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Towards an IFRS9-ready probability of default framework

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Introduction

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The opinions expressed are those of the authors and do not necessarily represent the views of the Central Bank of Ireland or the ESCB.

In particular, this is not intended as an interpretation of or guide to delineation of exposures in future stress testing exercises.

As this is mainly a framework presentation, please forgive any elision of impairments, defaults, NPLs...



Objective and preview of findings

We focus on one impact of IFRS 9, namely, the identification of a **stock** of current performing balances subject to stricter provisioning requirements (the “Stage 2” balances). Compare and contrast with performing stock or default/NPL stock in previous stress tests.

Findings:

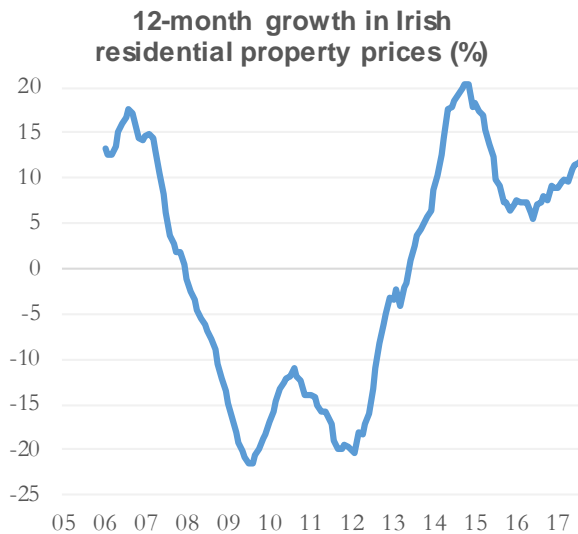
Irish mortgage PDs mostly remain **above** origination levels.

We identify a significant stock of Irish performing mortgage balances in IFRS 9 Stage 2 due to high PDs, that **cannot be identified using other suggested methods** (e.g. forbearance, early arrears).



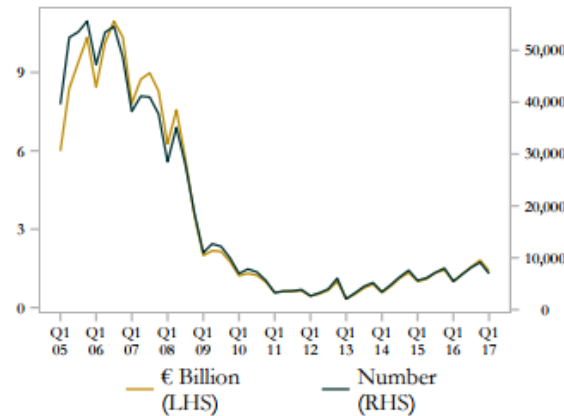
Irish residential property and mortgage markets, in summary

Bubble...



Deleveraging...

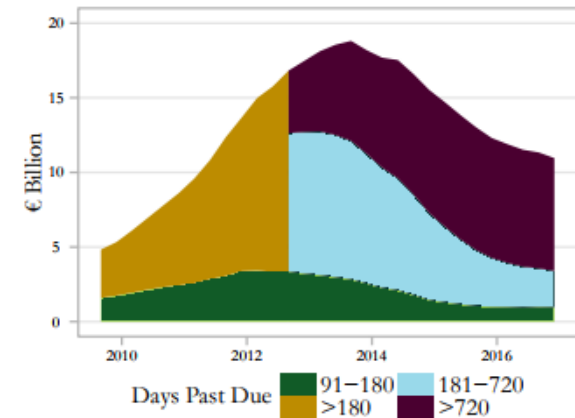
Figure 10. New Mortgage Lending by Loan Count and Balance, Q1 2005-Q1 2017



Source: Banking and Payments Federation Ireland.

Arrears...

Figure 24. PDH Mortgage Arrears by Depth of Arrears, Q3 2009-Q4 2016



Source: Central Bank of Ireland, Mortgage Arrears Statistics.

Sources: Central Statistics Office (property prices), Central Bank of Ireland Household Credit Market Report H1 2017



Central Bank of Ireland's PD model

The Financial Stability Division of the Central Bank of Ireland has developed a model to forecast one-year PDs for Irish residential mortgages based on loan-level data.

Re-estimated recently (Kelly and O'Malley 2016) based on original estimation exercise (Gaffney, Kelly and McCann 2014).

2009-2015 quarterly unbalanced panel.

Useful applications:

- Credit risk forecasting in bank stress tests

- Macroprudential policy evaluation (Joyce and McCann 2016)

- Sectoral vulnerability assessments (Kang and McCann 2016)



Markov multi-state model

To summarise our significant advantage: using loan-level panel data, we can model default as a continuous-time process with covariates.

Implemented by Jackson (2011) for disease progression, we use the Markov multi-state model to simultaneously estimate transition probabilities between two states using panel data:

	Performing next quarter	In default next quarter
Performing today	$1 - PD$	PD
In default today	$PCure$	$1 - PCure$

Time-dependent covariates affect transition probabilities using *proportional hazards model* of Cox (1972)



Central Bank of Ireland's PD model

Our covariates include economic and affordability conditions

- Current loan-to-value (CLTV)

- Local unemployment rate

- Change in repayment burden since origination

- Depth of arrears

And borrower type or intrinsic credit quality conditions

- Experience of forbearance or modification of loan

- Borrower's chosen interest rate type

- Loan purpose

- Property price mis-alignment to fundamentals at origination

- Presence of other liens on same property



PD coefficients of Markov models may be hard to interpret

	Variable	Cure	Default
1	Time Since Default	-0.046	
2	CLTV	-0.003	0.007
3	Multi-Loan	0.032	0.064
4	BTL	-0.058	0.534
5	Regional Unemployment	-0.132	0.093
6	SVR	-0.186	0.612
7	Tracker	-0.169	0.272
8	Modification		1.576
9	House Price Misalignment	0.000	0.016
10	Delta Instalment	-0.739	0.473



PD coefficients: Interpretation

We generate a baseline loan containing mean values of dummies and medians of quantitative variables. PD = 0.57%.

We vary a single parameter and re-estimate PD.

Qualitative	PD change	Quantitative	PD change
Never modified → modified	0.47% to 2.26%	Median to 75 th percentile of:	0.57% to:
Non-BTL → BTL	0.52% to 0.90%	LTV	0.72%
Fixed → SVR	0.38% to 0.71%	Unemployment	0.68%
Fixed → Tracker	0.38% to 0.50%	House price misalignment	0.64%
One-loan → Multi-loan	0.56% to 0.59%	Change in instalment	0.61%



IFRS 9

Under IFRS 9, it must be discerned whether a loan's **credit risk has increased significantly** since origination.

Such loans must bear larger provisions than under previous accounting standards, based on the probability of default over the remaining lifetime of the loan, instead of one-year PD. (These are called “Stage 2” assets.)

Some Stage 2 conditions are strongly advised, but not all:

IFRS 9: Arrears 31-90 days past due

EBA draft methodological note: Current PD ≥ 3 * original PD



From guidance to implementation

We use the FSD multi-state model for PD to score each loan as at December 2015.

We estimate origination PD for each loan, transforming panel data as per Joyce and McCann (2016):

- All loans begin performing, with original instalment

- We know origination conditions, unemployment, LTV and other loans

- We know initial modification status. Almost all begin unmodified, except “split loan warehoused balances”, which are split from distressed mortgages, are not repayable until maturity, and bear a lower interest rate



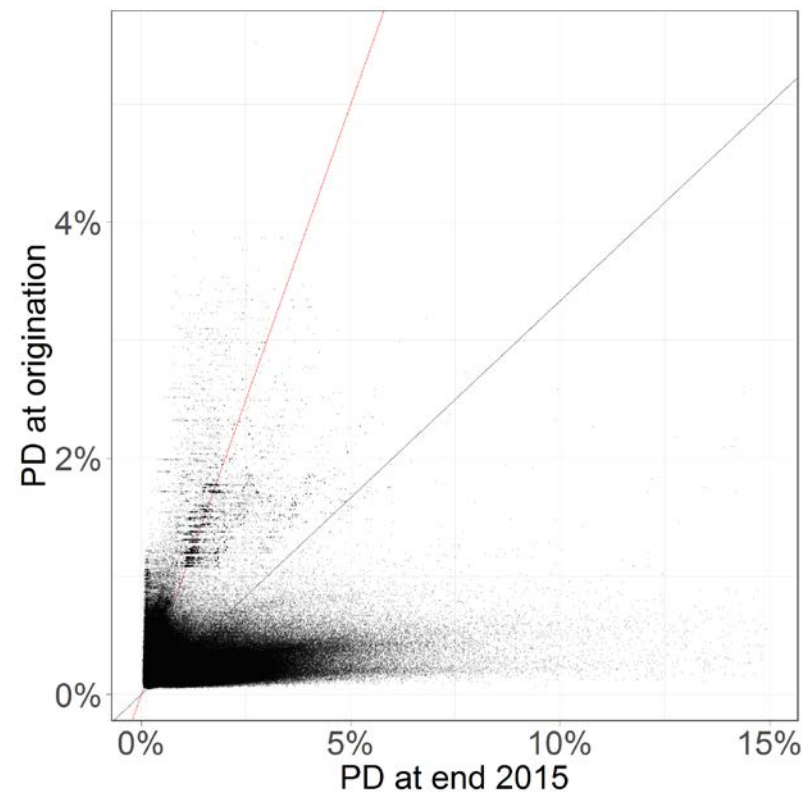
Change in PDs between origination and end-2015

Current PD versus origination PD

Red line: 45 degrees (CPD = OPD)

Black line: $CPD = 3 * OPD$

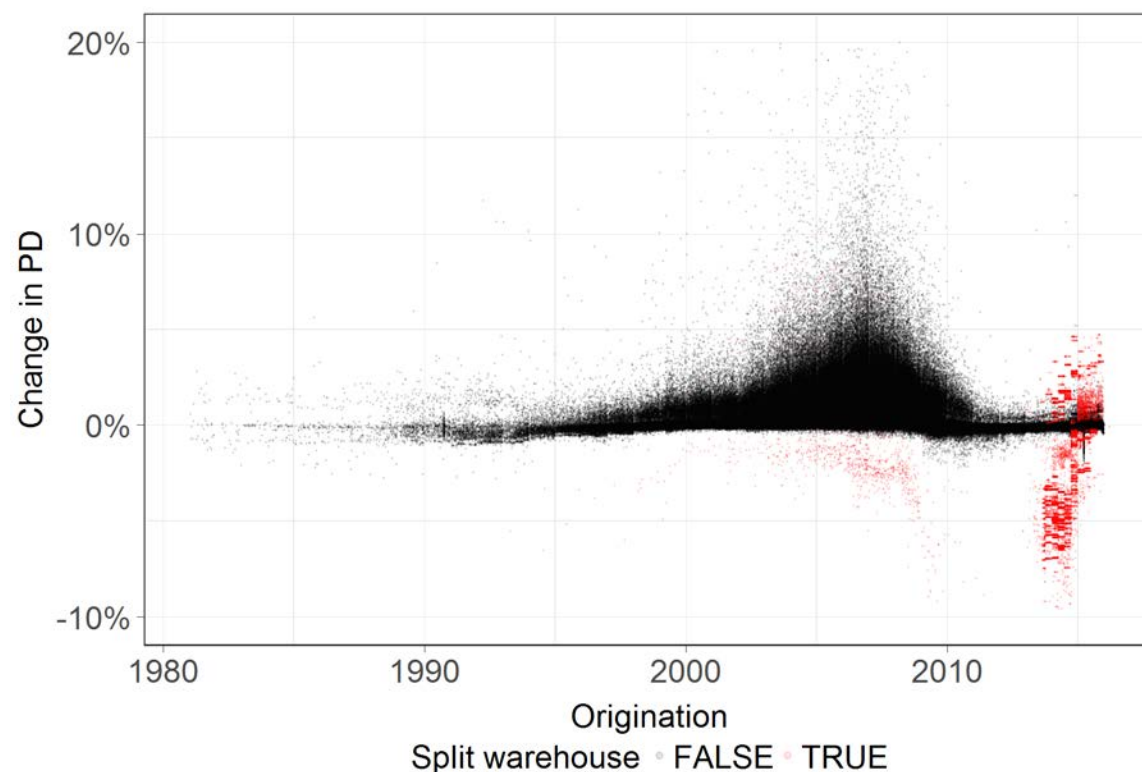
Many loans have OPD < 1% and
CPD between 0-5%.





(CPD – OPD) per loan, by date of origination

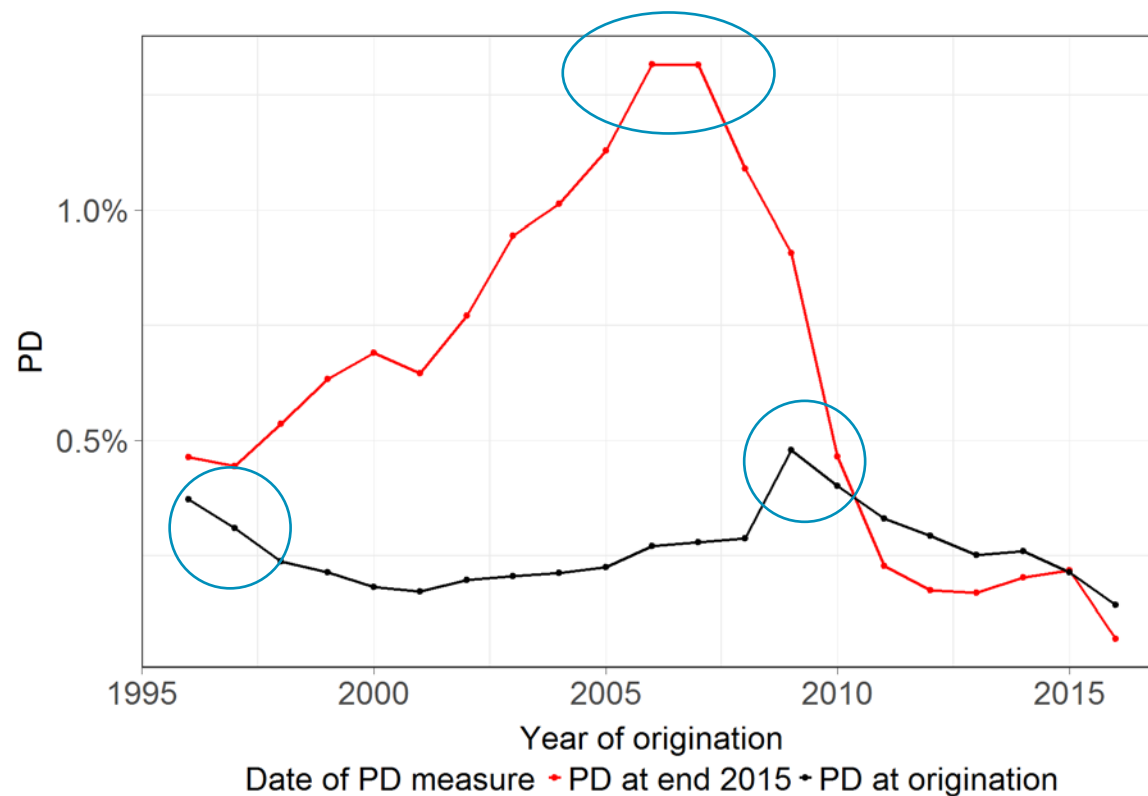
Note outliers: loans that begin modified (“split loan warehouse”)





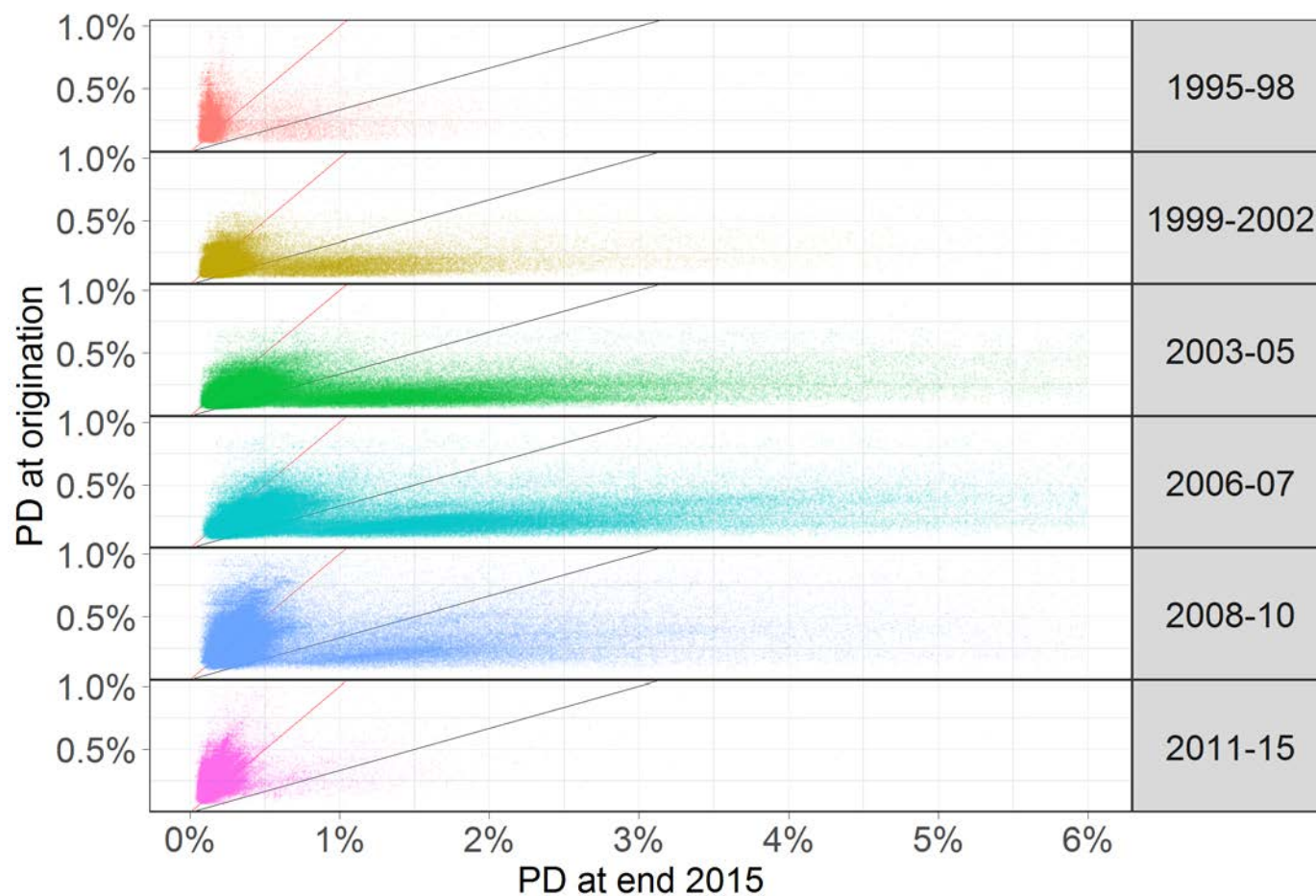
Average CPD and OPD, by year of origination

Balance-weighted. The peaks don't coincide.





CPD and OPD, by year of origination





For those who like numbers...

Mean PDs and shares of loans by type of PD change among performing, non-warehouse loans, by year of origination.

Year	Current PD	Origin PD	Share $O \leq C < 3*O$	Share $C \geq 3*O$
1995-98	0.29%	0.34%	20%	8%
1999-2002	0.41%	0.18%	55%	22%
2003-05	0.66%	0.19%	62%	30%
2006-07	0.84%	0.24%	62%	31%
2008-10	0.65%	0.34%	42%	21%
2011-15	0.28%	0.34%	19%	1%



Classifying loans to IFRS 9 Stages 1, 2 and 3

Absent guidelines, we implement a very simple set of rules:

Stage	Classification
1	Performing loans not in Stage 2
2	All performing loans which are in arrears between 31 and 90 days past due, or are performing forborne, or have experienced a material increase in PD ($CPD \geq 3 * OPD$)
3	Non-performing loans

We analyse the impact of including the “material increase in PD” condition on the Irish residential mortgage portfolios under IFRS 9.

Outcome: PD-based share of Stage 2 is very significant, at c. 50%.



IFRS 9 and the economic cycle

Irish banks issued many loans during the “bubble” period of high property prices in 2004-08, but few loans during the subsequent period of low property prices.

Because residential property prices and macroeconomic conditions remain weaker than in 2004-08, it is unsurprising that many loans are captured in the Stage 2 PD test.

IFRS 9 can be pro-cyclical! Since end-2015, property prices rose by 19%. This will reduce the Stage 2 share among performing loans.



The future, and remaining challenges

Remaining challenges include...

Estimating “lifetime PD”. We will await supervisory guidance, but it’s more difficult for long-maturity portfolios like mortgages.

Forecasts are uncertain. We want to avoid models that are computationally opaque with little analytical gain.

Using 2*2 transition matrix to model what is fundamentally a 3*3 process.

Forecasting **future dynamics of balances moving between stages**

We haven’t got all the answers yet!



References

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