Regulating Household Leverage

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December 2016
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2. Forward-looking leverage curtailment
   - Macroprudential regulation
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   - Consumer financial protection
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Relatively little empirical evidence on the impacts of #2
This Paper

Use loan-level data to study the impact of a central U.S. policy intended to reduce household leverage in the mortgage market

The Ability-to-Repay/Qualified Mortgage Rule

• Dodd-Frank rule making high-leverage loans more costly to originate

Research Questions:

• How did this affect the price of credit?
• How did this affect the quantity of credit?
  • Extensive margin: Did it result in the loss of loans?
  • Intensive margin: Did it reduce household leverage at the loan level?
• What are the implications for mortgage market performance?
• **Sharp but modest effect on prices**
  - Borrowers pay a 10-15bps premium for non-QM mortgages
    - $13,000–20,000 over 30 years for average affected loan
    - $1,700–2,600 if refinanced into QM after 5 years

• **Sizable effect on quantities**
  - About 2% of the affected market disappears completely
  - Another 2.7% take out less-leveraged loans

• **Minimal implications for performance**
  - In most extreme scenario, policy would only ↓ default rate by 0.2pp
Institutional Background and Data
Ability-to-Repay Rule (ATR)

- Mandated by Dodd-Frank and implemented by CFPB

  “A creditor shall not make a loan that is a covered transaction unless the creditor makes a reasonable good faith determination at or before consummation that the consumer will have a reasonable ability to repay the loan according to its terms.”

- Consumer protection and macroprudential purpose

  “During the years preceding the mortgage crisis, too many mortgages were made to consumers without regard to the consumers’ ability to repay the loans. Loose underwriting practices by some creditors – including failure to verify consumers’ income or debts and qualifying consumers for mortgages based on “teaser” interest rates after which monthly payments would jump to unaffordable levels – contributed to a mortgage crisis that led to the nation’s most serious recession since the Great Depression.”

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ATR and Qualified Mortgage (QM)

Compliance with ATR requires lenders to either

- Make “reasonable good faith” evaluation of 8 underwriting criteria
  - current/expected income
  - employment status
  - mortgage payment at maximum, fully-amortizing rate
  - payments on simultaneous loans on same property
  - taxes, insurance, HOA fees, etc
  - other debts, alimony, child support
  - debt-to-income ratio
  - credit history

- Originate “Qualified Mortgages”
  - Product features and underwriting standards set by the CFPB
Compliance with ATR requires lenders to *either*

- Make “reasonable good faith” evaluation of 8 underwriting criteria
  - No explicit limits on product features

- Originate “Qualified Mortgages”
  - Product features and underwriting standards set by the CFPB

Compliance with ATR provides legal protection

- Borrowers can bring lawsuits for violations of ATR
- Actual costs unclear, no suits have been brought
- If a loan is QM then the loan has ATR “safe harbor”
QM Standards

- QM product features and underwriting rules
  - No interest-only, balloon, or negative amortization
  - Term $\leq$ 30 years
  - Points and fees $\leq$ 3%
  - Verified income, assets, and debt
  - Debt-to-income (DTI) ratio $\leq$ 43%

- QM “Patch”
  - GSE loans not required to meet DTI limit
  - Implication: non-QM $\approx$ Jumbo loans with DTI $> 43 +$ other stuff
  - Expires in 2021 or when GSEs exit conservatorship
Research Questions

Has ATR/QM affected credit prices, quantities, or performance?

- **Prices**
  - Do lenders charge a premium for non-QM loans?

- **Quantities**
  - How does the DTI limit affect the allocation of credit?
    
    *Intensive margin*: shifts from high- to low-DTIs
    *Extensive margin*: loss of high-DTI loans

- **Performance**
  - Given DTI effects, what are the implications for mortgage default?
Data

- CoreLogic Loan-Level Market Analytics (LLMA) Data
  - Loan-level data covering $\approx 80\%$ of all active first mortgages
  - Provided by majority of top-20 loan servicers
  - Origination characteristics (FICO, LTV, DTI, property type)
  - Contract terms (rate, term, product type)
  - Monthly performance information over the life of the loan

- Sample restrictions
  - Purchase loan
  - Conventional (non-FHA)
  - 30-year, fixed-rate
  - Owner-occupied
  - Non-missing: FICO, LTV, DTI, rate, appraisal, geography
Research Design and Results
Has ATR/QM affected credit **prices**, **quantities**, or **performance**?

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Mean Interest Rates by DTI and Month of Origination

- DTI ∈ (36, 43]
- DTI ∈ (43, 50]

Difference in Mean Interest Rate


Month of Origination
Research Design: Difference in Differences

- Compare high/low DTI jumbo loans, pre/post QM

\[ r_{it} = \alpha + \delta_t + X'_{it} \gamma + \beta_0 \cdot 1[DTI_i > 43] + \beta_1 \cdot 1[DTI_i > 43] \times Post_t + \epsilon_{it} \]

- \(1[DTI_i > 43] \): dummy for whether DTI exceeds QM threshold
- \(Post_t\): dummy for whether month \(t\) is after QM implementation
- \(X_{it}\): loan/property characteristics
- \(\delta_t\): month of origination FEs

- Identifying assumption: parallel trends above and below cutoff

- Sample restriction: jumbo loans with DTI \(\in (36, 50]\)
  - Results robust to triple difference using conforming loans
## The Effect of Non-QM Status on Interest Rates

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
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<tbody>
<tr>
<td><strong>DTI &gt; 43</strong></td>
<td>-0.018***</td>
<td>-0.017***</td>
<td>-0.004</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>DTI &gt; 43 × Post</strong></td>
<td>0.131***</td>
<td>0.141***</td>
<td>0.119***</td>
<td>0.113***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.008)</td>
<td>(0.007)</td>
<td>(0.007)</td>
</tr>
</tbody>
</table>

|                  | X             | X             | X             | X             |
| **Month FEs**    |               |               |               |               |
| **County FEs**   | X             | X             | X             | X             |
| **FICO × LTV Bin FEs** | X         | X             |               |               |
| **Property Type FEs** |           |               |               | X             |

|                  | 2.9%          | 3.2%          | 2.7%          | 2.5%          |
| **Implied %Δ**   |               |               |               |               |
| **R-Squared**    | 0.70          | 0.72          | 0.75          | 0.75          |
| **Number of Observations** | 62,748    | 62,748        | 62,748        | 62,748        |
The Effect of Non-QM Status on Interest Rates by DTI

![Graph showing the effect of Non-QM status on interest rates by DTI. The x-axis represents Back-End DTI with values from 37 to 49, and the y-axis represents Interest Rate with values from 0 to 0.2. The graph includes a line for Coefficient and 95% CI.](image-url)
Has ATR/QM affected credit **prices**, **quantities**, or **performance**?

- **Prices**
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    \[ \text{Premium} \approx 10-15bps \rightarrow \$13-20,000 \text{ over 30 years} \]

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Fraction of Loans by DTI (2013)
Constructing the Counterfactual DTI Distribution

- Need to estimate number of jumbo loans at each DTI absent QM:

\[ \hat{n}_{jd}^{\text{post}} \]

- Information available to construct this estimate
  - Post-QM empirical distribution of jumbo and conforming loans:
    \[ n_{jd}^{\text{post}}, n_{cd}^{\text{post}} \]
  - Pre-QM empirical distribution of jumbo and conforming loans:
    \[ n_{jd}^{\text{pre}}, n_{cd}^{\text{pre}} \]

- Our approach: assume QM does not affect conforming market and, that in absence of QM, jumbo market would have behaved similarly
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Constructing the Counterfactual DTI Distribution

- **Assumption 1:** Conforming market unaffected \((\hat{n}_{cd}^{post} = n_{cd}^{post})\)

- **Assumption 2:** Total jumbo volume only affected at high-DTIs

\[
\sum_{i=0}^{d} \hat{n}_{ji}^{post} = \sum_{i=0}^{d} n_{ji}^{post} \triangleq N_{jd}^{post}
\]

- **Assumption 3:** Parallel trends in ratios

\[
\frac{\hat{n}_{jd}^{post}}{N_{jd}^{post}} = \frac{n_{jd}^{pre}}{N_{jd}^{pre}} + \left( \frac{n_{cd}^{post}}{N_{cd}^{post}} - \frac{n_{cd}^{pre}}{N_{cd}^{pre}} \right) \triangleq \hat{\pi}_{jd}^{post}
\]

- **Counterfactual:** \(\hat{n}_{jd}^{post} = \hat{\pi}_{jd}^{post} \times N_{jd}^{post}\)
Constructing the Counterfactual DTI Distribution

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  \]

  **Counterfactual**: \( \hat{n}_{jd}^{post} = \hat{\pi}_{jd}^{post} \times N_{jd}^{post} \)
Proof of Concept: Placebo Policy Year 2013

![Graph showing Back-End DTI vs. Number of Loans for Empirical and Counterfactual cases.](image-url)
Distribution of Counterfactual Errors: 2000-2013

Summary Stats
Mean: 0.013
Med: 0.007
SD: 0.003
IQR: [-0.083, 0.100]
Estimating Intensive and Extensive Margin Effects

- **Intensive margin response (bunching)**
  \[ \hat{B} = \left| \sum_{i=d}^{43} \left( \hat{n}_{ji}^{post} - n_{ji}^{post} \right) \right| \]

- **Missing mass**
  \[ \hat{M} = \sum_{i=44}^{50} \left( \hat{n}_{ji}^{post} - n_{ji}^{post} \right) \]

- **Extensive margin response**
  \[ \hat{M} - \hat{B} \]
The Effect of QM on Quantity of Credit

\[ \frac{B}{N} = 0.027 \]
\[ \frac{(M-B)}{N} = 0.020 \]
## The Effect of QM on the Quantity of Credit: Robustness

<table>
<thead>
<tr>
<th>Preferred Specifications</th>
<th>Alternative Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>$\bar{d} = 38$</td>
<td>$\bar{d} = 30$</td>
</tr>
<tr>
<td>$\hat{B} / \hat{N}_j^{post}$</td>
<td>$\hat{B} / \hat{N}_j^{post}$</td>
</tr>
<tr>
<td>0.027***</td>
<td>0.025**</td>
</tr>
<tr>
<td>(0.006)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>$(\hat{M} - \hat{B}) / \hat{N}_j^{post}$</td>
<td>$(\hat{M} - \hat{B}) / \hat{N}_j^{post}$</td>
</tr>
<tr>
<td>0.020***</td>
<td>0.024**</td>
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<td>(0.007)</td>
<td>(0.011)</td>
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<tr>
<td>Bootstrap Replications</td>
<td>100</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>418,105</td>
</tr>
</tbody>
</table>
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    \[ \text{Intensive margin: } \rightarrow \approx 2.7\% \text{ of market shifted to lower DTI} \]
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Would QM Have Helped to Avoid the Mortgage Crisis?

Answering this requires knowing

- How QM would have affected distribution of DTIs during the crisis
  - Extrapolate our estimates to crisis-era distribution
- The relationship between DTI and mortgage performance
  - Estimate historical relationship using performance data
  - Origination cohorts 2005–2008
  - Basic estimating equation:
    \[ d_{it} = \alpha_c + \delta_t + \beta_d \cdot 1[D_{TIi} = d] + X_i \gamma + \epsilon_{it} \]
  - Estimate for jumbos only and pooling jumbos + conforming
# DTI and Five-year Default Rate: Jumbo Only

<table>
<thead>
<tr>
<th>Back-End DTI</th>
<th>Coefficient</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>-0.05</td>
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</tr>
<tr>
<td>40</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>50</td>
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</tbody>
</table>

Default Probability Relative to DTI = 38%
DTI and Five-year Default Rate: Jumbo + Conforming

Back-End DTI

Default Probability Relative to DTI = 38%

Coefficient

95% CI
Estimating Implied Effect of QM on Aggregate Default Rate

- Assume policy applied to entire market
- Group loans into DTI bins consistent with bunching analysis
  - High: $DTI > 43$
  - Med: $DTI \in (38, 43]$
  - Low: $DTI \leq 38$
- Estimate relative 1–5 year default rates by cohort
  
  \[ d_{it} = \alpha_c + \delta_t + \beta_L \cdot \mathbb{1}[DTI_i \leq 38] + \beta_H \cdot \mathbb{1}[DTI_i > 43] + X_i' \gamma + \epsilon_{it} \]
- Implied reduction in cohort-level default rate
  
  \[ \Delta \text{DefaultRate} = (\beta_H - \beta_L)(\hat{\delta}_H - \delta_H) - \beta_L(\hat{\delta}_M - \delta_M), \]

  where $\hat{\delta}_i, \delta_i$ denote share of loans in bin $i$ with and without QM
Counterfactual Effect of QM on Cohort Default Rates

2005 Cohort

2006 Cohort

2007 Cohort

2008 Cohort
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- **Performance**
  - Given DTI effects, what are the implications for mortgage default?
    
    \[ \downarrow \text{default rate on worst-performing cohort by only 0.2pp} \]
Conclusion

**Bottom Line**
- Prices and quantities respond sharply
- Only moderate performance improvements in extreme scenarios
- Suggests that regulating household leverage is costly

**Possible Next Steps**
- Decompose shift in DTI distribution
  - Reductions in loan size?
  - Higher borrower incomes?
- Understand how different kinds of lenders are responding
  - Which lenders charge a premium?
  - Which lenders drop out of non-QM market?
Thanks!