Just in Time

Loss-Given-Default and Macroeconomic Conditions

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Executive Summary

In July 2024, the **European Central Bank (ECB)** published a **working paper** analyzing the **sensitivity of the realized loss given default (LGD) to macroeconomic conditions.**

LGD is one of the **key factors used to calculate ECL** (Expected credit losses), alongside with PD (Probability of Default) and EAD (Exposure at default).

LGD reflects the **amount a bank or non-bank financial institution loses when a borrower default on a loan, expressed as a percentage of total exposure at time of default.**

The study utilized Global Credit Data's confidential dataset on cash flows from defaulted loans to address **three key research questions**:

1. Does LGD **increase** during **adverse** macroeconomic conditions?
2. Does the **timing of cash flows** influence the relationship between LGD and macroeconomic conditions?
3. Is the **sensitivity of LGD to macroeconomic conditions** more significant for secured loans than for unsecure loans?

Key Findings

- LGD tends to **rise** when macroeconomic conditions **deteriorate**.
- The **timing of cash flows does not** significantly **affect** the sensitivity of LGD to macroeconomic conditions.
- **Secured loans** show a **higher LGD sensitivity** to macroeconomic conditions than unsecured loans.

These results offer insights into the **procyclicality of the bank capital requirements**, suggesting the need for regulatory guidelines that incorporate economic downturn scenarios into LGD models. They also support the **calibration of countercyclical capital buffer** to mitigate the impact of economic cycles.

At a Glance

Keywords: Credit Risk, LGD, Economic Downturn

01

Introduction

Limitations of Current Studies on LGD

Main Objectives of the Paper

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Limitations of Current Studies on LGD

While the macroeconomic drivers of PDs are well understood, as far as LGD is concerned there is not the same degree of knowledge.

The main limitations are due to:

Scarcity in Literature

Limited research on macroeconomic factors affecting LGD, especially in Europe

Data and Methodology Differences

Inconsistencies in findings due to differences in data granularity, sample sizes and econometric methods

Legal Framework

Extrapolating country-level findings to the European context is challenging due to different legal frameworks

Timing of LGD Cash Flows

Many studies overlook how LGD relates to macroeconomic conditions at the time of default vs. resolution

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Main Objectives of the Paper

The study aims to answer **three main research questions** relating to understanding the LGD behavior:

1. **LGD Downtun Sensitivity**: does LGD increase during adverse macroeconomic conditions?

2. **Timing of Cash Flows:** does the timing of cash flows influence the relationship between LGD and macroeconomic conditions?

3. **Secured Loans vs Unsecured Loans**: is the sensitivity of LGD to macroeconomic conditions more significant for secured loans than for unsecured loans?

To test these hypotheses, the study relies on detailed loan cash flow data from **The Global Credit Data Consortium (GCD).** Moreover, both **classic regression techniques** (OLS) and **more complex statistical approaches** (Fractional Response Model) **have been used**.

02

Data and Empirical Setup

Sample Composition and Loan Characteristics

Impact of Timing of Cash Flows on LGD

Model Selection

Driver Selection

Data and Empirical Setup 1/4

Sample Composition and Loan Characteristics

The sample used in the study comes from the **GCD dataset** and contains **large corporate borrowers** reported by 47 European banks in the period **between 2000 and 2019**. The long sample period spans several business cycles.

Sample Composition

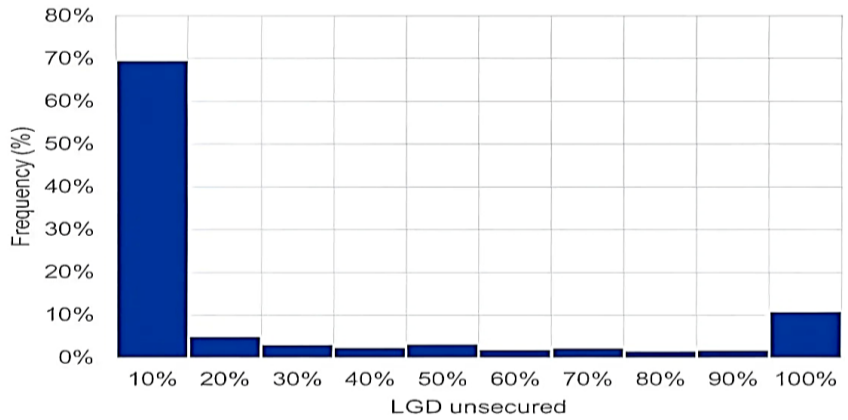
The sample includes **8.712 loans**, with 80% being unsecured (not collateralised by real estate) and the remaining 20% secured by real estate collateral.

Key characteristics of the loans in the sample are reported in the table below where it's immediately apparent that the **average LGD is lower for secured loans** compared to unsecured loans.

Loan type	Number of loans	Number of countries	Average LGD
Unsecured	7.040	40	25%
Secured	1.672	30	18%

Loan Characteristics

The following figure shows the **distribution of LGD** for the 7040 **unsecured loans** in the sample. The distribution exhibits a pronounced **bimodal pattern**, with two distinct clusters around 0 and 1.



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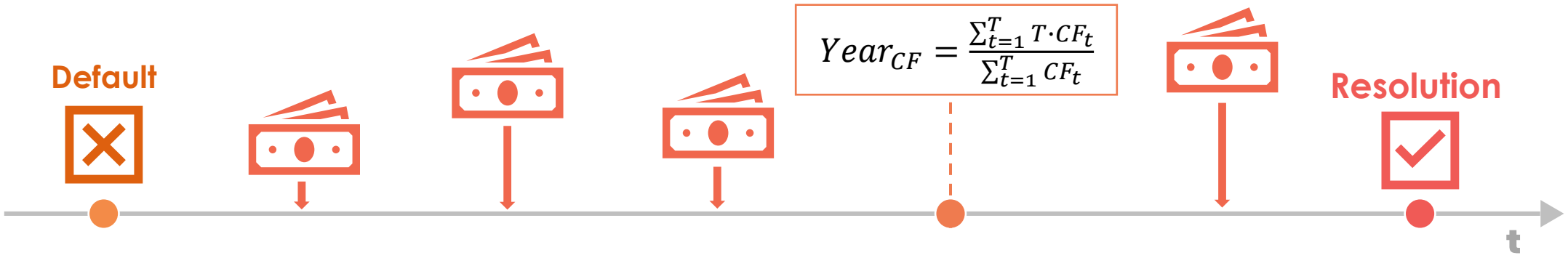
Impact of Timing of Cash Flows on LGD

The time required to resolve a defaulted loan and collect all associated cash flows **can vary significantly**. This variation in resolution time underscores the importance of considering different time points to capture the relationships between LGD and relevant macroeconomic variables

With the aim of capturing the potential impact of macroeconomic conditions on the LGD calculation more comprehensively, **the study considered** both the 'year of default' and the **"year of peak cash flow"**.



The 'year of peak cash flow' represents the weighted average of all relevant points in time between the default event and the time when cash flows were received by the bank. **To conduct the regression, the explanatory variables are considered in the year of default and in the year of peak cash flow.**

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Model Selection

The study propose to use two different models to analyze the **sensitivity of the realized loss given default (LGD) to macroeconomic conditions**

OLS

$$Y_t = \alpha + \beta_i X_{i,t} + \beta_2 Cure_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where:

1. Y_t is a continuous variable over the interval [0,1] **representing the LGD**;
2. $X'_{i,t}$ is a **vector of macroeconomic variables** for country I at time t
3. $Cure_{i,t}$ is a **dummy variable** taking the value **1 if a loan was cured and 0 otherwise.**

Fractional Response Model

For overcoming the limitations of the OLS specification, the study propose to use also an alternative model: **the Fractional Response Model.** So, the left-hand side of Equation (1) is transformed via the logistic function as follow:

$$G(\beta_i X'_{i,t}) = \frac{exp(\beta_i X_{i,t})}{1 + exp(\beta_i X_{i,t})}$$

OLS Limitation

1. The **explanatory variables cannot be guaranteed to lie between [0;1]**, while the LGD is defined over the unit interval.
2. The distribution of LGD displays a **bimodal distribution**, with two clusters around 0 and 1, implying that the **OLS method may not be a suitable specification.**

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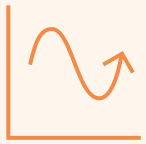
Driver Selection

To analyze the potential impact of macroeconomic conditions on LGD, the study incorporates the following **macroeconomic variables as predictors** in the analysis:

Real GDP growth / Unemployment rate

Real GDP growth and unemployment rates capture the overall economic conditions affecting the recovery process



House price growth and stock returns influence collateral values

House price growth / Stock Returns

Long terms interest rate

Changes in long-term interest rates are included as they can impact borrowing costs and the discounting of future cash flows.

These variables are sourced from the European Central Bank (ECB) Statistical Data Warehouse.

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Empirical Evidence

Model Estimation for LGD Secured and Unsecured

Result Interpretation

Empirical Evidence 1/2

Model Estimation for LGD Secured and Unsecured

MODEL	OLS		FRACTIONAL RESPONSE	
LGD SEC / LGD UNSEC	**Peak cash flow**	**Year of default**	**Peak cash flow**	**Year of default**
Intercept	0.11* / 0.26*	0.13* / 0.26*	-1.97* / -1.01*	-1.97* / -1.07*
GDP Growth	0.97* / -0.50*	0.43 / -0.07	8.33* / -3.21*	6.68* / 0.19
Δ Unemployment Rate	0.01* / 0.00	0.01* / 0.00	0.06* / -0.01	0.07* / 0.00
Δ Interest Rate	0.03* / 0.01	0.00 / 0.01	0.19* / 0.08	0.00 / 0.07
House price growth	0.08 / 0.17	-0.50* / 0.29*	-0.12 / 0.67	-4.79* / 1.61*
Stock Returns	-0.10* / -0.01	-0.20* / -0.10*	-0.88* / -0.11	-1.33* / -0.60*
Cured	-0.17* / -0.24*	-0.20* / -0.24*	-	-

LGD SECURED

- **In each model specification**, there is always a **negative correlation between the Stock Returns and the LGD**, while the **correlation with the Unemployment Rate** is always **positive**.
- **The Real GDP growth** is statistically **significant** in both **Fractional Response specifications and in OLS Peak Cash Flow specification**, but his **coefficient sign is counterintuitive**, because to an increase of GPD is linked an increase of LGD level.
- **Long term interest rate is significant only in the 'Peak Cash Flow' specification** and its increase is associated to a higher LGD, while **House price growth is significant in the 'Year of Default' specification** and its decrease leads to an increase of LGD level.

LGD UNSECURED

The model estimations lead to **similar results respect to LGD secured models** in terms of:
1. correlation between explanatory variables and LGD;
2. statistical signification of estimates.

But the **sensitivity to macroeconomics conditions is less pronounced** for the unsecured LGD compared to secured LGD. **As shown by the table on the left, the coefficients estimated in each model specifications are lower than LGD secured coefficients.**

Note: The table represets the estimates of the macrovariables for the LGD secured (on the left) and LGD unsecured (on the right) for each model and both specifications.
* denotes the significance of the estimate.

Empirical Evidence 2/2

Result Interpretation

Below are the main findings that can be drawn from the estimation of the models and the comparison between the different model specifications tested:

Interpretation of the estimates

01 Regarding the **Secured LGD model**, the study concludes that a **deterioration in macroeconomic conditions leads to a decrease in collateral value**, **thereby increasing the LGD.**

02 **Unsecured LGD could be directly affected by macroeconomics conditions** or by unobserved country characteristics correlated with macroeconomics conditions. It is important to underline that the sensitivity to macroeconomics conditions is less pronounced for the unsecured LGD compared to secured LGD

Comparison between model specifications

01 There is **no significant difference in the pattern of results between the "year of default" and "year of peak cash flow" estimations**. This means that timing of cash flows does not seem to affect the sensitivity of the LGD to macroeconomic conditions.

02 The **estimates obtained** using the **OLS modeling technique and the more complex Fractional Response** Model are consistent. Both methods allow for the observation of the same findings.

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Conclusion

Conclusion

This research represents the first comprehensive study to use time-series data on cash flow-based recovery rates to investigate the sensitivity of LGD to macroeconomic conditions within the broader European context.

CONCLUSIONS

1) Does LGD increase during adverse macroeconomic conditions?

Banks' regulatory models for capital requirements generally **assume that LGD deteriorates in line with macroeconomic conditions**. This study propose **an additional explanation for the weak relation between LGD and macroeconomic conditions observed in previous research*.** The prolonged resolution times and reluctance to liquidate collateral during economic downturns may weaken the link between macroeconomic conditions at the time of default and realized LGD.

2) Does the timing of cash flows influence the relationship between LGD and macroeconomic conditions?

To account for this temporal aspect shown in the previous point, **the study assigns the LGD to macroeconomic conditions at two distinct points in time: 'the year of default' and 'the year of peak cash flows'.** The results indicate that **LGD responds to macroeconomic conditions both in 'the year of default' and in 'the year of peak cash flows.**

3) Is the sensitivity of LGD to macroeconomic conditions more significant for secured loans than for unsecured loans?

the **sensitivity to macroeconomic conditions** is **more pronounced for secured LGD** compared to unsecured LGD. This finding underscores the **potential impact of collateral** and its value on the recovery process, which may be influenced by economic conditions

Note: The different results across the literature may be driven by small sample sizes, cross-country differences and econometric methods used.

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This document was prepared in collaboration with Francesco Saverio Persico and Simone Brivio who at the time were working for Iason Consulting.

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