The Delinquency of Subprime Mortgages

Michelle A. Danis
U.S Securities and Exchange Commission
&
Anthony Pennington-Cross
Marquette University

The views expressed in this research are those of the authors and do not represent policies or positions of the U.S Securities and Exchange Commission, other officers, agencies, or instrumentalities of the United States Government, as well as any other author affiliations.
Subprime Literature

• Where and when is subprime used?
  – High-risk locations
    • Low-income, minority census tracts
    • High foreclosure rate census tracts
    • High proportion of individuals with “very low credit score”
    • Lower house price appreciation areas
  – Less knowledgeable and high transition rates

• Performance
  – Higher default for third party originations
  – Less responsive to interest rates
  – Higher loss severity
  – Hybrids terminate early
Option Theory Literature

• Traditional mortgage model
  – Default, prepay, current (continue or alive)
  – Ruthless default

• Value of delay -- option pricing framework
  – Kau and Keenan, REE 1994
  – Ambrose, Buttimer, and Capone, JMCB1997
    • Expected and realized value of property matters
    • Delay of foreclosure assumed exogenous
    • Longer delay and higher LTV -- leads to default
      – Short delay and more variance -- leads to default
      – Long delay and very high variance $\leftrightarrow$ Prob(default) $\downarrow$
30-years of Delinquency Research

• Examine one or two states of delinquency in isolation
  – Assume Independence
  – Ignore competing risks
    • Termination (default or prepayment)
  – Remarkable consistent results
    • LTV at origination
    • Income
    • Other financial assets
    • Contemporaneous economic conditions
      – Housing and labor market
    • Credit scores
    • Lender behavior/characteristics
Nested Logit Model

Loan Performance

terminate

current

delinquent

prepay

default

30 late

60 late

90 late

current

“branches” indexed by $l$

outcomes in “nests” indexed by $j$
90+ Days Delinquent

90 Late Frequency

Quarter

Frequency (percentage)

Sample
MBA
90+ Days Delinquent and Age of Loan

- Nested Logit
- Multinomial Logit

Age of Loan in Months

Probability
90+ Days Delinquent and FICO

![Graph showing the relationship between FICO score and probability of being 90+ days delinquent. The graph compares Nested Logit and Multinomial Logit models. The probability decreases as the FICO score increases.]
90+ Days Delinquent and House Prices

![Graph showing the relationship between probability and change in house price index. The graph compares Nested Logit and Multinomial Logit models.](image)
90+ Days Delinquent & House Price Volatility

- Nested Logit
- Multinomial Logit

Probability vs. Standard Error of HPI
## Elasticity Estimates

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>30-Late</th>
<th>90+-Late</th>
<th>Default</th>
<th>Prepaid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepay Penalty</td>
<td>0.7%</td>
<td>7.0%</td>
<td>2.5%</td>
<td>2.6%</td>
<td>-27.6%</td>
</tr>
<tr>
<td>Low Doc</td>
<td>-1.9%</td>
<td>87.6%</td>
<td>87.9%</td>
<td>19.8%</td>
<td>1.7%</td>
</tr>
<tr>
<td>No Doc</td>
<td>-5.8%</td>
<td>270.7%</td>
<td>336.8%</td>
<td>24.3%</td>
<td>5.8%</td>
</tr>
</tbody>
</table>

### The Recipe for Delinquency

- Young loans
- Moderately volatile and flat or declining house prices
- Low credit scores
- Low & no documentation