Modelling Credit Spreads on Commercial Mortgage Loans

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Motivation and aims of work

- **Does loan pricing differentiate between different credit risks?**

- **Theory suggests that mortgages secured on property types that are perceived to be riskier should be priced higher**

- our model examines the impact of mortgage **endogenous factors** such as loan-to-value ratios, property types, loan size on loan pricing

- and **exogenous factors** including lender business type and origination date on commercial mortgage credit spreads

- With regulatory changes post GFC lenders are exposed to different regulatory costs, which have been passed on to the borrower

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Key findings from literature

- **Literature on loan pricing**

- Titman and Torous (2005) find that the determinants of mortgage characteristics, such as the LTV ratio, the mortgage amortization rate and mortgage maturity impact on loan pricing

- Loan pricing is a function of the risks of different property types. Titman and Torous (2005) find that properties like hotels, which are likely to be both riskier and have the greatest investment flexibility, have significantly higher spreads than warehouses and multifamily housing

- Titman et al (2004) are also investigating the endogeneity of the mortgage contract and examine the choices of individual originators. They find that different originators have different risk preferences; some originators attract riskier clienteles, attracting mortgages with higher LTV ratios as well as mortgages on properties that are riskier

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Key findings from literature

- **Literature on regulatory capital**

- Research by Ruthenberg (2007), Bridges, Gregory, et al. (2014) confirm that more advanced commercial banks, which are using the IRB approach to determine their regulatory capital can provide their customers with lower borrowing margins than small retail banks, which are using the standardised approach.

- Benetton et al. (2016) examined UK residential mortgages for 2005-2015 found that differences in regulatory capital approaches cause lenders to specialise. This leads to systemic concentration of high risk mortgages in lenders with less sophisticated risk management.

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Theoretical model

- We define credit spread as the difference in yield between two bonds of similar maturity but different credit quality

- Loan spread is a function of interest margin less risk free rate

  - $$loan\ credit\ spread_{a,b,t} = (margin_{a,b,t} + libor_t) - gilt_t$$

  - Loan spread is determined by loan exogenous as well as endogenous variables:

  - $$Loan\ spread_{a,i,t} = c + \beta asset + \alpha\ origin + \gamma business\ type + \delta LTV + \tau Region + \rho size$$

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Methodology

- We use a time demeaned panel analysis for cross section and time based analysis
- With Time fixed effect
- Lender type fixed effect
- **The dataset**
- contains loan pricing offer quotes for key property types (office, retail, industrial) for prime and secondary locations
- Collected annually between 2002 – 2018
- By LTV
- By lender type by business model
- Lender portfolio by geography
- Lender portfolio by average loan size

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Methodology

- Assumption 1: Loan pricing is a function of the risks of different property types.
- Model 1: We test the effect of our selected endogenous and exogenous loan variables over the entire period 2002 - 2018
- Assumption 2: Loan pricing is driven by the home regulating country of the bank since 2012, hence there is a correlation between the bank's business type and loan pricing
- Since Basel II was introduced in 2008, two approaches to calculating bank capital requirements have co-existed: lenders' internal models, and a less risk-sensitive standardised approach (SA) and advanced IRB .
- Model 2: We test our model for two different periods 2002 - 2011 & 2012 – 2018

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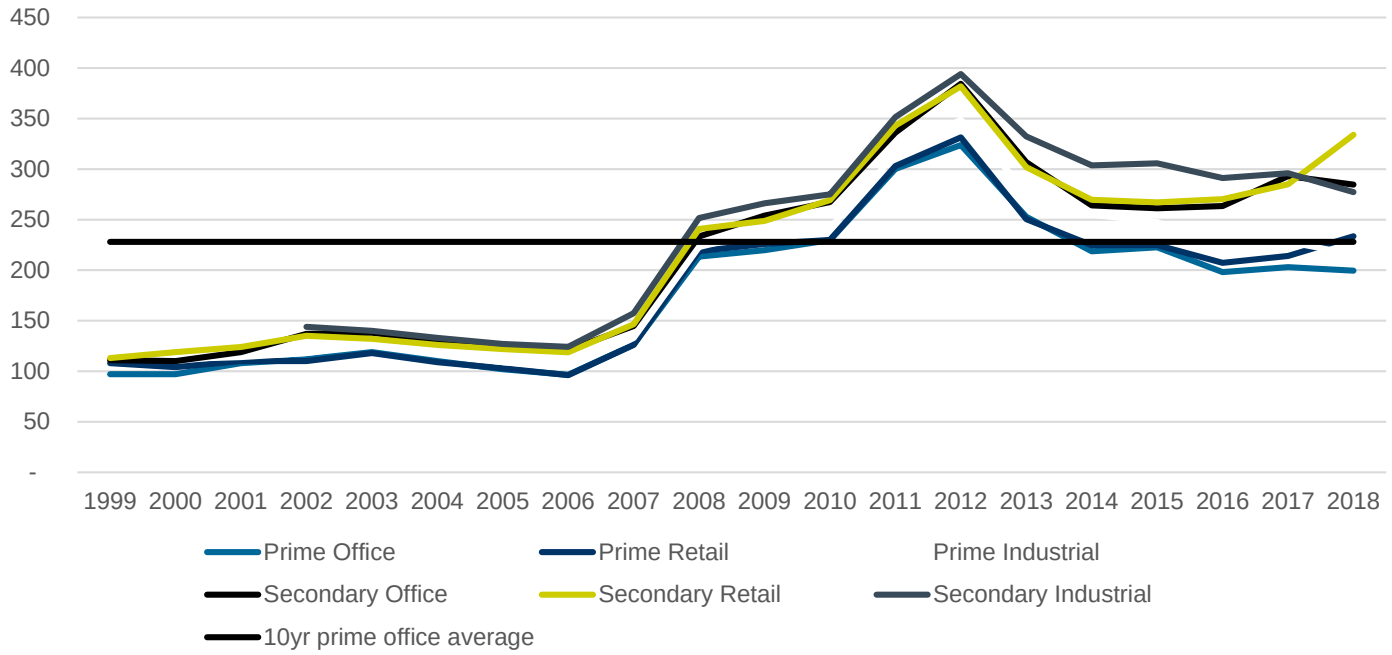
Data description

- Loan margins have been provided for different asset types:
  - Prime office, retail, industrial, residential
  - Secondary office, retail, industrial
- Margins for property types have changed over time, with less risk differentiation prior to 2012



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Data description

- Our lender sample distinguishes between 7 business models:

- Retail bank, commercial bank (specialised unit), mortgage bank (monoliner), regional bank (specific to one region), investment bank (originate to distribute), insurance, large fund (multi asset manager), small fund (one specialist fund)

Type of lender	Share of total
Retail bank	7%
Commercial bank	50%
Mortgage bank	11%
Regional bank	3%
Investment bank	16%
Small fund	2%
Large fund	2%
Insurance	10%
Total	100%

Data description

Type of lender	Average loan £m
Retail bank	46
Commercial bank	107
Mortgage bank	75
Regional bank	111
Investment bank	233
Small fund	43
Large fund	77
Insurance	131
Total	103

Geography	Share of total
London	35%
South East	15%
West England	1%
Midlands	14%
North England	14%
Scotland	6%
Mixed	16%
Total	100%

- Lender portfolio distinction by geography
  - Half of the loan portfolios are concentrated in London and South East England
- Lender portfolio distinction by loan size
  - Retail banks and small funds supply the smallest loans
  - The largest loans are written by investment banks followed by insurers

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Results I – LTV and asset type effect

	variable	Time demeaned
VARIABLES	spread	spread
LTV	336.3***	169.6***
	(56.23)	(41.82)
Prime office	-43.03***	-22.17***
	(7.970)	(4.370)
Prime retail	-33.33***	-13.41***
	(7.609)	(4.362)
Prime industrial	-19.33**	-3.492
	(7.754)	(4.369)
Secondary office	15.06*	20.07***
	(8.369)	(5.363)
Secondary retail	18.60**	27.43***
	(8.266)	(5.921)
Secondary industrial	29.00***	33.92***
	(8.746)	(6.026)

- The model suggests that a 1% increase in LTV will result in a 33bps credit spread increase
- The is a clear differentiation in credit spread depending on asset type
- Fixed effect model (time demeaned) provides a R-square of 85%

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Results II Banks' business model effect

	Pre crisis	Post crisis
UK mortgage bank	15.40***	41.01**
	(4.651)	(16.80)
UK regional bank	25.51*	170.3***
	(12.98)	(60.37)
German commercial bank	0.934	-27.65***
	(8.320)	(8.568)
German mortgage bank	-16.64***	-37.47***
	(5.013)	(7.536)
International retail bank	36.62***	21.03
	(11.08)	(37.64)
International commercial bank	15.92*	-17.98
	(8.622)	(12.74)
Investment bank	5.307	-1.300
	(5.436)	(10.50)
Insurance	-1.812	-3.407
	(8.138)	(12.32)
Debt_fund	32.87***	35.79
	(12.01)	(25.13)
Constant	94.10***	
	(18.56)	
Observations	4,237	
R-squared	0.763	

- UK regional banks have been negatively impacted by regulatory changes post crisis
- German mortgage banks have further benefited post crisis
- German commercial banks have benefited post crisis

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Results III LTV effect pre and post crisis

	Pre crisis	Post crisis
LTV	-63.16*	324.7***
	(32.99)	(58.03)
Prime office	-20.00***	-0.0430
	(3.551)	(6.591)
Prirme retail	-19.74***	14.64**
	(3.352)	(6.652)
Prime industrial	-13.89***	18.36***
	(3.459)	(6.301)
Secondary office	-1.980	38.60***
	(3.557)	(8.136)
Secondary retail	-2.134	56.66***
	(3.536)	(8.538)
Secondary industrial	4.542	50.18***
	(3.991)	(9.521)
Obersvations	4,235	
R squared	0.872	

- LTV effect stronger
- Larger pricing difference between prime and secondary assets

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Results Summary

- **Model 1: testing the impact of selected variables on credit spreads over whole period**

- Endogenous variables were significant for
  - LTV
  - Asset types except prime industrial property spreads
  - Geography: tested significant for loan spreads in Midlands & Wales
  - Loan size: tested not significant

- Exogenous variables
  - Bank business models tested significant except for investment banks and international commercial banks

  - Benchmark for all tests: UK commercial banks

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Results Summary

- **Model 2: testing the impact of different periods on credit spreads over whole period**

- Endogenous variables were significant for
  - LTV is most significant in the post crisis period
  - Asset types except prime industrial property spreads
  - Geography:was significant for Rest of South East, Scotland, North E pre-crisis
  - Loan size: tested significant post-crisis

- Exogenous variables
  - Business models were not significant for insurance companies, international commercial banks and investment banks pre or post crisis and debt funds were no longer significant post-crisis.

  - Conclusion
    - Lenders business models are an important determinant for loan pricing
    - Post crisis lenders have passed higher regulatory costs on to borrowers

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Conclusion

- **Lenders business models are an important determinant of commercial mortgage pricing**
- **Post crisis lenders have passed higher regulatory costs on to borrowers**
- **LTV and asset type risk pricing has become more significant post crisis**
- **Overall credit spreads are wider post crisis**

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