



EUROPEAN CENTRAL BANK

EUROSYSTEM

LGD and macroeconomic conditions

GCD and ECB

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Global Credit Data
Conference

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LGD and the macro environment – why does it matter?

Policy makers

1. **Micro perspective:** a more realistic estimation of risk parameters -> adequate bank capitalisation
2. **Financial stability perspective:** informs on the procyclicality of bank capital requirements

Banks

Plausible estimation of credit losses -> **efficient allocation of capital requirements** across portfolios -> efficient pricing of loans

Related literature

Existing studies

- ❑ Most LGD studies focus on loan and borrower specific variables
- ❑ Studies focusing on macro variables yield mixed results

Small sample - one bank or one country

- Macros **irrelevant** : Dermine & Carvalho (2006), Gruenert (2009)
- Macros **relevant** for **unsecured** loans: Belotti & Crook (2012), Koenecny et al. (2017)
- Some macros relevant for **secured** loans: house prices (yes), GDP, unemployment – counterintuitive sign

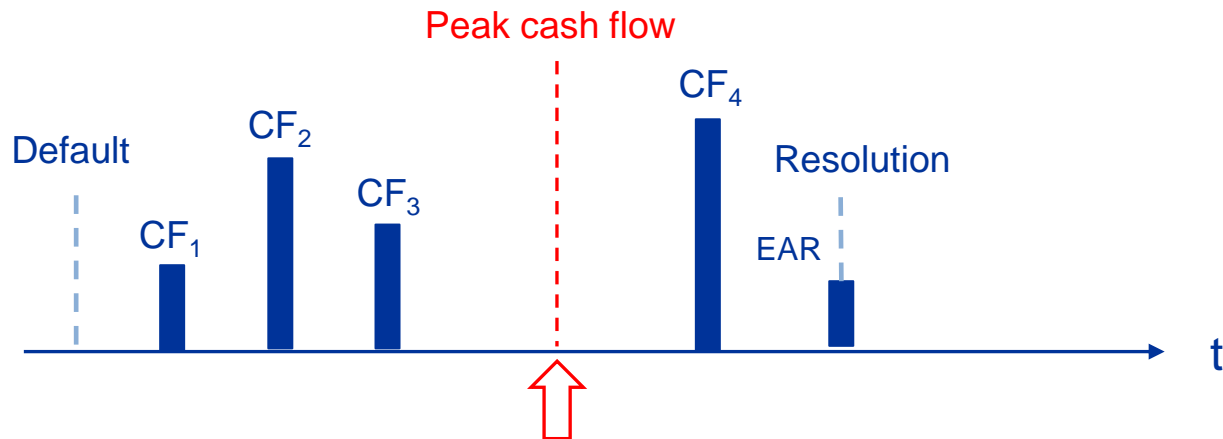
Related literature

Large sample studies

- Macros relevant - US data (Krueger and Rosch, 2017)
- Macros irrelevant – macro data not at country level (Brumma & Winkle, 2017)

Timing of cash-flows

- Most studies do not distinguish between different LGD definitions
- Timing of cash-flows crucial for assessing **procyclicality** of LGD (and capital requirements)



Research questions

1. Is the LGD **procyclical**?
2. Which are the **relevant** macro-economic **variables**?
3. Does the **LGD definition** (i.e. timing of cash-flows) affect the sensitivity to macroconditions?

Data

LGD - Granular data on cash flow recovery of defaulted loans (GCD database)

- Portfolio: large corporates
- Sample: 53 European banks
- Time period: 2000 to 2019

Macro variables

- Real GDP growth
- House price growth
- Unemployment rate
- Long-term interest rate changes
- Stock returns

Empirical setup

1. OLS regression

$$LGD_{b,t} = +\beta X_{i,t} + \xi_{i,t}$$

Loss-given-default (cash-flow
or point of default definition) for
borrower b at time t

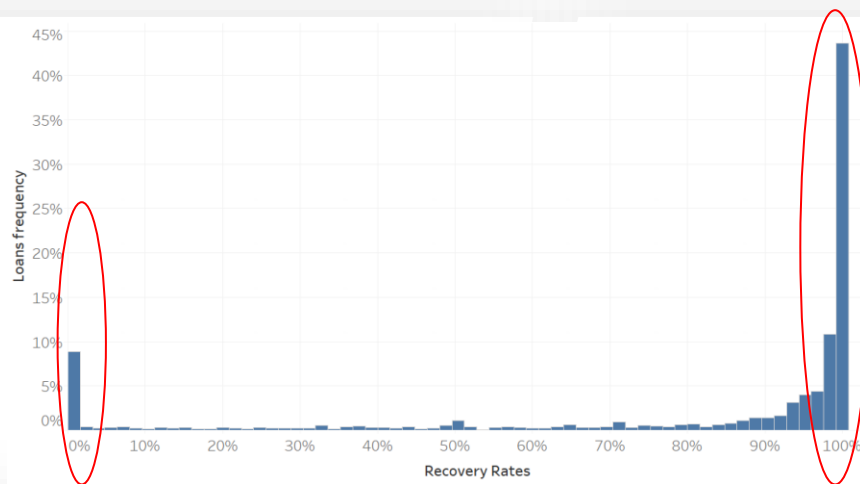
Vector of macro vars
for **country** i at time t

Potential issues with OLS

- i. Predicted values can be outside $[0;1]$
- ii. Does not account for the bimodal LGD distribution

Empirical setup: potential issues with OLS

Example bimodal recovery rate distribution



Note: Distribution of recovery rates for unsecured data sample

Empirical setup

2. Fractional response regression

Transform LGD via logistic regression:

$$G(LGD_{i,t}) = \frac{\exp(\beta X_{i,t})}{1 + \exp(\beta X_{i,t})} \quad \leftarrow \text{Defined between 0 and 1}$$

Estimate via maximum likelihood:

$$E(LGD_{i,t} | X_{i,t}) = \log G(\beta X_{i,t}) LGD_{i,t} + \log[1 - G(\beta X_{i,t})] (1 - LGD_{i,t})$$

↑
↑

“LGD = 1 cluster”
“LGD = 0 cluster”

Results

LGD and macroconditions [Secured LGD]

Model	(1)	(2)	(3)	(4)
	Ordinary Least Squares		Fractional Response	
Dependent Variable	Peak cash flow	Year of default	Peak cash flow	Year of default
Intercept	0.11*** (0.02)	0.13*** (0.02)	-1.97*** (0.16)	-1.97*** (0.15)
Real GDP growth	0.97** (0.32)	0.43 (0.37)	8.33** (2.35)	6.68* (3.13)
Unemployment rate	0.01*** (0.00)	0.01*** (0.00)	0.06** (0.02)	0.07*** (0.02)
Δ Long-term interest rate	0.03** (0.01)	0.00 (0.01)	0.19** (0.06)	0.00 (0.06)
House prices growth	0.08 (0.16)	-0.50*** (0.16)	-0.12 (1.28)	-4.79** (1.25)
Stock returns growth	-0.10* (0.04)	-0.20*** (0.03)	-0.88** (0.31)	-1.33*** (0.24)
Cured	-0.17*** (0.02)	-0.20*** (0.02)	-	-
Number of observations	1332	1344	1158	1172
R-Square	8%	10%	-	-
F-Value	20.04	24.27	-	-

3 out of 5 macro variables significant with correct sign

These tables present the estimates of the OLS model and fractional regression, for the effects of macroeconomic variables on LGDs. The dependent variables is defined as the yearly LGD. The LGD in models 1 and 3 is defined relying on the peak cash flow. The LGD in models 2 and 4 is defined based on the year of default. The estimates are obtained by controlling for: real GDP, house prices and nominal stock prices growth; unemployment rate and long-term interest rate changes. The OLS specification includes bank and quarter fixed-effects. The standard errors are reported in parentheses and are clustered by bank. ***, **, and * denote significance at the 1, 5 and 10 percent level, respectively.

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Similar pattern for LGD by year of default

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Results

LGD and macroconditions [Unsecured LGD]

Model	(1)	(2)	(3)	(4)
	Ordinary Least Squares		Fractional Response	
Dependent Variable	Peak cash flow	Year of default	Peak cash flow	Year of default
Intercept	0.26*** (0.01)	0.26*** (0.01)	-1.01*** (0.10)	-1.07*** (0.09)
Real GDP growth	-0.50* (0.21)	-0.07 (0.23)	-3.21* (1.52)	0.19 (1.64)
Unemployment rate	0.00 (0.00)	0.00 (0.00)	-0.01 (0.01)	0.00 (0.01)
Δ Long-term interest rate	0.01 (0.01)	0.01 (0.01)	0.08 (0.05)	0.07 (0.04)
House prices growth	0.17 (0.11)	0.29** (0.11)	0.67 (0.75)	1.61* (0.73)
Stock returns growth	-0.01 (0.03)	-0.10*** (0.02)	-0.11 (0.18)	-0.60*** (0.14)
Cured	-0.24*** (0.01)	-0.24*** (0.01)	-	-
Number of observations	5918	6057	4672	4814
R-Square	9%	9%	-	-
F-Value	92.27	92.27	-	-

Only 1 out of 5 macro vars significant

Note: These tables present the estimates of the OLS model and fractional regression, for the effects of macroeconomic variables on LGDs. The dependent variables is defined as the yearly LGD. The LGD in models 1 and 3 is defined relying on the peak cash flow. The LGD in models 2 and 4 is defined based on the year of default. The estimates are obtained by controlling for: real GDP, house prices and nominal stock prices growth; unemployment rate and long-term interest rate changes. The OLS specification includes bank and quarter fixed-effects. The standard errors are reported in parentheses and are clustered by bank. ***, **, and * denote significance at the 1, 5 and 10 percent level, respectively.

Conclusions

1. **LGD is procyclical**: Higher sensitivity to macro conditions for secured LGD compared to the unsecured LGD
2. **Most relevant macro variables**: unemployment, house price growth, long-term interest rates
3. Secured LGD **procyclical under both** the cash-flow and the year-of-default **definition**: banks do not seem to postpone liquidation of collateral in bad times
4. Macro conditions matter, but not too much ($R^2 < 7\%$) -> loan specific characteristic (age of loan, industry, seniority) may be more relevant

Thank you for your
attention!

