,2%	1,0	30,6%
	36 to 47	175	1	0,9	34,4%	0,0	97,6%
	48 to 59	40	1	0,4	52,1%	0,4	52,1%
Over 48	0 to 11	261	1	1,2	26,4%	2,0	15,4%
	12 to 23	414	1	0,9	35,1%	4,2	4,0%
	24 to 35	319	1	4,6	3,3%	5,5	1,8%
	36 to 47	237	1	7,6	0,6%	10,2	0,1%
	48 to 59	159	1	0,6	43,6%	1,0	31,4%
	60 to 71	92	1	0,3	56,0%	0,3	56,0%
	Over 71	7	1	0,2	61,7%	0,2	61,7%

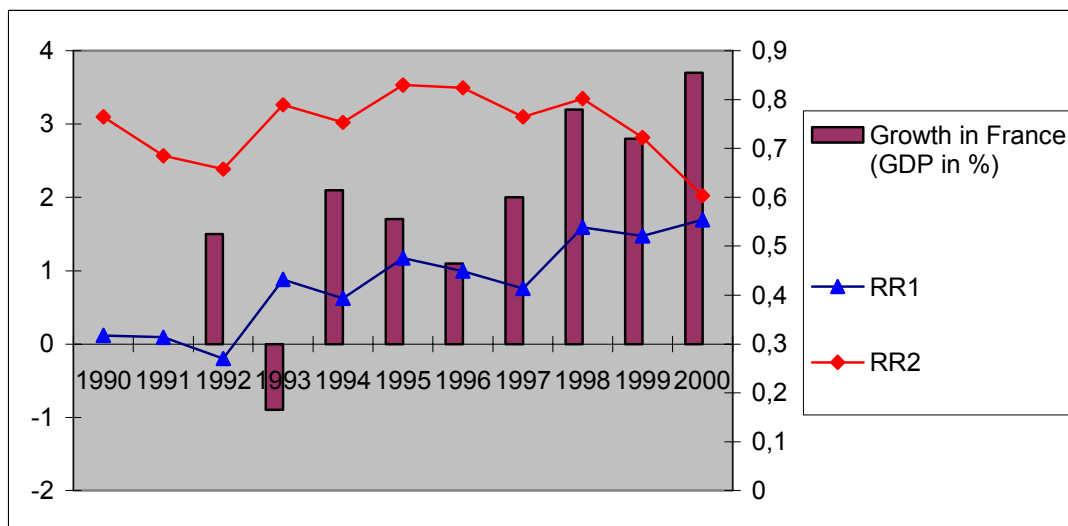
#### France (Period: 1992-2000)

maturity in months	age in months			RR1		RR2	
		N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	0 to 11	6	1	0,8	38,0%	2,3	13,2%
12 to 48	0 to 11	218	1	27,0	0,0%	0,5	49,8%
	12 to 23	700	1	12,2	0,0%	0,7	40,3%
	24 to 35	791	1	13,2	0,0%	2,7	10,1%
	36 to 47	467	1	14,1	0,0%	7,4	0,6%
	48 to 59	27	1	0,9	35,0%	0,6	44,9%
Over 48	0 to 11	84	1	17,4	0,0%	0,3	57,2%
	12 to 23	262	1	15,5	0,0%	4,8	2,9%
	24 to 35	267	1	30,9	0,0%	0,1	76,6%
	36 to 47	231	1	3,1	8,0%	1,3	24,7%
	48 to 59	165	1	1,3	25,3%	9,9	0,2%
	60 to 71	23	1	4,3	3,9%	0,1	73,6%
	Over 71	37	1	1,0	32,4%	0,6	42,0%

## Appendix 4

### AUTOMOTIVE SEGMENT

#### RR1 and RR2 versus GDP growth in France



## Appendix 5

### EQUIPMENT SEGMENT

#### Kruskal-Wallis test 1: independence of recovery rates from the default date

##### Austria (Period: 1992-2000)

Age in months	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
0 to 11	45	7	10,7	15,2%	19,2	0,7%
12 to 23	107	9	22,5	0,7%	49,8	0,0%
24 to 35	66	9	19,5	2,2%	20,3	1,6%
36 to 47	46	8	9,9	26,9%	14,1	7,8%
48 to 59	22	5	2,5	77,0%	7,5	18,8%
60 to 71	There are not enough cases to be performed					
Over 71						

##### Belgium (Period: 1992-2000)

Age in months	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
0 to 11	172	8	13,7	9,0%	18,5	1,8%
12 to 23		8	30,4	0,0%	29,5	0,0%
24 to 35		8	11,5	17,5%	11,0	20,3%
36 to 47	178	8	33,2	0,0%	23,9	0,2%
48 to 59	93	6	17,1	0,9%	15,7	1,5%
60 to 71	25	5	3,3	65,8%	8,2	14,8%
Over 71	9	4	4,4	35,5%	3,4	49,7%

##### France (Period: 1992-2000)

Age in months	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
0 to 11	1096	8	50,9	0,0%	44,2	0,0%
12 to 23	2699	8	90,8	0,0%	57,8	0,0%
24 to 35	3042	8	67,5	0,0%	190,8	0,0%
36 to 47	2013	8	40,9	0,0%	158,9	0,0%
48 to 59	1108	8	64,2	0,0%	120,2	0,0%
60 to 71	236	8	8,7	36,8%	30,2	0,0%
Over 71	147	8	36,3	0,0%	31,1	0,0%

##### Italy (Period: 1997-2001)

Age in months	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
0 to 11	222	4	0,5	97,5%	1,3	86,7%
12 to 23	477	4	9,7	4,5%	4,3	36,5%
24 to 35	464	4	7,9	9,5%	4,1	38,8%
36 to 47	327	4	20,5	0,0%	16,3	0,3%
48 to 59	157	4	3,8	43,1%	10,4	3,4%
60 to 71	85	4	15,0	0,5%	18,5	0,1%
Over 71	83	4	5,3	25,6%	4,1	39,5%

**Luxembourg (Period: 1999-2002)**

Age in months	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
0 to 11	18	3	4,4	22,0%	2,3	51,3%
12 to 23	40	3	6,8	7,8%	1,8	60,6%
24 to 35	36	3	2,8	42,7%	0,5	92,9%
36 to 47	23	3	0,4	94,3%	7,1	6,9%
48 to 59	3	1	1,5	22,1%	1,5	22,1%
60 to 71	There are not enough cases to be performed					
Over 71						

**Sweden (Period: 1995-2001)**

Age in months	N	df	RR1		RR2	
			Chi-Square	P-value	Chi-Square	P-value
0 to 11	46	5	2,5	77,0%	2,0	84,8%
12 to 23	54	5	5,8	32,7%	6,7	24,4%
24 to 35	35	5	6,2	28,5%	6,2	28,5%
36 to 47	15	3	3,1	38,4%	3,1	38,4%
48 to 59	7	3	5,2	15,8%	5,2	15,8%
60 to 71	There are not enough cases to be performed					
Over 71						

## Appendix 6

### EQUIPMENT SEGMENT

**Kruskal-Wallis test 2: independence of recovery rates from the default date.**

**2 periods considered: 1990-1996 and 1997-2000**

#### **Austria (Period: 1992-2000)**

age in months			RR1		RR2	
	N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	28	1	0,8	36,1%	3,2	7,3%
12 to 23	49	1	0,1	74,7%	1,0	32,6%
24 to 35	33	1	0,5	50,2%	0,1	71,8%
36 to 47	18	1	1,1	29,3%	0,1	82,1%
48 to 59	13	1	0,2	69,1%	0,2	69,3%
60 to 71	There are not enough cases to be performed					
Over 71						

#### **Belgium (Period: 1992-2000)**

age in months			RR1		RR2	
	N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	172	1	7,8	0,5%	6,6	1,0%
12 to 23	400	1	12,6	0,0%	7,9	0,5%
24 to 35	380	1	0,8	36,6%	0,1	77,9%
36 to 47	178	1	9,6	0,2%	3,0	8,4%
48 to 59	93	1	7,1	0,8%	9,8	0,2%
60 to 71	25	1	0,1	78,4%	1,6	20,7%
Over 71	9	1	0,0	100,0%	0,3	60,6%

#### **France (Period: 1992-2000)**

age in months			RR1		RR2	
	N	df	Chi-Square	P-value	Chi-Square	P-value
0 to 11	1096	1	5,8	1,6%	13,2	0,0%
12 to 23	2699	1	5,1	2,4%	11,2	0,1%
24 to 35	3042	1	6,3	1,2%	9,9	0,2%
36 to 47	2013	1	17,3	0,0%	19,6	0,0%
48 to 59	1108	1	36,0	0,0%	26,2	0,0%
60 to 71	236	1	6,0	1,4%	4,8	2,8%
Over 71	147	1	14,8	0,0%	0,1	72,2%