

Credit risk in commercial real estate lending

Danmarks Nationalbanken conference on the use of credit register data for financial stability purposes

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DeNederlandscheBank

EUROSYSTEEM

Disclaimer: the views presented are those of the author and do not necessarily reflect the views of De Nederlandsche Bank or the Eurosystem.

Roadmap

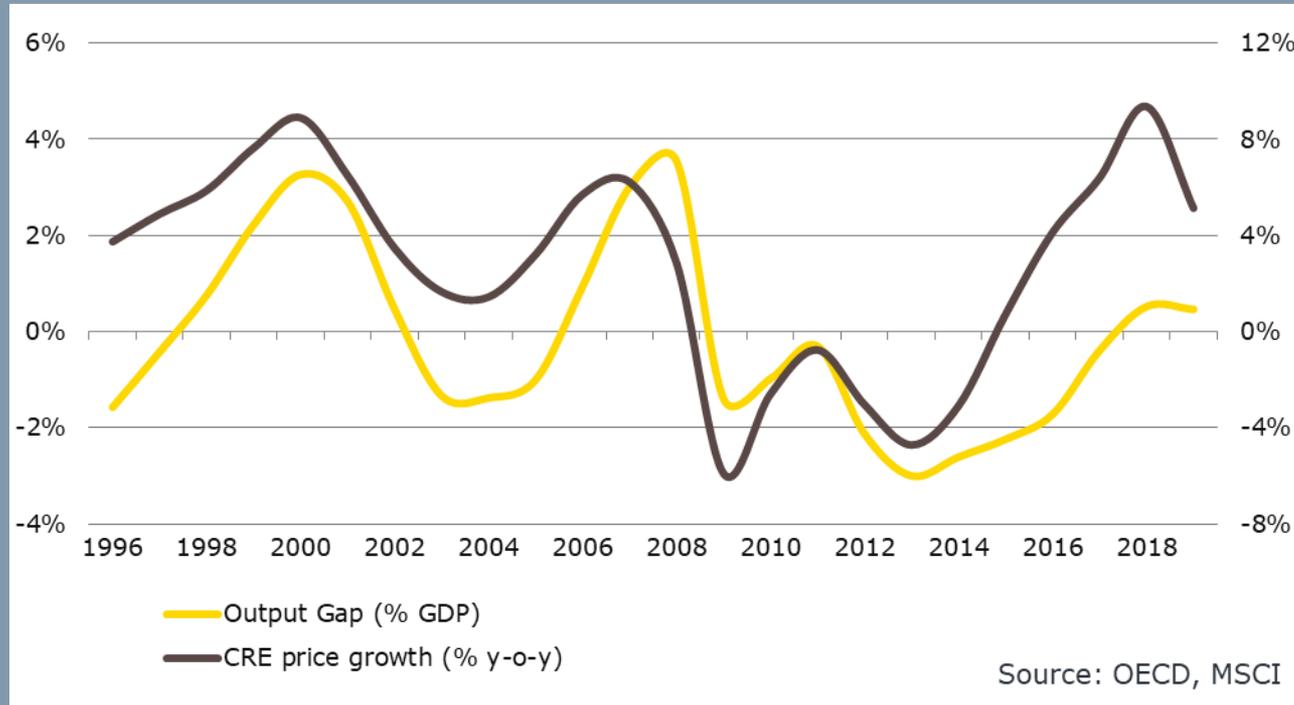
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- Introduction: why look at CRE?
- The change in data collection practices
- Using new data: analysing credit risk in commercial real estate lending

Why look at commercial real estate?

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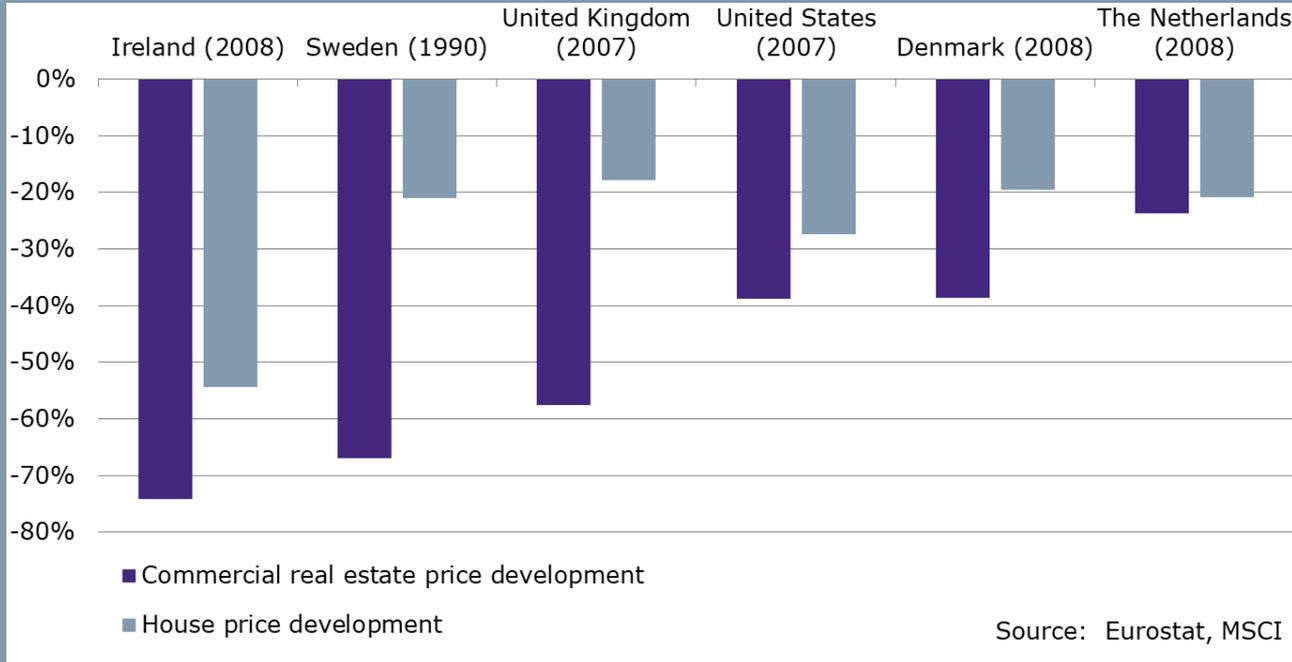
Example for the Netherlands:



- Procyclicality:
CRE prices correlate positively with the business cycle

Why look at commercial real estate?

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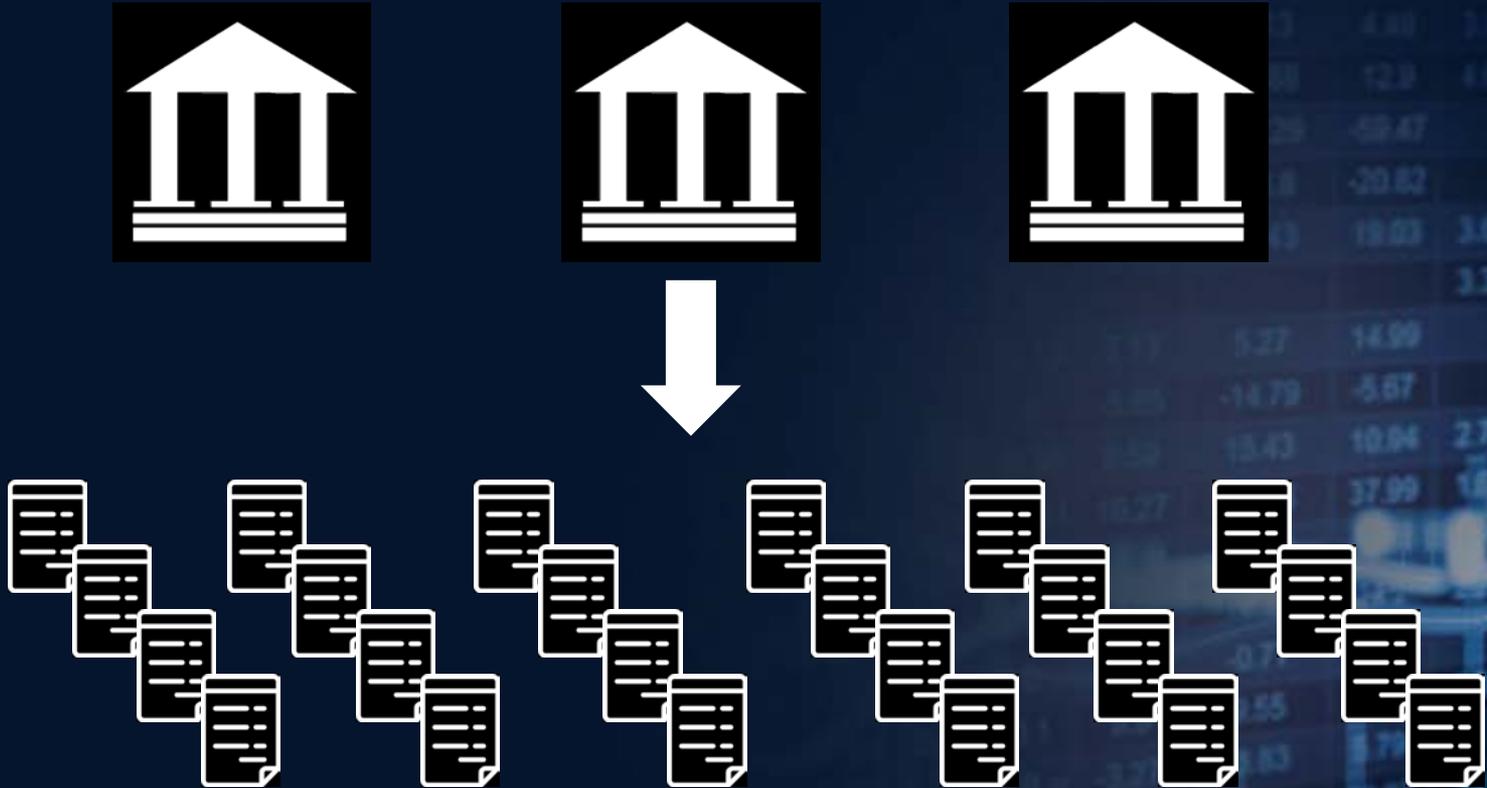
- Financial crises:
CRE prices drop steeply in crises, and more than house prices

The change in data collection practices: from bank...

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The change in data collection practices: from bank... ...to loan level

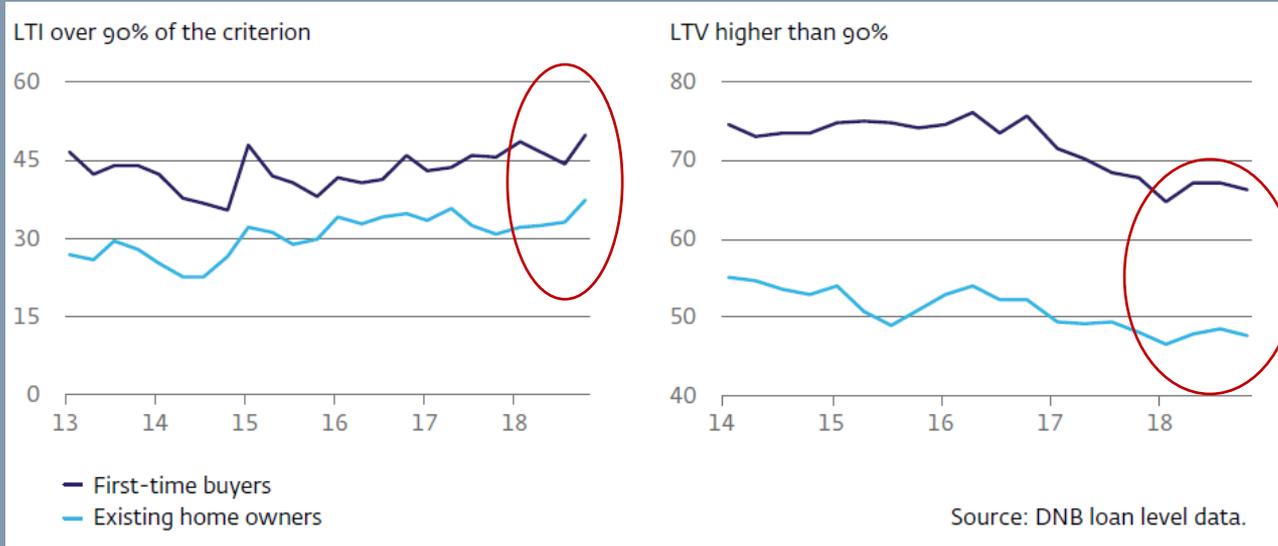


The change in data collection practices: initiatives

- **Residential mortgage loan level data (RRE)**
 - DNB initiative, together with Statistics Netherlands
 - Housing mortgages by nearly all Dutch banks
- **Commercial real estate loan level data (CRE)**
 - DNB initiative
 - Income producing real estate loans by largest Dutch banks
- **Analytical Credit Dataset (AnaCredit)**
 - ECB initiative, based on European legislation
 - Covers loans to all legal entities, not households

The change in data collection practices: use

→ Mortgage loan level data is used to assess housing market risks

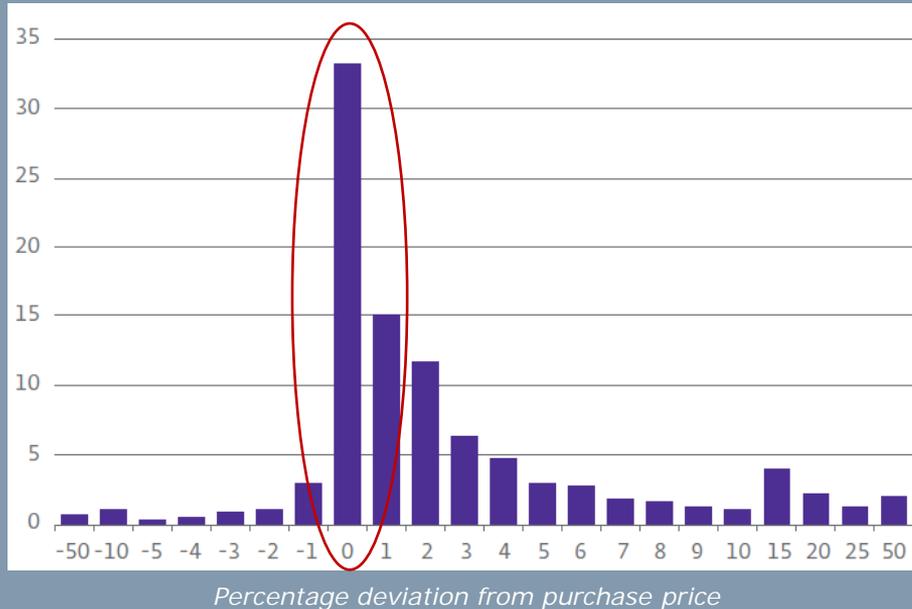


- Loan-to-Income ratio of first time buyers inching up
- Share of high Loan-to-Value loans declined, but has now stabilized

The change in data collection practices: use

→ Assessing the quality of housing appraisals

*Difference between appraisal value and purchase price
Percentage of transactions*



- Appraisal value is much more frequently above than below the purchase price
- In one third of cases, appraisal value exactly equals the purchase price

Analysing credit risk in CRE lending

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Based on the paper Mokas, D. & Nijskens, R. (2019), "Credit risk in commercial real estate: the role of idiosyncratic versus macro-economic factors", [DNB Working Paper 653](#)

Research questions:

- What are the main drivers of default for bank loans to the commercial real estate (CRE) sector?
- What is the relevance of macroeconomic factors versus individual loan characteristics?

Analysing credit risk in CRE lending

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Default channels

Theory:

- Firms take on debt to conduct investments with uncertain future returns.
- Debt default occurs when firm value turns negative (**net worth covenant**) or when the cash flow falls short (**flow based covenant**); see Merton (1974) and Leland and Toft (1996). → **LTV and cash flow matter**.
- Default can also happen for positive net worth or even when cash flow is sufficient: **strategic default**. This may depend on associated costs: forgoing tax benefits, legal, accounting, reputation costs (Haugen 1979).

Empirical work:

- **Balance sheet and market information** are useful in probabilistic models of firm default (Ohlson 1980, Altman 1977, Shumway 2001).
- Consensus: liquid balance sheet, strong equity base and less volatile earnings → lower defaults.
- Bank loan risk and the role of collateral are, however, **less well documented** (Altman 2000)

Analysing credit risk in CRE lending

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Are CRE firms different? Yes.

- **Industry effects** are important to improve default models (Chava 2004; Maksimovic and Phillips 1997, Opler and Titman 1994, Acharya 2003, Bruneau et al. 2012)
- Construction and real estate are **more sensitive to macroeconomic conditions** (Bonfim 2009, Simons and Rolwes 2009).
- Real estate loans are sensitive to **property value drops** and **cash flow shocks** (An and Sanders, 2010; Chen and Deng, 2012).
- **CRE is different from RRE**: home-owners need to live in their house and usually full-recourse → harder to default. Still, also RRE default risk increases with LTV (LaCour-Little, 2004, Archer and Smith, 2013).
- **Credit standards** are an important determinant of default risk (Lown and Morgan 2006; Kirti 2018) as well as an indicator for risk build-up (Dell'Ariccia et al. 2012)

Analysing credit risk in CRE lending

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Data

- We use the CRE loan level data described above.
- It contains over 70 variables for counterparty, loan and collateral characteristics.
- As of 2017H1: 33,014 counterparties, 65,572 loans, 225,288 collateral items, total outstanding around €77 bln.
- Only a cross-section of the loan book can be used for the analysis: no time series (yet). Here, we use 2017H1 data.
- We add macroeconomic variables: (regional) GDP, the ECB Bank Lending Survey index and a CRE price index.

Analysing credit risk in CRE lending

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Methodology

- We use a logit regression to estimate probability of default (PD):

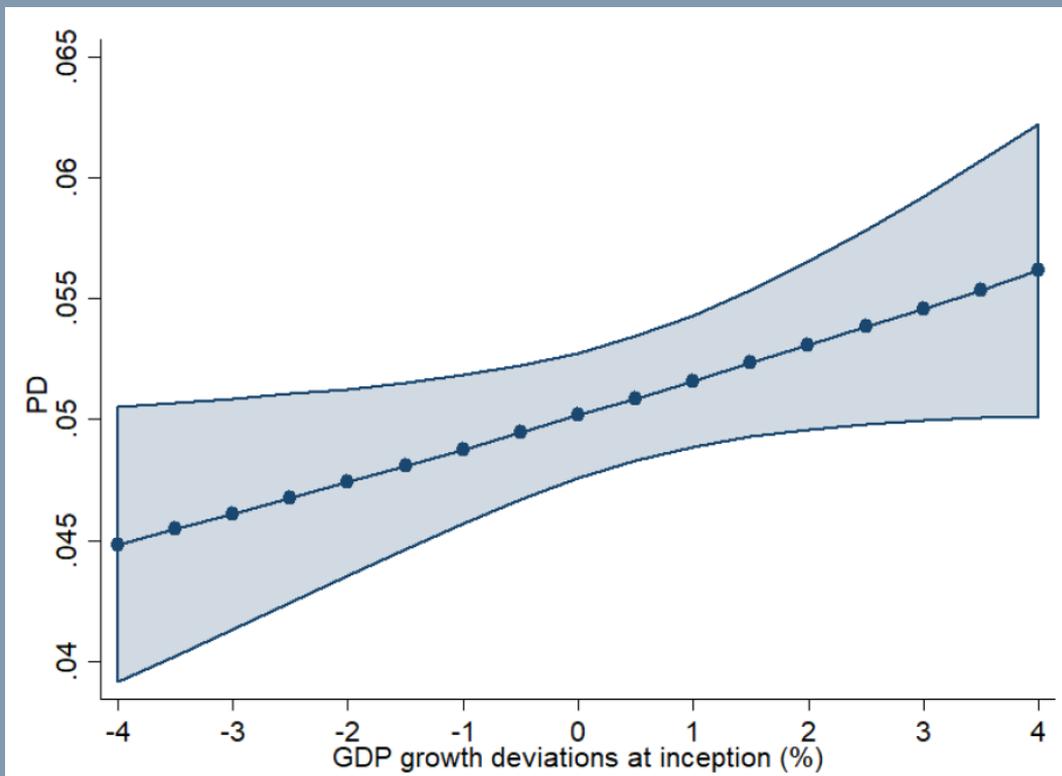
$$Pr(\text{default}) = f(\text{loan characteristics}, \text{macro factors})$$

- Loan characteristics: interest rate, LTV, interest rate type, (fixed/variable), time in performing
- Macro factors: GDP, CRE prices and bank lending standards at time of loan inception

→ In what follows, only graphs. Main regression table in [appendix](#) and paper.

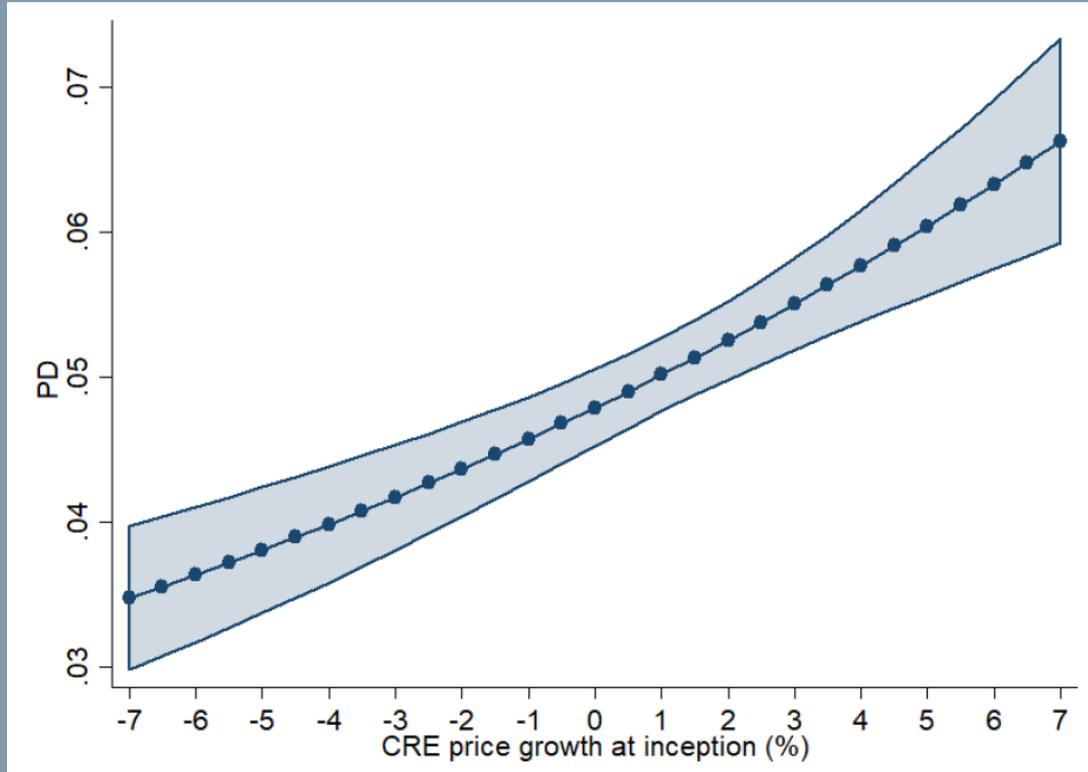
Analysing CRE credit risk: results for GDP

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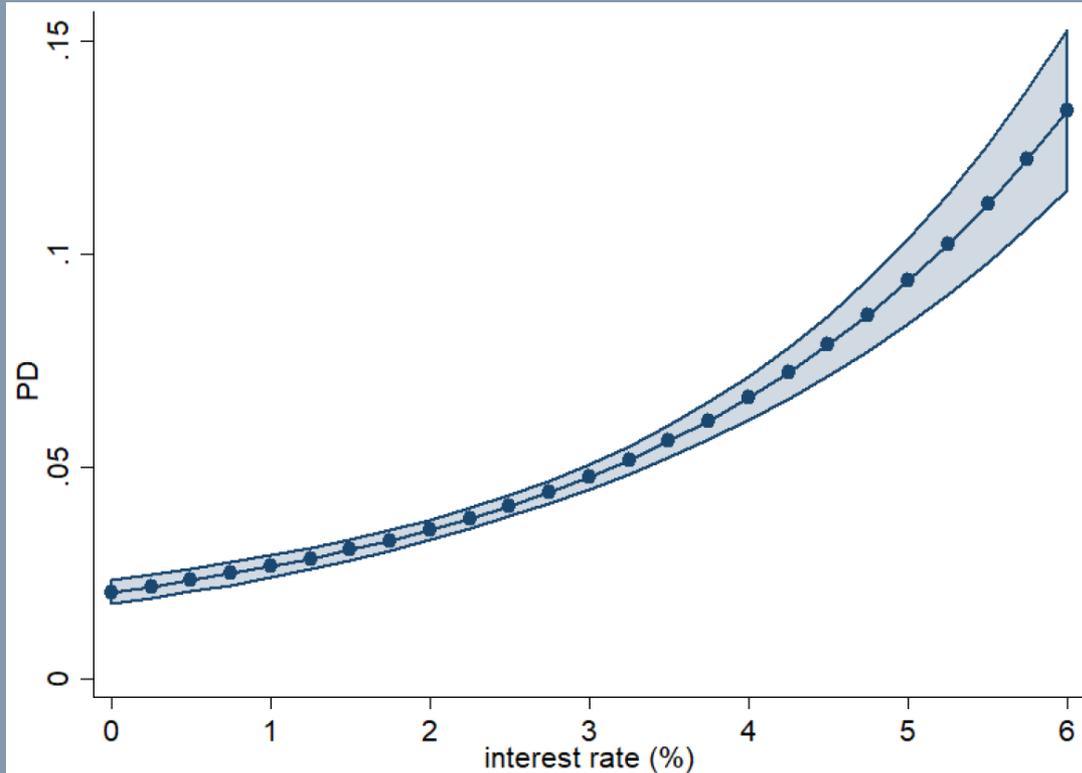
Analysing CRE credit risk: results for prices

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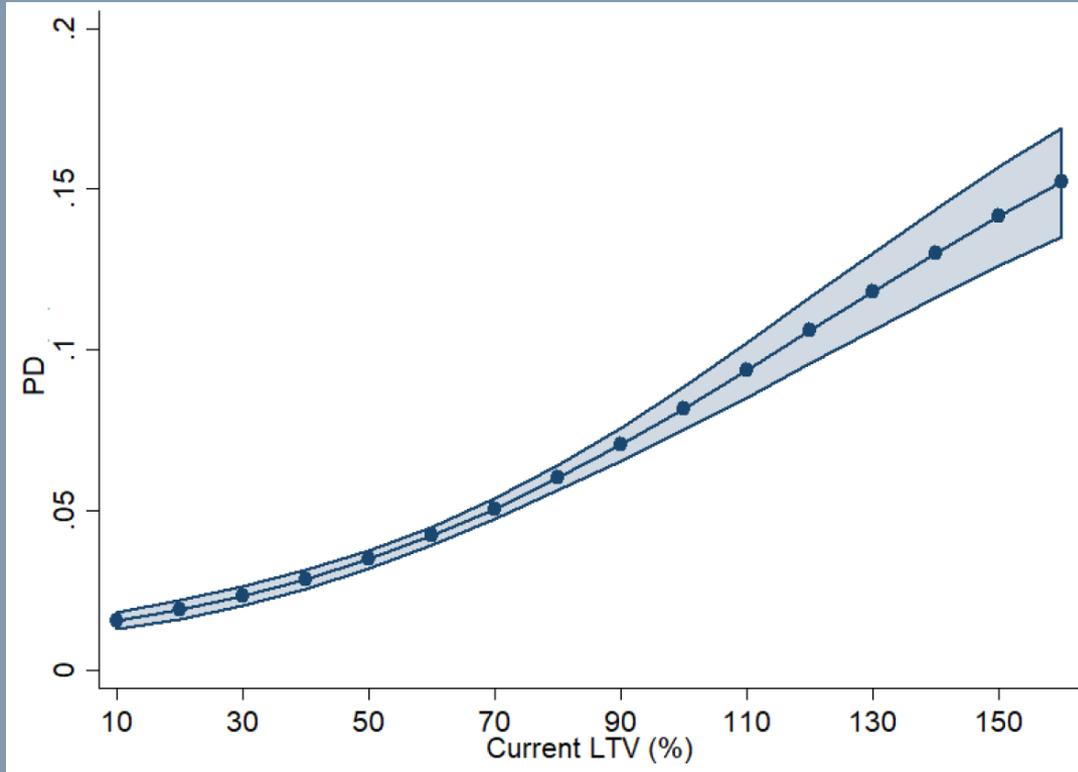
Analysing CRE credit risk: results for interest rates

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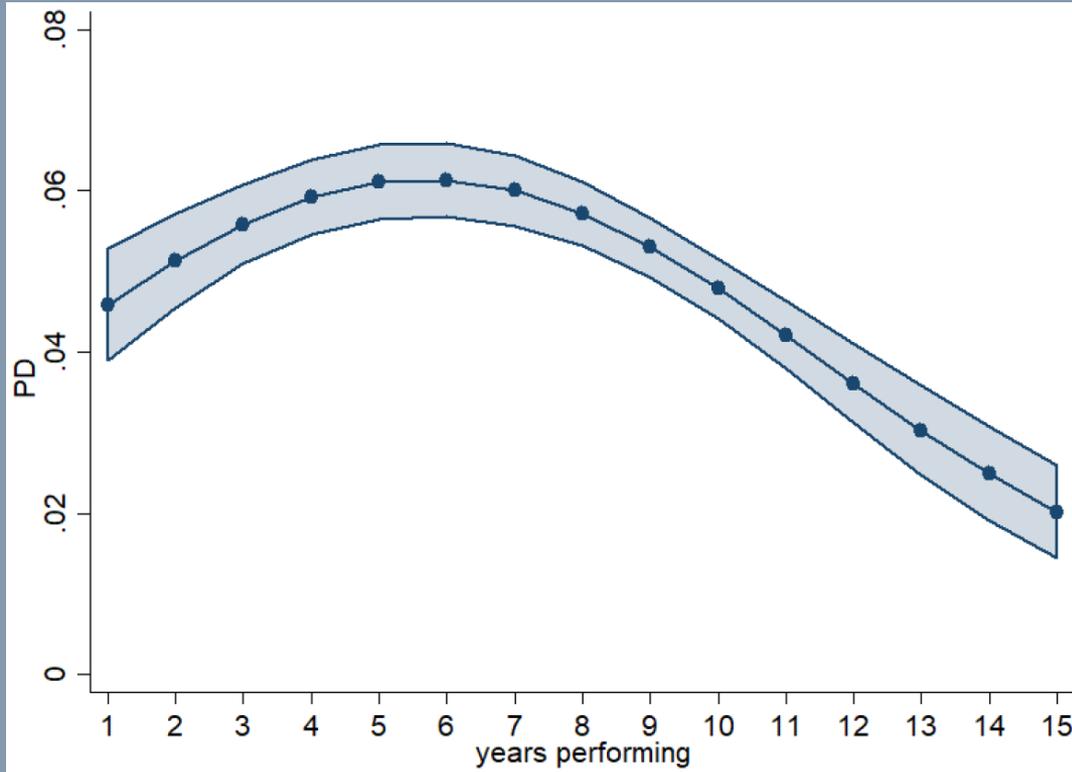


Analysing CRE credit risk: results for LTV

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3. Analysing CRE credit risk: results for time spent in performing



Next steps

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- **Improve data**

- Focus more on data quality and missing data
- Advanced data model
- Linking data with company register

- **Apply machine learning**

- Pilot has been successfully completed: tree boosting is much better at predicting (not explaining) than logit
- Paper to be written

Concluding remarks

- **Results:** the business and real estate cycle matter for default risk of CRE loans; interest rate structure, LTV and collateral characteristics are also significant.
- **Data matter:** we are able to conduct one of the few studies of default on CRE bank loans, because we have micro data from Dutch banks.
- **Implications for policy:**
 - (Macroprudential) policymakers should watch bank lending standards, especially in boom times
 - Supervisors want to monitor e.g. LTV, interest rates, interest rate types and bank lending standards

Thank you!

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Table: Main estimation results

	(1)	(2)	(3)	(4)	(5)
Time in performing (years)	-3.6965*** (0.45)	0.0762* (0.03)	0.2278*** (0.05)	0.5089*** (0.07)	0.3951*** (0.07)
Time in performing, squared	-0.1016*** (0.03)	-0.0056** (0.00)	-0.0201*** (0.00)	-0.0483*** (0.01)	-0.0352*** (0.01)
Current Loan to Value	0.0304*** (0.00)	0.0340*** (0.00)	0.0365*** (0.00)	0.0384*** (0.00)	0.0357*** (0.00)
Current Loan to Value, squared	-0.0001*** (0.00)	-0.0001*** (0.00)	-0.0001*** (0.00)	-0.0001*** (0.00)	-0.0001*** (0.00)
Current interest rate	0.4733*** (0.08)	0.7744*** (0.06)	0.7308*** (0.06)	0.7083*** (0.07)	0.7236*** (0.06)
Share of bullet loans	-0.0065 (0.01)	0.0192* (0.01)	0.0225* (0.01)	0.0277*** (0.01)	0.0231** (0.01)
Share of variable rate loans	0.0177*** (0.00)	0.0308*** (0.00)	0.0292*** (0.00)	0.0297*** (0.00)	0.0290*** (0.00)
Share of residential real estate	-0.0045** (0.00)	-0.0045*** (0.00)	-0.0045*** (0.00)	-0.0039*** (0.00)	-0.0046*** (0.00)
GDP growth deviation, inception		-0.0010 (0.02)	0.0437* (0.02)		-0.0801** (0.03)
GDP growth deviation, default		-1.6277*** (0.10)	-1.6212*** (0.11)		-1.5700*** (0.11)
CRE price growth, inception				0.1161*** (0.01)	0.1024*** (0.02)
Lending standards, inception			0.2189 (0.16)	0.0944 (0.15)	-0.0485 (0.17)
Observations	22798	21428	18702	19897	18702
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	No	No	No	No
Province fixed effects	Yes	No	No	No	No
Client location fixed effects	Yes	Yes	Yes	Yes	Yes
Interaction Terms	Yes	Yes	Yes	Yes	Yes