How Do Regulators Influence Mortgage Risk? Evidence from an Emerging Market

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The Importance of Mortgages

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- Mortgage markets vary considerably across countries.
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  - Part of a broader research agenda on international comparative household finance.
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- We have excellent data from an Indian mortgage provider.
  
  - An opportunity to learn from the time-series of innovations.
Our Study

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2. We also find that regulation – priority sector lending norms – distorted the relationship between loan defaults and rate-setting.

3. We find evidence consistent with learning over time by the mortgage provider in the face of a rapidly changing regulatory environment.
The Time Series of Rates and Defaults

- Beginning with a majority of fixed-rate mortgage initiations (~65%) in 1995, virtually all issuance by 2010 is variable-rate.

- Variable and fixed interest rates generally track benchmark rates.
  - Significant declines in benchmark rates beginning in 1999.

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Default Rate, 90 days past due
Seasonally adjusted using monthly dummies
A Hazard Model for Defaults

- We estimate a hazard model to better understand the determinants of defaults.
  - Decompose time-series variation in default rates into cohort-time variation and demographic/loan characteristic variation.

- Default Indicator on Loan

$$\delta_{i,c,b,t} = FE(Branch, Cohort \times Time) + j(Dem., LoanChars) + \gamma r_{i,c,b} + e_{i,c,b}$$

- To control for house-price movements, we include (in LoanChars) branch-level house-price appreciation up to time $t$ from the beginning of the sample period.
Decomposing Default-Rate Variation

Variable-Rate Loans

Decomposing 90 Day Delinquency Rates
Variable Rate Mortgages

Due to Demographics/Loan Characteristics
Due to Cohort X Time Dummies
Default Rate
GDPGrowth
Regulation and Mortgage Lending

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- Change in classification of NPAs in 2004 and 2005 – 90-day delinquencies.
Cohort-Time Fixed Effects, Which Loans?

Variable-Rate Loans

Risk Weights and Cohort-Time Dummies

Variable Rate Loans

No interest-rate ceiling in this period

Older (t-4+) Cohorts

Two Year Old (t-2) Cohort

Three Year Old (t-3) Cohort

Current (t) and (t-1) Cohorts

Average Risk Weight (Bank & HFC, LTC < 75%)

3*Interest Rate Ceiling (HFC)
More Regulatory Norms: Priority Sector Lending

- Low-cost housing is one component of "priority sector lending" (PSL) norms mandated by the RBI.
  - Quantity targets and price subsidies for “qualified” lending.

- Quantity:
  - 40% of net bank credit for domestic banks (32% for foreign banks)
  - 3% of net new deposits of public sector banks into housing.
    - HFCs indirectly subject to PSL quantity norms.

- Price subsidies: Interest-rate “subventions.”

- Compulsory low-interest lending to rural agriculture if you violate targets...!
Detecting the Effects of PSL Norms

- Plot loan size dummies from lifetime default regressions versus those from initial interest-rate rate regressions.
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  - Size of bubble corresponds to fraction of the loan flow over the period that occurs in the size bucket.

Idea:
- In an efficient mortgage market, size-bucket fixed effects should lie on a positively-sloped straight line passing through origin.
- Distorting effect of subsidies should move bubbles north-west (low initial interest rate, high lifetime default rate).
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Fixed-Rate Loans, 1995-1999

1995-1999
Fixed Rate Mortgages

Initial Interest Rate Above Initial Interest Rate on Smallest Non-Subsidized Loans

Default Propensity Relative to Smallest Non-Subsidized Loans
Fixed-Rate Loans, 2000-2004

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Learning by the Mortgage Provider

- We measure:

1. Cross-sectional correlation in each cohort of initial interest rates and lifetime default indicator.
   - 1.1 To what extent are rates set in line with rational forecasts of default?

2. Rolling cross-sectional correlation between fitted initial interest rates and fitted lifetime default indicator.
   - 2.1 Is mortgage provider using measurable loan and borrower characteristics “correctly”?

- Idea: correlations rise if the mortgage provider is learning, since interest rates increasingly set to account for subsequent defaults.
Cross-Sectional Variation in Initial Rates
Variable Rate Mortgages

- Standard Deviation of Actual Initial Interest Rates
- Standard Deviation of Fitted Initial Interest Rates
- Standard Deviation of Fitted Initial Interest Rates, Pooled Model
Correlations, Variable Rate Mortgages

- Corr(Actual Initial Rates, Actual 90d Defaults)
- Corr(Fitted Initial Rates, Fitted 90d Defaults)
- Corr(Fitted Initial Rates, Fitted 90d Defaults), Pooled Model
The Early 2000s

- Significant increase in correlations of initial interest rates and lifetime default rates over the early 2000s.

- Substantial increase in the cross-sectional standard deviation of initial (mostly variable) rates.
  - Mostly from higher coefficients on demographic variables (no great change in variation of demographics).

- Which demographics/loan attributes are they learning about?
  - Variable rate loans: Loan size (some evidence for loan-to-cost and loan-to-income ratios).
  - Fixed rate loans: Loan term (size also important).
Conclusions

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  - Significant variation in default rates and interest rates.

- Highly important effects of regulatory changes and national housing policy.

- Priority-sector lending norms.

- Reserve Bank changes in risk-weights for housing finance.

- Unintended negative consequences of well-meaning regulatory changes.

- Mortgage provider seemingly learning fast in a difficult environment.
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Initial Fixed and Variable Rates for Mortgages
Average across all Loans issued in each Cohort

Initial Fixed Interest Rates
- 6.00%
- 8.00%
- 10.00%
- 12.00%
- 14.00%
- 16.00%
- 18.00%

Initial Variable Interest Rates
- 0.00%
- 2.00%
- 4.00%
- 6.00%

1 Year Indian Government Bond Yield

10 Year Indian Government Bond Yield
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