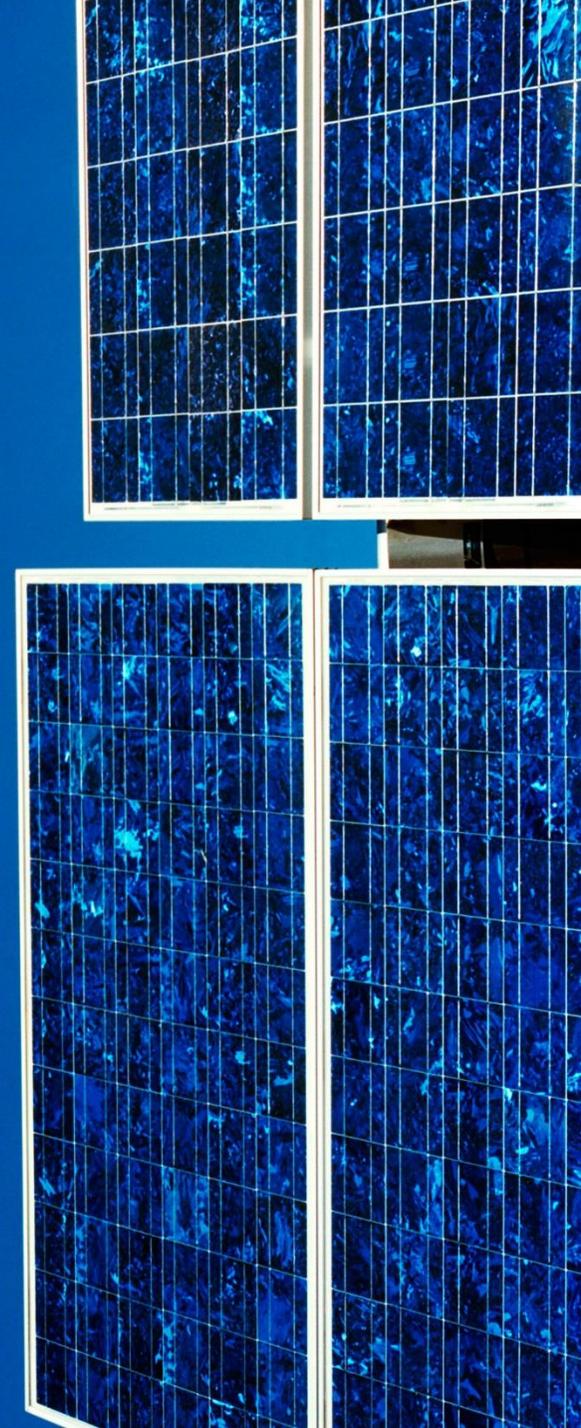




KPMG – Federico II: Business case 2018

KPMG @ Federico II
Naples, May 25th 2018



Credit Risk - expected and unexpected loss

- **Credit risk** refers to the risk that a **borrower may not repay a loan** and that the lender may lose the principal of the loan or the interest associated with it
- Credit risk arises because borrowers expect to **use future cash flows to pay current debts**; it's almost never possible to ensure that borrowers will definitely have the funds to repay their debts

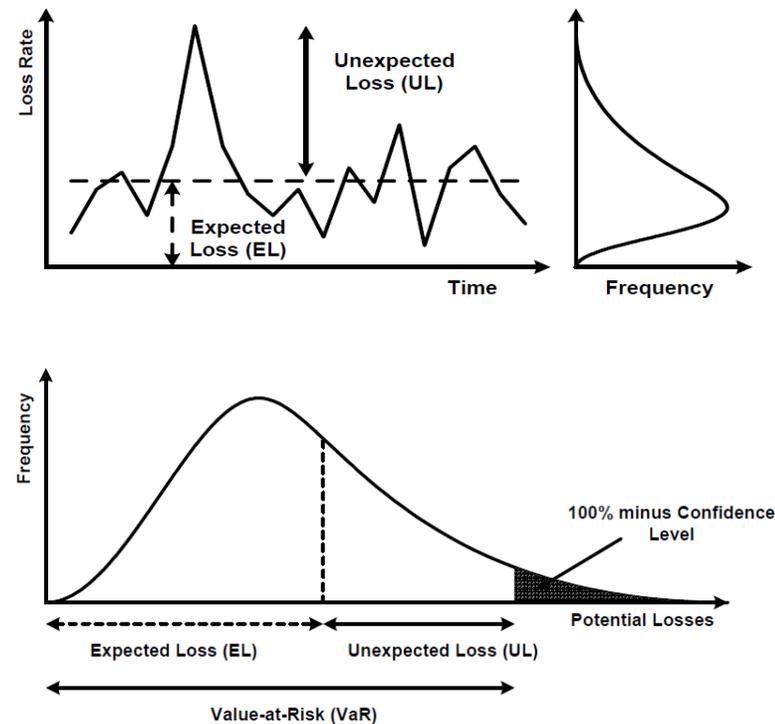
- Credit risk measurement is based on the estimate of 2 elements:

Expected Loss

- The Expected Loss (EL) is the **average level of credit losses the bank can reasonably expect to experience**
- Banks have to cover the EL on an ongoing basis, e.g. provisions and write-offs
- The EL is computed as: **Probability of Default (PD) * Loss Given Default (LGD) * Exposure at Default (EAD)**

Unexpected Loss

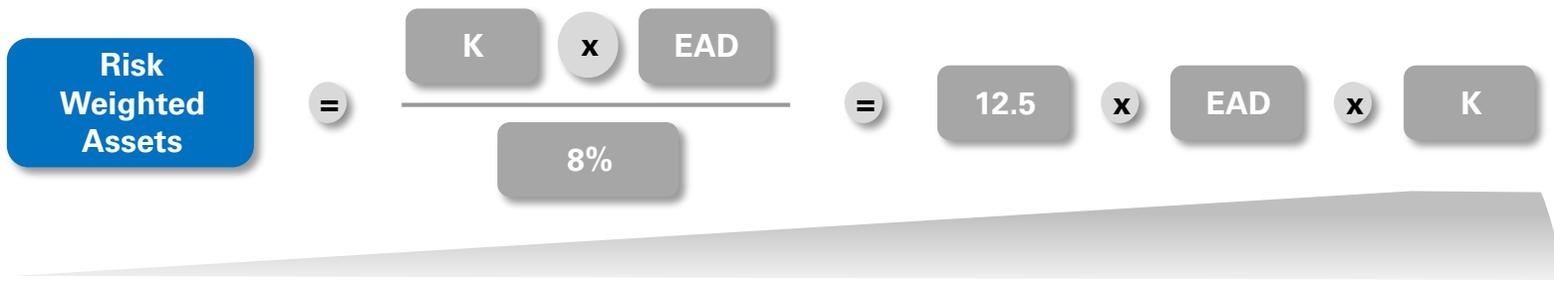
- Unexpected Loss (UL) is the **peak losses that exceed the expected levels**
- Institutions know they will occur now and then, but they cannot know in advance their timing or severity
- The UL relates to **potentially large losses**
- **Capital** would only be needed **for absorbing Unexpected Losses**



The Risk Weighted Assets computation

- **Risk-weighted assets** (RWA) are used to determine the **minimum amount of capital** that must be held by banks and other institutions to reduce the **risk insolvency**
- **The capital requirement** is based on a **risk assessment** for each type of bank asset

Risk weighted assets are computed according to the following formula:



Capital Requirement

$$K = \left\{ \text{LGD} \times N \left[\frac{N^{-1}(\text{PD}) + \sqrt{\rho} \times N^{-1}(0.999)}{\sqrt{1 - \rho}} \right] - \text{PD} \times \text{LGD} \times \frac{1 + (M - 2.5) \times b(\text{PD})}{1 - 1.5 \times b(\text{PD})} \right\}$$

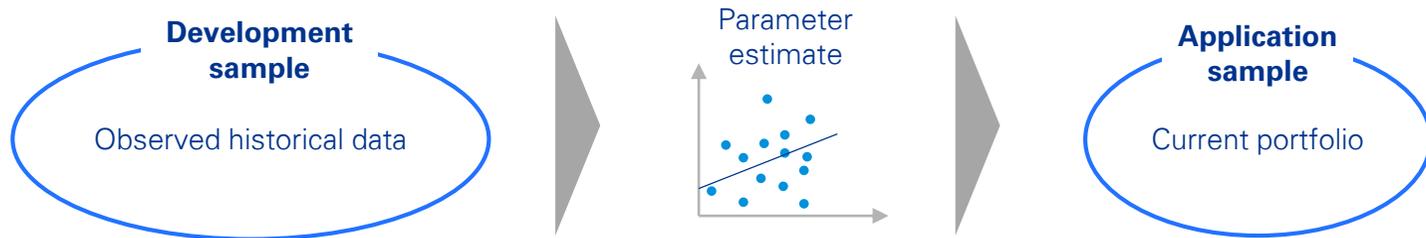
Loss Given Default: definition, estimation and application

Concept of Loss

- Loss Given Default is the percentage of exposure the bank might lose if the borrower defaults
- As reported in article 5 of the CRR, it is intended as "economic loss, including material discount effects, and material direct and indirect costs associated with collecting on the instrument"

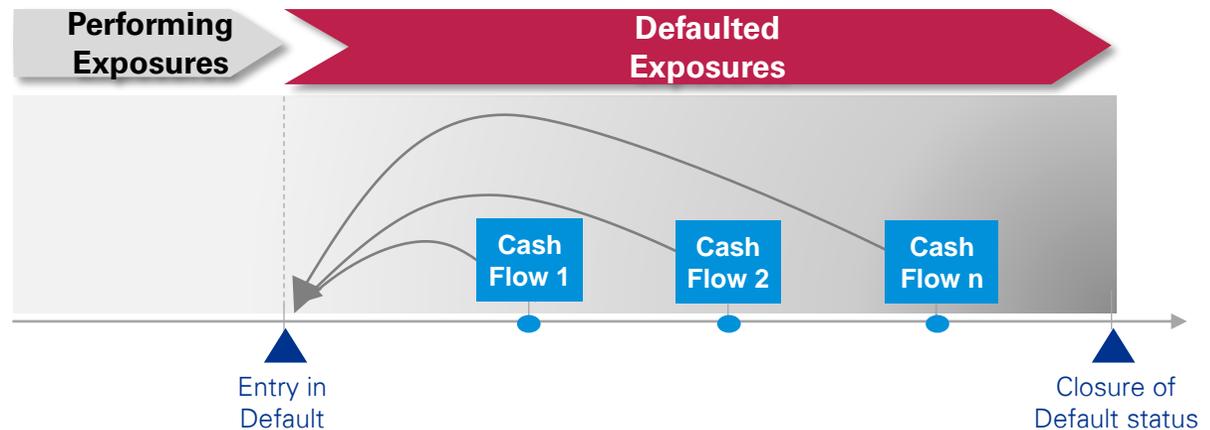
Development sample vs application portfolio

- The development sample is used as basis for parameter estimation
- Estimated parameters will be applied to the positions belonging to the bank's portfolio (i.e., application portfolio) according to their features



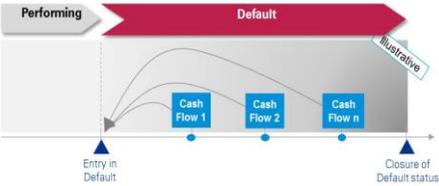
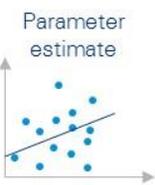
Concepts of performing vs defaulted assets

- The estimation of the "Long Run LGD" is based on the discounting of all cash flows to the moment of entry in default¹



1. Loss covering the entire duration of the default

What is LGD: answer (1/4)

Scope	Questions	Answers
<p>Development sample Observed historical data</p> 	<p>1</p> <p>Taking in exam all the observed data what do you think is the set of historical observations to be used as basis for the LGD estimation?</p>	<p>?</p>
	<p>2</p> <p>Which are the main elements you would take into account in the LGD estimation?</p>	<p>?</p>
	<p>3</p> <p>In order to estimate a simple OLS model, which are the variables (so called risk drivers) that you would chose?</p>	<p>?</p>



What is LGD: answer (2/4)

Scope

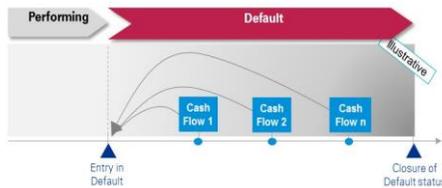


Questions

1 Taking in exam all the observed data what do you think is the set of historical observations to be used as basis for the LGD estimation?

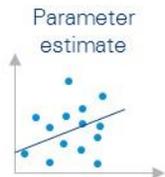
Answers

- The LGD should be estimated using **all information available**
- In particular, only **closed** defaults are used for LGD estimation, being the only cases for which it is possible to observe the entire life (i.e. all the cash flows) of the defaulted exposures



2 Which are the main elements you would take into account in the LGD estimation?

?



3 In order to estimate a simple OLS model, which are the variables (so called risk drivers) that you would chose?

?

What is LGD: answer (3/4)

Scope

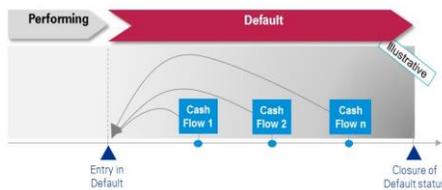


Questions

1
Taking in exam all the observed data what do you think is the set of historical observations to be used as basis for the LGD estimation?

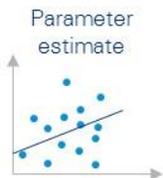
Answers

- The LGD should be estimated using **all information available**
- In particular, only **closed** defaults are used for LGD estimation, being the only cases for which it is possible to observe the entire life (i.e. all the cash flows) of the defaulted exposures



2
Which are the main elements you would take into account in the LGD estimation?

- They are:
- The exposure at the date of entry in default
 - The amount of cash flows (recoveries and costs)
 - The date of the cash flows



3
In order to estimate a simple OLS model, which are the variables (so called risk drivers) that you would chose?

?

What is LGD: answer (4/4)

Scope

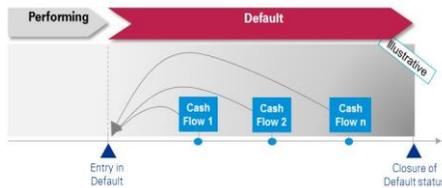


Questions

1
Taking in exam all the observed data what do you think is the set of historical observations to be used as basis for the LGD estimation?

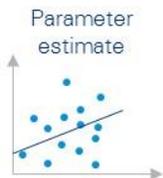
Answers

- The LGD should be estimated using **all information available**
- In particular, only **closed** defaults are used for LGD estimation, being the only cases for which it is possible to observe the entire life (i.e. all the cash flows) of the defaulted exposures



2
Which are the main elements you would take into account in the LGD estimation?

- They are:
- The exposure at the date of entry in default
 - The amount of cash flows (recoveries and costs)
 - The date of the cash flows



3
In order to estimate a simple OLS model, which are the variables (so called risk drivers) that you would chose?

- They significantly vary according to the type of product/counterparty. Some examples are:
 - Geographical area
 - Type of product
 - Existence of guarantees



Credit risk: close up on Loss Given Default

LGD formula

The **Economic LGD** is computed by applying the following formula, where the numerator of the ratio is the realized loss and the denominator is the exposure at the moment of entry in default status

The diagram illustrates the Economic LGD formula as a ratio. On the left, a grey box labeled "Economic LGD" is followed by an equals sign. To the right of the equals sign is a large fraction. The numerator is enclosed in large square brackets and consists of three horizontal bars: a dark blue bar labeled "EAD" with a minus sign to its right, a light blue bar labeled $\Sigma_t \text{Rec}_t \cdot (1+r)^{-t}$ with a minus sign to its left and a plus sign to its right, and a cyan bar labeled $\Sigma_t \text{Cost}_t \cdot (1+r)^{-t}$ with a plus sign to its left. The denominator is a dark blue bar labeled "EAD" positioned below a horizontal line.

EAD

Principal and interest due at the date of entry in Default status

$\Sigma_t \text{Rec}_t \cdot (1+r)^{-t}$

Recoveries on principal, interests and costs amount

$\Sigma_t \text{Cost}_t \cdot (1+r)^{-t}$

Additional costs of the workout process: internal and external costs and legal fees

Credit risk: close up on Loss Given Default

Database

Customer ID	Segment	Default Entry Date	Default Closure Date	EAD	Type of Cash Flow	Date of Cash Flow	Amount of Cash Flow
10001	Retail	27/04/2006	04/06/2012	478,932	Recovery	03/03/2008	18,387
10001	Retail	27/04/2006	04/06/2012	478,932	Cost	07/09/2007	348
10007	Corporate	06/01/2012	31/12/9999	6,093,487	Cost	26/08/2013	3,982
10007	Corporate	06/01/2012	31/12/9999	6,093,487	Cost	28/11/2016	298
10007	Corporate	06/01/2012	31/12/9999	6,093,487	Recovery	02/01/2015	1,893,422
20084	Retail	08/12/2002	20/03/2015	1,997,821	Recovery	03/11/2012	1,178
20084	Retail	08/12/2002	20/03/2015	1,997,821	Recovery	21/01/2018	99,134
20084	Retail	08/12/2002	20/03/2015	1,997,821	Cost	07/07/2014	2,241
20084	Retil	08/12/2002	20/03/2015	1,997,821	Recovery	02/11/2003	100,546
20084	Retail	08/12/2002	20/03/2015	1,997,821	Cost	17/06/2005	778
32009	Corporate	17/02/2004	23/12/2011	-	Recovery	02/09/2005	3,288
32009	Corporate	17/02/2004	23/12/2011	-	Cost	21/03/2006	1,022
32009	Corporate	17/02/2004	23/12/2011	-	Recovery	03/07/2009	19,221

Warnings

- Misspelled words: it's worth correcting them!
- Incomplete information: observations with missing values in fundamental attributes cannot be used
- Common terminology: open positions have Default Closure Date equal to 31/12/9999

To Do's



Given the database attached, you are asked to:

- ① Solve eventual data quality issues (correct misspelled words, delete incomplete observations...)
- ② Identify the final development sample
- ③ Compute the observed LGD (comprehensive of indirect costs) for each position of the development sample
- ④ Compute the average observed LGD for each Segment

Your presentation is your shop window! Please, prepare a **presentation** aimed at showing the results you achieved:

- a Report the number of exclusions aimed at identifying the final development sample and explain the reason underlying the choice of exclusion
- b Describe the procedure you adopted for the calculation of the observed LGDs
- c Report the computed average LGD values
- d Provide an answer to the following *Food for thought*  **(NOT MANDATORY)**

Food for thought

- Did you find any LGD lower than 0% or higher than 100% in the exercise? How would you interpret these two cases and how would you treat them for developing purposes?
- The economic crisis determined a structural break, influencing the credit behavior: since 2008 banks have started observing higher numbers of defaults, longer recovery periods and lower recovery rates. Nowadays, the effect of the economic crisis on credit portfolios is represented by a high number of open defaults (consequence of long recovery period) and bad quality of the recoveries.
This means that the sample used for LGD estimation (consisting of closed defaults) is not fully representative of the real banks' portfolios. As a consequence, the LGD parameter estimated on a set of closed historical observations is lower than the loss that the bank will probably suffer: how would you correct this bias?



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