

The Risk Profile of Leasing in Europe

The role of the leased asset

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Chapter 1 – About this report

Chapter 1 – About this report

1. Background to the report

- The European Union aims to strengthen the resilience of the banking sector through the introduction of new regulation such as the CRD4/CRR.
- Many European leasing companies are affected by the new rules as they will be applying the CRD4 package, either directly or indirectly.
- Leasing is different to other forms of finance in that the lessor remains the owner of the leased asset throughout the contract. These ownership rights provide lessors with a form of in-built security.
- When certain eligibility conditions are met, regulatory capital requirements partially recognise the role this collateral plays in mitigating credit risk.
- The European Banking Authority has been tasked with establishing which types of physical assets would meet these conditions.
- In 2012, leasing helped European businesses invest in equipment worth over €200 billion. Therefore, given the importance of leasing for the European economy, it is necessary to understand the role asset ownership plays in lowering loss rates for leasing, and for regulation to recognise its full risk mitigation potential.

Chapter 1 – About this report

2. Contributions of the study

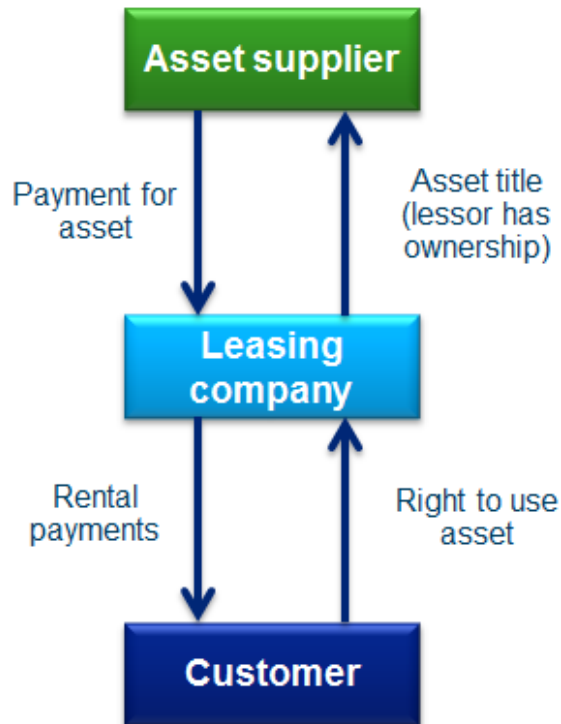
- Our report aims to contribute to the EBA's work by examining the risk profile of leasing in Europe over the period 2007 to 2011, which includes some of the worst downturn years in recent history.
- In order to do this, we:
 1. Explain the unique benefits that leasing enjoys due to the lessor's ownership of the leased asset, and how the mechanisms of recovery for leasing are improved in light of this.
 2. Quantify European leasing loss rates by asset type and counterparty and show that the disposal value of the asset keeps these loss rates at a very low level.
 3. Confirm that leasing is less risky than traditional lending, as leasing exhibits both lower default rates and lower loss rates across all Basel 2 asset classes.
 4. Show that regulatory requirements for leasing are overly prudent, as leasing loss rates are significantly lower than the 40% LGD prescribed under the IRB-F approach.

Chapter 2 – Leasing in Europe

Chapter 2 – Leasing in Europe

1. What is leasing

- Leasing is a contract whereby a leasing company (lessor) makes an asset it owns available to another party (lessee) for a period of time in exchange for payment.
- The common feature of all lease contracts is that the lessor retains ownership of the leased asset throughout the life of the contract.
- The retention of ownership rights provides lessors with inbuilt security that allows them to provide businesses with the use of assets in situations where traditional loans to obtain equipment may not necessarily be available to these firms.



- Legal ownership carries weight – in practice repossession is often not necessary in the case of a default (as clients rely on these assets to run their businesses).
- If repossession is required, it is efficient (no need to force bankruptcy or go through lengthy procedures such as realising pledges, etc.).
- Other secured lending is typically not done on the basis of physical collateral (e.g. other lenders have a preference for guarantees, etc.) as providers of these products do not have the same expertise as lessors when it comes to evaluating and managing physical assets.

Chapter 2 – Leasing in Europe

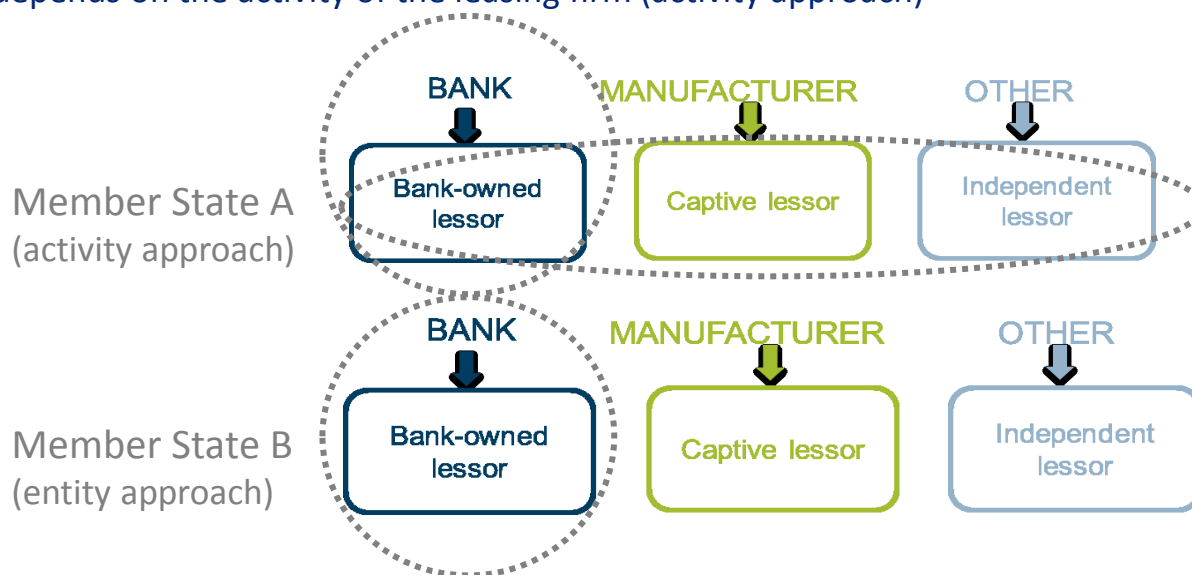
1. What is leasing (cont.)

- Across Europe, a range of different types of contractual agreements fall under the notion of “leasing”.
- The only common and standardised definition of a lease is given in international accounting rules (IFRS): under IAS 17, **a lease 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.**
- Almost any type of physical asset can be leased, as can certain intangible assets.
 - Examples of leased assets include, but are not limited to, plant and manufacturing equipment, IT equipment and software and software licences, printing machines, photocopiers and telecommunication equipment, construction and logistics equipment, passenger and commercial vehicles, as well as other means of transport, medical equipment, renewable energy producing equipment, infrastructure, utilities and property, to name but a few.
- **Leasing is used by businesses of all sizes**, financial institutions and the public sector (eg. leasing to schools, hospitals, etc.) to obtain the use of assets. It is easy to access and is **distributed via many channels**, for instance through retail banking networks, directly from leasing companies, through brokers or from vendors and dealers of assets at their point of sale.

Chapter 2 – Leasing in Europe

2. European lessors

- Lessors can be **banks, bank-owned or non-bank** leasing companies, including **manufacturers of assets** and **other independent or commercial companies**.
 - There are about 1 300 leasing firms in Europe, either regulated directly, indirectly (through their bank parent company), or not regulated depending on national laws.
- The legal entity status of firms that carry out leasing activities in Europe includes commercial companies, financial institutions (i.e. institutions which do not receive deposits but engage in activities which may include “financial leasing”*) and credit institutions (i.e. deposit taking institutions).
- The regulatory framework for leasing within the various Member States can broadly be summarised on the basis of the following two criteria (as depicted in the figure below):
 - Regulation depends on the shareholding structure of the leasing firm (entity approach)
 - Regulation depends on the activity of the leasing firm (activity approach)



Chapter 2 – Background

3. Economic and regulatory context

- Following the last financial and economic crisis, the Basel Committee modified its Basel 2 framework.
- The new Basel 3 framework will be progressively implemented in the EU through the CRD4 / CRR.
 - This new framework reinforces existing principles for solvency, introducing new requirements on liquidity risk and risk management and a leverage ratio in a crisis context.
- This report on the risk profile of leasing should be seen in the context of the implementation of this new framework in Europe.
 - The new requirements could indeed impact the leasing sector, and as a consequence, European businesses who rely on this product to gain access to productive business assets.
 - The European Banking Authority has been mandated by the European Commission to specify several technical standards, undertake additional impact analysis, etc. which may further impact the financial sector in general, including the leasing industry.

Chapter 3 – Regulatory framework for leasing

Chapter 3 – Regulatory framework for leasing

1. Risks in leasing – Distinction between credit & residual value risk

- Lessors are exposed to two main types of risks:

- The risk on the lessee who may default (**credit risk**).
- The risk on the leased asset (**residual value risk**): risk that the market value of the asset at the end of the contract is lower than the original forecasted value of the asset at the beginning of the lease.

Credit risk

- The three components of credit risk are:

- The Probability of Default (**PD**)
- The Loss Given Default (**LGD**) of defaulted leases which take into account recovery flows
- The Exposure At Default (EAD)

- Lease contracts specify the conditions under which the lessee is considered to be in default.

- Recovery rates are mostly calculated on an individual contract level as the discounted amounts recovered in comparison with the outstanding amount on the date of default.

Residual value risk

- The lessor is exposed to residual value risk if the residual value is not guaranteed (e.g. by an independent third-party or the lessee), or if any *non-bargain* option* to purchase at the end of the lease is not exercised, and the lessee is in default.

Chapter 3 – Regulatory framework for leasing

2. Capital requirements

- Capital requirements are either applied directly to regulated leasing companies, or to bank-owned leasing entities which are then regulated indirectly through consolidation of their activities with those of the banking group.
- Our panel for this study is only composed of bank-owned leasing companies.
- Under current European requirements, regulatory capital for leases is calculated as follows:

$$8\% \times RW \times Lease\ exposure + 8\% \times \frac{1}{t} \times 100\% \times Residual\ exposure$$

Where:

- **RW** = risk-weight, determined according to whether the lessors uses the Standardised or Advanced approaches.
 - **Lease exposure** = discounted minimum lease payments, which include payments the lessee is required to make over the lease term, as well as bargain purchase options and guaranteed residual values.
 - **t** = the remaining lease term (in years, rounded up to the nearest whole number).
 - **Residual exposure** = unguaranteed residual values or guaranteed residual values that do not qualify for inclusion in the lease exposure.
-
- Under the **standardised** approach, risk-weights are prescribed by the regulator and depend on the asset class of the counterparty. There is no recognition of the leased asset as a form of credit risk mitigation.
 - Under the **IRBF** approach, PDs can be determined internally (subject to approval by national regulator) and LGD is given set at 40% (prior to the introduction of Basel 3 in Europe, LGDs was subject to national discretion and was either 35% of 40%).
 - Under the **IRBA** approach, both PDs and LGDs are calculated through internal models (subject to approval by the national regulator), allowing a more accurate assessment of risk as the security of the leased asset is taken into account.

Chapter 3 – Regulatory framework for leasing

2. Capital requirements (cont.)

- Apart from an overall increase in the minimum level of capital that institutions will be required to hold under the CRD4 / CRR, the formula and definitions for calculating capital requirements for leases do not change under the EU introduction of Basel 3.
- Hence, assuming that the CRD4 package requires an 8% minimum capital ratio to which the Capital Conservation Buffer (*) (of 2.5% of Common Equity Tier 1) is added (at a minimum), the capital requirements for a lease exposure would be:

$$10.5\% \times RW \times Lease\ exposure + 10.5\% \times \frac{1}{t} \times 100\% \times Residual\ exposure$$

(*) The Capital Conservation Buffer will progressively be implemented, from 0.625% of Common Equity Tier 1 in 2016, 1.25% in 2017, 1.875% in 2018 to 2.5% in 2019. Consequently, the minimum capital ratio institutions should satisfy will increase from 8% to a target of 10.5% in 2019. This does not take into account additional capital buffers (such as countercyclical buffers, additional requirements for systemically important institutions, etc.).

Chapter 3 – Regulatory framework for leasing

3. Recognition of the leased asset for credit risk mitigation purposes

- Under the CRD 4 / CRR requirements (as under the previous legislative requirements), the leased asset is handled differently depending on the credit risk approach:

- Under the **standardised** approach, the leased asset is still not recognised as mitigating the risk.
- Under the **IRBF** approach, LGD is set at 40%:

Same PD & volume	IRBF LGDs
Cash	0%
Receivables	35%
Leases	40%
Other collateral	40%
Non-collateralised	45%

- Under the **IRBA** approach:
 - Internal models allow a more accurate approach of risk as the security of the leased asset can be reflected in company specific LGD models (under certain eligibility conditions).

- **EBA mandate on physical collateral eligibility: “EBA shall disclose a list of types of physical collateral for which institutions can assume that the conditions referred to in points (a) and (b) of paragraph 8 are met” (*).**

- In these cases, assets listed will be “considered as eligible”
- No deadline as for the publication of the list.

(*) §8 - (a) there are liquid markets, evidenced by frequent transactions, for the disposal of the collateral in an expeditious and economically efficient manner. Institutions shall carry out the assessment of this condition periodically and where information indicates material changes in the market;
(b) there are well-established, publicly available market prices for the collateral. Institutions may consider market prices as well-established where they come from reliable sources of information such as public indices and reflect the price of the transactions under normal conditions. Institutions may consider market prices as publicly available, where these prices are disclosed, easily accessible, and obtainable regularly and without any undue administrative or financial burden;

Chapter 4 – Methodology

Chapter 4 – Methodology

- The general approach to this analysis is to determine the actual risks arising from leasing, identify the role the leased asset plays as a form of risk mitigation, and compare our results with current regulatory requirements.
- To achieve this, we carried out the following analyses, the corresponding chapter is specified on the right.

- **Collection of leasing portfolios** including defaulted contracts and their losses from a sample of leasing companies across Europe.
- Descriptive analysis of the portfolios and **key features of leasing contracts**



Chapter 5 - Dataset

- **Behavioural analysis of defaults**, including an analysis of annual default and loss rates over time and broken down by different categories (types of counterparty, Basel 2 asset class, type of assets, ...) **to draw the risk profile of defaulting contracts in leasing and compare the level of risk in leasing with that of traditional lending.**



Chapter 6 –
Defaults



Chapter 7 – Losses

- Focus on the **particular role of the leased asset as collateral** (risk mitigation):
 - We look at the impact that the sale of the leased asset has on loss rates.
- Extension of the analysis of loss rates in Chapter 7 to include unresolved defaults, where proxies are made for losses.



Chapter 8- Risk
Mitigation



Chapter 9-
Unresolved
defaults

- **Estimation of LGDs for the leasing business** based on closed and unresolved cases of defaults:
 - Assessment of the level of conservatism of existing regulatory requirements through the simulation of various loss rates under several states of nature.



Chapter 10 -
Bootstraps

- We summarise our findings



Chapter 11-
Conclusion

Chapter 4 – Methodology

Focus on the methodology used in Chapter 10 – Stressed LGDs

- By modelling LGDs using observed loss rates under stressed economic conditions, our analysis can be used to backtest the regulatory LGD level given under the IRBF Approach.
- We use a **non-parametric approach, called a bootstrap method**, to estimate the loss rate distribution for the portfolio of defaulted lease contracts.
- We integrate both closed and unresolved defaults (where loss rates are approximated with conservative assumptions) into our bootstrap.
- The results stress the importance of the leased asset as physical collateral and are analysed according to the type of underlying leased asset, counterparty type and Basel 2 asset class.

Chapter 5 – Description of the dataset

Chapter 5 – Description of the dataset

Key findings

- Our sample includes detailed, contract-level data on the leasing portfolios of 13 major European leasing companies, covering their activities in 15 European markets, with 4 additional major leasing companies providing aggregate information on the risk characteristics of their portfolios.
- The data spans a 5 year period (2007 – 2011), covering the depths of the European economic crisis.
- The database contains contract-level information for 3.3 million contracts, with the average outstanding portfolio worth almost €60 billion.
- The sample covers both equipment (64%) and automotive (36%) assets and includes finance and operating leases.
- Leases to all types of counterparties are included, except those to private persons. Leases to SMEs make up around 65% of the portfolio and corporates 30%.
- The average lease in our sample lasts for 50 months and the average financed amount is €48 643.
- The database includes 184 496 defaulted contracts (5.44% of the total sample). 82% of our default database is made of leases granted to SME clients.

Chapter 5 – Description of the dataset

1. Scope of the study

Product types

- All types of leases (i.e. hire purchase, finance and operating leases) are included.
- Cases where ownership transfers at the beginning of the contract are excluded.

Physical asset types

- Our study includes:
 - **Automotive leases** composed of any registered vehicle (i.e. with a licence plate):
 - Commercial Vehicles: all light, medium, heavy and “other” commercial vehicles
 - Passenger Cars: all new and used cars, be they for private or business use, including motorcycles and caravans
 - **Equipment leases** composed of:
 - Machinery & Industrial Equipment: all machinery for commercial, industrial or agricultural use, including harvesters, tractors and earth movers
 - Computers & Business Machines: all IT equipment and other business machines such as photocopiers, etc.
 - Ships, Aircraft, Railway, Rolling Stock
 - Other: all other types of equipment, such as containers, medical equipment, etc.
- Real estates leases are excluded:
 - This leasing market is structurally different to the automotive and equipment leasing markets: it is concentrated in a few national markets and there are typically fewer contracts for higher amounts.
 - CRD sets out specific requirements for real-estate exposures and recognises real estate collateral, even under the Standardised Approach for Credit Risk.

Chapter 5 – Description of the dataset

1. Scope of the study (cont.)

Time period

- Our original intention was to collect data spanning a complete economic cycle (i.e. 2004 – 2011).
- However, we found that the vast majority of leasing firms did not have detailed information available prior to 2007 as many had not yet adopted advanced approaches to credit risk modelling.
- **Our study therefore covers contracts alive between 2007 and 2011, with all defaults occurring within this timeframe.**

Geographical scope

- Our approach to geographical scope:
 - The **largest leasing markets in the EU** were specifically targeted (Germany, France, Italy and the UK)
 - **Other significant markets** are also covered (Netherlands, Poland, etc.)
- **List of countries covered:**

Austria	Belgium	Czech Republic	Denmark	France
Germany	Italy	Luxembourg	The Netherlands	Norway
Poland	Romania	Spain	Sweden	United Kingdom

Chapter 5 – Description of the dataset

1. Scope of the study (cont.)

Customer scope

- We include all types of customers using leasing, except for private persons. We use two types of classification:
 - **Type of counterparty** detailed as:
 - Financial Institutions
 - Public Sector
 - Corporate
 - SMEs (as defined by the European Union: see note below *)
 - **Basel 2 asset class**, compliant with Capital Requirements Directive / Regulation as follows:
 - Sovereign (central governments and central banks)
 - Retail (Professionals and SMEs qualifying for the Retail exposure class according to the CRD)
 - Corporate (which includes other SMEs)
 - Institutions (financial institutions and regional governments / public sector entities)

* “The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro.”, Extract of Article 2 of the Annex of Recommendation 2003/361/EC.

Chapter 5 – Description of the dataset

2. Sample of leasing firms

- Our sample covers the **individual contract data of 13 leasing firms** which includes **3.3 million contracts** with a **current outstanding of almost €60 billion**.
- An **additional 4 leasing firms contributed aggregate portfolio data** which was used as a validation sample. For reasons of confidentiality their data cannot be shown.
- All of the firms participating in the study are banks or bank-owned companies, their activities are subject either directly or indirectly to EU capital requirement regulation.

ABN Amro	BNP	DNB Finans	De Lage Landen	ING
LBBW	Leaseplan	Leasint	Lloyds	MPS
Nordea		Raiffeisen	Unicredit	

Participated with aggregated data	
ALD	Arval
Lombard	SGEF

Chapter 5 – Description of the dataset

2. Sample of leasing firms (cont.)

- We compare our sample to total equipment European leasing market data taken from Leaseurope's 2011 Annual Survey in terms of new business (both € and # of contracts) and outstandings.
- The resulting representativity of our sample is strong. When measured in terms of the total outstanding portfolio, **our sample represents 14% of the total European leasing market.**
- Detailed breakdowns of the sample's representativity by country are not shown here for reasons of data confidentiality.

	Stage B Database *		Leaseurope Annual report figures		Representativity over Leaseurope Annual report figures	
	2011 New Production	2011 new contracts	2011 Equipment New Production	2011 Equipment Number of new contracts	Representativity of New Production	Representativity of New contracts
Total	19 364 199 645	405 584	195 884 368 000	4 775 623	9.9%	8.5%

	Database of the study (Global)	Leaseurope Equipment figures	Representativity
	2011 Current outstanding		
Total	57 100 809 455	418 851 178 000	13.6%

* LeasePlan data is not included in the new production or new contracts figures.

Chapter 5 – Description of the dataset

3. Data issues and reprocessing

- Several issues were encountered during the process of consolidating the final database. These issues can be classified into two main categories:
 - **Ensuring compliance with data templates:** data mapping, verification of detailed data availability, consistency of definitions, varying management practices and internal processes.
 - **Ensuring data quality and consistency:** a number of corrections, modifications or exclusions of data were carried out in order to ensure the data we use in this report is of high quality and as comparable as possible across the firms in the sample.
- **The various management rules we applied to the raw data were either provided or validated by the participants based on their own practice when modelling LGDs.**
 - Our reprocessing also led to the exclusion of contracts where basic information was inconsistent (for instance, contracts with small (or negative) initial outstanding or outstanding at default, contracts where the engagement date was posterior to the maturity date, defaults where the default start date was posterior to the contract real termination date, etc.).
 - We also excluded defaults for which the loss was unknown or had a rate higher than 140%.
 - In order to remain consistent and conservative in our approach, we also bounded negative losses (i.e. gains – a feature which can occur in leasing) to zero (for more details, see Chapter 8).

Chapter 5 – Description of the dataset

3. Data issues and reprocessing (cont.)

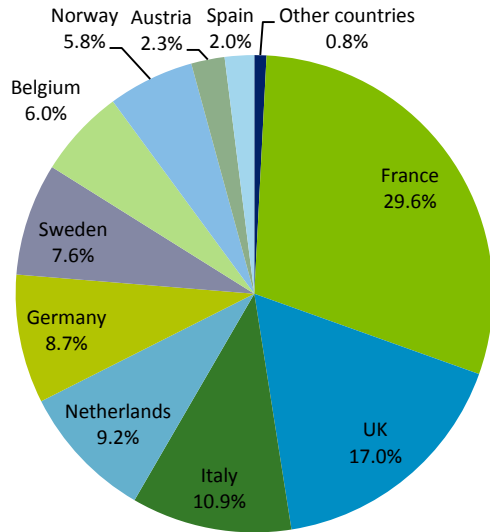
- In some cases, participants were not able to provide certain detailed information:
 - For instance, DnB, LBBW and LeasePlan were not able to provide default closing dates.
 - Nordea Sweden, LeasePlan and MPS were not able to provide information on whether the leased asset had been sold in cases of default.
 - MPS and LeasePlan were not able to provide reasons for default resolution.
 - **These missing data are indicated in the relevant chapters/slides that follow.**
- The LeasePlan contract database:
 - The LeasePlan database did not contain information on individual contracts but was provided on a counterparty basis.
 - We therefore did not have the following information:
 - Start and end date of contracts (only effective average remaining maturity of the contracts of the counterparty)
 - No initial outstanding (only exposure value at a point in time)
 - **LeasePlan data are therefore not included in the description of our overall leasing portfolio (i.e. the analysis in Chapter 5) unless otherwise stated.**
 - Additionally, due to a change in their counterparty identification key, we were not always able to identify counterparties for some older contracts. As a result, **some statistics (such as default rates) were not computed for their defaults. These cases are footnoted in the slides that follow.**

Chapter 5 – Description of the dataset

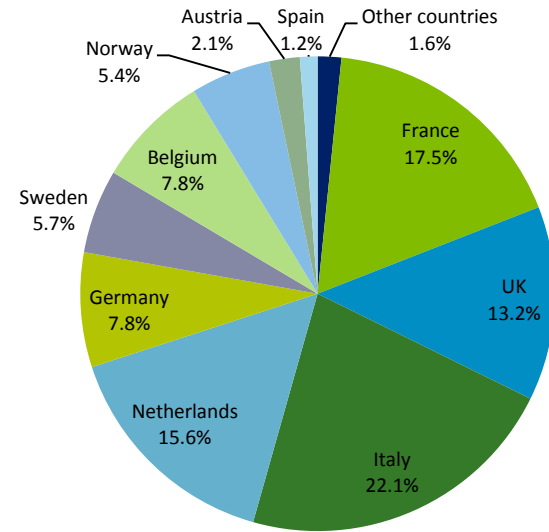
4. Key characteristics of the dataset

Countries covered

Number of contracts by country



Financed amounts by country



- The countries most widely represented in our study are France, the United Kingdom, Italy, Germany and the Netherlands.
- In some cases a country's representation will be markedly different when looking at number of contracts and financed amounts. For example, Italy is less represented in terms of numbers of contracts, but contributes more to the total financed amounts, meaning that the Italian leasing contracts are relatively bigger on average.
- In addition to the 10 countries listed on the charts above, a further 15 countries for which we have only a very small number of contracts are included under "other countries".

Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

Historical range

- The timeframe covers all contracts between 2007 and 2011 and all defaults that occurred within this timeframe.

Number of contracts by year of engagement						
<2007	2007	2008	2009	2010	2011	Total
1 081 226	504 196	489 518	399 173	409 116	405 584	3 288 813

Sum of initial outstanding (financed amounts in M€) by year of engagement						
<2007	2007	2008	2009	2010	2011	Total
53 583	25 031	25 027	18 110	18 859	19 364	159 976

- Our dataset contains almost 3.3 million contracts for a total of amount financed of €160 billions. This dataset is twice as large as the database for our previous report, *Implicit Risk Weights for SME Leasing in Europe*, which contained over 1.5 million contracts.
- More than 504 000 contracts were financed in 2007, for a total outstanding of €25 billion, and 406 000 contracts in 2011 for a total outstanding over €19 billions.
- Over this 5-year observation window covering periods of financial and economic turmoil, new production levels decreased in 2009 and rebounded slightly thereafter. However, they have not returned to levels seen prior to 2009.
- The minimal required historical observation period for modelling own estimates (PD and LGD) under the capital requirements regulation is 5 years. Our timeframe is therefore compliant with this requirement.

Chapter 5 – Description of the dataset

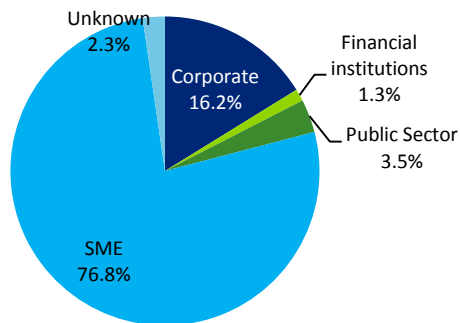
4. Key characteristics of the dataset (cont.)

Client breakdowns

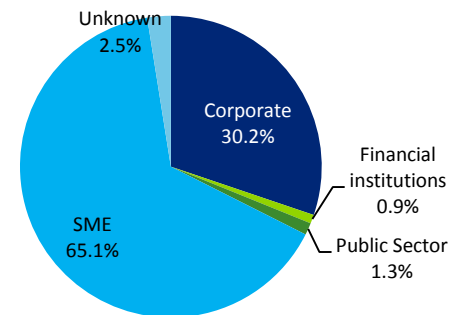
- Breakdown by client (counterparty and Basel 2 asset class):

- The SME portfolio represents a significant part of the whole database, i.e. around 77% of the database in number of contracts, and 65% of financed amounts.
- Other entities that use leasing as a financing tool are mainly corporates (30% of financed amounts).
- Financial and public institutions also use leasing, but more marginally.

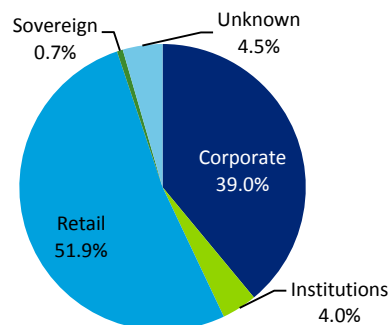
Number of contracts by client type



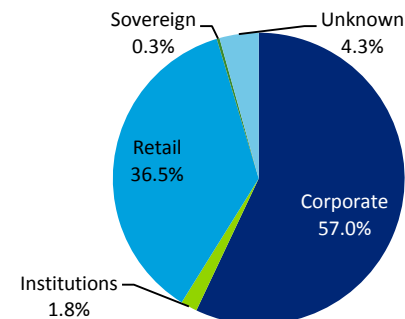
Financed amounts by client type



Number of contracts by Basel 2 asset class



Financed amounts by Basel 2 asset class



Chapter 5 – Description of the dataset

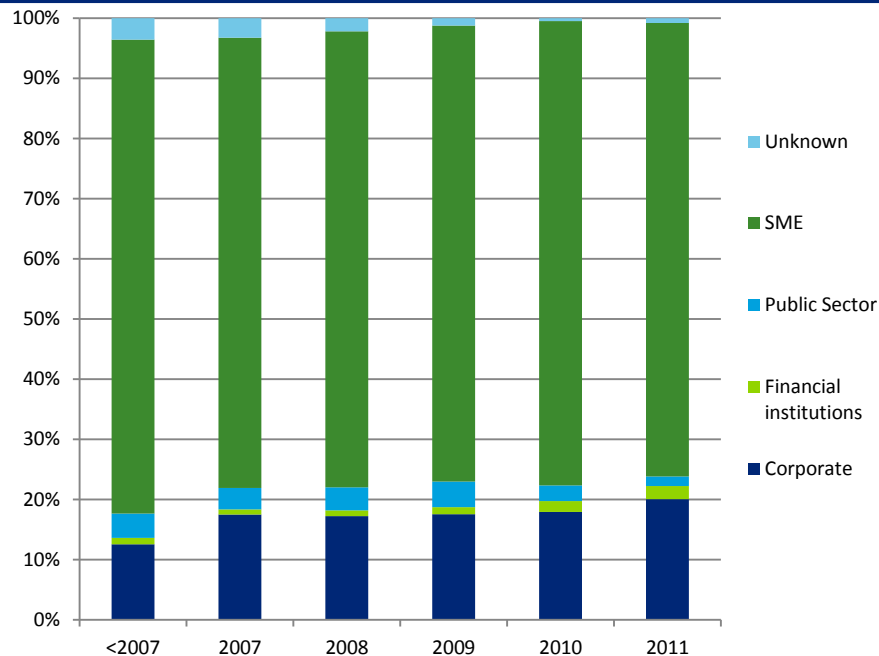
4. Key characteristics of the dataset (cont.)

Characteristics over time

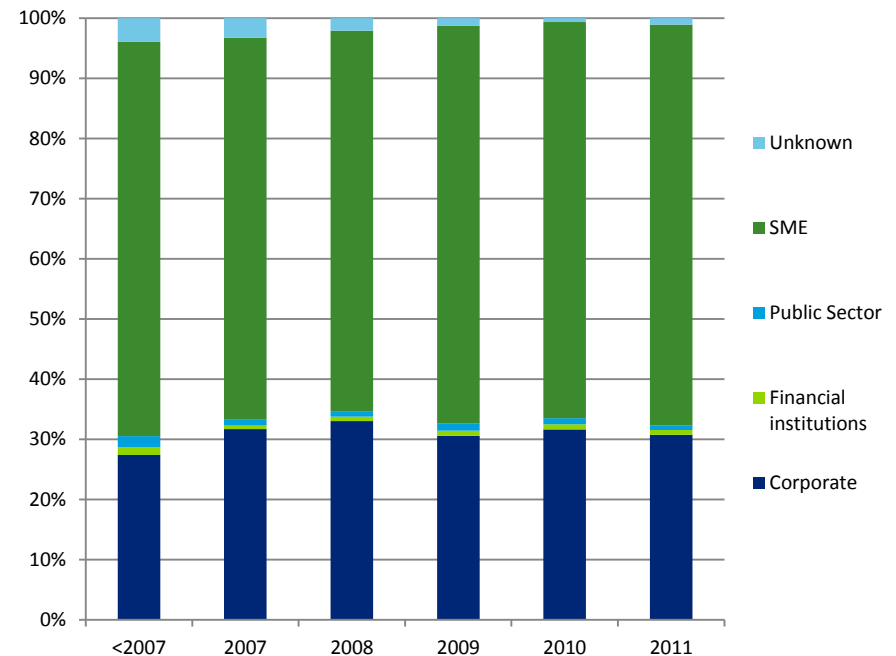
- Breakdown by type of client over the period:

- The trends are largely stable over the period.
- Slight changes are observed on Corporate and Public Sector counterparties, with a rise in Corporate contracts and a decrease in Public Sector contracts.

Proportion of contracts by counterparty and year of engagement



Proportion of initial outstanding by counterparty and year of engagement



Chapter 5 – Description of the dataset

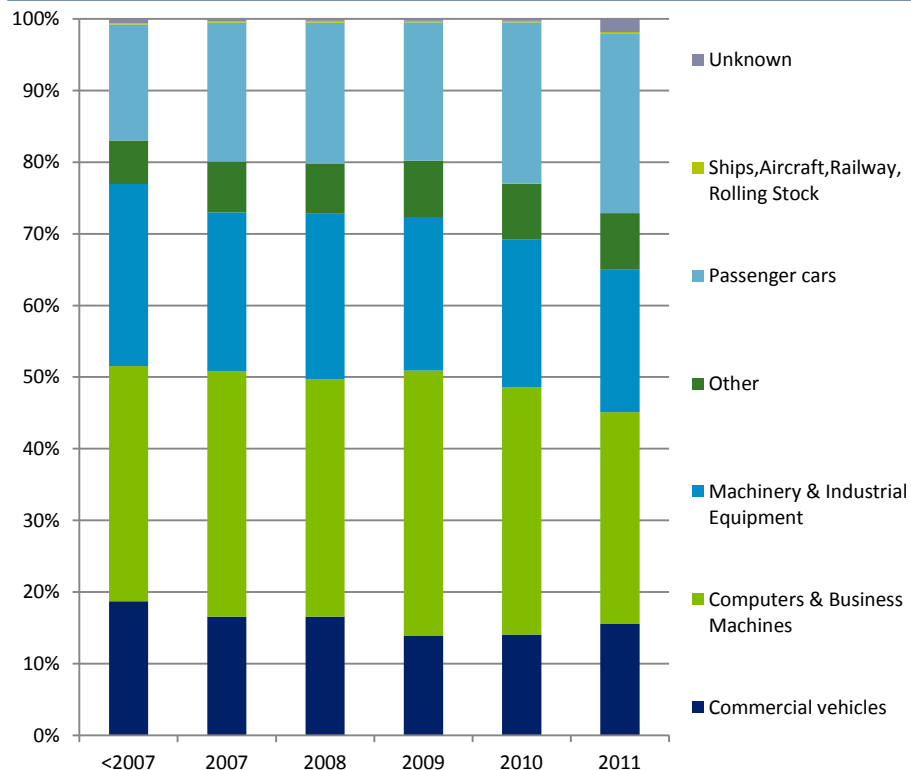
4. Key characteristics of the dataset (cont.)

Characteristics over time (cont.)

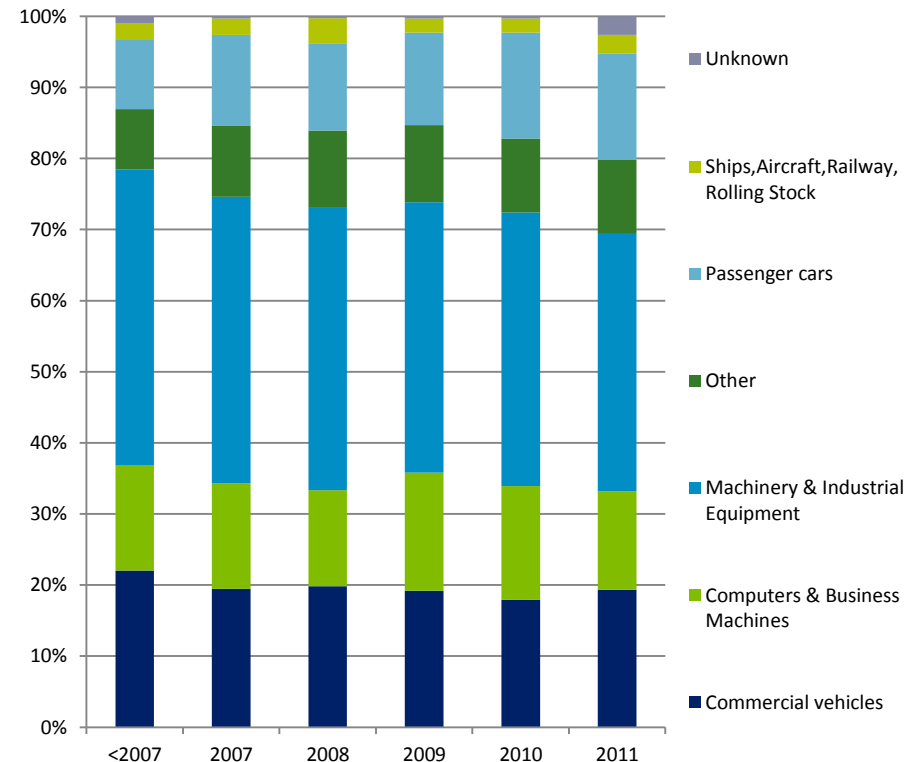
- Breakdown by type of leased asset over the period:

- The structure of the portfolio is generally stable over our timeframe.
- However, the share of Passenger Cars increases over the period and the share of Computers & Business Machines and Commercial Vehicles are more variable over time.

Proportion of contracts by asset type and year of engagement



Proportion of initial outstanding by asset type and year of engagement



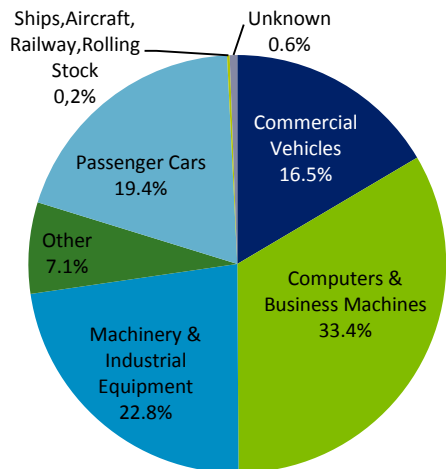
Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

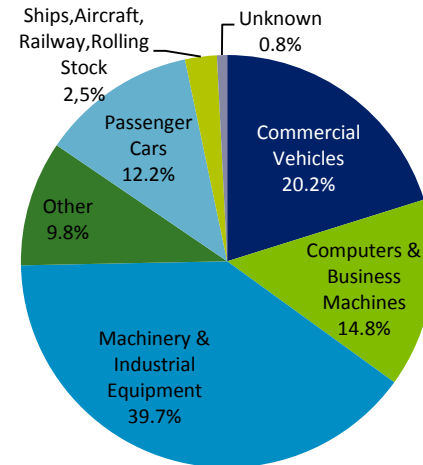
Breakdown by type of leased asset

- Within our sample of 3.3 millions contracts, 36% are for Automotive leases and 64% for Equipment leases. This ratio does not change over the years.
 - Due to the nature of the companies included in our sample, this proportion of Automotive/Equipment differs from Leaseurope figures, where Automotive represents 60% of the leases.

Number of contracts by type of asset



Financed amounts by type of asset



- The largest asset category in number of contracts is Computers & Business Machines, followed by Machinery & Industrial Equipment and Passenger Cars.
- In terms of outstanding, the largest category is Machinery & Industrial Equipment, followed by Commercial Vehicles and Computers & Business Machines.
- The category Ships, Aircraft, Railway, Rolling Stock represents a small part of the portfolio. Moreover, with the duration of contracts and the amounts financed being very different from the other types of assets, we decide to exclude these assets from our in-depth analysis.
- We also exclude the Unknown category from our analysis.

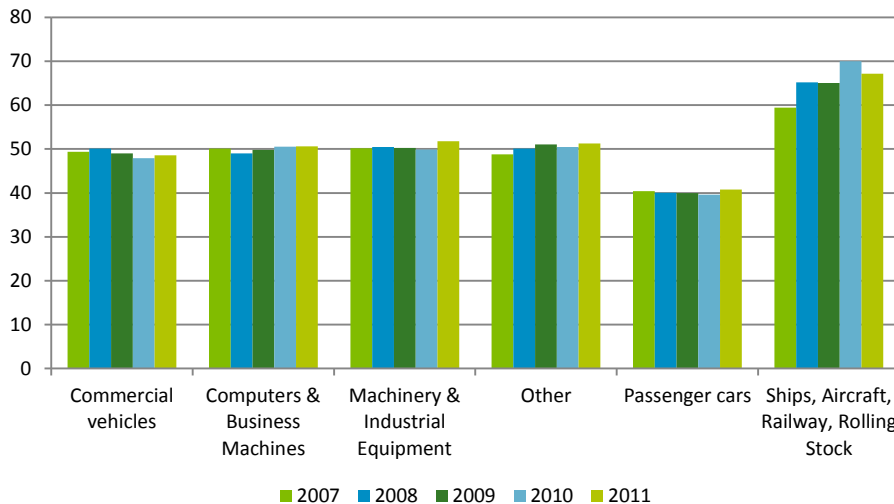
Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

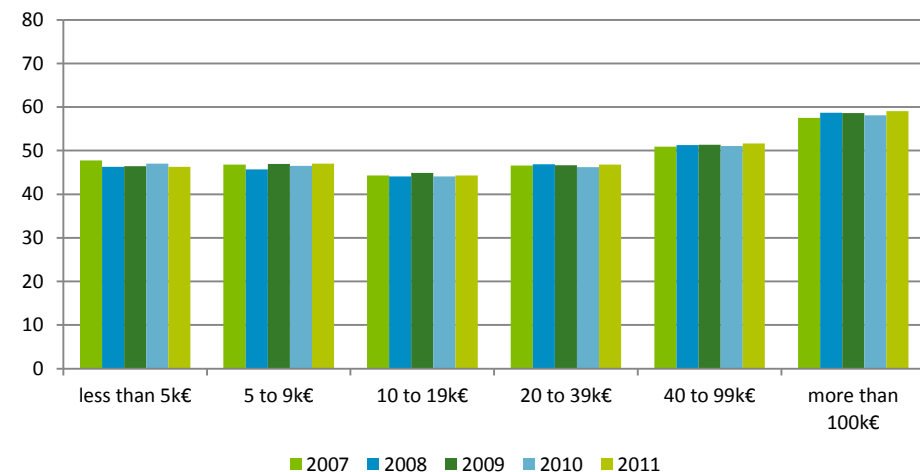
Characteristics of the contracts in the sample

- Contracts last on average 50 months (4 years and 2 months), whatever the type of counterparty:
 - 52 months for **Equipment** leases
 - 46 months for **Automotive** leases

Average contract duration (in months) by type of leased asset and year of engagement



Average contract duration (in months) by initial outstanding and year of engagement



- Contract duration is close to 40 months for Passenger Cars
- It reaches 70 months for Ships, Aircraft, Railway and Rolling Stock in 2010.
- Commercial Vehicles, Computers & Business Machines, Machinery & Industrial Equipment and Other assets have a stable duration of approximately 50 months over the period.
- Contract duration generally increases with the level of financed amounts but remains steady over the years.

Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

Characteristics of the contracts in the sample (cont.)

- The average financed amount is 48 643€.

Average initial outstanding by counterparty	
Corporate	€ 90 677
Financial Institutions	€ 36 161
Public Sector	€ 18 134
SME	€ 41 229

Average initial outstanding by asset type	
Commercial Vehicles	€ 59 446
Computers & Business Machines	€ 21 566
Machinery & Industrial Equipment	€ 84 720
Other	€ 67 706
Passenger Cars	€ 30 510
Ships, Aircraft, Railway, Rolling Stock	€ 604 215

Average initial outstanding by asset type and counterparty						
	Commercial Vehicles	Computers & Business Machines	Machinery & Industrial Equipment	Other	Passenger Cars	Ships, Aircraft, Railway, Rolling Stock
Corporate	€ 97 153	€ 44 079	€ 166 581	€ 198 063	€ 34 505	€ 1 279 531
Financial Institutions	€ 71 312	€ 41 240	€ 121 758	€ 78 373	€ 18 723	€ 278 607
Public Sector	€ 75 663	€ 10 667	€ 61 110	€ 117 092	€ 32 902	€ 66 890
SME	€ 51 882	€ 18 046	€ 70 138	€ 42 505	€ 29 076	€ 421 454

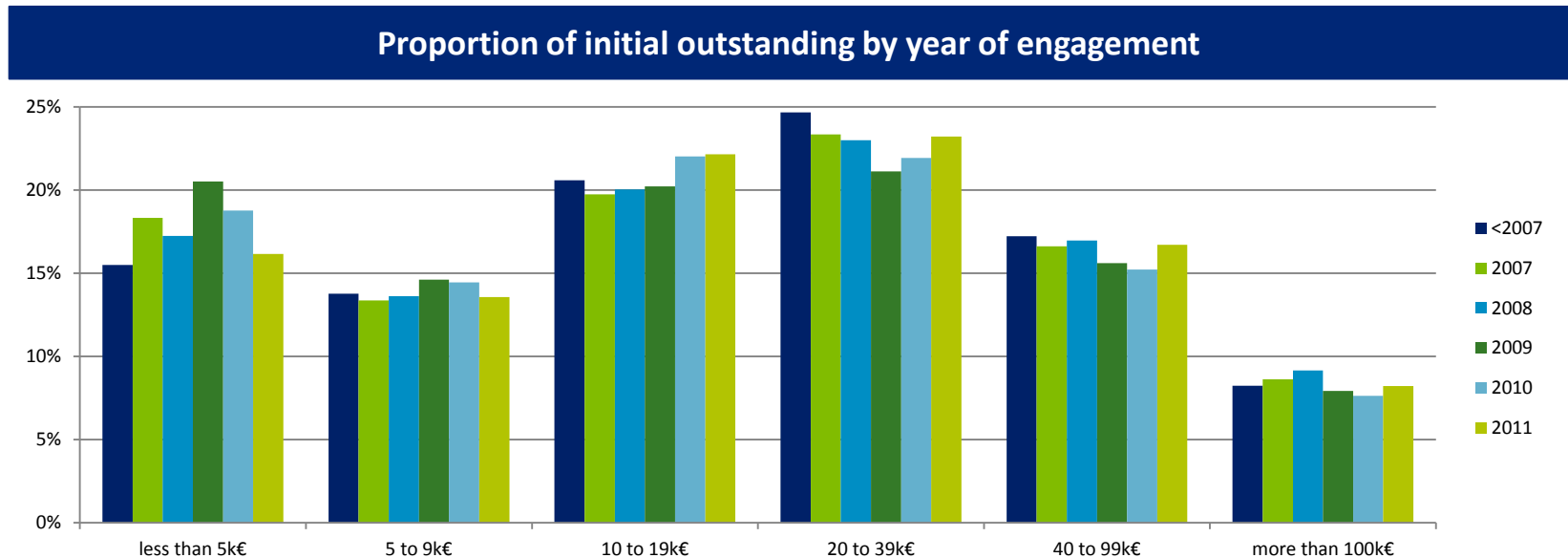
- The average financed amount very much depends on the type of counterparty and leased asset:
 - It is lower for smaller items such as Computers & Business Machines and Passenger Cars, higher for larger items (i.e. Machinery & Industrial Equipment and Ships, Aircraft, Railway, Rolling Stock).
 - The average initial outstanding for Automotive leases is more homogeneous across client types than the other asset categories.
 - The average initial outstanding for Public Sector and Financial Institution clients is lower than for Corporates (including SMEs), and is linked to the type of assets they finance through leasing: the Public Sector makes more use of Computers & Business Machines (83% of their contracts), as do Financial Institutions. Passenger Cars are also important for these counterparties (making up respectively 48% and 44% of their contracts).
 - Larger corporates have bigger leasing contracts.

Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

Characteristics of the contracts in the sample (cont.)

- We observe an increase in the number of smaller contracts and a decrease in the number of bigger contracts over the period 2007-2011.
- This can be linked to the economic and financial turmoil, and the response of the leasing industry to their clients' needs (e.g. diversification of risk through more, smaller contracts or the extension of contract terms instead of issuing new leases for new equipment).
- However, this trend seems to reverse in 2011, indicating a return to normal conditions.



Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

Coverage of defaulted contracts*

- Among the 3.3 millions contracts of our sample, **184 496 contracts defaulted** between 2007 and 2011.

Number of defaults by counterparty and default year						
	In number of contracts	Corporate	Financial Institutions	Public Sector	SME	Unknown
2007	16 685	7.4%	0.3%	0.4%	79.4%	12.5%
2008	30 026	9.7%	0.3%	0.2%	82.9%	6.9%
2009	52 691	12.8%	0.2%	0.3%	83.9%	2.9%
2010	45 597	17.2%	0.2%	0.2%	80.1%	2.2%
2011	39 497	16.1%	1.0%	0.2%	81.2%	1.6%
Total	184 496	13.6%	0.4%	0.3%	81.8%	4.0%

- The number of defaults peaks in 2009, i.e. the height of the crisis, and decreases between 2010 and 2011.
- The proportion of defaults for Financial Institutions and Public Sector clients is quite steady over the years, accounting each for 0.3% of the default database, except for Financial Institutions in 2011, when they accounted for 1% of the defaults. This is due to one participant who implemented a new definition for default in November 2010.
- After 2009, the portion of corporates defaulting increased, representing more than 16% of total defaults in 2010 and 2011, in contrast the portion of SMEs defaulting decreased.
 - This trend is also visible within the overall sample, where the share of corporates increased

* LeasePlan data is included in this slide. The higher share of “Unknown” counterparties in 2007 and 2008 can be attributed to a change in LeasePlan’s counterparty identification key, which meant that it was no longer possible to identify client types for some older contracts.

Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

Coverage of defaulted contracts (cont.)*

- Among the **184 496** defaulted contracts, **111 007** were closed at the end of 2011.

Closing rate by counterparty	
Corporate	63.5%
Financial Institutions	83.8%
Public Sector	82.2%
SME	58.8%
Total	60.2%

Closing rate by default year	
2007	71.2%
2008	68.3%
2009	63.7%
2010	60.8%
2011	43.9%
Total	60.2%

- SME contracts represent 82% of the default database but have the lowest closing rate.
- The closing rate of contracts for which the type of counterparty is unknown is 72.9%.
- The closing rates for defaults of Financial Institutions and Public Sector entities are the highest, although these counterparties represent a very small portion of all defaults in our database.

- The closing rate decreases over the years.
- The lower closing rate observed in 2011 is due to the time horizon of our database, as for this year we were only able to capture those defaults that occurred and closed within less than one year.
- Without considering 2011, the closing rate is above 60%, reaching more than 70% for the 2007 generation of defaults.

* LeasePlan data is included in this slide.

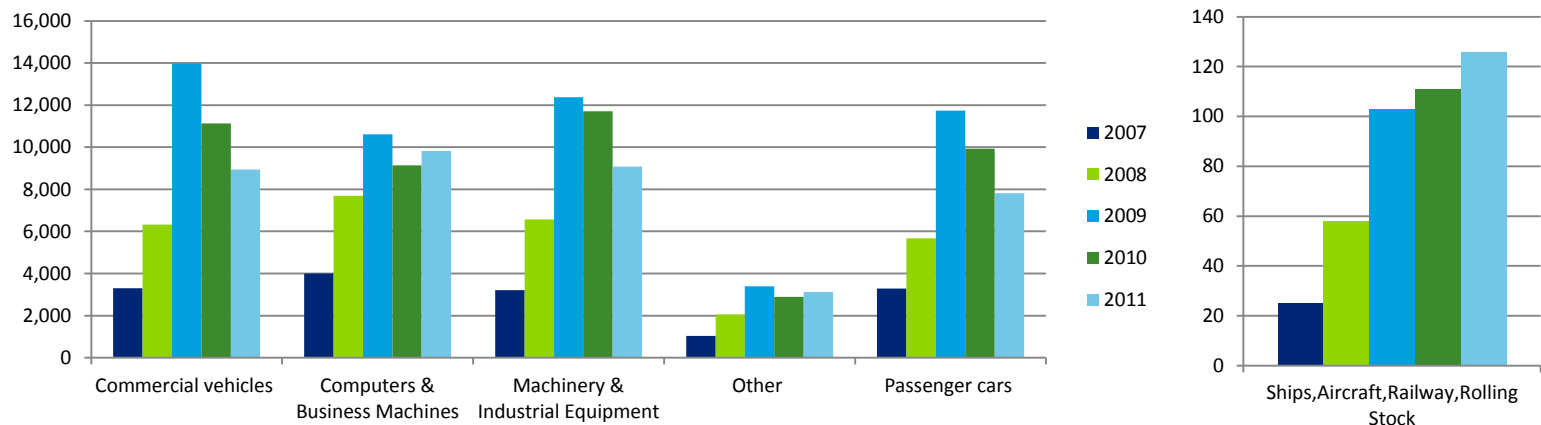
Chapter 5 – Description of the dataset

4. Key characteristics of the dataset (cont.)

Coverage of defaulted contracts (cont.)

- The proportion of defaulted contracts within our sample is 5.44 %.
- Commercial Vehicles default more than other assets (8% of these contracts), while Computers & Business Machines leases have the lowest default proportion (3.8%).

Number of defaults by type of leased asset and default start year



- As already observed, the proportion of defaults is cyclical: the number of defaults increases from 2007 to 2009 and then decreases afterwards.
- For Computers & Business Machines and Other assets, the number of defaults increases again slightly in 2011.
- For Ships, Aircraft, Railway, Rolling Stock leases, the number of defaults increases from 2007 to 2011, probably linked to an increase of the contracts financed over the timeframe. The default proportion remains however very low.

Coverage of loss data

- The number of contracts for which defaults have been resolved is 111 007. Among them, 110 567 have a loss rate below 140%.

Chapter 6 – Characteristics of Defaults in Leasing

Chapter 6 – Characteristics of defaults in leasing

Key findings

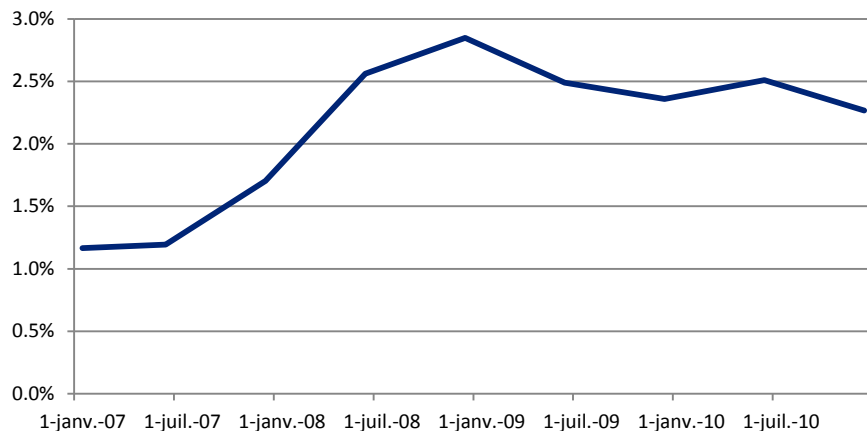
- The average one-year default rate (Basel 2 compliant) of our portfolio, calculated over five years, is 2.12%. Even during peak crisis years (i.e. 2008, 2009), the default rate remains low and is under 3%.
- Our default rates are slightly higher for the Retail exposure class than the Corporate category, although they both follow the same pattern over time.
- Leasing default rates are lower than those for traditional lending. For instance, our one-year default rate for Retail SMEs in 2010 is 2.66%, whereas, according to the EBA (in their 2011 EU-wide stress test aggregate report), the median one-year default rate of their sample of banks lending to Retail SMEs is approximately 4.5%. Similarly, our results show a default rate of 2.32% for Corporate leases compared to the EBA's 3% for all Corporate exposures.
- In terms of asset types, default rates are highest for Commercial Vehicles (which peak at 4.7% in 2009) and lowest for Computers & Business Machines (around 1% at the beginning of 2007).
- The average time-to-default is 26.4 months after contract inception. Over half of the defaults (56%) occur more than 2 years after contract inception.
- Defaults within our sample last for 8.5 months on average. 75.6% of closed defaults resolve within the first year of default and 90% are resolved within 20 months.
- Our results show differences in recovery strategies, resolution rates and closing speeds by asset type.
- The recovery process is significantly faster for defaults for which the leased asset has been sold.
- Over 60% of defaulted contracts return to a healthy position. Corporates exposures return to a healthy position in the vast majority of cases (73%), while SMEs do in 60% of cases. The high proportion of regrades is consistent with the fact that the leased asset is often a crucial working tool for the client, thus creating an incentive for a lessee to return to a regular payment situation in order to avoid losing the asset.

Chapter 6 – Characteristics of defaults in leasing

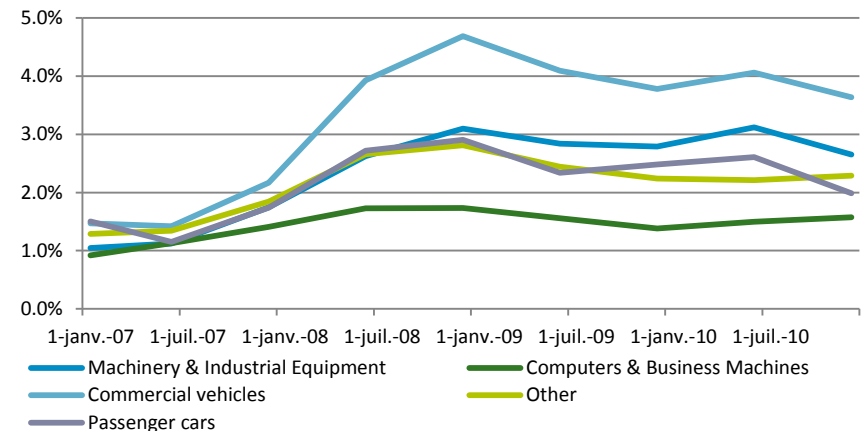
1. One-year default rates within our panel

- In this chapter, we calculate one-year default rates, which show the probability of a leasing contract defaulting over the next 12 months, based on historical information from our sample portfolio.
- Please note that LeasePlan data is not included in this chapter (unless stated otherwise).
- The average one-year default rate of our portfolio (calculated over 5 years) is **2.12%**.
- Aggregate default rates peak in 2009.
- Default rates per type of leased asset are similar in 2007 and then diverge from 2008 on. They seem to start converging again in 2011, but a longer time series would be needed to confirm this.
- Default rates of Computers & Business Machines are the lowest, whereas those for Commercial Vehicles are the highest, peaking in 2009 and remaining relatively high compared to other asset types.

One-year default rates for the total population



One-year default rates by asset type



Chapter 6 – Characteristics of defaults in leasing

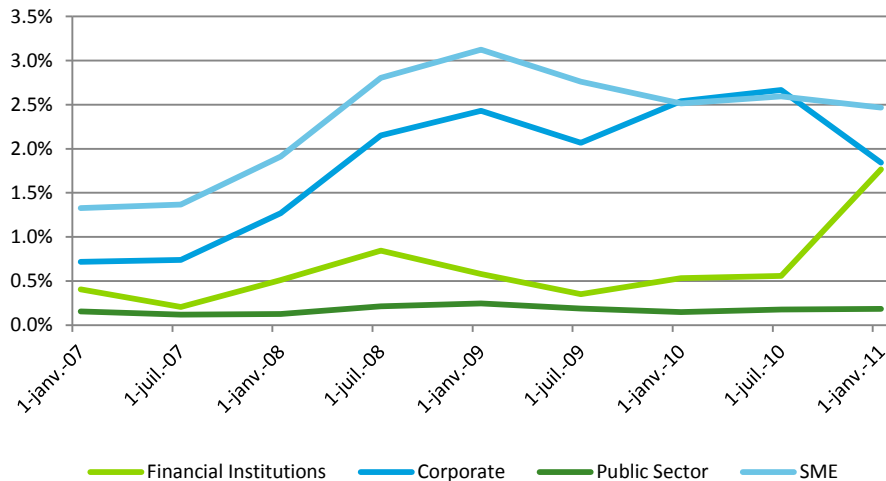
1. One-year default rates within our panel (cont.)

- The average one-year default rate of our portfolio (calculated over the 5 years spanning 2007-2011) per Basel 2 asset class is summarised in the following table:

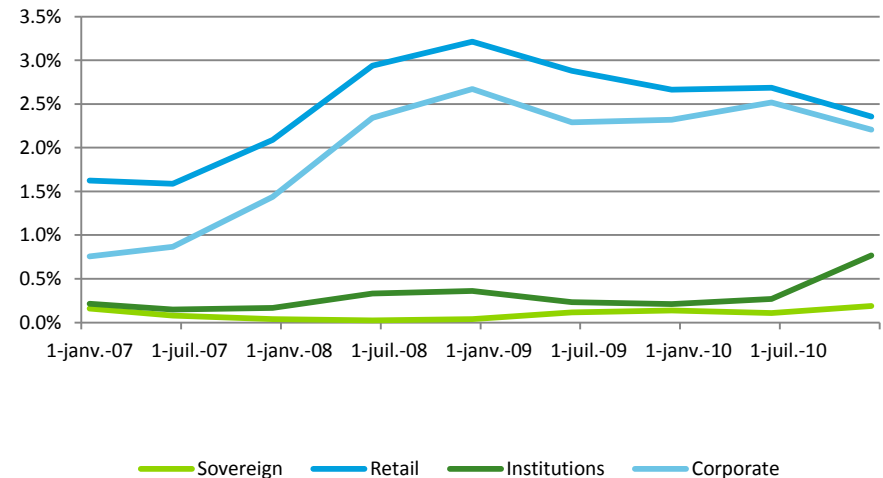
Total	Corporate	Institutions	Sovereign	Retail
2.12%	1.93%	0.30%	0.10%	2.45%

- Retail default rates are the highest at 2.45%, while Sovereign default rates are the lowest at 0.1%.
- Retail and Corporate curves have followed a relatively trend in default rates over time, converging closely towards the end of our period.

One-year default rates by counterparty



One-year default rates by Basel 2 asset class



Chapter 6 – Characteristics of defaults in leasing

2. Comparison to traditional lending PDs and default rates

- We compare these rates to other available sources of probability of default (PDs) information
- The **Results of the fifth quantitative impact study (QIS 5)** presents average PDs as of 30/06/2005, i.e. under better economic conditions than our timeframe. The average PDs are provided by Basel 2 asset class
 - For the **Corporate** class, the default rates on our panel are higher than in the QIS 5 benchmark.
 - Our observed default rate for the **Retail (SME)** category is however clearly lower than Retail SMEs in the QIS 5 figures.

Source: QIS 5	PDs for the corporate portfolio	PDs for the bank portfolio	PDs for the sovereign portfolio	PDs for the SME corporate portfolio	PDs for the SME retail portfolio
PD Bucket	Average	Average	Average	Average	Average
CEBS Group 1	1.04%	0.22%	0.13%	2.20%	3.26%
CEBS Group 2	0.83%	0.11%	0.04%	2.16%	3.66%

Source: Basel Committee on Banking Supervision, *Results of the fifth quantitative impact study QIS 5* – June 16 2006

Timeframe: Results on the portfolio as of 30/06/2005

Participants: CEBS Group 1 and 2 composed of 20 participating countries (*) among European countries which are either EU member states, EU accession candidates or members of the European Economic Area (EEA). The split between Group 1 and 2 is not specified.

*Belgium, Bulgaria, Cyprus, the Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Norway, the Netherlands, Poland, Portugal, Spain, Sweden and the United Kingdom.

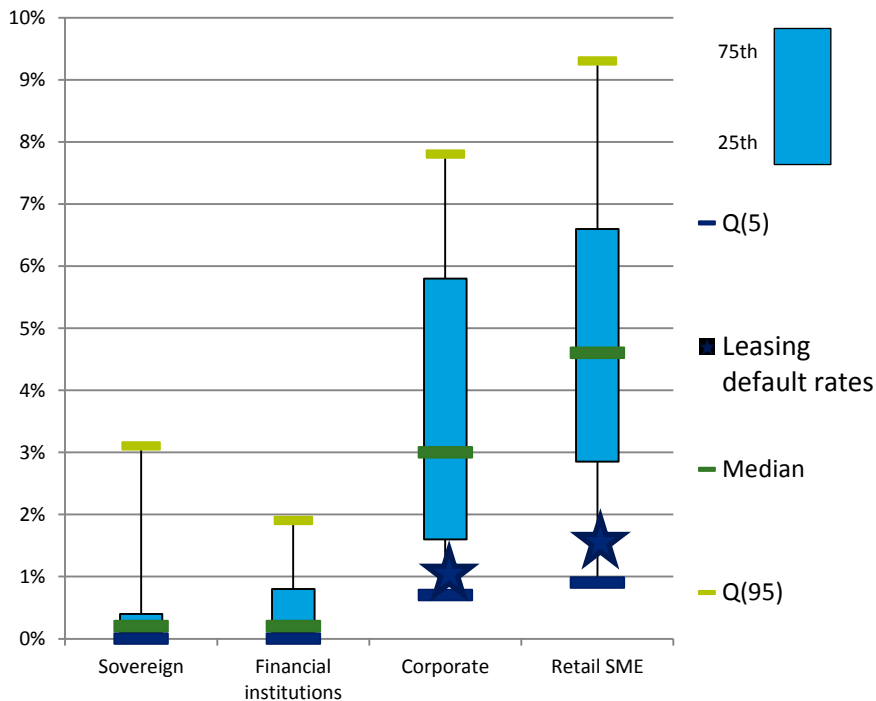
Chapter 6 – Characteristics of defaults in leasing

2. Comparison to traditional lending PDs and default rates (cont.)

- The 2010 default rates on our portfolio by Basel 2 asset class are:

Corporate	Institutions	Sovereign	Retail SME
2.32%	0.21%	0.14%	2.66%

EBA 2010 Default rates – Regulatory portfolios



- The *European Banking Authority's 2011 EU-wide Stress Test Aggregate Report of July 15 2011* shows the dispersion of average default rates across banks in 2010. These figures are more consistent with our timeframe.
- For the **Corporate** asset class, the EBA median default rate is higher than our estimate for leasing, at around 3% with an interquartile range between 1.6% and 5.8%.
- Compared to **retail SME** figures, the leasing retail portfolio defaults significantly less, even lower than the 25th quartile of better performing banks.
- The observed default rates on leasing are consistent and in line with the default rates provided for the **Sovereign and the Financial Institutions** portfolios.

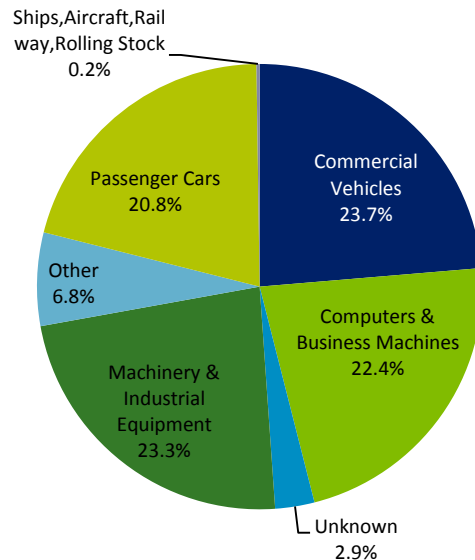
Source: EBA, *European Banking Authority 2011 EU-wide Stress Test Aggregate Report – July 15 2011*
Participants: 90 EU Banks

Chapter 6 – Characteristics of defaults in leasing

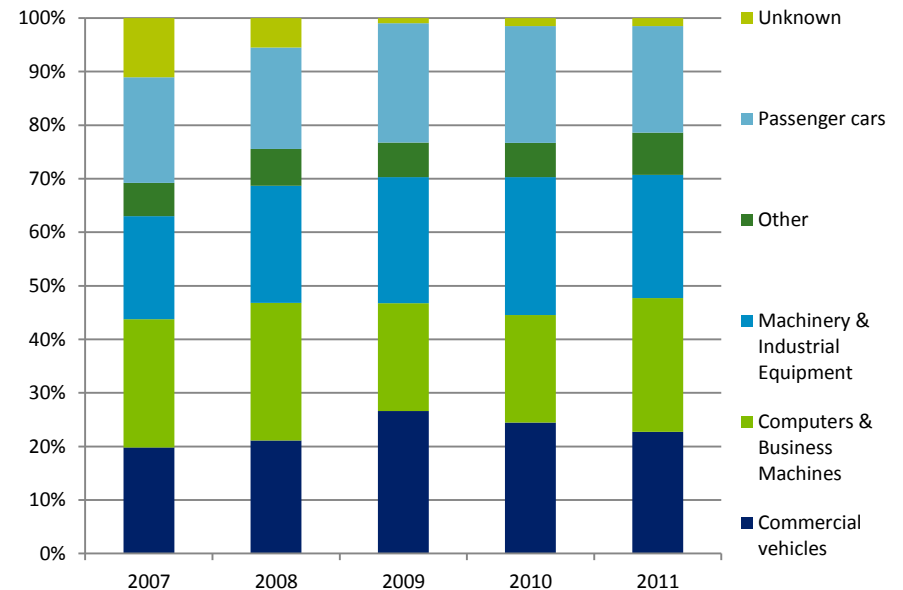
3. Characteristics of defaults*

- The breakdown of defaulted contracts by type of leased asset does not change significantly over the period.

Number of defaults by asset type



Proportion of defaults by asset type and default start year

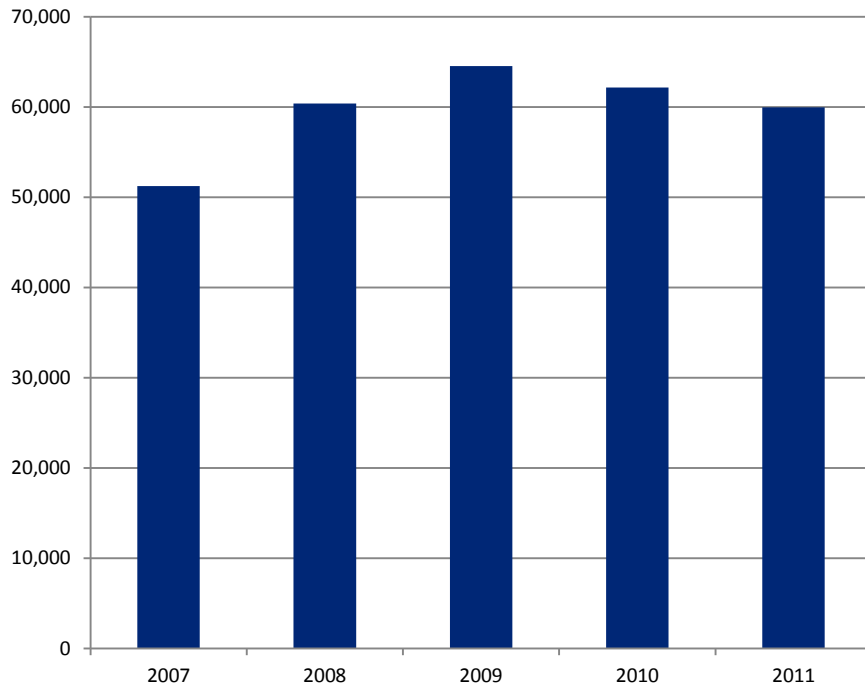


- In comparison to the overall database, Computers & Business Machines are somewhat less represented in the default database whereas Commercial Vehicles are more represented.

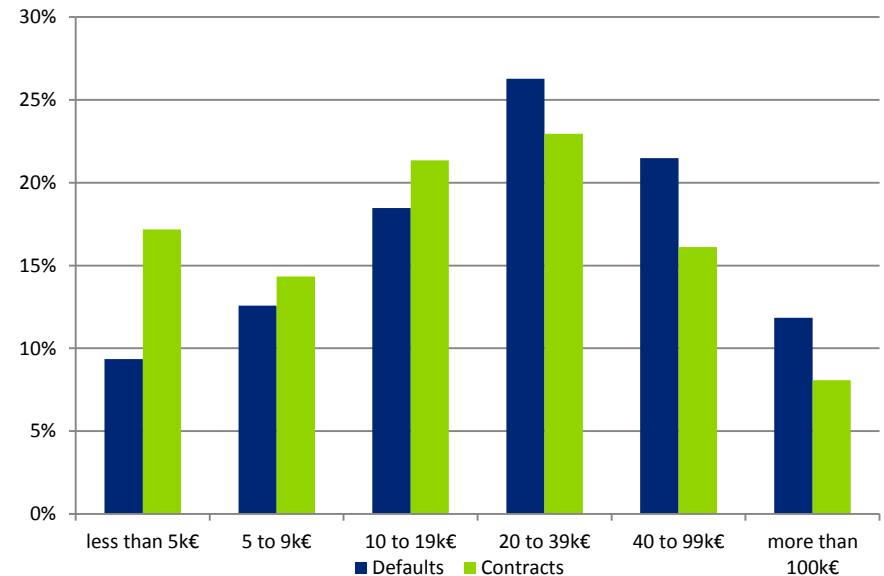
Chapter 6 – Characteristics of defaults in leasing

3. Characteristics of defaults (cont.)

Average initial outstanding by default start year



Proportion of all contracts and the defaulted population by initial outstanding



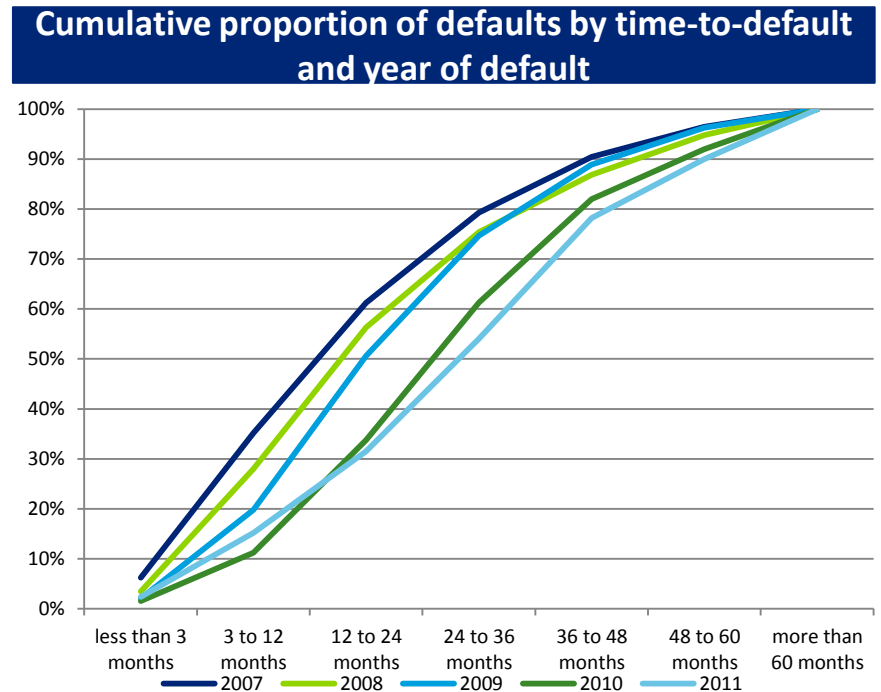
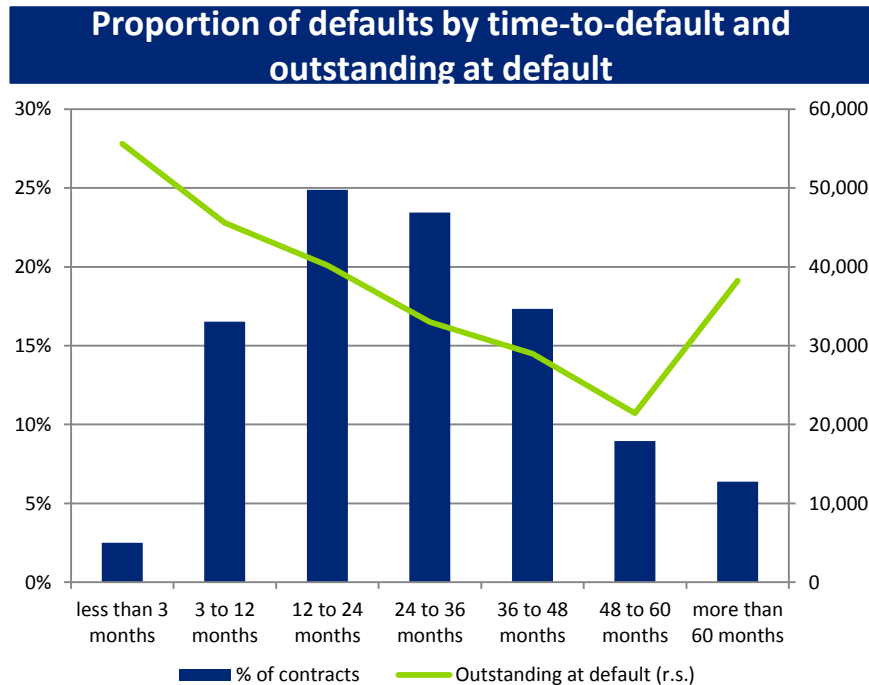
This graph should be read as follows: contracts with an initial outstanding of 20 to 39k€ represent 23% of all leasing contracts within our database and 26% of all defaulted contracts within our database.

- The average initial outstanding increases between 2007 and 2009 from 51k€ to 65 k€ and then decreases to 60k€.
- Defaulted contracts have on average a higher initial outstanding than the total contract dataset. For instance, 21% of defaults have an initial outstanding between 40 and 99k€ whereas these contracts represent 16% of all contracts. In other words, proportionally more defaults occur with bigger contracts.

Chapter 6 – Characteristics of defaults in leasing

4. Defaults occur late in the life of the contract

- More than half of the defaults (56%) occurred more than 2 years after contract inception.
- Over the period, contracts tend to default later: in 2007, more than 60% of the defaults occurred on contracts initiated between 12 to 24 months earlier. In 2011, this was only the case for 30% of the defaults.



Chapter 6 – Characteristics of defaults in leasing

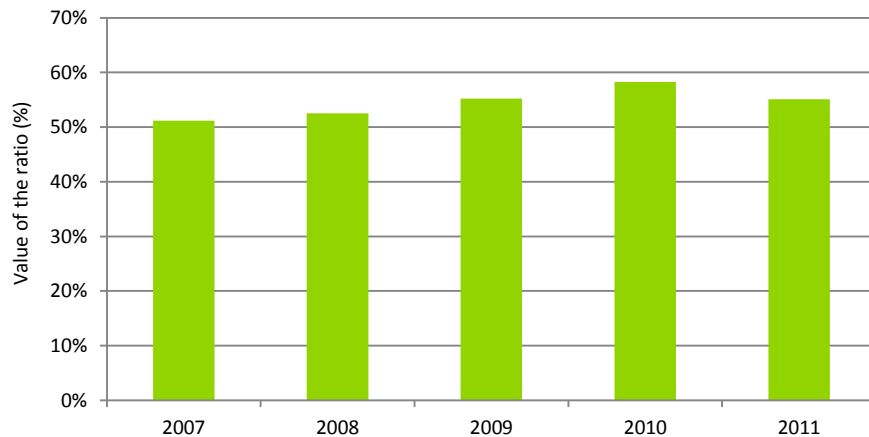
4. Defaults occur late in the life of the contract (cont.)

- To identify at what point in the contract life the default occurs, we calculated the ratio of time-to-default over the initial contract term as:

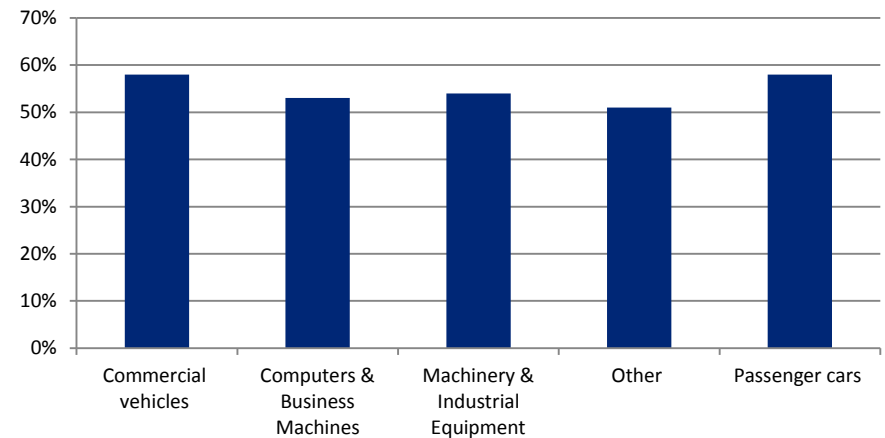
$$\text{Default timing ratio} = \frac{\text{Default Start Date} - \text{Contract Engagement Date}}{\text{Contract maturity date} - \text{Contract Engagement Date}}$$

- If the rate is closer to 0%, the contract defaults at the beginning of its life
- If the rate is closer to 100%, it defaults later and closer to the contract end date

Average default timing ratio by default year



Average default timing ratio by asset type



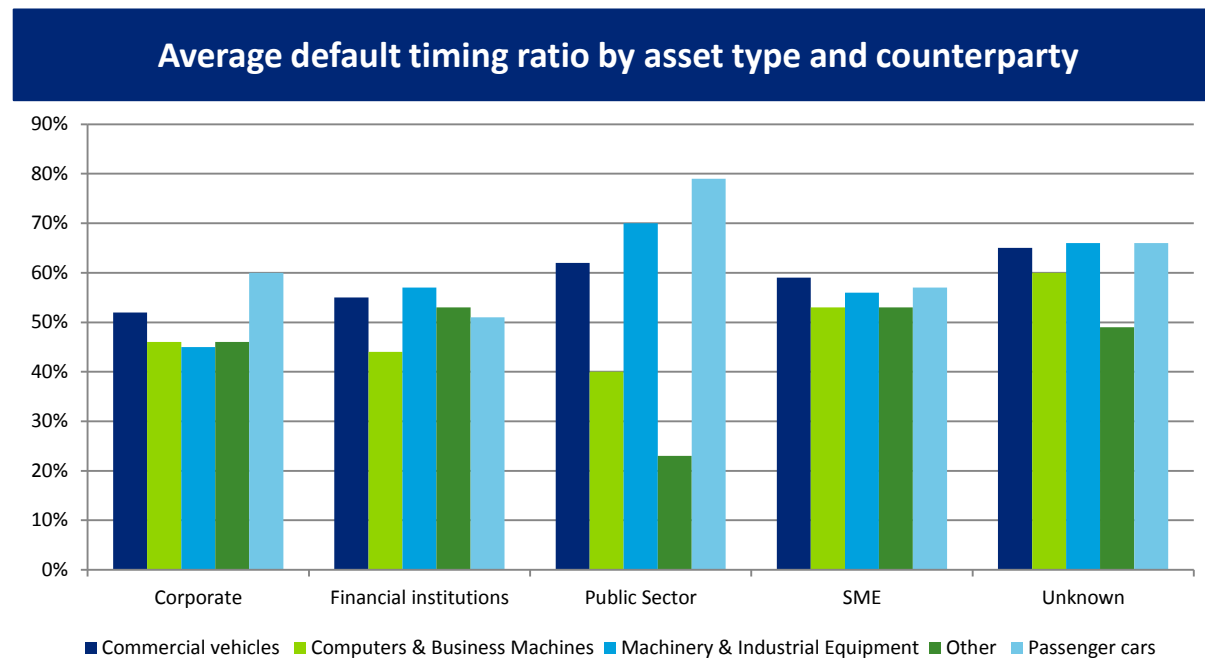
- The ratio shown above ranges between 50 and 60% depending on the asset type:
 - Passenger Cars and Commercial Vehicles tend to default closer to their term whereas Equipment contracts default approximately in their mid-life.
- The ratio also increases over time and until 2010.

Chapter 6 – Characteristics of defaults in leasing

4. Defaults occur late in the life of the contract (cont.)

- Refining the analysis by type of counterparty:

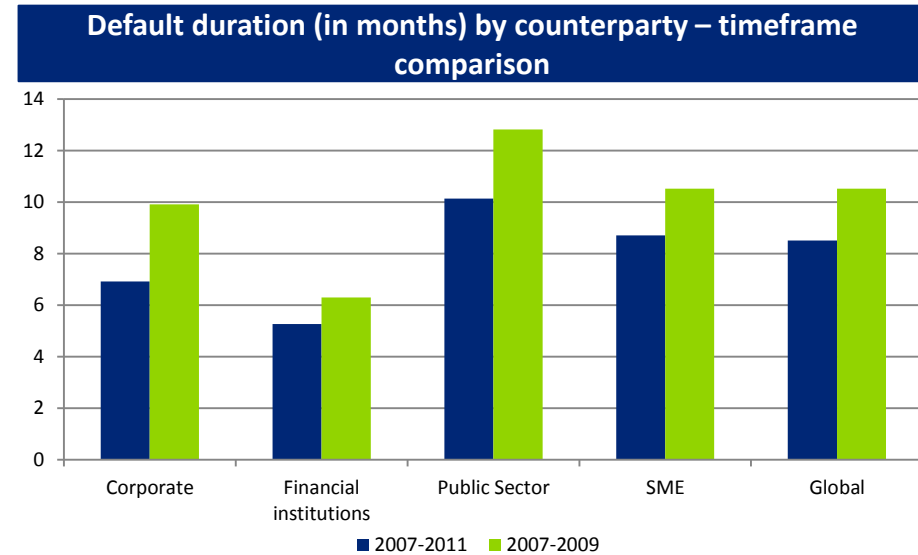
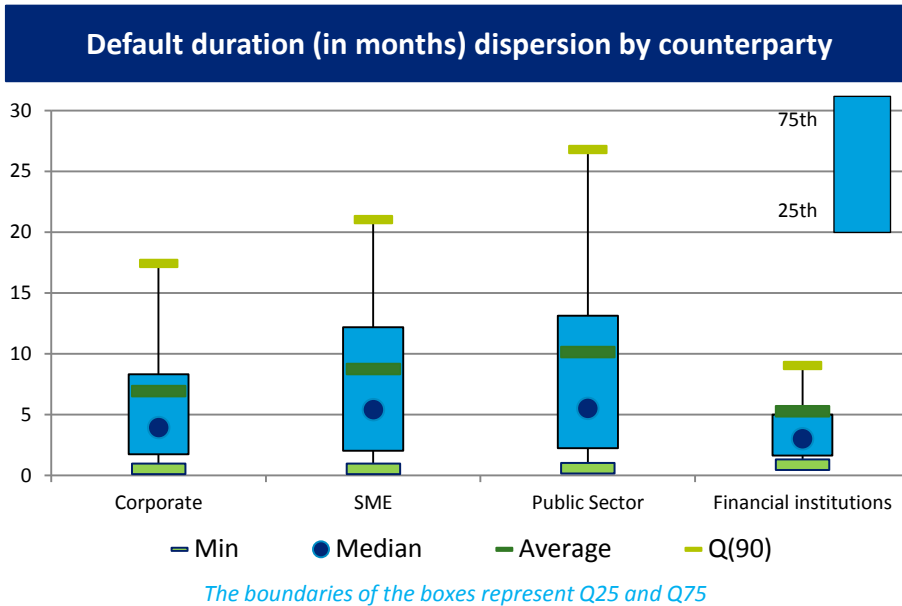
- We observe high variability in the ratio for Public Sector entities depending on the asset type: lower for Computers & Business Machines and Other and higher for Passenger Cars and Machinery & Industrial Equipment.
- In general, defaults occur later in the contract life for SMEs than for Corporate.



Chapter 6 – Characteristics of defaults in leasing

5. Defaults resolve quickly*

- Defaults within our sample last **8.5 months on average**.



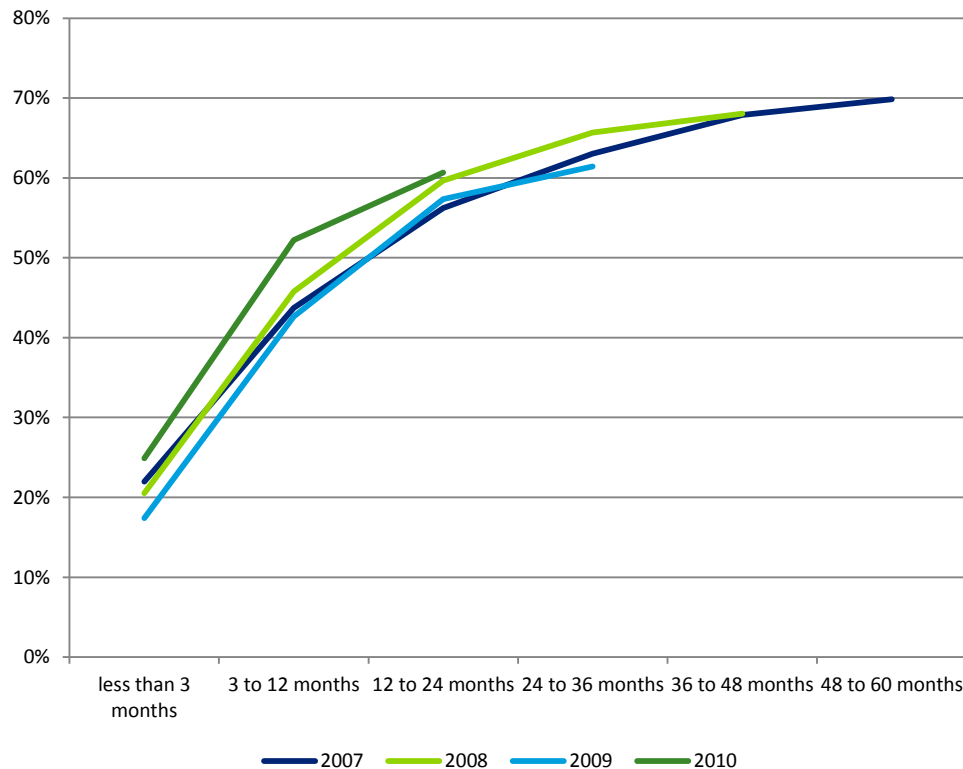
- Around 90% of resolved defaults close in less than 20 months. However this figure varies depending on the type of counterparty:
 - Around 26 months for Public Sector
 - Less than 10 months for Financial Institutions
 - A gap of almost 3 months between Corporate and SMEs, with SMEs defaults taking longer to resolve.
- It should be noted that the median is below the average, implying that a few outlier defaults influence the average.
- Default duration is longest for Public Sector contracts (10 months on the full timeframe and almost 13 months for the defaults having started between 2007 and 2009) and lowest for Financial Institutions (5 months / 6 months).
- Between 2007 – 2009, defaults took marginally longer to resolve (10.5 months on average).

Chapter 6 – Characteristics of defaults in leasing

5. Defaults resolve quickly (cont.)*

- Focusing on how many defaults are closed by a certain time gives insights on the efficiency of default management processes.
- The following graphs indicate the cumulative proportion of defaults which close after X months in default.

**Cumulative proportion of defaults closed by x months:
by default start year**



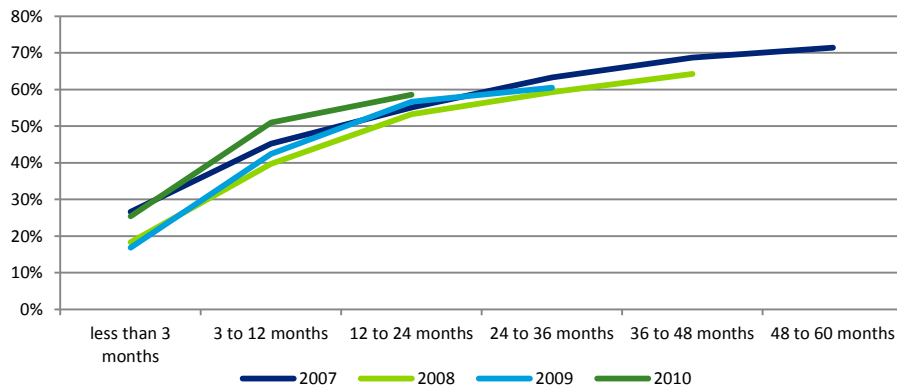
- Between 43% to 52% of closed defaults resolved within the first year, showing lessors' reactivity in default management.
- Patterns per default year are similar over our timeframe, with slightly improved figures for 2010.
- After 4 years, 30% of defaults are however still unresolved. A high number of these cases (63%) can be attributed to situations where the lessor has repossessed and sold the leased asset but has decided to keep the contract in default status as it hopes to obtain additional recoveries from the client. Such situations are therefore not necessarily an indicator of high loss on the exposure (as the asset sale could cover a substantial part of the EAD).

Chapter 6 – Characteristics of defaults in leasing

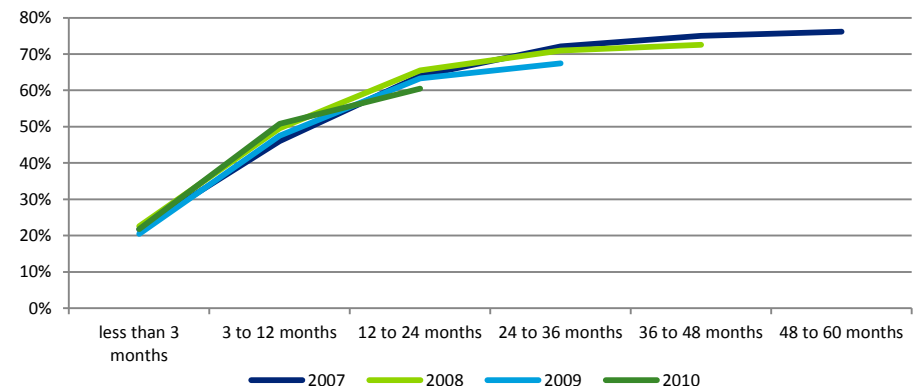
5. Defaults resolve quickly (cont.)*

- Default management strategies depend on many factors including asset types. This can have an impact on how quickly defaults close.
 - For Passenger Cars, the speed of default closure varies more by year, illustrating that the car leasing industry is particularly reactive to changes in economic conditions and second hand asset markets.
 - Defaults on Computers & Business Machines have a higher resolution rate overall, probably due to the small amounts at risk with this kind of lease.

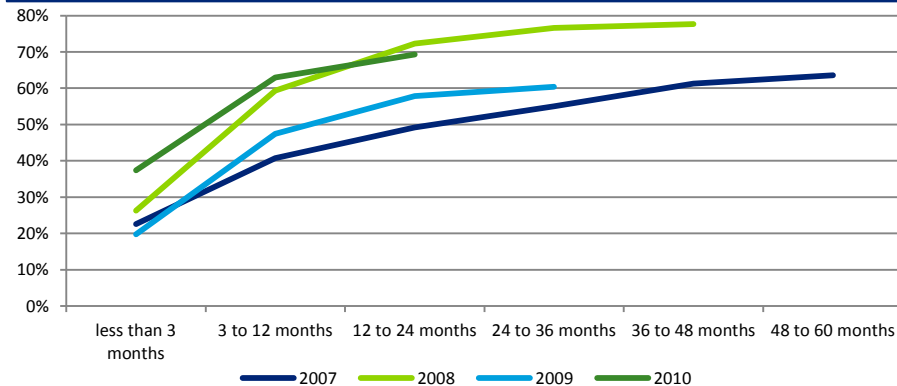
Machinery & Industrial Equipment



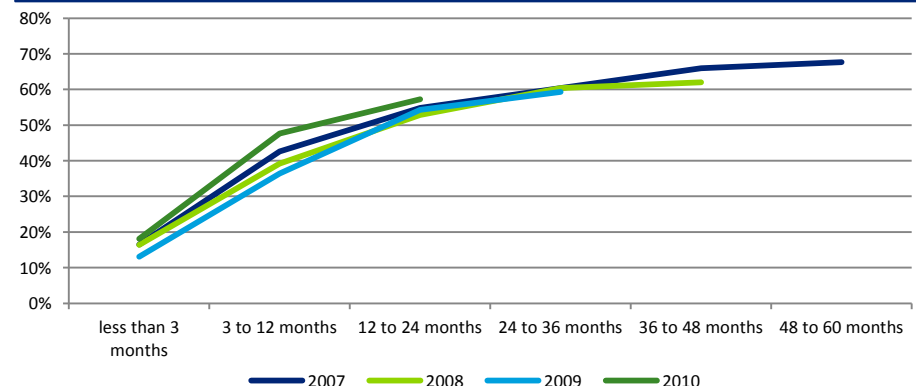
Computers & Business Machines



Passenger Cars



Commercial Vehicles



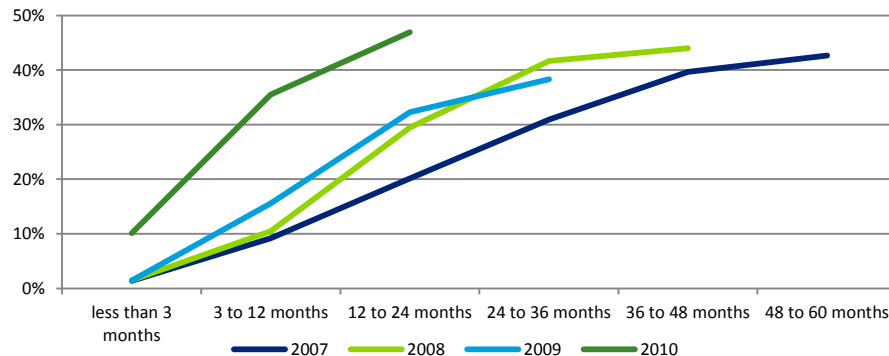
Chapter 6 – Characteristics of defaults in leasing

6. Default management is customised*

- We compare the proportion of defaults closed by a certain time for defaults where the asset was repossessed and sold during the recovery process with cases where the asset was not sold. To clearly show the effect of asset sales, we exclude cases where the default regraded to a healthy situation.
- The following graphs show that **defaults close significantly faster in cases where the asset has been sold, across all asset types.**

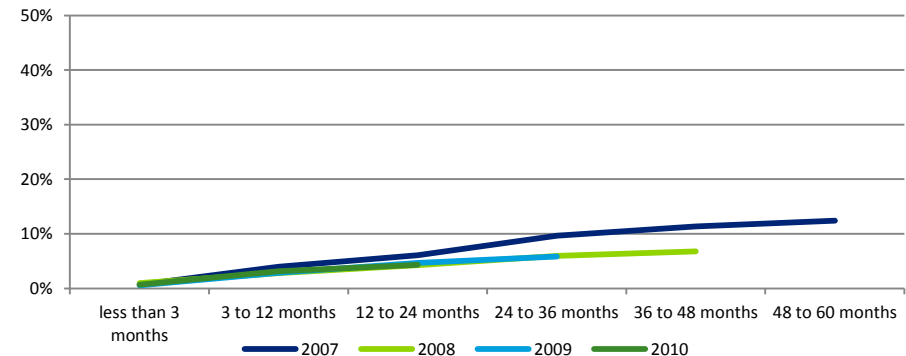
With sale of the asset

Machinery & Industrial Equipment with sale of the asset

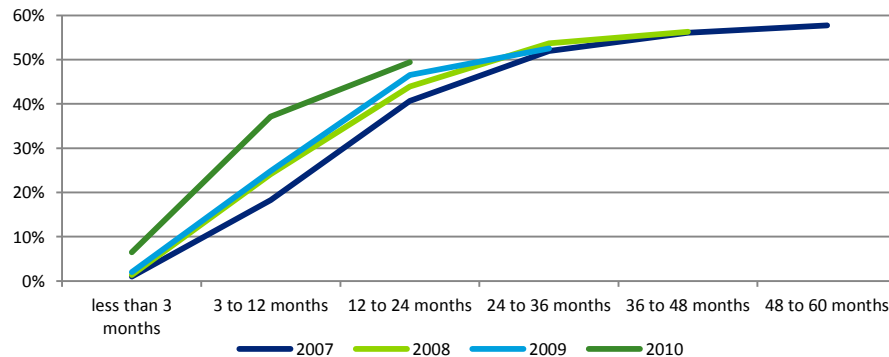


Without sale of the asset

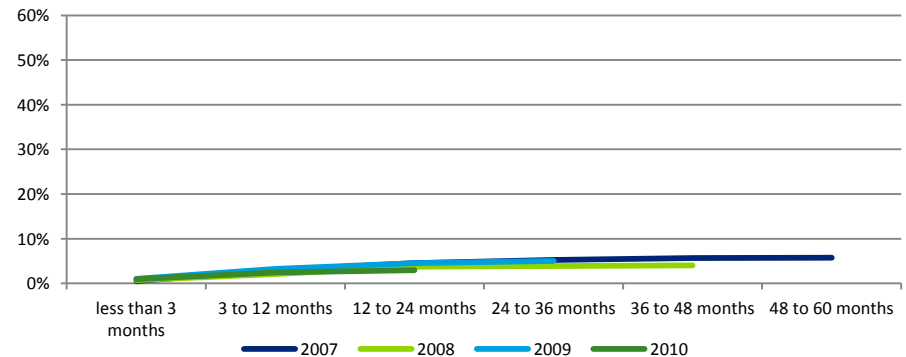
Machinery & Industrial Equipment without sale of the asset



Computers & Business Machines with sale of the asset



Computers & Business Machines without sale of the asset

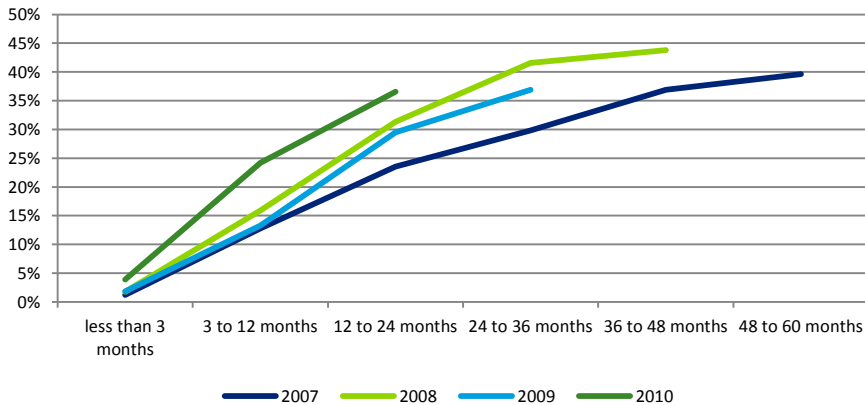


Chapter 6 – Characteristics of defaults in leasing

6. Default management is customised (cont.)*

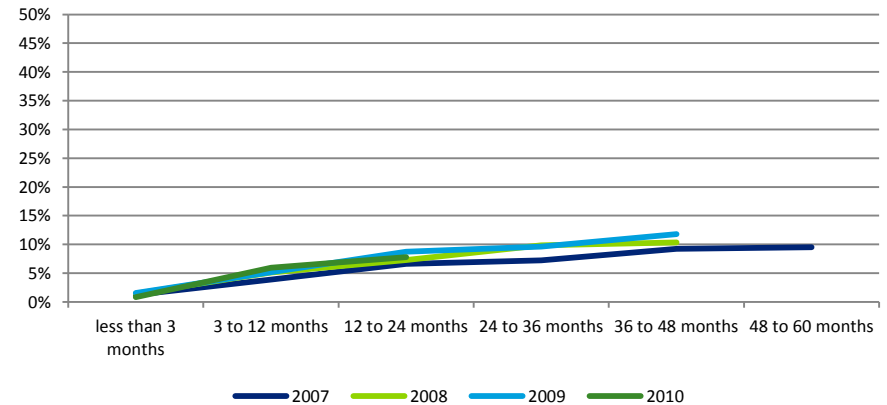
With sale of the asset

Commercial Vehicles with sale of the asset

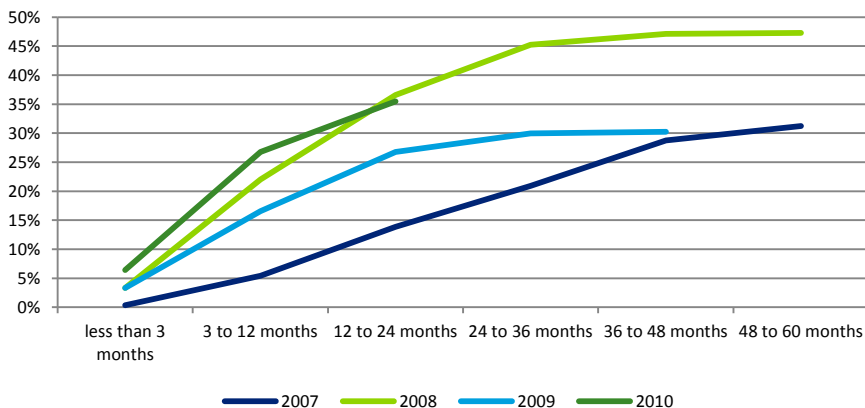


Without sale of the asset

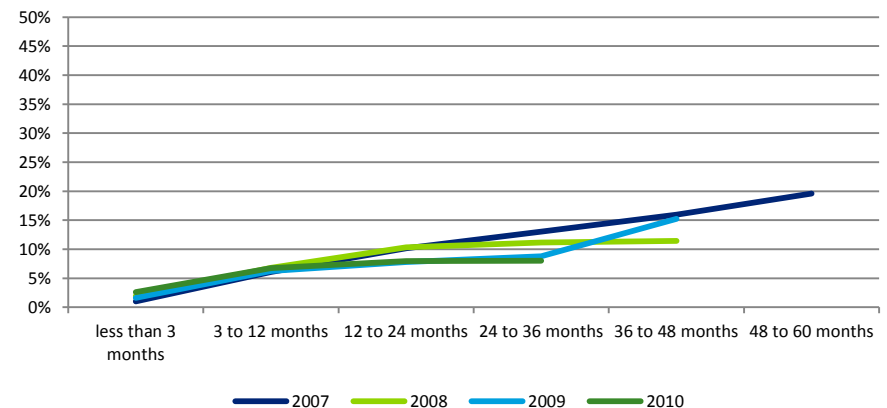
Commercial Vehicles without sale of the asset



Passenger Cars with sale of the asset



Passenger Cars without sale of the asset

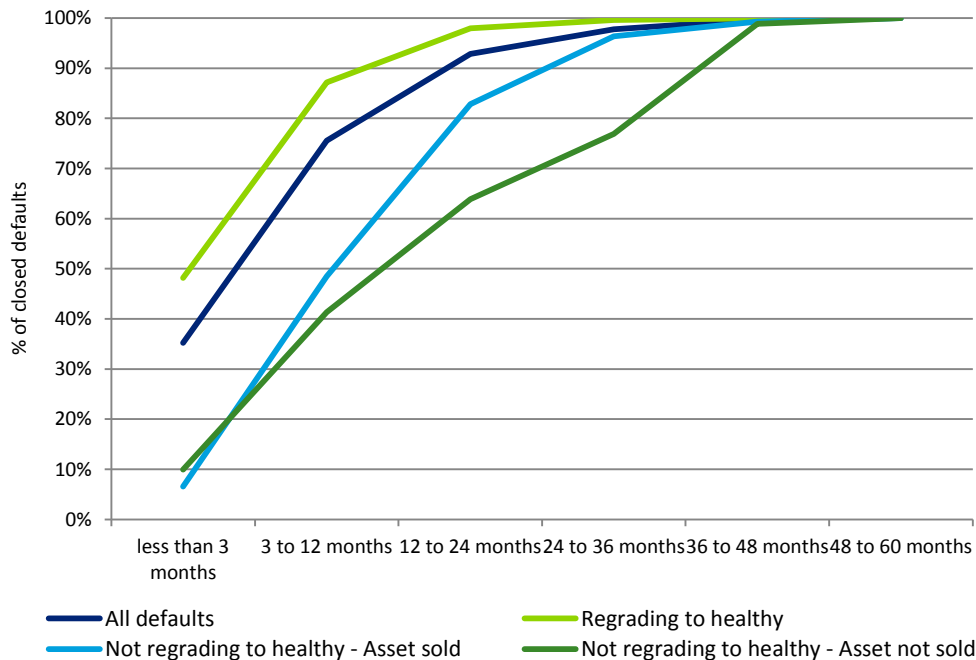


Chapter 6 – Characteristics of defaults in leasing

6. Default management is customised (cont.)*

- The chart below compares the proportion of defaults closed (after a certain time period) for:
 1. Defaults that regrade
 2. Defaults that do not regrade but where the asset has been sold
 3. Defaults that do not regrade and where the asset has not been sold.

**Cumulative proportion of defaults closed by x months:
by default outcome**



- Clearly, defaults that regrade close the fastest, and cases where the asset is sold perform better than those where the asset is not sold.
- Note that 98.3% of defaults that regrade to a healthy situation have a final accounted loss equal to zero (see subsequent slides).

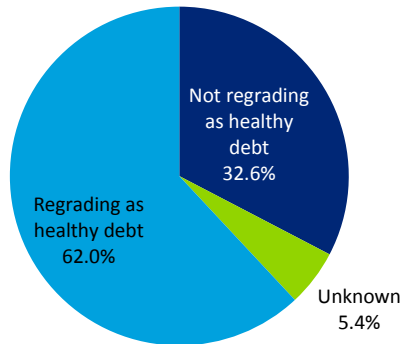
For the purpose of this analysis, only closed defaults are included and zero losses have been excluded from the population of not regrading defaults.

Chapter 6 – Characteristics of defaults in leasing

7. Defaults that return to a healthy situation*

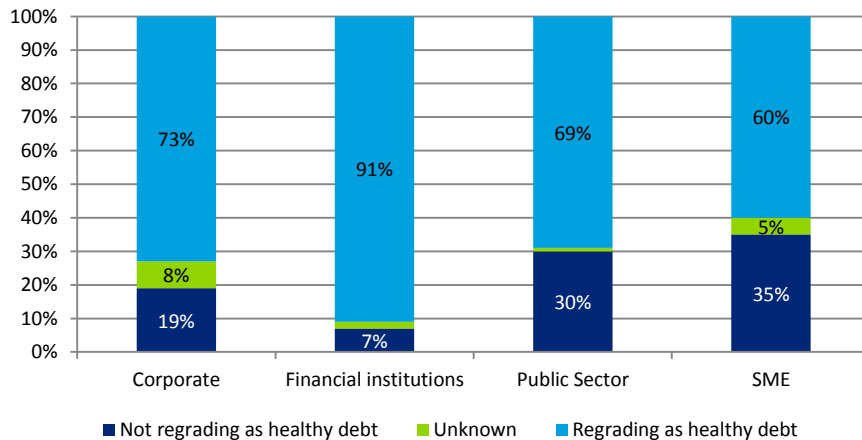
- Over 60% of defaulted contracts return to a healthy position.

Reasons for default resolution

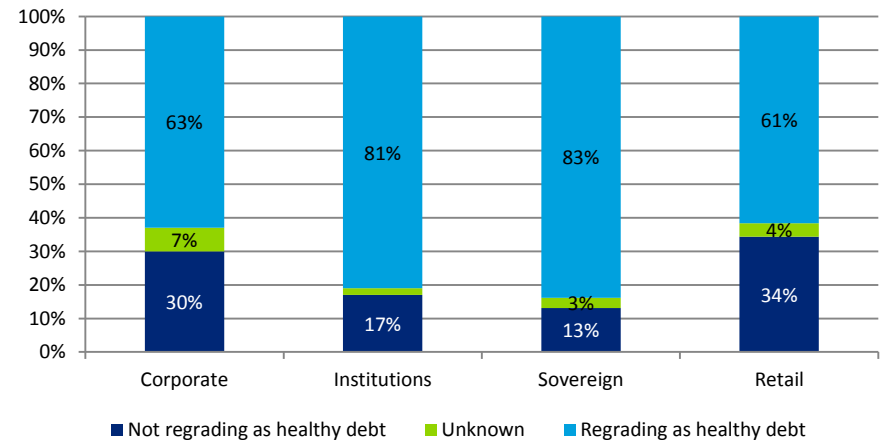


- The high frequency of regrades is consistent with the fact that the leased asset is often a crucial working tool for a business, thus creating an incentive for a lessee to return to a regular payment situation in order to avoid losing the asset.
- Sovereign and financial institution counterparties have the highest portion of defaults that regrade to a healthy position.
 - Note that as public sector entities and regional and local governments are classified as Institutions under Basel 2 segmentation rules, the Public Sector results are not comparable with the Sovereign results.

Reasons for default resolution by counterparty



Reasons for default resolution by Basel 2 asset class



Chapter 7 – Characteristics of Losses in Leasing

Chapter 7 – Characteristics of Losses in Leasing

Key findings

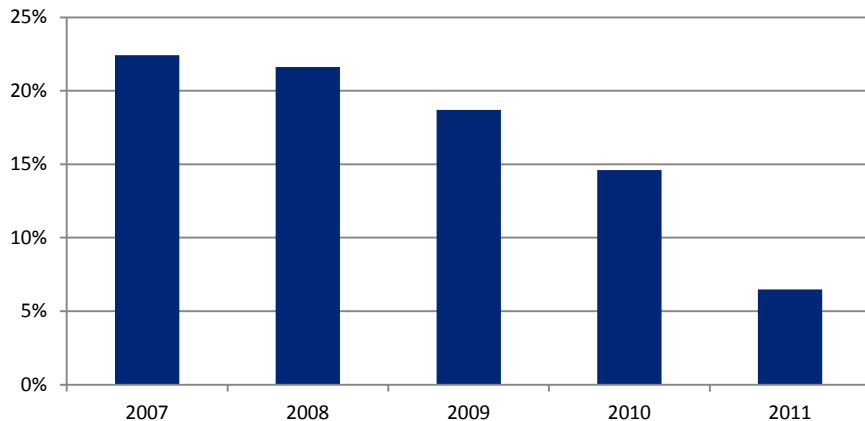
- The average loss rate for our sample is **16.7%**.
 - Loss rates decrease when the size of the contract increases.
 - Loss rates vary over time, between 15% and 22%.
- Loss rates depend on the asset type:
 - Commercial Vehicles and Machinery & Industrial Equipment have the lowest loss rates (around 11%).
 - Computers & Business Machines have the highest loss rates (around 27%).
- Loss rates depend on the type of counterparty:
 - Higher loss rates are observed for SME and Public Sector contracts when compared to Corporates and Financial Institutions.
- Loss rates for leasing are significantly lower than those observed in “traditional” lending:
 - For instance, loss rates on the Corporate and Retail SME exposures of our portfolio are 11,1% and 19,6% respectively. This compares very favourably to the figures published in the EBA’s EU-wide 2011 stress test report where equivalent loss rates for Corporate and Retail SME lending are both in excess of 30%.
- Shorter defaults are synonymous with lower loss rates:
 - 93% of closed defaults resolve within 2 years, with low loss rates.
 - For those that last over 2 years, the loss plateaus at around 35%.
- Loss rates are lower when the default occurs later in life of the contract.

Chapter 7 – Characteristics of Losses in leasing

1. Aggregate observed loss rates

- This chapter only covers closed defaults.
- The loss rate observed in our sample, taking into account all closed defaults occurring between 2007 and 2011 stands at **16.7%**.
 - 67.2% of resolved defaults have an accounted loss equal to zero.
 - Loss rates decrease within our timeframe: higher loss rates are observed in 2007 and 2008 (around 22% on average).
 - Loss rates for 2011 are particularly low, this can be attributed to our sample and the window of observation for 2011 defaults – the resolved defaults of 2011 closed within a year, ensuring a good loss rate.
 - Nevertheless, even if 2011 is excluded, the loss rate remains quite low, between 15 and 22%, over the other years in the sample.

Average loss rate by year



Average loss rate by initial outstanding

less than 5k€	29.17%
5 to 9k€	22.50%
10 to 19k€	15.83%
20 to 39k€	11.56%
40 to 99k€	10.67%
more than 100k€	8.39%
Total	15.23%

Note: the figures displayed in this table exclude LeasePlan data.

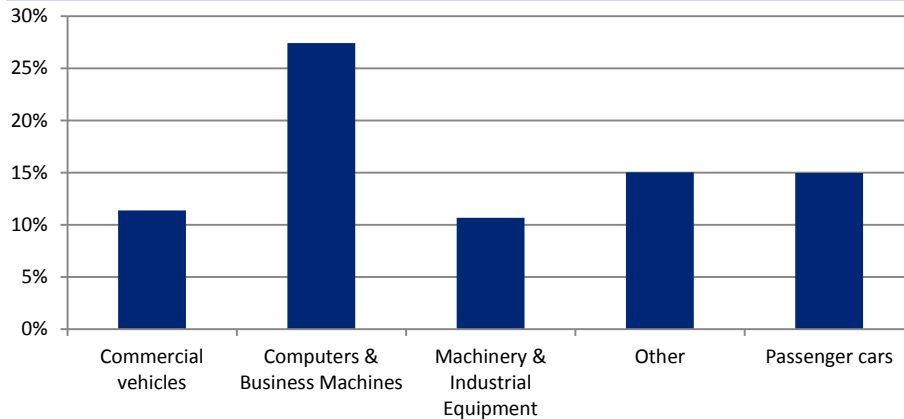
- The loss rate is influenced by the level of the initial outstanding, with higher loss rates for contracts with smaller initial outstanding.

Chapter 7 – Characteristics of Losses in leasing

2. Loss rates by asset type

- Loss rates are also dependent on the type of leased asset.
 - The average loss rates observed for Commercial Vehicles are comparable with those of Machinery & Industrial Equipment (below 12%).
 - Passenger Cars and Other equipment average loss rates are similar, around 15%.
 - For Computers & Business Machines, the loss rate is higher, around 27%.

Average loss rate by asset type



Average loss rate by default year and asset type

	Computers & Business Machines	Machinery & Industrial Equipment	Other	Commercial Vehicles	Passenger Cars
2007	34.1%	14.9%	21.8%	12.3%	17.3%
2008	32.0%	13.8%	20.8%	15.6%	17.1%
2009	32.3%	10.6%	15.9%	13.5%	20.2%
2010	28.9%	11.7%	13.2%	9.2%	10.7%
2011	9.0%	3.0%	6.9%	4.6%	7.8%

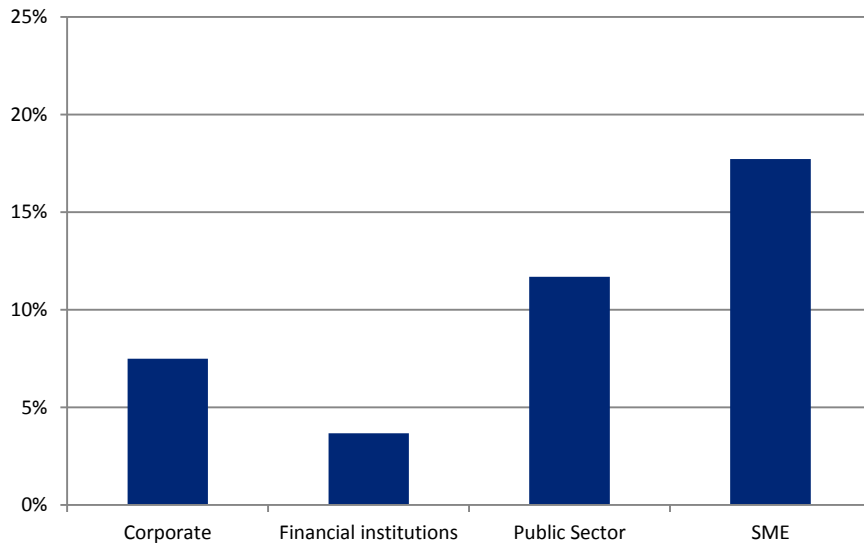
- For the equipment categories, loss rates decrease by default year.
- Although they remain comparatively low, Passenger Car loss rates peak in 2009 and those for Commercial Vehicles in 2008, reflecting the impact of the crisis on second-hand vehicle markets.

Chapter 7 – Characteristics of Losses in leasing

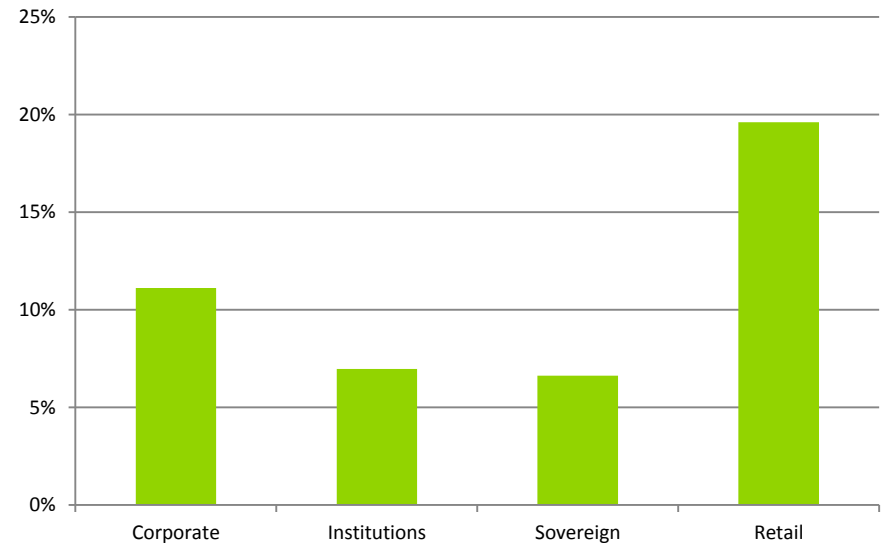
3. Loss rates by counterparty

- The average loss rate on resolved defaults for SMEs (which make up 71.9% of all contracts in our database and 81.8% of the defaults) is 17.7%.
 - As for the SMEs classified as Retail exposures, the loss rate is higher than when considering all SMEs together, which indicates that the larger the SME, the lower the loss rate.
- For contracts made with Corporates or Financial Institutions, the average loss rate is much lower: at 7.5% and less than 4% respectively.
- The loss rates for Public Sector and Sovereign are not comparable because public sector entities and regional and local governments are classified as Institutions under Basel 2 segmentation rules.

Average loss rate by counterparty



Average loss rate by Basel 2 asset class



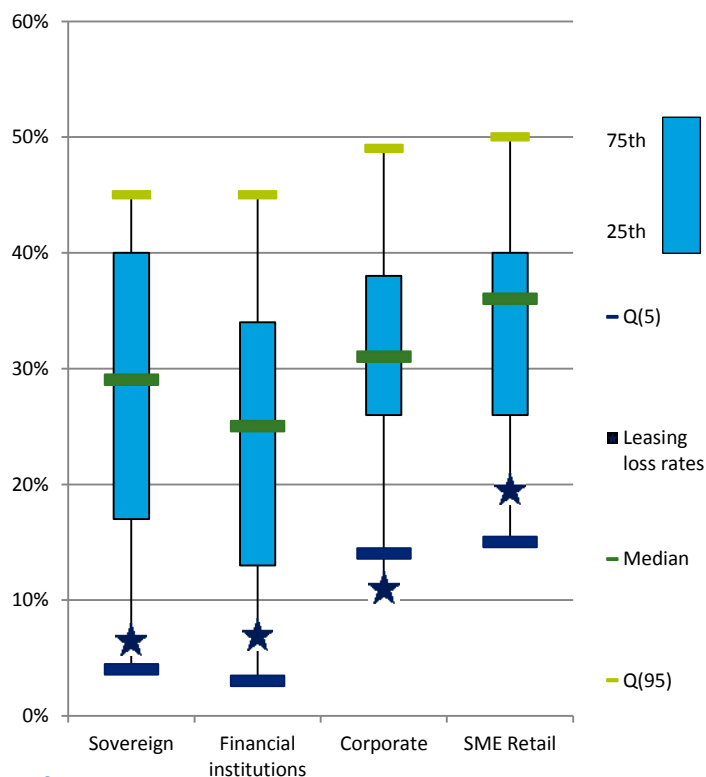
Chapter 7 – Characteristics of Losses in leasing

4. Comparison of leasing and traditional lending loss rates

- Our loss rates by Basel 2 asset class are summarised in the following table:

Total	Corporate	Institutions	Sovereign	Retail
16.7%	11.1%	7.0%	6.6%	19.6%

Loss rates on defaults which resolved in 2010 – EBA study



- These rates are compared to those published in the *European Banking Authority 2011 EU-wide Stress Test Aggregate Report of July 15 2011* which shows the dispersion of loss rates across banks in 2010.
- Given that the EBA's figures* are calculated on a population of contracts defaulting in 2010, we consider that the best comparison with our data is to use our average loss rates (over all five years) on our portfolio as shown in the table above.
- We represent the loss rates observed on our sample on the graph with the sign ★.
- The loss rates on our sample are clearly much lower than the loss rates observed on traditional lending portfolios, and for each Basel 2 asset class: they are between the 5th to 25th percentiles (or even below Q(5) for Corporate), i.e. among the lowest loss rates observed in banks' historical experience.

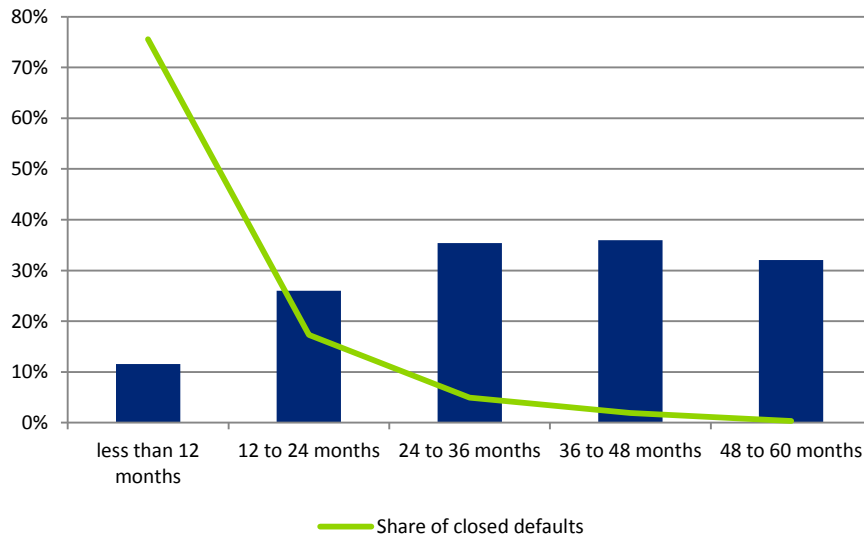
* The EBA's Stress Test uses yearly impairment flows on new default assets in 2010. © 2013 Deloitte

Chapter 7 – Characteristics of Losses in leasing

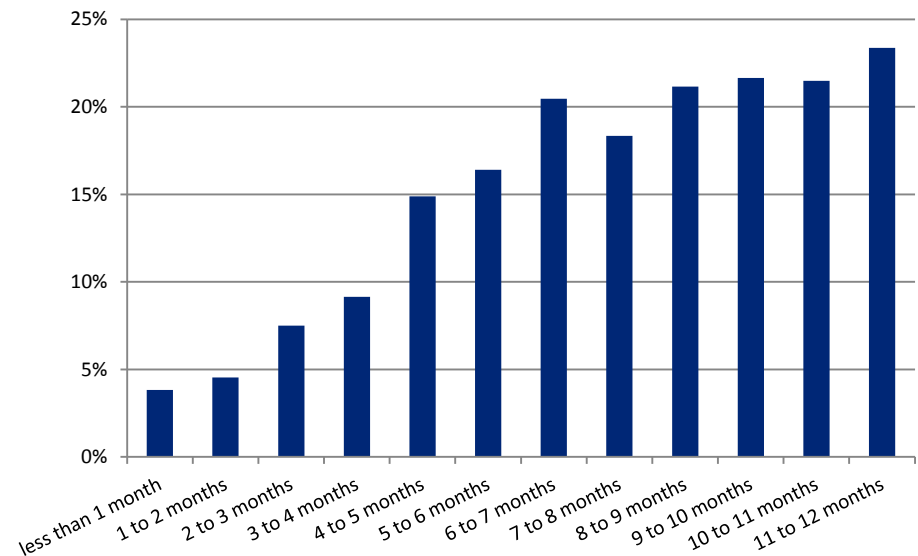
5. Leasing loss rates are lower when defaults resolve quickly*

- Longer defaults are synonymous with higher loss rates.
- However, across the portfolio of closed defaults, 93% are closed within 2 years. In fact, more than 75% close within one year.
- This leads to low loss rates for the vast majority of the defaulted contracts in our sample.
- Of the 7% that last for over 2 years, the loss plateaus at around 35%.

Average loss rate by default duration



Average loss rate by default duration less than a year



- When focusing on defaults closing in the first months, loss rates are very low until the 4th month (lower than 10%). From then until the end of the first year, they vary between 15% and 23% approximately.

Chapter 7 – Characteristics of Losses in leasing

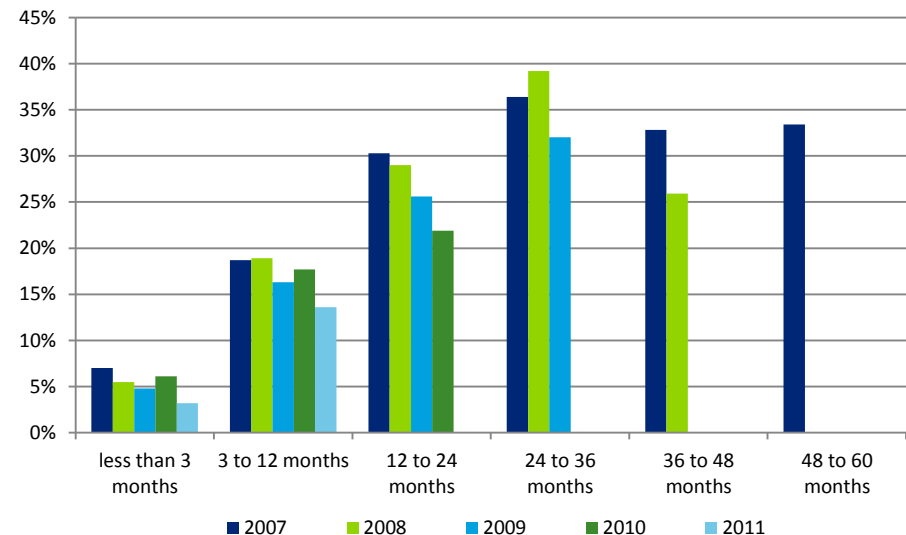
5. Leasing loss rates are lower when defaults resolve quickly (cont.)*

- In order to better compare loss rates across our time frame, we refine the analysis by generation of default and default duration:
 - Loss rates increase as default duration increases.
 - For a given default duration, loss rates generally tended to decrease over time.

Average loss rate by default duration and default year

	less than 3 months	3 to 12 months	12 to 24 months	24 to 36 months	36 to 48 months	48 to 60 months
2007	7.0%	18.7%	30.3%	36.4%	32.8%	33.4%
2008	5.5%	18.9%	29.0%	39.2%	25.9%	
2009	4.8%	16.3%	25.6%	32.0%		
2010	6.1%	17.7%	21.9%			
2011	3.2%	13.6%				

Average loss rate by default duration and default year

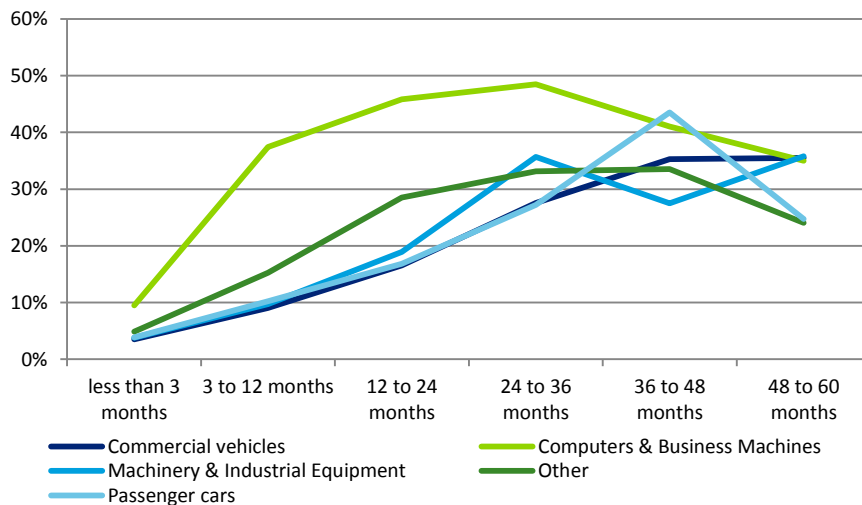


Chapter 7 – Characteristics of Losses in leasing

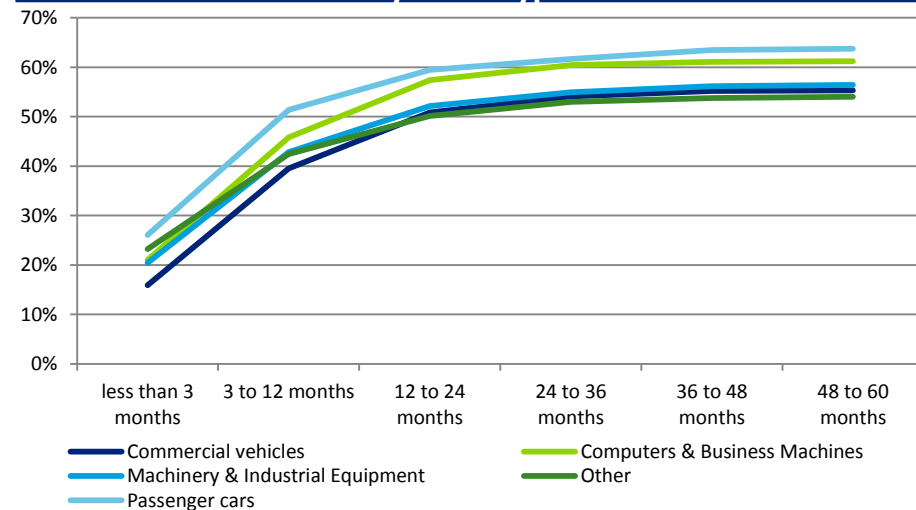
5. Leasing loss rates are lower when defaults resolve quickly (cont.)*

- Depending on the duration of default, loss rates diverge across asset categories:
 - For defaults lasting less than 3 months, loss rates are very low and are around the same level for all asset types except Computers & Business Machines.
 - As default duration progresses, loss rates of the different asset categories become more variable.
- Rapid default resolution is therefore important in managing losses. As already observed in Chapter 6 we note that around half of all defaults (between 43% to 52% depending on asset category) closes within the first year of default.
 - Closing speed varies depending on the type of asset and is lower for Commercial Vehicles and higher for Passenger Cars.
 - Recovery processes have to be optimised, in particular when the economic conditions are not favourable, to increase the speed of resolution. For instance, the charts show that just above 45% Computers & Business Machines are resolved within 12 months, i.e. when loss rates for this asset category are the lowest.

Average loss rate by default duration and asset type



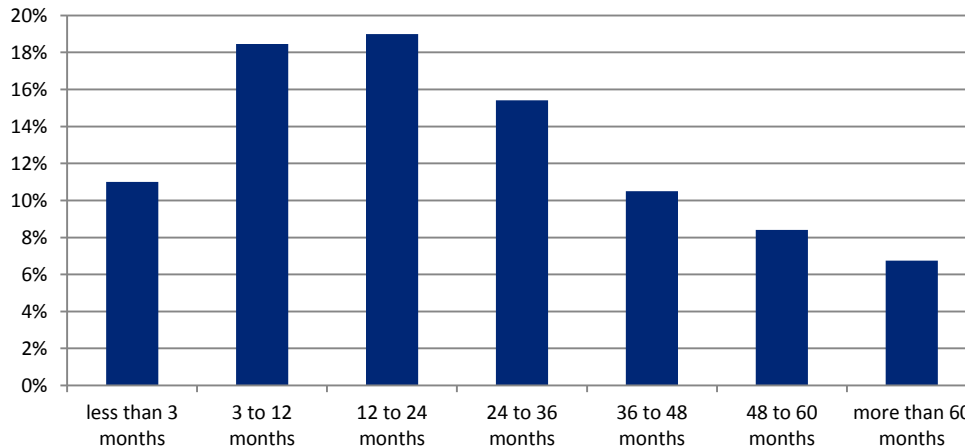
Cumulative proportion of defaults closed by x months: by asset type



Chapter 7 – Characteristics of Losses in leasing

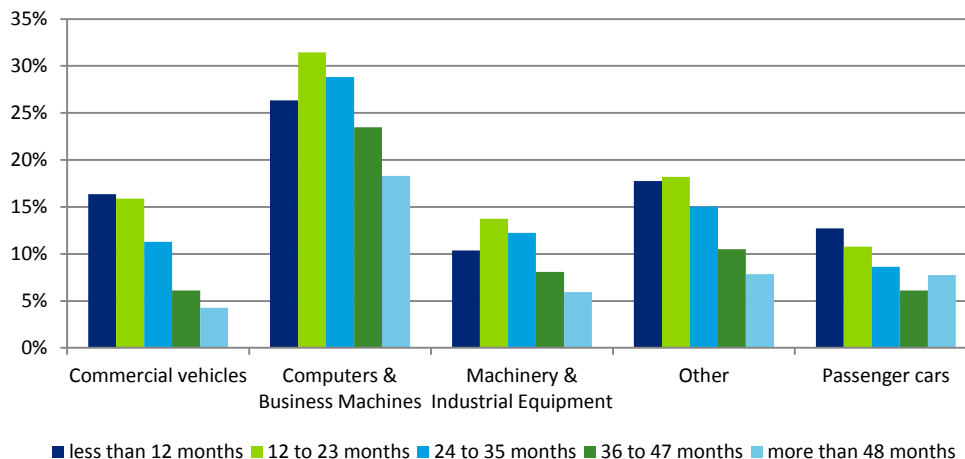
6. Loss rates are lower when the default occurs later in life of the contract*

Average loss rate by time-to-default**



- We already pointed out that most defaults occur at the mid-life of the contract or after.
- The highest loss rates are registered for contracts defaulting during the second year of the contract (19% loss rate).
 - Looking at asset categories, equipment leases have the highest loss when the contract defaults in the second year of the lease, the loss rate decreases thereafter.
 - This pattern is slightly different for Commercial Vehicles and Passenger Cars for which the loss rate is highest in the first year, and then decreases thereafter.
- When the default occurs after the third year, the average loss rate across asset categories is under 10%, except for Computers & Business Machines where it is 24%.
- For Corporates and Financial Institutions, loss rates are quite low and stable whatever the time-to-default. However, for Public Sector entities and SMEs, the later the default occurs, the better the loss rate:

Average loss rate by time-to-default and asset type



* This section excludes LeasePlan data.

** The time-to-default of the contract is the age of the contract when the default occurs.

- For SMEs, the loss rate is around 20% when the default occurs within 2 years, this decreases to 15% for the third year and to less than 10% after the third year.

Chapter 8 – The Leased Asset: A Powerful Risk Mitigation Tool

Chapter 8 – The Leased Asset: A Powerful Risk Mitigation Tool

Key findings

- The lessor's ownership of the leased asset keeps leasing losses low.
- As the asset is a key working tool for the lessee, many defaulted leases regrade:
 - Almost two thirds (62%) of defaulted contracts in our dataset regrade to healthy **and have a zero loss**.
- When the contract does not regrade to healthy, the lessor is able to repossess the asset efficiently and quickly thanks to its ownership rights. It is then able to sell the asset or redeploy it (e.g. re-release).
 - In 80% of defaults where the lease does not regrade, the asset is sold.
- Asset sale proceeds are an important contributor to low losses:
 - 22% of (non-regrading) contracts where the asset is sold have a zero loss.
 - Asset sales contribute significantly to lowering the loss rate and also default duration.
 - This is true across all asset categories except Computers & Business Machines.
- The sale of the asset is the main source of recovery for defaulted lease contracts, representing 80.3% of total recoveries on a portfolio level
 - On a portfolio level, Machinery & Industrial Equipment assets, as well as Automotive assets have the highest proportion of recoveries coming from the sale of the asset (90.3% for Machinery & Industrial Equipment, 83.6% for Passenger Cars and 80.6% for Commercial Vehicles).
- Losses in leasing are influenced by when the default occurs in the life of the contract.
 - The later they take place, the lower the losses.
 - Lessors are even able to make a gain (negative loss) on the sale of the leased asset when the asset's market value exceeds the outstanding payments at the time of default.

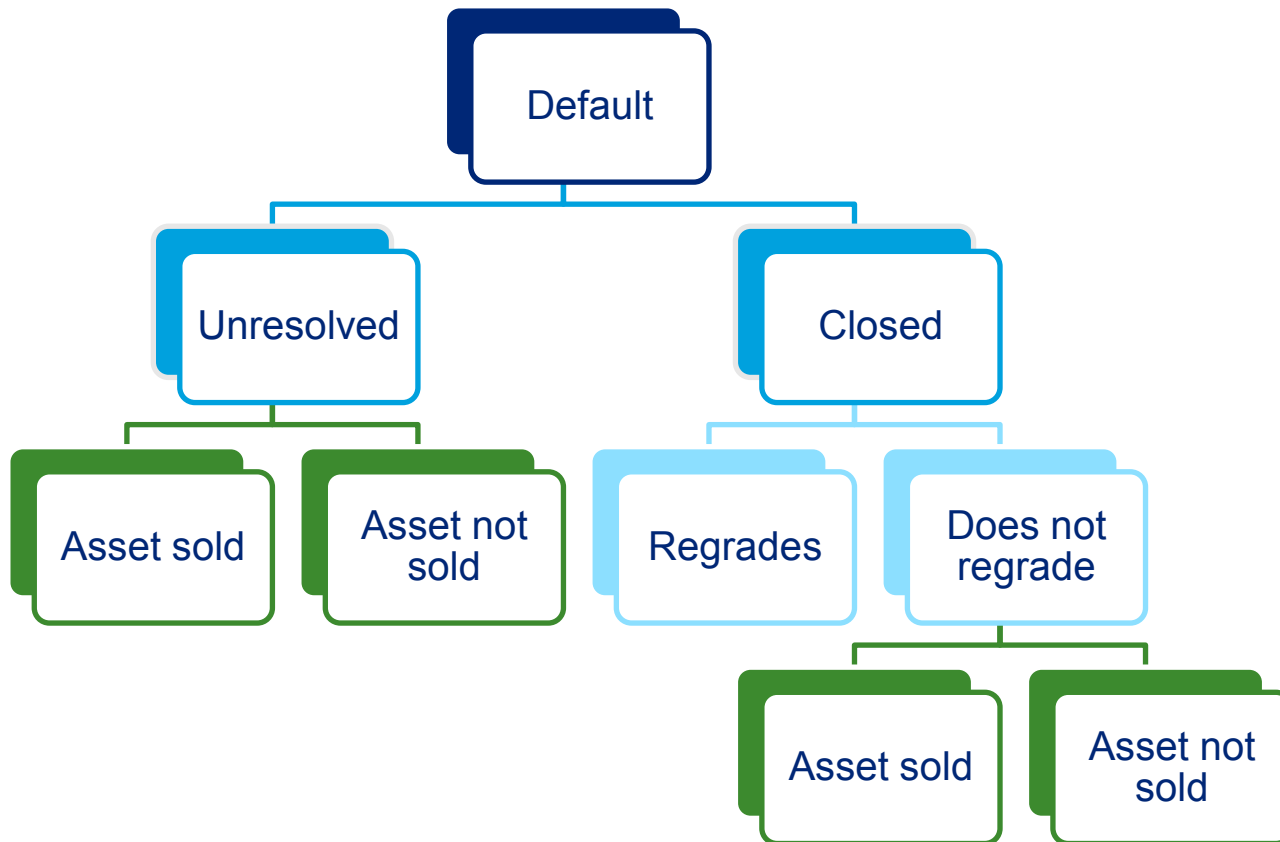
Chapter 8 – The role of the leased asset in risk mitigation

1. General overview of the outcomes of a leasing default

- When a contract falls into default, there are two possible outcomes for its resolution: either the contract returns to a healthy situation (regrades to healthy) or it does not. The default will close after the firm has sought to maximise its recovery process at which point in time a final loss (or gain) will be attributed to the contract.
- There is relatively high frequency of regrades within leasing. This is consistent with the fact that the leased asset is often a crucial working tool for a business. This creates an incentive for a lessee to prioritise its lease payments over other types of payments in order to avoid losing the leased asset. Thus, the lessor does not experience any loss in such cases.
- In cases where the contract does not regrade, there are different sources of recovery:
 - Repossession and resale of the asset (or re-lease)
 - Direct repayments by the lessee
 - Use of other collateral (e.g. deposits, guarantees (e.g. EIB/EIF schemes)) if available.
- Asset ownership and expertise maximise recovery:
 - A lessor's ownership of the leased asset means that repossession is faster and more straightforward compared to holders of other types of security, for whom it can often be more lengthy and burdensome.
 - The lessor's specialised asset knowledge implies that it is able to dispose of the asset in a way that maximises its value. Indeed, lessors track asset values, markets and disposal channels as part of their core business. Traditional lenders on the other hand do not possess this expertise and therefore prefer to secure their loans on the basis of non-physical collateral (e.g. financial collateral, personal guarantees, etc.).

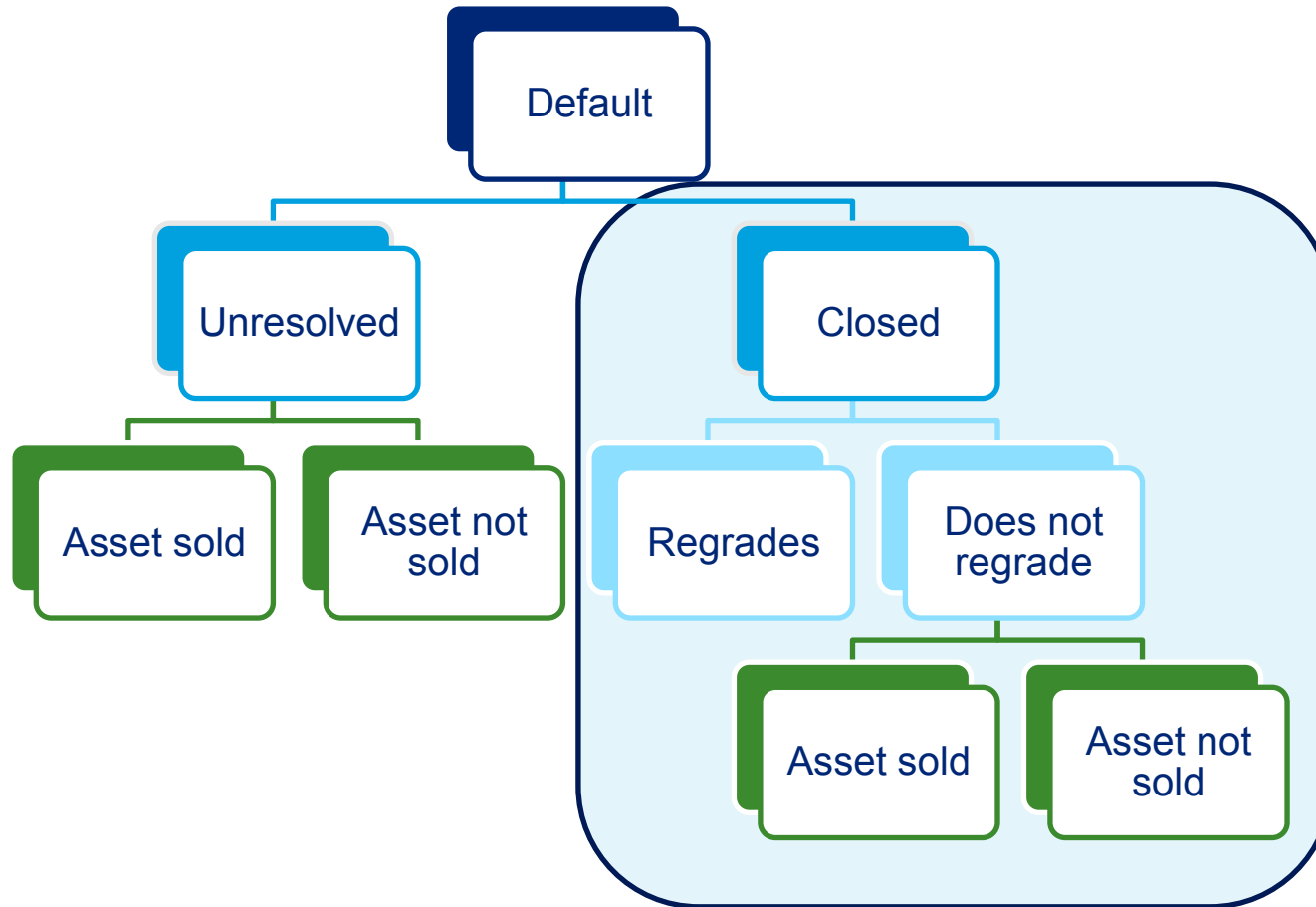
Chapter 8 – The role of the leased asset in risk mitigation

1. General overview of the outcomes of a leasing default (cont.)



Chapter 8 – The role of the leased asset in risk mitigation

1. General overview of the outcomes of a leasing default (cont.)

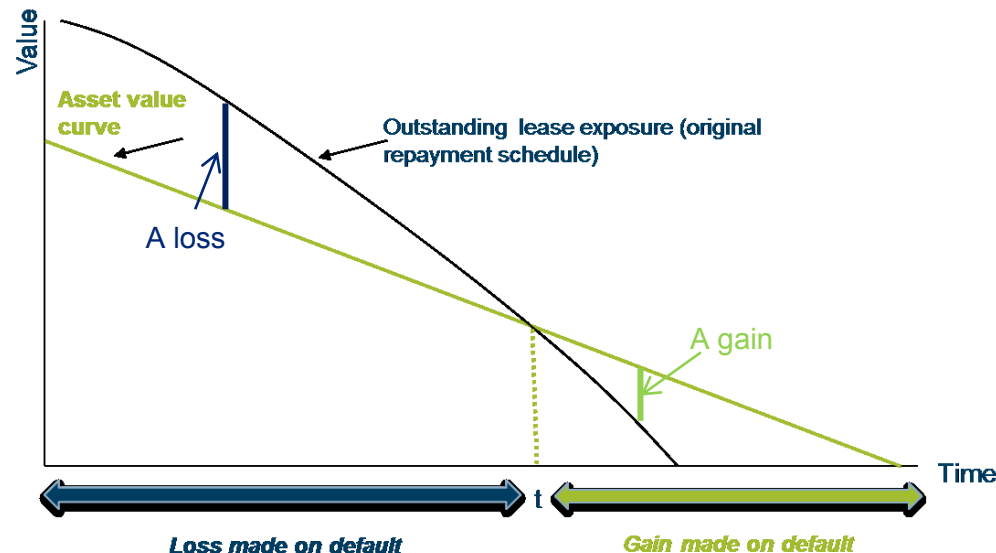


*Please note that this chapter analyses **closed defaults only** whereas the following chapter will look at unresolved defaults.*

Chapter 8 – The role of the leased asset in risk mitigation

2. Making a gain on a default

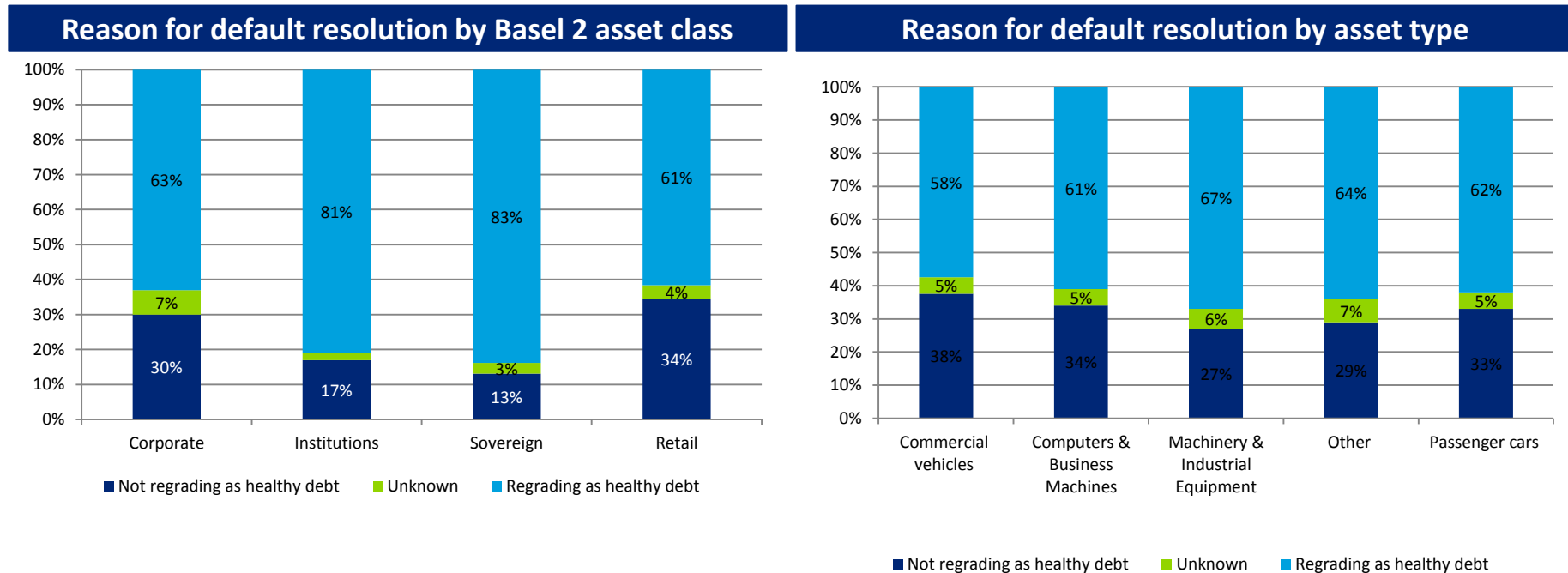
- Ownership of the leased asset can also have another direct and positive impact on the loss rate: a potential gain which can be made on the sale of the asset.
- The graph presented below illustrates how outstanding lease payments (amortisation schedule of the contract) evolve over the lease term compared to the value of the underlying asset (depreciation of the asset).
 - At a certain point during the lease (noted as t in the graph below), the value of the asset exceeds the amount outstanding.
- In such cases, if the lessor were to sell the asset for that value, it would make a gain.
- Losses in leasing are therefore influenced by the timing of the default.
- Since some Member States do not allow the recognition of negative losses (gains), thus ignoring the unique characteristics of leasing, we also bound all losses in our dataset to zero in order to ensure comparability.



Chapter 8 – The role of the leased asset in risk mitigation

3. Defaults that regrade*

- 62% of defaulted contracts in our dataset regrade to healthy

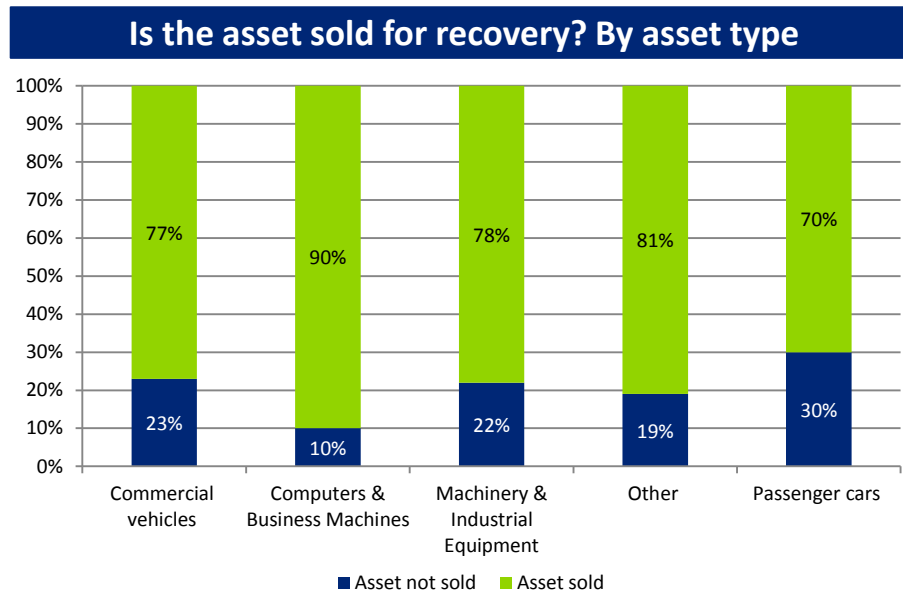


- Institutions and Sovereigns tend to regrade to healthy more often than Corporate or Retail.
- The outcome of a default is not significantly different for different types of leased asset, although slightly more Machinery & Industrial Equipment contracts regrade to healthy.

Chapter 8 – The role of the leased asset in risk mitigation

4. Defaults that do not regrade

- The following analysis (points 4. – 5.) covers firms able to provide the necessary information. These firms account for 86% of the entire closed default dataset.
- For 80% of closed defaults, the leased asset is repossessed and sold.
- In 22% of these cases, the lessor actually records a zero loss.
- The proportion of assets sold is broadly similar across type of leased asset although Automotive assets have a slightly lower percentage of sales whereas Computers & Business Machines have a slightly higher percentage than the average.
- This is explained by the fact that assets which are not sold are likely to be re-leased, which is more likely to occur in the automotive market and less likely to occur in the IT & business machine market.

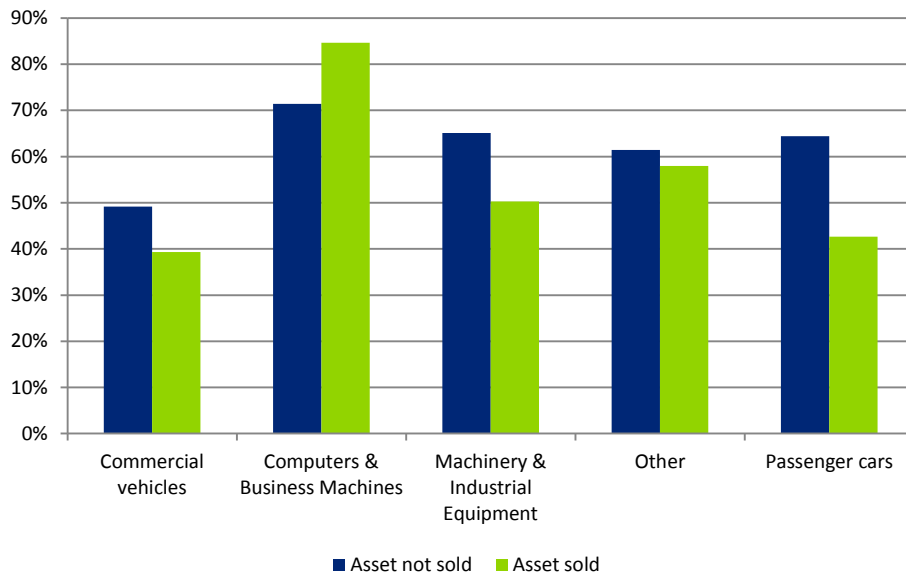


Chapter 8 – The role of the leased asset in risk mitigation

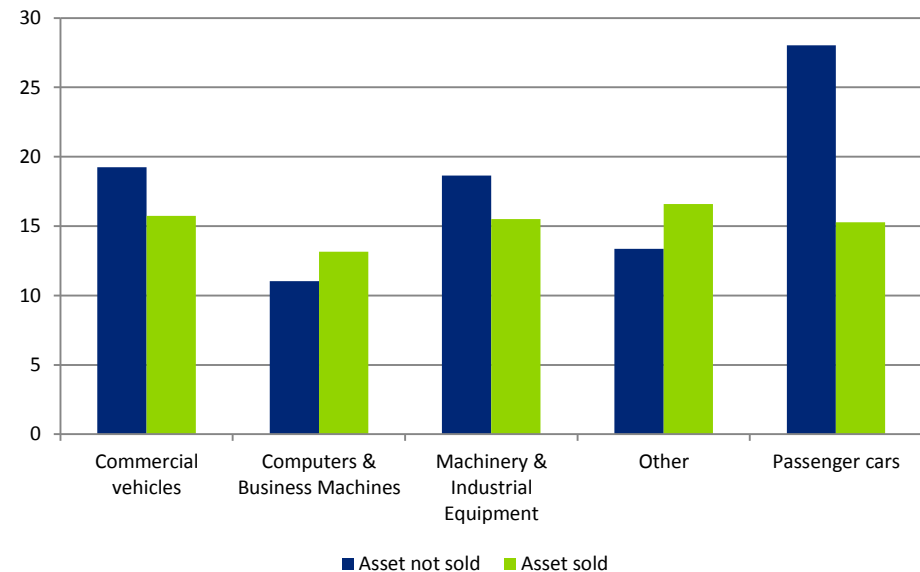
4. Defaults that do not regrade (cont.)

- For the following analysis, we evaluate loss-given-loss (LGL), i.e. cases where the lessor's loss is greater than zero.
- **Sale of the asset lowers the average loss rate**, for all asset types except for Computers & Business Machines. In this case, the main source of recovery is not the asset itself.
- **Defaults are shorter on average when the asset has been sold:** Repossession is normally a quick and simple process and the asset value usually covers the bulk of the outstandings. This is especially true for Passenger Cars, where the secondary market is well developed. In cases where the asset does not represent the main source of recovery, such as Computers & Business Machines, defaults with sale of the asset last longer as other forms of recovery are attempted.

Average loss rates, excl. zero losses (LGL)



Duration of default, excl. zero losses



Chapter 8 – The role of the leased asset in risk mitigation

5. Recovery from asset sales

- We calculate the contribution of the sale of the asset to the total recovery on a portfolio basis.
- This contribution is calculated according to the following formula:

$$\text{Asset recovery (\%Total Recovery)} = \frac{\sum_i \text{Disposal value of the asset}}{\sum_i \text{Exposure at default} - \sum_i \text{Final loss as accounted}}$$

Where i represents the population on which the contribution is computed (either the total population or the asset type).

	Contribution of the sale of the asset to the whole recovery: <i>Asset recovery (%Total Recovery)</i>
Commercial Vehicles	80,6%
Computers & Business Machines	46,3%
Machinery & Industrial Equipment	90,3%
Other	70,2%
Passenger Cars	83,6%
Total	80,3%

- For Machinery & Industrial Equipment, sale of the asset represents the vast majority of recoveries (90.3%).
- Automotive assets have the next highest proportion of recoveries coming from sale of the asset (83.6% for Passenger Cars and 80.6% for Commercial Vehicles).
- The lowest proportion of recoveries coming from sale of the asset is for Computers & Business Machines, although it still represents almost half of all recoveries (46.3%).

Chapter 9 –Unresolved Defaults

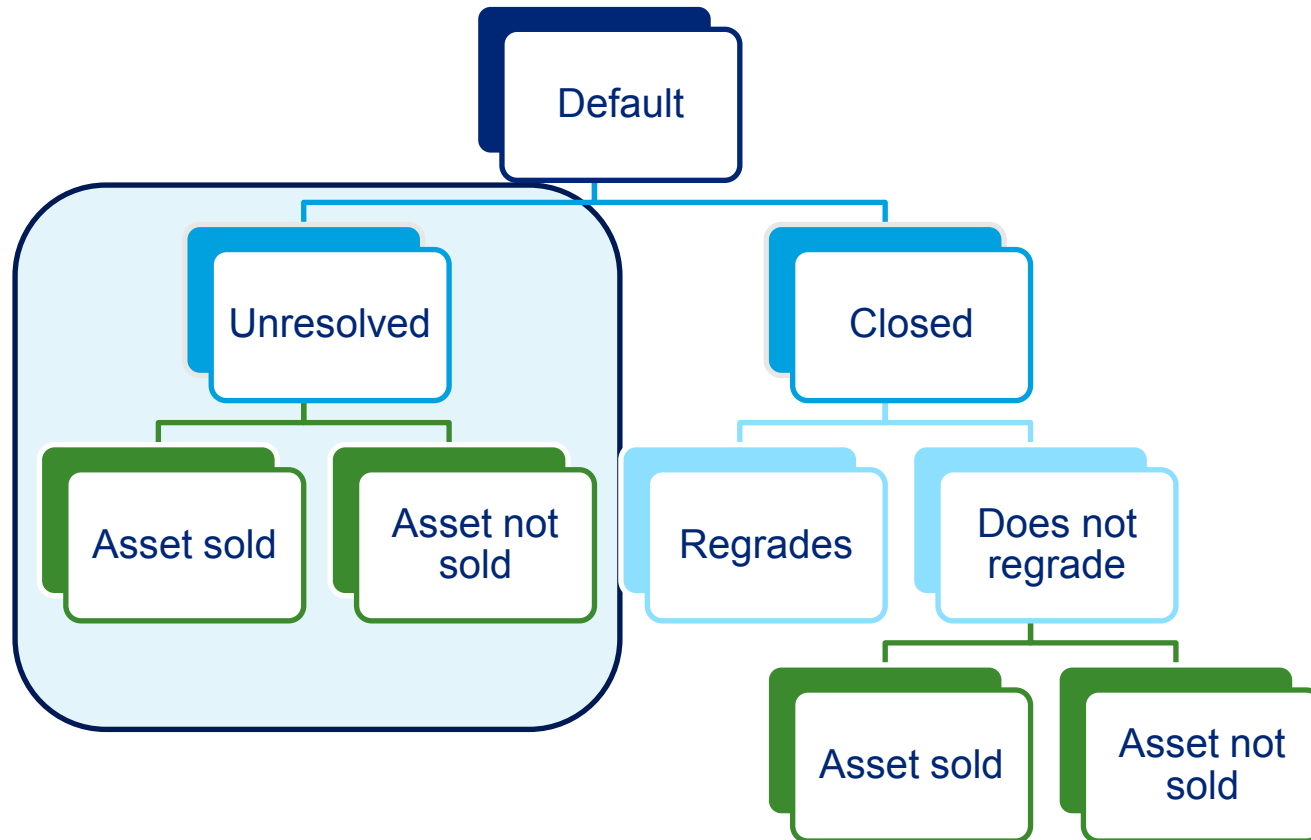
Chapter 9 – Unresolved defaults

Key findings

- 40% of the defaults in our sample are unresolved:
 - They have been open for 23 months on average.
 - 85% of unresolved defaults are to SME counterparties.
- We therefore proxy the losses on these in order to take them into account in our loss analysis.
- Using these estimated losses, we calculate an average loss rate of 33.4% for unresolved defaults.
- This brings the average loss rate for our entire default population (i.e. both resolved and unresolved defaults) to 23.10%.
- An examination of the average loss rates for our entire default population by asset type and Basel 2 asset class shows that loss rates increase with the inclusion of unresolved defaults but remain consistently low across all categories:
 - Loss rates for Passenger Cars are almost unaffected by the inclusion of unresolved defaults.
 - Loss rates for Commercial Vehicles are the most heavily impacted.
 - In terms of counterparties, loss rates for the Corporate exposure class are the most influenced.

Chapter 8 – Unresolved defaults

1. General overview of the outcomes of a leasing default



- This chapter looks at unresolved defaults.
- Given that recoveries for these defaults are still ongoing, we explain how we estimate losses for these cases in order to take them into account in our analysis.

Chapter 9 – Unresolved defaults

1. General overview of the outcomes of a leasing default (cont.)

- 60% of defaulted contracts within our sample close.
 - These are resolved quickly (duration of 8.5 months on average).
- The remaining 40% of defaults are unresolved.
 - These have been open for 23 months on average.
- In this chapter, we examine and proxy the loss on unresolved defaults, (since our database does not contain any final loss as accounted for these contracts) in order to avoid any potential bias in our LGD analysis.

Total number of defaults	Number of resolved defaults	Number of unresolved defaults
184 496	111 007	73 489

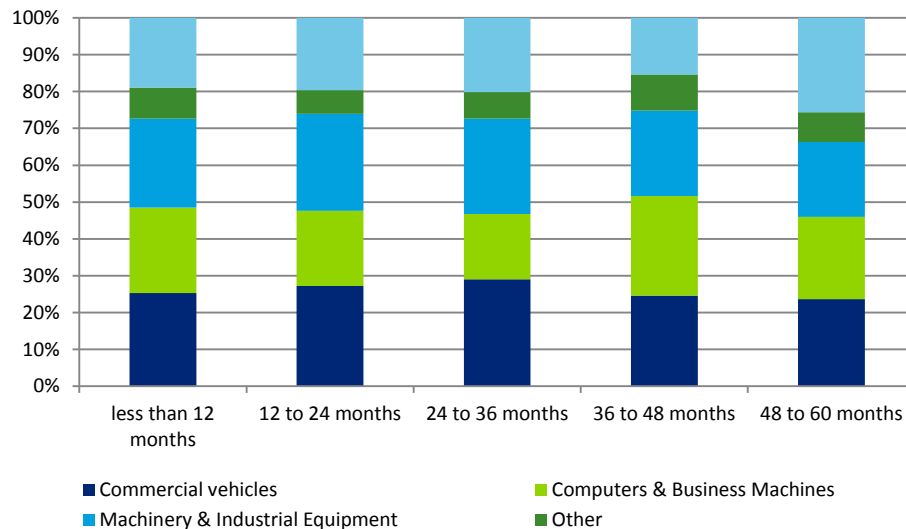
Number of defaults	Less than 12 months	From 12 to 23 months	From 24 to 35 months	From 36 to 47 months	From 48 to 60 months	Average duration
Resolved	67 863	15 519	4 421	1 717	291	8.51
Unresolved	21 796	17 571	19 829	8 121	4 556	22.67
Total	89 659	33 090	24 250	9 838	4 847	14.87

Chapter 9 – Unresolved defaults

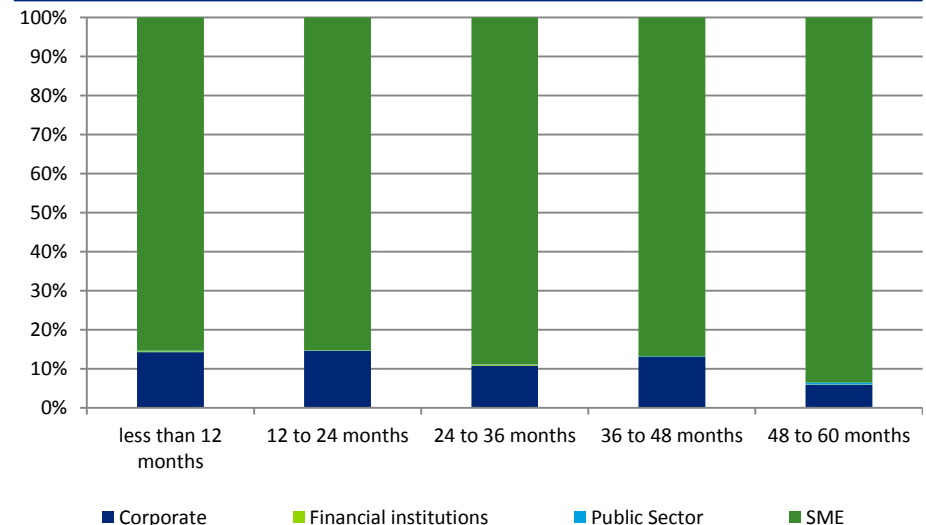
2. Unresolved defaults by asset type and counterparty

- Looking at the population of unresolved defaults, the proportion of asset types and the proportion of counterparty types do not change for different default durations.
- Around 85% of unresolved defaults are for SME counterparties and this figure increases to 95% for defaults open longer than 48 months.

**Proportion of unresolved defaults by asset type:
by default duration as of 31/12/2011**



**Proportion of unresolved defaults by counterparty:
by default duration as of 31/12/2011**



Chapter 9 – Unresolved defaults

3. Proxying loss on unresolved defaults

A. Unresolved defaults where the asset has been sold (i.e. quasi-closed defaults)

- We observe that in most defaults where the asset has been sold, the vast majority of the recovery comes from the sale of the asset (see next slides). In such cases, we consider that these defaults are “quasi-closed” since the share of other sources of recovery is minimal.
- This allows us to assess the expected loss on defaults that are currently unresolved by assuming that the asset is the only source of recovery.
 - We are not able to make the same assumption however for Computers & Business Machines and Other equipment as the sale of the asset is a less important form of recovery for these asset types. We therefore address these below.
- We apply this proxy to 23.9% of unresolved defaults.

B. Unresolved defaults where the asset has not been sold

- In cases where the asset has not been sold, we use another proxy, set out on slide 84.
- The same proxy is also applied to unresolved Computers & Business Machines and Other defaults, whether the asset is sold or not (see above).
- This proxy is applied to 73.9% of unresolved defaults.

Chapter 9 – Unresolved defaults

4. Proxying loss on quasi-closed defaults

- In cases where the default is quasi closed, we consider proxying the loss by applying the following formula:

$$\frac{\text{Outstanding balance at default} - \text{Disposal value of the asset}}{\text{Outstanding balance at default}}$$

- In order to test the reliability of this proxy, we consider the following ratio, which shows the difference between the loss rate only taking the sale of the asset into account and the actual loss rate:

$$\text{Non-asset recovery (\%EAD)} = \frac{\text{Exposure at default} - \text{Disposal value of the asset}}{\text{Exposure at default}} - \frac{\text{Final loss as accounted}}{\text{Exposure at default}}$$

Distribution of non-asset recovery sources (%EAD)	
Q10	-10.56%
Q(25)	0.00%
Average	10.42%
Median	4.33%
Q(75)	56.29%
Q(90)	94.52%
Max	100.00%

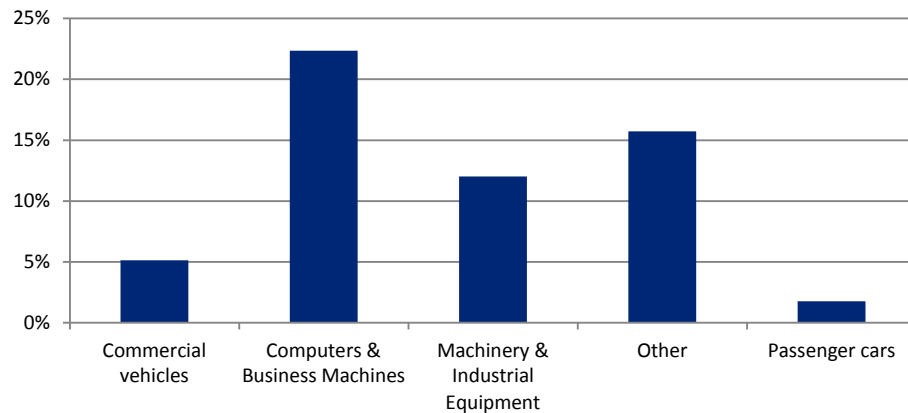
- We find that the sale of the asset is generally the main source of recovery for defaulted lease contracts.
- Other forms of recovery (excluding sale of the asset) only represent 10.4% of the EAD on average.

Chapter 9 – Unresolved defaults

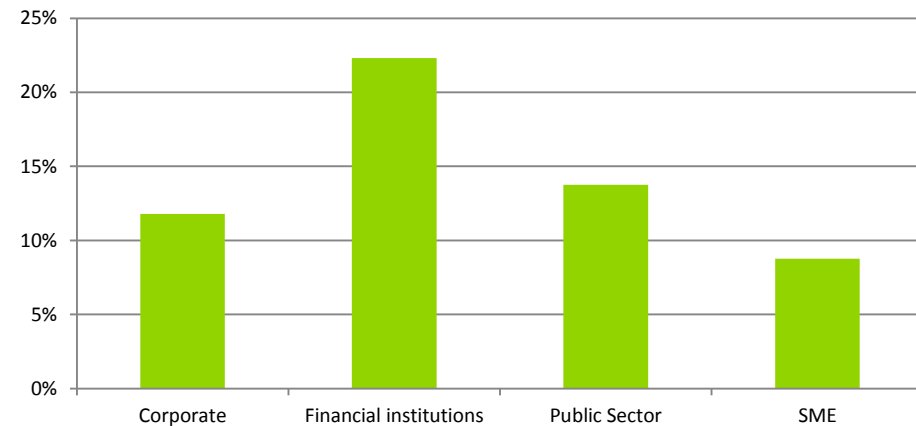
4. Proxying loss on quasi-closed defaults (cont.)

- On the following graphs, we analyse the non-asset recovery ratio by type of leased asset and by type of counterparty.

Non-asset recovery (%EAD): by asset type



Non-asset recovery (%EAD): by counterparty



- Non-asset recoveries are lowest for Automotive Assets and highest for Computers and Business Machines.
- The proxy is therefore not a good estimation of loss in the case of Computers and Business Machines and Other assets. We therefore deal with these asset types later on.
- Given that Financial Institutions make use of leasing particularly for Computers & Business Machines (these contracts make up 68% of their defaults for which the asset has been sold), non-asset sale recoveries are highest for this type of counterparty.

Chapter 9 – Unresolved defaults

5. Proxying loss when the asset is not sold: weighted estimate of loss

- From the previous analysis, we found that the loss rate was particularly sensitive to two factors: default duration and type of leased asset.
- The methodology for proxying losses when the asset is not sold is therefore based on two parameters:
 - The probability that a default will resolve within a certain duration, (p) (see below)
 - The loss rates observed on resolved defaults, by duration of default, (τ) (see below)
- For each asset type, the expected loss rates of unresolved defaults are calculated as a weighted average of observed loss rates. The weights are the probability that the default will resolve within a certain timeframe, which is then multiplied by the observed loss rate for defaults resolving within that timeframe.
- Default durations are divided into 6 buckets: less than 3 months, 3 – 12 months, 12 – 24 months, 24 – 36 months, 36 – 48 months and 48 - 60 months.
- This is shown in the following formula:

$$\left\{ \begin{array}{l} Loss(k) = \sum_{i=k}^6 \left[p_i \times \prod_{j=1}^{i-1} (1 - p_j) \right] \times \tau_i \\ where \ p_6 = 1 - \sum_{i=k}^5 p_i \end{array} \right.$$

- k represents the age of the unresolved default as of 31/12/2011, $k = 1$ if the contract defaulted less than 3 months before the 31/12/2011.

Chapter 9 – Unresolved defaults

5. Proxying loss when the asset is not sold: weighted estimate of loss (cont.)

- The table below indicates the percentage of defaults closing within each default duration bucket.
- We interpret this percentage as the probability a default will resolve within this duration bucket (p).
 - For instance, a Commercial Vehicle contract which defaulted 3 to 12 months before the 31/12/2011 has a 25.19% chance of resolving within this duration bucket.
 - If this is the case, the loss rate will be of 1.99% (see table on the next slide).
 - In $(1 - 25.19\%)$ of the time, the default will not resolve. It then has a 7.89% chance of resolving within 12 to 24 months and the loss rate in this case will be 4.99%.
 - Since the rates below do not sum up to 100%, if the default does not resolve within 60 months, we assume the loss rate will be that of the last bucket (between 48 to 60 months).

Default closing speed as observed on resolved defaults (p)					
	When the asset is not sold			Whether the asset is sold or not	
	Commercial Vehicles	Machinery & Industrial Equipment	Passenger Cars	Computers & Business Machines	Other
less than 3 months	21.87%	25.24%	32.45%	19.08%	23.26%
3 to 12 months	25.19%	22.56%	25.14%	22.55%	19.17%
12 to 24 months	7.89%	6.14%	6.14%	10.51%	7.71%
24 to 36 months	1.15%	1.39%	0.95%	2.77%	2.86%
36 to 48 months	0.89%	1.15%	2.24%	0.56%	0.79%
48 to 60 months	0.02%	0.14%	0.21%	0.11%	0.22%

Chapter 9 – Unresolved defaults

5. Proxying loss when the asset is not sold: weighted estimate of loss (cont.)

- The following table shows the observed loss rates by type of leased asset and duration of default.

Loss rates of resolved defaults (τ)					
	When the asset is not sold			Whether the asset is sold or not	
	Commercial Vehicles	Machinery & Industrial Equipment	Passenger Cars	Computers & Business Machines	Other
less than 3 months	1.16%	0.66%	0.38%	9.53%	5.23%
3 to 12 months	1.99%	2.67%	2.54%	37.42%	15.85%
12 to 24 months	4.99%	6.05%	4.32%	45.84%	28.50%
24 to 36 months	12.84%	28.07%	16.95%	48.48%	33.91%
36 to 48 months	48.99%	15.62%	58.29%	41.00%	37.13%
48 to 60 months	76.19%	44.70%	14.92%	34.99%	29.86%

Chapter 9 – Unresolved defaults

5. Proxying loss when the asset is not sold: weighted estimate of loss (cont.)

- Combining the various loss rates weighted by the probability of resolution gives us the following loss rate matrix.
- For instance, Passenger Cars which have been in default for 3 to 12 months have a total expected loss of 8.49%.
- Commercial Vehicles which have been in default for 3 to 12 months have a total expected loss of 34.55%.

Loss rate matrix to be applied to unresolved defaults					
	When the asset is not sold			Whether the asset is sold or not	
	Commercial Vehicles	Machinery & Industrial Equipment	Passenger Cars	Computers & Business Machines	Other
less than 3 months	18.46%	11.41%	3.63%	20.97%	13.20%
3 to 12 months	34.55%	23.03%	8.49%	28.14%	20.62%
12 to 24 months	62.83%	38.19%	13.90%	32.27%	26.84%
24 to 36 months	73.67%	42.97%	15.41%	34.23%	28.92%
36 to 48 months	75.25%	43.79%	15.53%	34.79%	29.62%
48 to 60 months	76.19%	44.70%	14.92%	34.99%	29.86%

Chapter 9 – Unresolved defaults

6. Total loss rates for leasing

- In summary, we estimated loss on defaults that are not yet resolved as follows:
 - In cases where the vast majority of the recovery comes from sale of the asset (i.e. Commercial Vehicles, Passenger Cars and Machinery & Industrial Equipment), we assume the disposal value of the asset is the total expected recovery and consider these defaults “quasi-closed”.
 - In cases where the sale of the asset does not prove to be a good proxy for total recovery (i.e. Computers & Business Machines and Other equipment), we apply the expected loss rate matrix as previously described.
 - In cases where the asset has not yet been sold, we apply the expected loss rate matrix as previously described.
- The final loss rates, i.e. including those on closed defaults and our estimates on unresolved defaults are as follows:

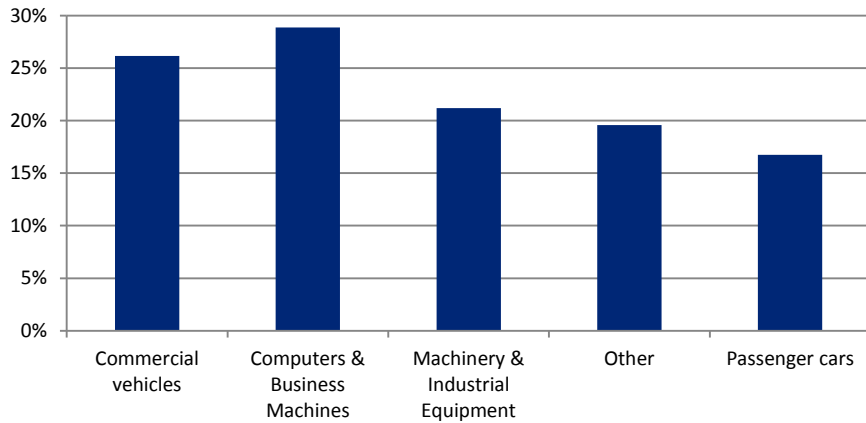
Average estimated total loss rate	Average loss rate of resolved defaults	Average loss rate of unresolved defaults	Average loss rate of quasi-closed defaults	Average loss rate of unresolved defaults using loss rate matrix
23.10%	16.7%	33.40%	36.10%	32.53%

Total number of defaults	Number of resolved defaults	Share of resolved defaults	Number of unresolved defaults	Number of quasi-closed defaults	Number of unresolved defaults for which the loss rate matrix is used	Number of unresolved defaults for which the loss is not assessed*
184 496	111 007	60.2%	73 489	17 579	54 294	1 616

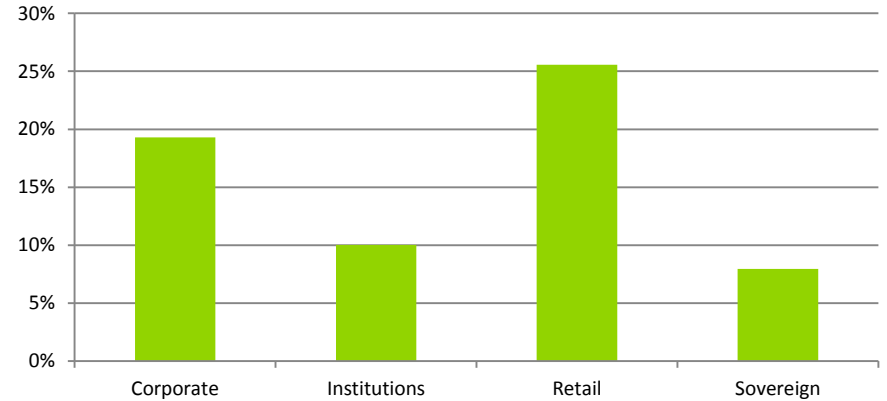
Chapter 9 – Unresolved defaults

6. Total loss rates for leasing (cont.)

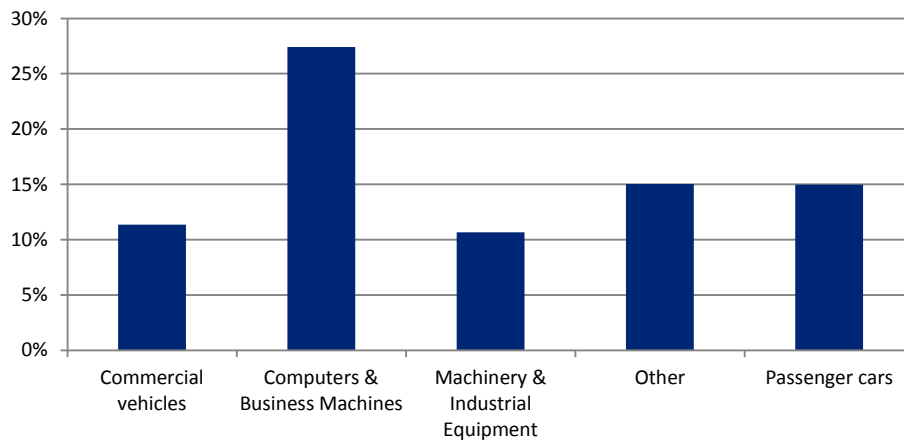
Average loss rate for resolved and unresolved defaults by asset type



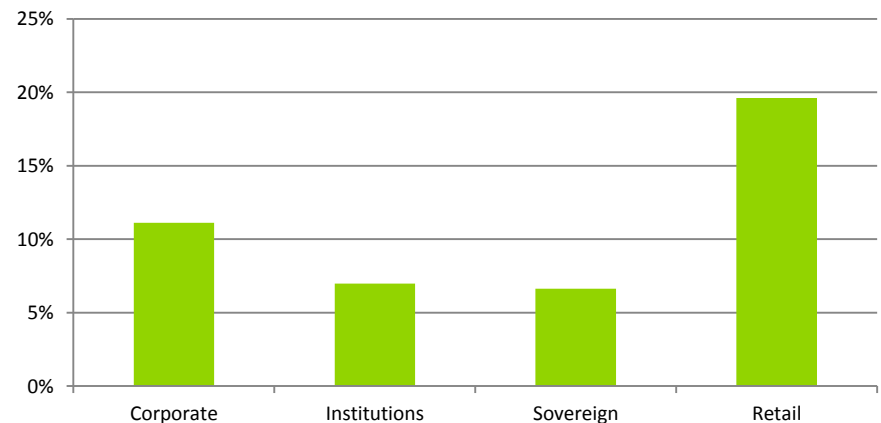
Average loss rate for resolved and unresolved defaults by Basel 2 asset class



Average loss rate for resolved defaults only by asset type



Average loss rate for resolved defaults only by Basel 2 asset class



Chapter 10 – Estimation of LGDs for leasing

Chapter 10 – Estimation of LGDs for leasing

Key findings

- We use bootstraps calculations on our entire default population (i.e. resolved and unresolved defaults) to estimate loss rate distributions.
- The average loss rate of our simulation stands at **23.15%**, with a 99.9th percentile at 24.20%. Both are significantly lower than the IRBF LGD of 40%.
- While there are variations in loss rates by asset type, they all remain relatively low.
 - Passenger Cars exhibit the lowest loss rates with an average of 16.9%.
 - Computers & Business Machines have the highest loss rates with an average of 28.9%.
- Loss rates also differ by counterparty and Basel 2 asset class:
 - Retail and SME average loss rates are the highest, around 24%.
 - The average loss rate for Corporates is approximately 16%.
 - Institutions have the lowest average loss rates, around 10%.
- We estimate that a discount factor of **23%** would need to be applied to leasing loss rates in order for them to reach the regulatory (IRB-Foundation) LGD of 40%.
 - This discount factor is extremely conservative when compared to the Euribor 4 year swap rate, which reaches a maximum of 5% in 2008.

Chapter 10 – Estimation of LGDs for leasing

1. Methodology

- This analysis aims to provide stressed loss rates that are comparable estimates for regulatory downturn LGDs.
 - The sample years for our database (2007 – 2011) cover the worst period of the economic crisis in Europe and these loss rates therefore provide a good approximation of downturn LGDs.
- We use a non-parametric approach, the bootstrap methodology, to replicate multiple samples from our original portfolio and use these sample loss rates to compute a loss rate distribution. The main benefit of this approach is that it does not involve making distribution assumptions.
 - Bootstrapping estimates average and stressed losses under various states of nature.
 - The distribution of the loss rates from each simulation is then used to establish a confidence interval, which shows how reliable the estimates are.
- We compute 50 000 samples, increasing the number of samples beyond this does not add any additional valuable information.
 - The sample size analysis is presented in Chapter 11 – Appendices.
- We also run simulations by type of leased asset, Basel 2 asset class and type of counterparty.
 - The results are shown in this chapter and detailed further in Chapter 11 – Appendices.

Chapter 10 – Estimation of LGDs for leasing

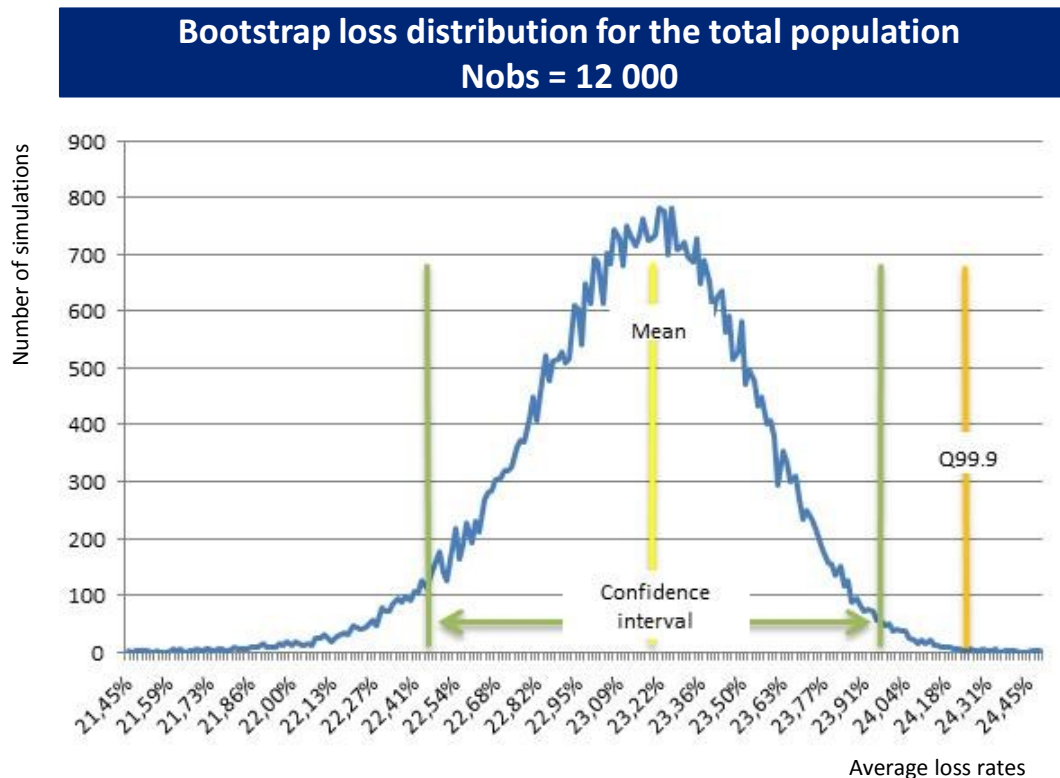
1. Methodology (cont.)

- In LGD modelling, it is important to include unresolved defaults in the estimates in order to ensure the applicability of the model to the whole default population.
- Leasing companies themselves generally use techniques based on analyses of recovery flows in order to do this. However, collecting a comprehensive database of recovery flows was not practically achievable within this study.
- We therefore rely on our estimates for losses as calculated under Chapter 9 – Unresolved defaults.
- This chapter shows the results of simulations drawn on both closed and unresolved defaults.
 - 99.12% of our default database is included.

Chapter 10 – Estimation of LGDs for leasing

2. Loss rate bootstrap results – aggregate results

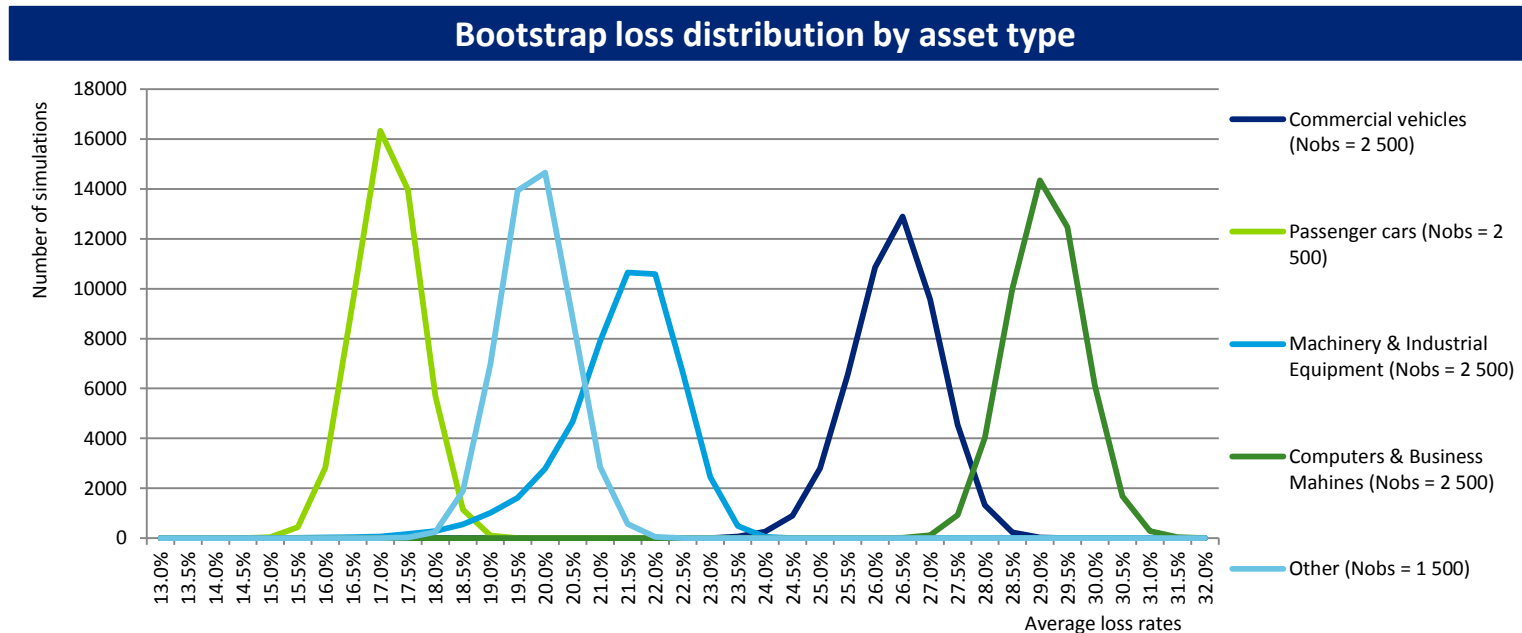
- The average loss rate from the distribution is 23.15%, which is very similar to the average loss rate of 23.10% calculated for the dataset previously.
- The 99.9th percentile is **24.20%** , which is significantly lower than the IRBF LGD of 40%.
- The bootstrap loss rate estimates are very reliable as they converge around the same level and have a very narrow confidence interval.



Chapter 10 – Estimation of LGDs for leasing

3. Bootstrap results – by asset type

- We analyse the level of losses per type of leased asset (detailed results are available in Appendix).

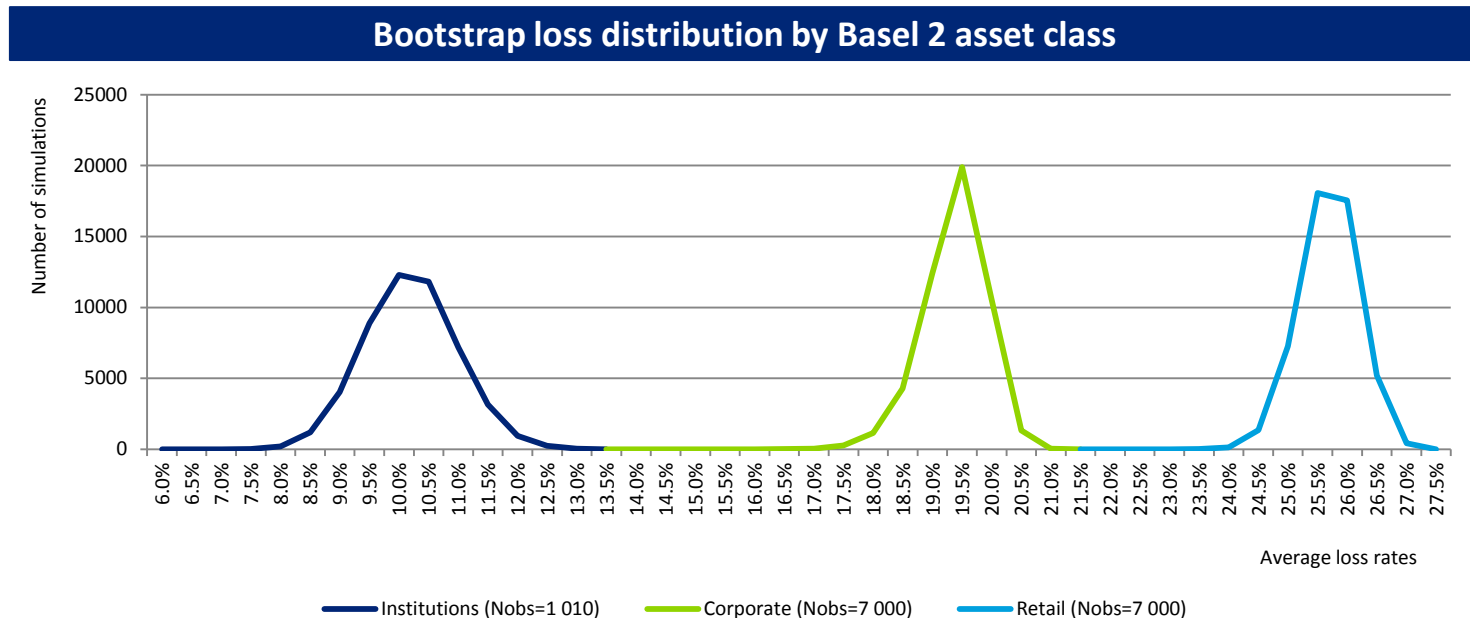


- While there are variations in loss rates by asset type, they all remain relatively low:
 - Passenger Cars exhibit the lowest loss rates with an average of 16.9%.
 - Machinery & Industrial Equipment and Other equipment assets also enjoy loss rates below 24%.
 - Commercial Vehicles experiences relatively higher loss rates, especially in comparison to Passenger Cars. This is mainly due to high expected loss rate values on unresolved defaults.
 - Computers & Business Machines have the highest loss rates with an average of 28.9%.

Chapter 10 – Estimation of LGDs for leasing

4. Bootstrap results – by Basel 2 asset class

- We analyse the level of losses per Basel 2 asset class, although the Sovereign default portfolio had to be excluded as its size was not significant enough to compute a bootstrap (detailed results are available in Appendix).

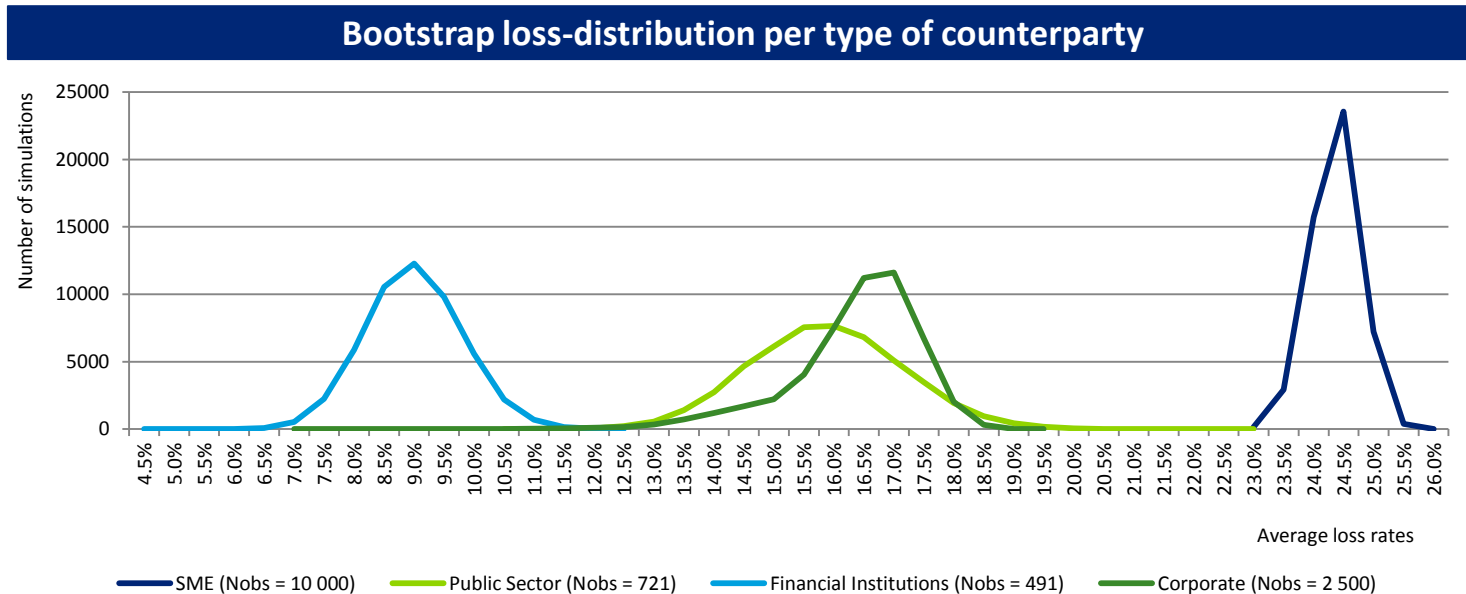


- The risk-profile is quite different depending on the Basel 2 asset class:
 - Institutional loss rates are very low with an average of 9.94% (variation is higher than other Basel 2 asset classes due to the small sample).
 - Corporate loss rates have an average level of 19.12%.
 - Retail loss rates are the highest with an average of 24.55% and a 99.9th percentile around 27%.

Chapter 10 – Estimation of LGDs for leasing

5. Bootstrap results – by counterparty

- We analyse the level of losses per type of counterparty. The size of the Financial Institutions and Public Sector samples is limited by the number of contracts in our dataset (detailed results are available in Appendix).



- As observed with Basel 2 asset class, loss rates differ by the type of counterparty to which the lease is granted.
 - SME loss rates are higher than other counterparties. The average SME loss rate (24.10%) is comparable to the average Retail loss rate.
 - The simulated loss rates for Corporate and Public Sector entities are similar, with average loss rates of 16.12% and 15.62% respectively.
 - Financial Institutions have extremely low loss rates with an average of 8.75%.

Chapter 10 – Estimation of LGDs for leasing

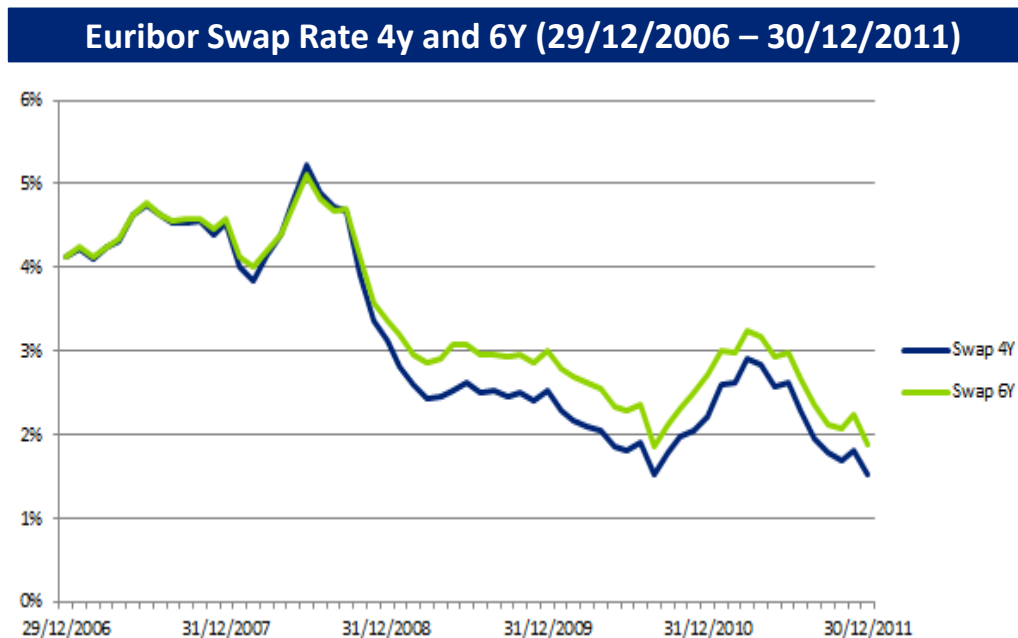
6. Conclusions and assessment of the IRB-F LGD conservatism

- At an aggregate level, the loss rates of leasing contracts are low, the IRBF LGD of 40% clearly overestimates the real level of risk of leasing.
- According to Basel 2 regulation on LGD modelling, LGDs need to take the following into account:
 - Recovery flows should be discounted back to the default moment.
 - Management fees (indirect costs of handling defaulted contracts, eg. legal fees) should be taken into account.
 - A downturn estimate is expected, which means that sensitivity to economic conditions should be considered.
- To comply with these requirements, we approach the downturn regulatory LGD as follows:
 - We assume 3% management fees, which is consistent with observed practices.
 - We consider the downturn assumption to be fulfilled as the timeframe of our dataset covers the latest economic and financial crisis, with significantly deteriorated economic conditions. We also include 99.9th percentile loss rates for added conservatism.
 - Instead of calculating discounted losses using appropriate discount factors, we calculate the discount factor which would be necessary for our downturn loss rate to reach the 40% IRBF LGD level.
 - The maximum loss rate from the aggregate distribution is used (24.49%) to which the 3% of management fees is added.
 - Assuming the default duration is 2 years (conservative as the average closed default duration is 8 months).

Chapter 10 – Estimation of LGDs for leasing

6. Conclusions and assessment of the IRB-F LGD conservatism (cont.)

- A 23% discount rate is needed to reach a 40% LGD.
- This discount rate is extremely conservative, especially when compared with Euribor swap rates (the closest proxy of a risk free rate). As leasing contracts have an average duration of around 4 years, we provide in the 4Y and 6Y Euribor swap rates observed over our timeframe (from 29/12/2006 to 30/12/2011) in the graph below. They both reached a maximum of just over 5% in 2008, less than a quarter of our calculated discount rate of 23%.



- The IRBF LGD given under the CRR is overestimating the observed LGD for leasing, even during a downturn period.

Chapter 11 – Conclusion

Chapter 11 - Conclusions

- This study examines the role that a lessor's ownership rights on leased assets plays in mitigating credit risk.
- We find that **default rates** are lower for leases than traditional lending.
 - For instance, our one-year default rate for Retail SMEs in 2010 is 2.66%, whereas, according to the EBA's 2011 stress test report, the median one-year default rate of their sample of banks lending to Retail SMEs is approximately 4.5%. Similarly, our results show a default rate of 2.32% for Corporate leases compared to the EBA's 3% for all Corporate exposures.
 - This is because leasing clients prioritise lease payments due to the importance of the leased asset as a working tool to run their business.
- We find that **loss rates** are lower for leases than traditional lending.
 - For instance, loss rates on the Corporate and Retail SME exposures of our portfolio were 11.1% and 19.6% respectively. This compares very favourably to the figures of the EBA's EU-wide 2011 stress test report where equivalent loss rates for Corporate and Retail SME lending were both in excess of 30%.
 - This is due to the risk mitigation power of the lessor's ownership of the leased asset which acts in two ways:
 - 1) A significant portion of defaults (60%) regrade because the lessee is incentivised to return to a healthy payment situation in order to prevent the lessor from exercising its ownership rights. In such cases the lessor has a zero loss.
 - 2) When regrades do not occur, the lessor is able to efficiently and quickly repossess the leased asset and re-deploy it (e.g. sell the asset, re-lease it, etc.) in order to minimise its losses. In such cases, the lessor may even make a gain on the realisation of its collateral.
 - The recovery process is significantly faster for defaults for which the leased asset has been sold.
 - As a consequence, lease defaults are generally short (8.5 months on average).

Chapter 11 - Conclusions

- Asset sale proceeds contribute significantly to low losses for leasing.
 - In 80% of defaults where the lease does not regrade, the asset is sold.
 - Approximately 22% of contracts where the asset is sold have a zero loss (as calculated on non regrading defaults).
 - On a portfolio level, asset sale proceeds account for 80.3% of the total recovery.
 - Defaults generally occur in the second half of the lease. Given the shapes of asset value and outstanding exposure curves, the later a default occurs in the contract life, the lower the loss.
 - The recovery process is significantly faster for defaults for which the leased asset has been sold. On average, defaults where the asset is sold are 5 months shorter and have a loss that is 13.4 percentage points lower than those where the asset is not sold (excluding Computers & Business Machines and Other assets).
- Our bootstrap loss distribution results are significantly lower than regulatory requirements:
 - The average loss rate is 23.15%, with a 99.9th percentile of 24.2%.
 - We estimate that an extremely high discount factor (23%) would need to be applied to leasing loss rates in order to reach the regulatory (IRB-Foundation) LGD of 40%.

Chapter 11 - Conclusions

- Loss characteristics by asset type are consistent with the conclusions above:

	Passenger Cars	Commercial Vehicles	Machinery & Industrial Equipment	Computer & Business Machines	Other
Average contract duration	40	50	50	50	50
Default duration	8	9	9	8	8
% regrades	62%	58%	67%	61%	64%
% asset sold	70%	77%	78%	90%	81%
Asset sale proceeds (% of recoveries)	84%	81%	90%	46%	70%
Average loss	16.88%	26.11%	21.13%	28.84%	19.57%
99.9th percentile	18.25%	27.88%	23.06%	30.11%	21.51%

- The 99.9th percentile values are significantly lower than regulatory LGDs across all asset types.
- Core business assets (i.e. Machinery & Industrial Equipment) have the highest regrade rate.
- The rate of cases where the asset is sold depends on the lessor's ability to re-deploy the asset in other ways. For instance, Passenger Cars are more often re-leased (and hence have the lowest asset sale rate – although it still remains high at 70%) compared to Computers & Business Machines.
- Defaults in the Computers and Business Machines category have relatively more recovery flows from non-asset sale sources.

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Chapter 12 – Appendices

Chapter 12 – Appendices

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Chapter 12 – Appendices

1. Glossary

- **CRD4/CRR package** : The CRD 4 package transposes – via a Regulation and a Directive – the new global standards on bank capital (commonly known as the Basel III agreement) into the EU legal framework.
- **Small and Medium Enterprises – SME**: “The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro.”, Extract of Article 2 of the Annex of Recommendation 2003/361/EC.
- **Leasing**: According to the IFRS accounting standards, a lease 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" (IAS 17).
 - Here we exclude contracts where ownership transfers at the beginning of the contract.
- **Types of leasing covered**: For the purpose of this study, both finance leasing and operating leasing (defined below) are included and all types of assets except real estate leasing. Hire purchase is included in this definition, excluding instances where ownership transfers to the lessee at the beginning of the contract.
- **Finance Lease**: According to IAS 17, a finance lease is a lease that transfers substantially all the risks and rewards incidental to ownership of an asset. Title may or may not eventually be transferred. This category includes Hire Purchase, as long as ownership transfers at the end of the contract.
- **Operating Lease**: According to IAS 17, an operating lease is a lease other than a finance lease.

Chapter 12 – Appendices

1. Glossary (cont.)

- **Leased assets:**

- Machinery & Industrial Equipment: All machinery, be it for commercial, industrial or agricultural use. Harvesters, tractors and earth movers are included under this section and not in “Commercial Vehicles”. As a general guideline, the distinction vehicle / equipment depends on whether or not the object in question is registered, i.e. has a licence plate. If the asset has a licence plate, then it is categorised under “Commercial Vehicles”.
- Computers & Business Machines: All IT equipment and other business machines such as photocopiers, etc.
- Commercial Vehicles: All light, medium, heavy and “other” commercial vehicles. By vehicles is meant registered vehicles. Unregistered vehicles are classified under “Machinery & Industrial Equipment”.
- Passenger Cars: All new and used cars, be they for private or business use. This category covers also motor cycles and caravans.
- Ships, Aircraft, Railway, Rolling Stock
- Other: All other types of equipment, including, for instance, containers.

Automotive is composed of Commercial Vehicles and Passenger Cars.

Equipment is composed of the other categories.

Chapter 12 – Appendices

1. Glossary (cont.)

- **Default:** We rely on the Basel definition of default, as stated in the Capital Requirement Directive. "A 'default' shall be considered to have occurred with regard to a particular obligor when either or both of the two following events has taken place:
 - the credit institution considers that the obligor is unlikely to pay its credit obligations to the credit institution, the parent undertaking or any of its subsidiaries in full, without recourse by the credit institution to actions such as realising security (if held);
 - the obligor is past due more than 90 days on any material credit obligation to the credit institution, the parent undertaking or any of its subsidiaries."

If a contract has multiple defaults over time, all its defaults are included in the analysis. The possible outcomes of a default are the following:

- A defaulted contract coming back to a healthy situation;
- A defaulted contract leading the company to terminate the agreement and to count a loss.

The "technical default", defined as flag of default resulting from technical difficulties with the payment systems) have been excluded of the analysis.

- **Default rate:** proportion of contracts having defaulted. It is most of the time understood as one-year default rate (in compliance with Basel standards, see for instance Article 4(54) of CRR), which is the ratio between the number of defaults occurred during a period that starts from one year prior to a date T and the number of obligor assigned to this portfolio prior to that date.
- **PD (Probability of Default):** In accordance with Basel standards, "probability of default" means the probability of default of a counterparty over a one year period (see for instance Article 4(27) of CRR). PDs shall be estimated from long run averages of one-year default rates (Article 176(a)), with a historical observation period of at least five years (Article 176(h)).

Chapter 12 – Appendices

1. Glossary (cont.)

- **Loss:** As stated in the Capital Requirements Regulation (Article 5 (2)), “loss” means economic loss, including material discount effects, and material direct and indirect costs associated with collecting on the instrument.

However, for the purpose of this study, we rely on the concept of **final loss as accounted in the financial statements** as it provides common audited information, available for all the surveyed companies (whether regulated or not) and it is amounting to what is actually lost should a default occur.

- **Loss rate:** as the LGD (see below), loss rate is calculated for defaulted contracts as the final loss as accounted in proportion to the amount outstanding at default.
- **LGD (Loss Given Default):** In accordance with Basel standards, “loss given default” means the ratio of the loss on an exposure due to the default of a counterparty to the amount outstanding at default (Article 4 §1 (55) of the CRR). LGD estimated shall be appropriate for an economic downturn (Article 181 §1 (b)), with a historical observation period of at least five years (Article 181 §1 (j) and Article 181 §2 for Retail exposures).

Chapter 12 – Appendices

2. Description of the requested data

- The data requested for our study was defined and tested with a subset of leasing companies from our panel. The detailed information requested to the leasing companies is listed below.

- **Contracts and counterparty information**

Contract information

- ✓ Type of lease
- ✓ Initial outstanding
- ✓ Purchase price of the leased asset
- ✓ Contract engagement and maturity date / real termination date
- ✓ Estimated residual value of the leased asset at lease term
- ✓ Guarantee of the residual value
- ✓ Other collateral, type and value
- ✓ Effective Interest Rate / Internal rate of return
- ✓ Nominal interest rate

Counterparty information

- ✓ Country of the counterparty
- ✓ Counterparty turnover
- ✓ Economic Sector
- ✓ Basel 2 asset class
- ✓ Category of leased assets

- **Default information**

- ✓ Default start and end date
- ✓ Initial provision at default
- ✓ Final loss as accounted / Current provision if default not closed
- ✓ Outstanding balance at default
- ✓ Has the defaulted contract been in a litigation process?
- ✓ If sold, disposal value of the leased asset
- ✓ Use of other collateral and disposal value
- ✓ Reason for default resolution

- **Contract flows (exposure view at several points in time)**

For each end of year:

- ✓ Outstanding balance
- ✓ Value of the leased asset as of date
- ✓ **IRB Financial Institutions :**
 - RW
 - Probability of defaults (PDs)
 - Loss given defaults (LGDs)
- ✓ **Financial Institutions under the standardised approach :**
 - Applicable RW

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2. Description of the requested data (cont.)

- To collect this information, we used three detailed data sheets, as represented below. Each is linked through the counterparty and the contract ID:
 - The first template “Contracts and counterparty information” aims to list all contracts alive between 2007 and 2011, as well as their characteristics. It is structured in two parts: contract information and counterparty information.
 - The second sheet “Default information” focuses on contracts having defaulted between 2007 and 2011, closed or unresolved as of 31/12/2011. To capture the loss we chose to rely on the final loss as accounted. For unresolved defaults, we asked for the current provision.
 - The third template “Contract flows” provides a view of the portfolio and current exposure at several points in time (as of each 31/12 of the timeframe).

Chapter 12 – Appendices

3. Bootstrap*

3.1. Definition of the size of the samples for the bootstraps on the total population

- The size of the samples should replicate an average portfolio.
- For this, we analysed the average size of the default portfolio for each participant.

Number of defaults by participant	
Participant	Number of defaults
A	5 619
B	5 802
C	45 970
D	884
E	28 157
F	13 452
G	12 866
H	2 225
I	12 908
J	7 781
K	1 265
L	3 953
M	5 945
N	7 833
O	3 352
P	24 115

Basic indicators for number of defaults	
Mean	11 383
Median	6 863
Variance	145 615 393
Standard deviation	12 067
Q(80)	13 452
Q(90)	26 136

- For the total population, we calculated the simulations for portfolios of **10 000, 12 000 and 15 000 defaults**, making the best compromise considering the significant size differences between participants.

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3. Bootstrap (cont.)*

3.2. Definition of the size of the samples for the bootstraps by asset type

- The bootstraps per type of leased asset have been calculated according to the following table.
 - In order to remain comparable, we computed the simulations for a sample of 1 500 defaults for each type of leased asset.

Commercial Vehicles	Passenger Cars	Computers & Business Machines	Machinery & Industrial Equipment	Other
1 500	1 500	1 500	1 500	1 000
2 500	2 500	2 500	2 500	1 500
4 000	4 000	6 500	4 000	

- These sample sizes were calibrated using the average default portfolio size of each participant broken down by type of leased asset.

Number of defaults by participant and asset type					
Participant	Commercial Vehicles	Computers & Business Machines	Machinery & Industrial Equipment	Other	Passenger Cars
A	1 501	140	1 448	528	1 993
B	2 300	418	971	0	2 107
C	13 816	19 652	7 931	3 534	1 029
D	415	58	130	0	281
E	5 469	12 681	5 536	4 067	394
F	2 347	3 632	3 061	798	3 480
G	3 410	1 897	3 011	120	4 366
H	818	148	648	368	233
I	5	0	0	0	9 189
J	2 376	289	3 209	992	853
K	108	48	549	60	500
L	796	564	1 218	736	602
M	486	833	2 705	321	1 598
N	1 020	659	1 355	753	3 998
O	1 251	98	258	166	1 576
P	7 377	0	10 692	0	6 046

Basic indicators for number of defaults					
	Commercial Vehicles	Computers & Business Machines	Machinery & Industrial Equipment	Other	Passenger Cars
Mean	2 718	2 570	2 670	778	2 390
Median	1 376	354	1 402	345	1 587
Var	12 775 110	30 659 814	9 133 883	1 509 684	6 191 128
Standard deviation	3 574	5 537	3 022	1 229	2 488
Q(80)	3 410	1 897	3 209	798	3 998
Q(85)	4 954	3 198	4 954	944	4 274
Q(90)	6 423	8 157	6 734	2 263	5 206

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.3. Definition of the size of the samples for the bootstraps by Basel 2 asset class

- The bootstraps per Basel 2 asset class have been calculated according to the following table.
 - In order to remain comparable, we computed the simulations for a sample of 3 500 defaults and of 7 000 defaults for the Retail and Corporate asset classes.

Corporate	Retail	Institutions
3 500	3 500	1 010
5 000	7 000	
7 000	10 000	

- The size of the Institutions sample is the number of defaults classified as such.
- The size of the Sovereign portfolio was not significant enough to compute a bootstrap.

- These sample sizes were calibrated using the average default portfolio size of each participant broken down by Basel 2 asset class.

Number of defaults by participant and Basel 2 asset class

Participant	Corporate	Institutions	Retail	Sovereign
A	5 619	0	0	0
B	2 578	21	3 167	0
C	8 189	77	37 685	19
D	480	5	399	0
E	4 741	0	22 625	0
F	10 719	324	787	5
G	7 482	101	5 278	5
H	415	0	1 810	0
I	607	3	8 591	6
J	2 931	16	3 362	0
K	1 265	0	0	0
L	3 932	4	17	0
M	828	17	5 068	32
N	7 682	147	0	0
O	438	0	2 910	4
P	2 694	295	17 734	0

Basic indicators for number of defaults

	Retail	Corporate	Institutions	Sovereign
Mean	3 788	63	6 840	4
Median	2 813	11	3 039	0
Var	10 845 447	11 135	110 618 263	78
Standard deviation	3 293	106	10 518	9
Q(80)	7 482	101	8 591	5
Q(85)	7 632	136	15 448	6
Q(90)	7 936	221	20 180	13

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.4. Definition of the size of the samples for the bootstraps by type of counterparty

- The bootstraps per type of counterparty have been calculated according to the following table.
 - The size of the Financial Institutions and Public Sector samples is the total number of defaults classified in each respective type of counterparty.

Corporate	SME	Financial Institutions	Public Sector
1 500	8 000	721	491
2 500	10 000		
	12 000		

- These sample sizes were calibrated using the average default portfolio size of each participant broken down by type of counterparty.

Number of defaults per participant and type of counterparty

Participant	Corporate	Financial Institutions	Public Sector	SME
A	1 232	0	0	4 387
B	2 578	21	0	3 167
C	1 830	55	84	44 001
D	480	5	0	399
E	4 741	0	0	22 625
F	2 202	324	5	10 921
G	1 284	43	63	11 476
H	415	0	0	1 810
I	607	3	6	8 591
J	703	0	16	5 590
K	0	0	0	1 265
L	3 256	1	4	692
M	94	17	32	5 802
N	2 445	147	0	5 241
O	437	0	4	2 911
P	2 591	105	277	21 142

Basic indicators for number of defaults breakdown

	Corporate	Financial Institutions	Public Sector	SME
Mean	1 556	45	31	9 376
Median	1 258	4	4	5 416
Var	1 767 348	7 384	4 937	129 916 881
Standard deviation	1 329	86	70	11 398
Q(80)	2 578	55	32	11 476
Q(85)	2 588	93	55	18 726
Q(90)	2 924	126	74	21 884

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3. Bootstrap (cont.)*

3.5. Bootstraps results on the total population

Loss rates bootstrap results on the total population			
Nsim = 50 000	Nobs = 10 000	Nobs = 12 000	Nobs = 15 000
Min	21.19%	21.45%	21.36%
Max	24.71%	24.49%	24.31%
Q(2.5)	22.28%	22.36%	22.44%
Q(25)	22.89%	22.91%	22.93%
Median	23.16%	23.17%	23.16%
Q(75)	23.42%	23.40%	23.38%
Q(95)	23.78%	23.73%	23.67%
Q(97.5)	23.89%	23.83%	23.76%
Q(99.9)	24.32%	24.20%	24.08%
Mean	23.14%	23.15%	23.15%
Standard deviation	0.409%	0.374%	0.336%
Confidence interval	0.8050%	0.7360%	0.6590%
Variance	0.0017%	0.0014%	0.001%

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.6. Bootstraps results by asset type

Passenger Cars

Nsim = 50 000	Nobs = 1 500	Nobs = 2 500	Nobs = 4 000
Min	13.59%	14.42%	14.82%
Max	20.08%	19.67%	18.65%
Q(2.5)	15.41%	15.73%	15.99%
Q(25)	16.38%	16.49%	16.57%
Median	16.89%	16.88%	16.88%
Q(75)	17.39%	17.27%	17.18%
Q(95)	18.10%	17.82%	17.62%
Q(97.5)	18.33%	18.00%	17.77%
Q(99.9)	19.16%	18.61%	18.25%
Mean	16.89%	16.88%	16.88%
Standard deviation	0.748%	0.577%	0.453%
Confidence interval	1.4600%	1.1325%	0.8900%
Variance	0.0056%	0.0033%	0.0021%

Commercial Vehicles

Nsim = 50 000	Nobs = 1 500	Nobs = 2 500	Nobs = 4 000
Min	21.24%	22.59%	22.62%
Max	30.01%	29.22%	28.81%
Q(2.5)	24.03%	24.51%	24.88%
Q(25)	25.47%	25.61%	25.71%
Median	26.15%	26.14%	26.12%
Q(75)	26.79%	26.64%	26.52%
Q(95)	27.70%	27.34%	27.08%
Q(97.5)	27.99%	27.58%	27.27%
Q(99.9)	28.93%	28.40%	27.88%
Mean	26.11%	26.11%	26.11%
Standard deviation	1.001%	0.779%	0.609%
Confidence interval	1.9765%	1.5340%	1.1955%
Variance	0.0100%	0.0061%	0.0037%

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.6. Bootstraps results by asset type (cont.)

Machinery & Industrial Equipment

Nsim = 50 000	Nobs = 1 500	Nobs = 2 500	Nobs = 4 000
Min	8.87%	13.10%	14.63%
Max	24.79%	24.33%	23.47%
Q(2.5)	17.62%	18.58%	19.19%
Q(25)	20.53%	20.60%	20.67%
Median	21.37%	21.29%	21.24%
Q(75)	22.03%	21.85%	21.72%
Q(95)	22.89%	22.56%	22.30%
Q(97.5)	23.15%	22.78%	22.47%
Q(99.9)	24.07%	23.51%	23.06%
Mean	21.14%	21.14%	21.13%
Standard deviation	1.356%	1.053%	0.834%
Confidence interval	2.7645%	2.0970%	1.6420%
Variance	0.0184%	0.0111%	0.0070%

Computers & Business Machines

Nsim = 50 000	Nobs = 1 500	Nobs = 2 500	Nobs = 6 500
Min	25.19%	25.91%	27.25%
Max	32.80%	31.68%	30.49%
Q(2.5)	27.19%	27.55%	28.03%
Q(25)	28.28%	28.40%	28.56%
Median	28.86%	28.85%	28.84%
Q(75)	29.44%	29.30%	29.12%
Q(95)	30.27%	29.93%	29.52%
Q(97.5)	30.54%	30.14%	29.65%
Q(99.9)	31.59%	30.92%	30.11%
Mean	28.86%	28.85%	28.84%
Standard deviation	0.856%	0.663%	0.412%
Confidence interval	1.6750%	1.2965%	0.8100%
Variance	0.0073%	0.0044%	0.0017%

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3. Bootstrap (cont.)*

3.6. Bootstraps results by asset type (cont.)

Other		
Nsim = 50 000	Nobs = 1 000	Nobs = 1 500
Min	16.50%	16.99%
Max	22.76%	22.27%
Q(2.5)	18.10%	18.35%
Q(25)	19.05%	19.14%
Median	19.57%	19.56%
Q(75)	20.09%	19.99%
Q(95)	20.84%	20.60%
Q(97.5)	21.09%	20.80%
Q(99.9)	22.02%	21.51%
Mean	19.57%	19.57%
Standard deviation	0.766%	0.626%
Confidence interval	1.4985%	1.2230%
Variance	0.0059%	0.0039%

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3. Bootstrap (cont.)*

3.7. Bootstraps results by Basel 2 asset class

Retail			
Nsim = 50 000	Nobs = 3 500	Nobs = 7 000	Nobs = 10 000
Min	22.03%	22.96%	23.58%
Max	28.08%	27.16%	27.10%
Q(2.5)	24.02%	24.46%	24.63%
Q(25)	25.03%	25.13%	25.19%
Median	25.49%	25.46%	25.46%
Q(75)	25.91%	25.77%	25.72%
Q(95)	26.49%	26.19%	26.08%
Q(97.5)	26.67%	26.33%	26.19%
Q(99.9)	27.35%	26.78%	26.58%
Mean	25.45%	25.44%	25.44%
Standard deviation	0.673%	0.475%	0.399%
Confidence interval	1.3245%	0.9340%	0.7810%
Variance	0.0045%	0.0023%	0.0016%

Corporate			
Nsim = 50 000	Nobs = 3 500	Nobs = 5 000	Nobs = 7 000
Min	13.83%	15.12%	15.58%
Max	21.71%	21.14%	21.12%
Q(2.5)	17.35%	17.69%	17.94%
Q(25)	18.74%	18.78%	18.82%
Median	19.21%	19.19%	19.17%
Q(75)	19.62%	19.54%	19.49%
Q(95)	20.17%	20.02%	19.89%
Q(97.5)	20.35%	20.17%	20.02%
Q(99.9)	20.98%	20.70%	20.47%
Mean	19.12%	19.12%	19.12%
Standard deviation	0.741%	0.618%	0.525%
Confidence interval	1.4985%	1.2410%	1.0400%
Variance	0.0055%	0.0038%	0.0028%

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.7. Bootstraps results by Basel 2 asset class (cont.)

Institutions	
Nsim = 50 000	Nobs = 1 010
Min	6.70%
Max	13.50%
Q(2.5)	8.46%
Q(25)	9.42%
Median	9.94%
Q(75)	10.45%
Q(95)	11.24%
Q(97.5)	11.50%
Q(99.9)	12.46%
Mean	9.94%
Standard deviation	0.773%
Confidence interval	1.5165%
Variance	0.0060%

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.8. Bootstraps results by type of counterparty

SME			
Nsim = 50 000	Nobs = 8 000	Nobs = 10 000	Nobs = 12 000
Min	21.89%	22.51%	22.62%
Max	25.74%	25.64%	25.48%
Q(2.5)	23.21%	23.32%	23.39%
Q(25)	23.83%	23.86%	23.87%
Median	24.12%	24.12%	24.12%
Q(75)	24.40%	24.38%	24.35%
Q(95)	24.79%	24.73%	24.67%
Q(97.5)	24.92%	24.84%	24.77%
Q(99.9)	25.38%	25.23%	25.13%
Mean	24.10%	24.11%	24.11%
Standard deviation	0.434%	0.385%	0.353%
Confidence interval	0.85%	0.76%	0.69%
Variance	0.0019%	0.0015%	0.0012%

Corporate		
Nsim = 50 000	Nobs = 1 500	Nobs = 2 500
Min	2.68%	7.13%
Max	19.54%	19.19%
Q(2.5)	12.18%	13.39%
Q(25)	15.62%	15.65%
Median	16.40%	16.33%
Q(75)	17.01%	16.84%
Q(95)	17.80%	17.48%
Q(97.5)	18.05%	17.67%
Q(99.9)	18.89%	18.35%
Mean	16.13%	16.12%
Standard deviation	1.392%	1.076%
Confidence interval	2.93%	2.14%
Variance	0.0194%	0.0116%

Chapter 12 – Appendices

3. Bootstrap (cont.)*

3.8. Bootstraps results by type of counterparty (cont.)

Financial Institutions	
Nsim = 50 000	Nobs = 721
Min	4.93%
Max	12.04%
Q(2.5)	7.22%
Q(25)	8.20%
Median	8.74%
Q(75)	9.28%
Q(95)	10.09%
Q(97.5)	10.37%
Q(99.9)	11.34%
Mean	8.75%
Standard deviation	0.801%
Confidence interval	1.58%
Variance	0.0064%

Public Sector	
Nsim = 50 000	Nobs = 491
Min	10.28%
Max	21.12%
Q(2.5)	13.18%
Q(25)	14.75%
Median	15.61%
Q(75)	16.47%
Q(95)	17.75%
Q(97.5)	18.18%
Q(99.9)	19.71%
Mean	15.62%
Standard deviation	1.278%
Confidence interval	2.50%
Variance	0.0163%