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Capital Sensitivity to the PD Calibration Methodology

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Overview

- Introduction
- Simple Calibration Approach
- A More Complicated Approach
- Impact
- Conclusions

Introduction

- The probability of default (PD) affects the capital requirement. Here we are looking at a UK Retail Mortgage portfolio.

- Point in time models are calibrated to observed default rate.

$$Log\ Odds_{(Adj)} = Log\ Odds_{(Raw)} + \beta$$

- There is a direct analogy to the standard scorecard calibration which can be used to give the correct predicted bad level and score distribution for the portfolio (e.g. 600 points is a good:bad ratio of 1:1 and 20 points doubles the odds).

- For AIRB models, a long run default rate is used. There is not always a distribution for this long run model so it is calibrated to the correct level only.

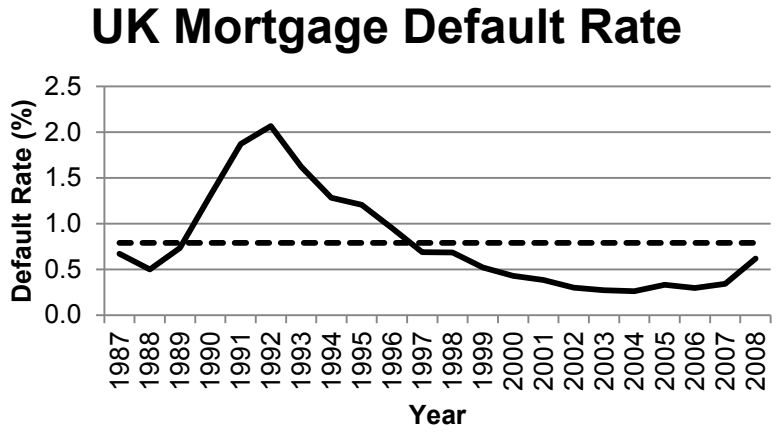
- For accuracy, this is usually done at a segment level.

- This presentation looks at the impact of the calibration on the PD distribution and its effect on capital.

Definitions

- An account is defined as being in default if it is
  - 6 or more months in arrears, or
  - the property has been marked as being in possession.

- The economic cycle is defined as:-
  - 1st December 1987 – 30th November 2008.



- The results here are all for a UK mainstream retail mortgage portfolio.

A Simple Calibration Approach

- Mean and Variance for PiT PD for a mainstream retail mortgages portfolio split into 5 segments are in the table.

		PiT model - Mean PD			PiT model - PD Variance		
Segment	**Long Run Default Rate**	**Jun- 06**	**Jun- 08**	**Jun- 10**	**Jun- 06**	**Jun- 08**	**Jun- 10**
1	1.47%	1.26%	1.35%	1.74%	4.80%	5.23%	6.89%
2	2.68%	1.85%	2.01%	2.77%	6.31%	6.84%	9.11%
3	3.79%	2.48%	2.97%	3.38%	7.93%	8.92%	9.92%
4	4.55%	3.28%	3.42%	4.04%	9.87%	9.77%	11.00%
5	9.70%	3.44%	4.30%	4.10%	9.58%	11.74%	10.70%

- This shows high correlation between mean PD and PD variance (98.7%).

- Note the blue cells are above the long run default rate.

A Simple Calibration Approach (2)

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- Using a simple calibration approach to shift the mean PD to its long run observed default rate gives

	PiT model - PD Variance			Capital model - PD Variance		
Segment	**Jun- 06**	**Jun- 08**	**Jun- 10**	**Jun- 06**	**Jun- 08**	**Jun- 10**
1	4.80%	5.23%	6.89%	5.31%	5.53%	6.12%
2	6.31%	6.84%	9.11%	8.05%	8.26%	8.91%
3	7.93%	8.92%	9.92%	10.42%	10.41%	10.71%
4	9.87%	9.77%	11.00%	12.21%	11.74%	11.93%
5	9.58%	11.74%	10.70%	17.97%	19.05%	18.53%

- The change in variance of the Capital model is much smaller than for the PiT model.
- Nevertheless, it does vary and this will affect the RWA.

Slope and Intercept Calibration

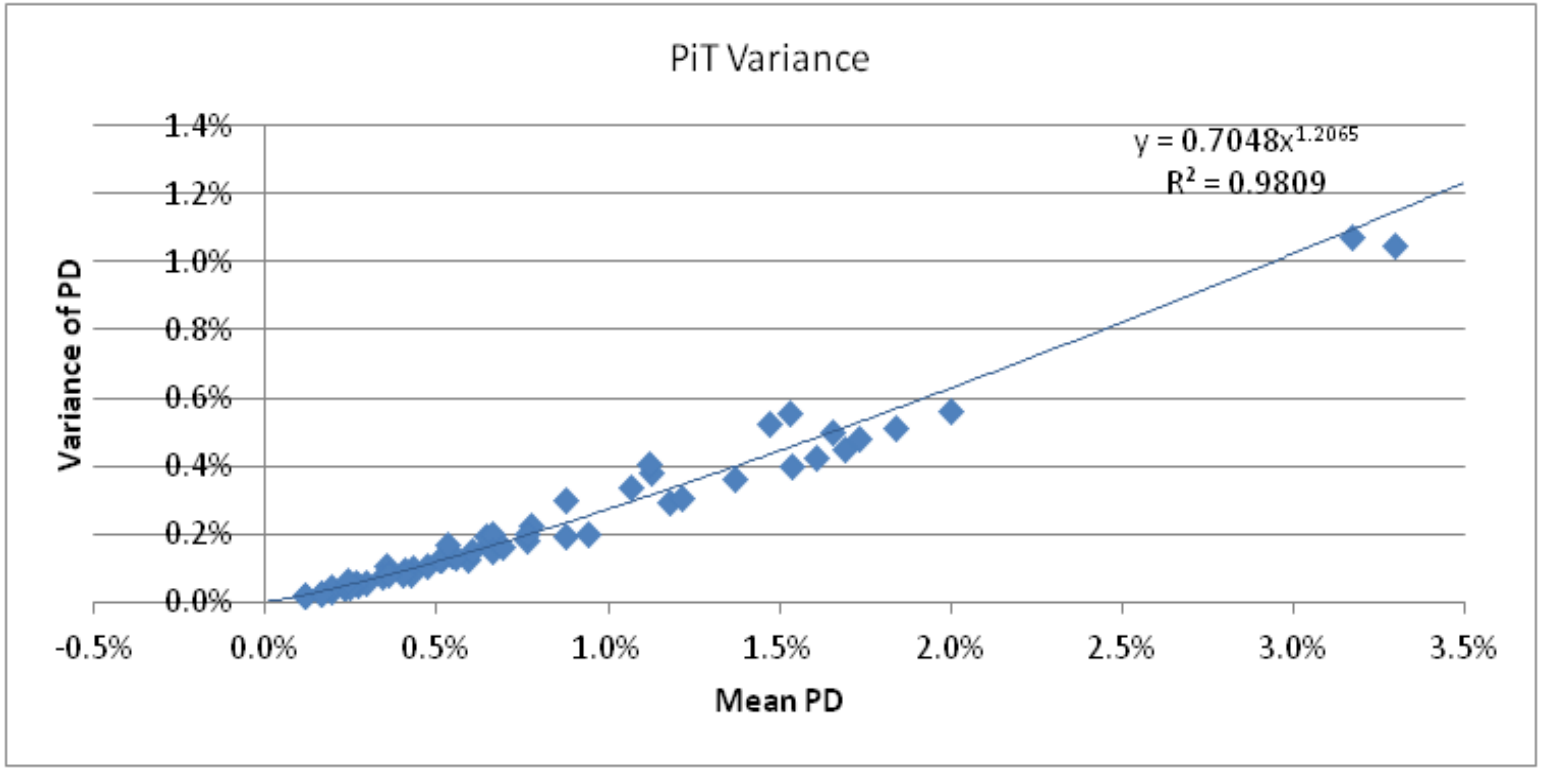
- The PD distribution can be fixed by allowing a second degree of freedom in the calibration

$$Log\ Odds_{(Capital)} = \alpha\ Log\ Odds_{(PiT)} + \beta$$

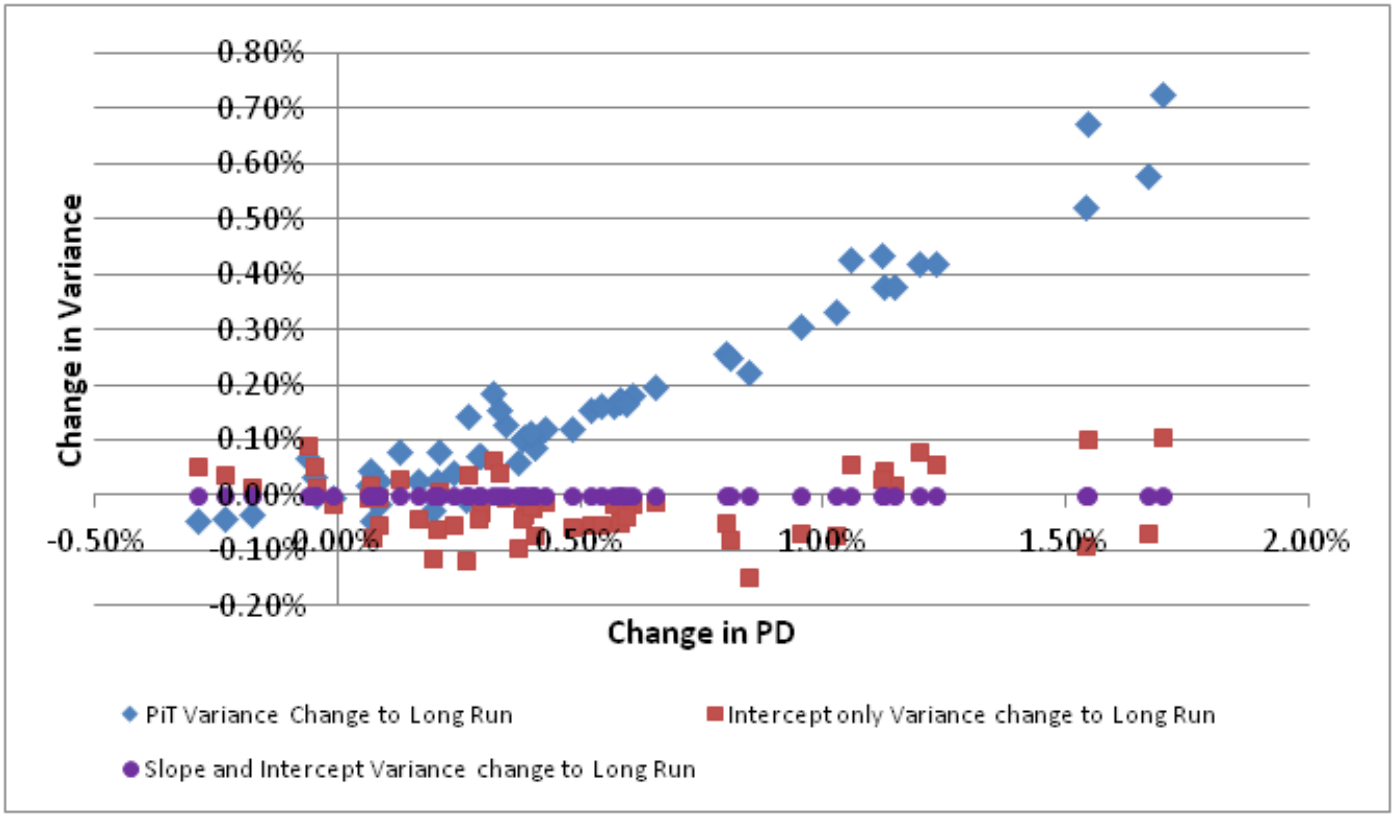
- α and β are calculated to ensure the mean PD and the variance of the PD are fixed for each segment.

- Need to determine what the variance is.

Correlation between mean PD and PD variance



Impact of Slope and Intercept Calibration



- PiT PD variance alters with mean PD
- Variance using intercept only approach is much smaller
- Using slope and intercept adjustment yields a fixed distribution

RWA Impact

- This approach gives a more stable PD
- What is the RWA impact?

Date	RWA – Intercept Only	RWA – Slope & Intercept
Jun-06	9.24%	9.23%
Jun-08	9.41%	9.54%
Jun-10	8.78%	9.58%
Jun-12	11.26%	10.38%

- Note that the change in RWA can be as much as 9%

RWA Impact (2)

- These changes could be due to underlying changes in the portfolio
- What are the impacts on a standardised risk distribution for the portfolio?

RWA % - Intercept only						
	Jun-06	Jun-08	Jun-10	Jun-12	Range	St Dev
For average portfolio	10.20%	9.94%	8.58%	10.67%	2.09%	0.90%
For observed portfolio	9.24%	9.41%	8.78%	11.26%	2.47%	1.09%

RWA % - Slope and Intercept						
	Jun-06	Jun-08	Jun-10	Jun-12	Range	St Dev
For average portfolio	10.15%	10.07%	9.36%	9.80%	0.80%	0.36%
For observed portfolio	9.23%	9.54%	9.58%	10.38%	1.15%	0.49%

Conclusions

- The calibration approach has a significant effect on the capital
- Adjusting the mean PD to its observed long run default rate gives some stability of capital
- Calibrating to the long run PD distribution by fixing both the mean and variance of the PD leads to greater stability in capital
- The difference in RWA between the two approaches is up to 9% for the retail mainstream portfolio used in this investigation

Any Questions?

For further enquiries, please contact me directly:

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