
Mortgages and the Future of Housing Finance: *Loan Renegotiation and Redefault*

Moderator:

Brent W. Ambrose

The Pennsylvania State University



Session Overview

- Brevoort & Cooper → Foreclosure Aftershocks

- Mayer, et al

- Bhutta, Dokko, & Shan

} “Trigger Events” vs.
“Ruthless Default”

Trigger Event vs. Ruthless Default

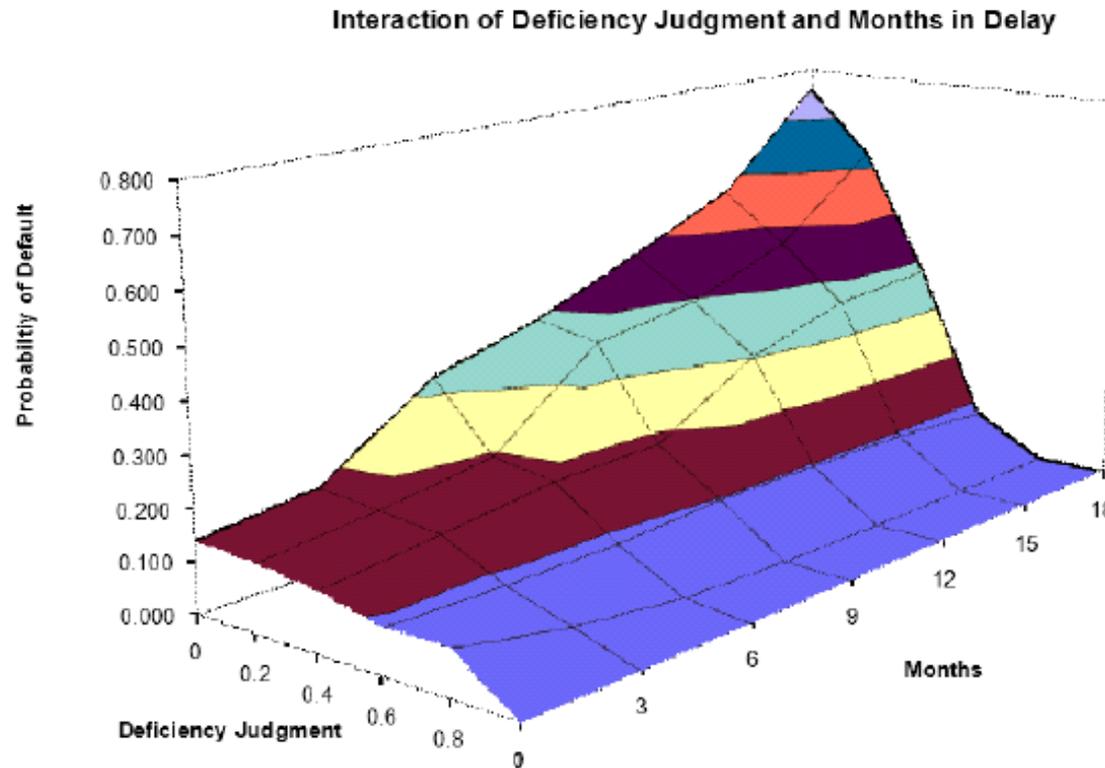
- An old debate in the “real estate” literature
 - “Ruthless Default” – stems from insights of option pricing models applied to mortgages
 - Titman & Torous (1989); Kau, et al (1992,1993); Kau & Keenan (1995,1999); Ambrose, Buttimer, & Capone (1997); Ambrose & Buttimer (2000, 2010)
 - “Trigger Events” – borrower solvency
 - Lekkas, et al (1993); Quigley & Van Order (1995); Vandell (1995), Elmer (1997), Deng, et al (2000)
 - Hybrid Empirical Models – attempt to link both theories
 - Kau & Keenan (1999); Ambrose & Capone (1998,2000); Ambrose, Capone & Deng (2001)

Trigger Events vs. Ruthless Default

- Why is it important to know whether borrower is “strategic”?
 - Necessary to avoid moral hazard problem associated with loan modification programs
 - Ambrose & Capone (1996), Riddiough & Wyatt (1994)
 - Theoretical Models: Ambrose and Buttimer (2000), Ambrose, Buttimer and Capone (1997)

Trigger Events vs. Ruthless Default

- Theoretical view of moral hazard problem at work:



Source: Ambrose, Buttimer, & Capone. "Pricing Mortgage Default and Foreclosure Delay," *Journal of Money Credit and Banking* 29:3 (1997) 314-325.

Trigger Events vs. Ruthless Default

- What do we know from previous studies?
 - Default is not the same as foreclosure
 - Strategic default appears to be primary cause for borrower default
 - Kau & Keenan (1999); Ambrose and Capone (1998); Ambrose, Capone & Deng (2001)
 - However, evidence also exists that trigger events do result in foreclosure
 - Ambrose and Capone (2000)

Trigger Events vs. Ruthless Default

- Previous studies were from a period of stable/rising house prices.
 - Very few borrowers had “negative equity”
 - Thus, difficult to test ruthlessness vs. trigger
- The papers in this session provide an update to the debate using data from a period with severe house price declines.

Brevoort & Cooper: Foreclosure Aftershocks

- ❑ Study credit scores after foreclosure “event” from 1999 to 2010.
- ❑ Major Findings:
 - Credit scores decline prior to foreclosure
 - ❑ This reflects delinquency period prior to “foreclosure”
 - Credit scores tend to recover after “foreclosure”
 - ❑ Prime borrowers do not recover to pre-event levels
- ❑ Implications:
 - Possible role of “trigger” events if borrower cohorts display divergent credit scores recovery rates

Brevoort & Cooper: Foreclosure Aftershocks

Alternative Views of Foreclosure:

1. Foreclosure is a “shock” that alters one’s future risk
 - ❑ Decreases future access to credit
 - ❑ Destroys wealth
2. Foreclosure results from “trigger” event
 - ❑ “Trigger” is underlying cause of future credit problems – not foreclosure event
 - ❑ Implication – no need to slow foreclosure process
3. Foreclosure alters borrower preferences
 - ❑ Reduced stigma of credit event, lower default costs

Brevoort & Cooper: Foreclosure Aftershocks

■ Comments

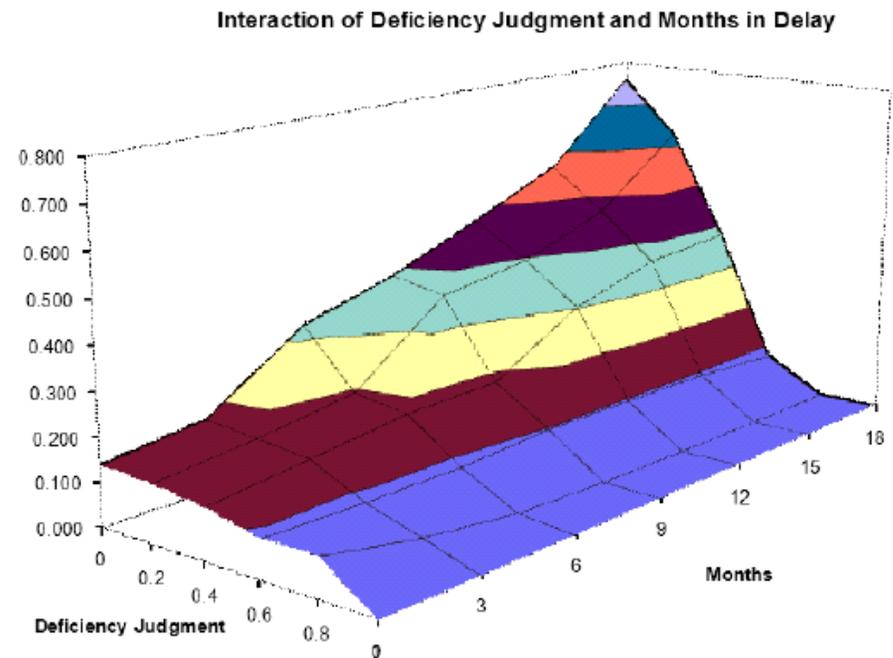
- Possible reasons for differences in score recovery after foreclosure:
 - Differences in borrowers
 - Differences in macro-economic environment (impacts ability to recover wealth)
 - Changes in bankruptcy laws & foreclosure processes
 - Changes in credit score calculation methods over time
- Need to design empirical study to control for these possibilities
 - Matched sample design
 - Focus on percentage change in score after foreclosure

Comments on Mayer, *et al*

- *“almost all of the increase in post-Settlement Countrywide defaults came from mortgages that reset around the time the Settlement was announced.”*
- Is effect caused by Settlement or Resets?
 - Results consistent with the “reset” causing default, not the Settlement.
 - Ambrose, LaCour-Little, and Huszar (2005) report that the default hazard rate is approx 77% higher at adjustment date for 3/27 loans.
 - Alternative method – estimate a hazard rate model that explicitly captures time-varying economic factors as well as Settlement date effect.

Comments on Mayer, *et al*

- The settlement reduced default transaction costs
 - E.g.: Suspended foreclosure process during modification period
- Previous theoretical work suggests that when default costs are reduced the probability of default increases
- Thus, results confirm intuition of option pricing models



Comments on Bhutta, Dokko, and Shan

- 2-stage estimation method to determine the extent that negative equity drives defaults:
 - First stage – hazard model of default based on “liquidity” factors
 - Second stage – estimate total default cost based on equity at t given no default and equity at $t-1$
 - Essentially, model is focused on ***level*** of negative equity

Comments on Bhutta, Dokko, and Shan

- Results are largely consistent with evidenced reported in the literature
 - For example, Ambrose and Capone (1998) focus on probability of foreclosure versus self-cure to demonstrate the presence of both trigger event and ruthless defaults.
 - E.g: Borrowers with high initial LTVs are more likely to end default in foreclosure than borrowers with low initial LTVs.
- However, theory and empirical tests do not recognize option values embedded in mortgages, thus empirical tests are open to alternative explanations.

Comments on Bhutta, Dokko, and Shan

- Theoretical Interaction of Default Option Value and Default Probability

- Default Value:

$$d_t = l_t - v_t + c_t + p$$

- l = loan value
 - v = property value
 - c = prepayment option
 - p = current payment due

- Theory: 2 Necessary Conditions for Default:

1. Default today must be worth more than expected future default

$$d_t \geq \max \left(\frac{d_{t+s}}{(1 + \delta)^s} \right), \forall s \in \{1, \dots, T - t\}$$

2. Negative equity is necessary

$$l_t - v_t + p \geq 0$$

Comments on Bhutta, Dokko, and Shan

- Implications of necessary default conditions:
 - ❑ Borrowers will exercise when house prices have declined such that borrower has negative equity
 - ❑ Loan amortization (age) will impact default
 - ❑ Borrowers will default when expected house price movements are minimal
 - ❑ Interest rates changes can have significant impact
 - ❑ Magnitude of house price decline effect changes based on interest rates

Comments on Bhutta, Dokko, and Shan

■ Specific concerns:

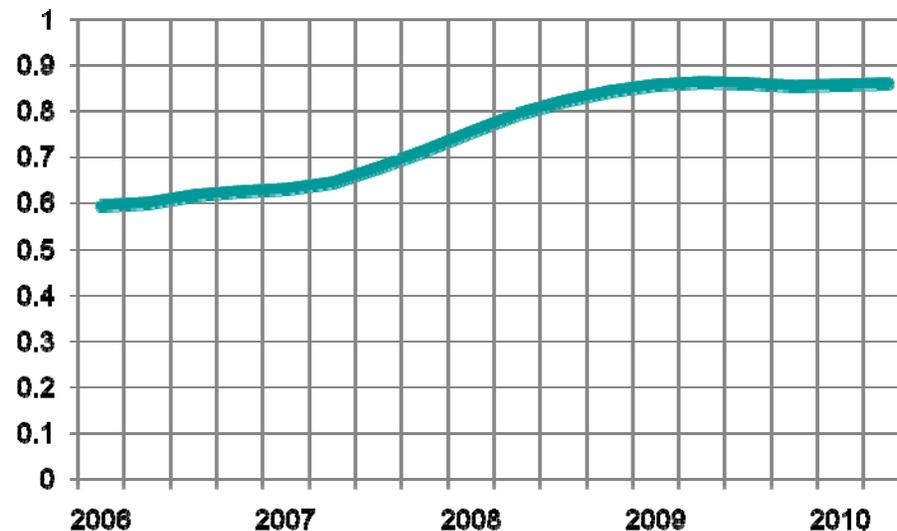
- Theoretical default conditions imply that equity (based on simple change in HPI) is not sufficient
 - Does not account for variance in HPI estimates
 - Need to estimate the probability of negative equity (Deng, 1997 and Deng, Quigley and Van Order, 1996)

$$PNEQ = \Phi \left(\frac{\log(L) - \log(V)}{\sqrt{\sigma^2}} \right)$$

- Must know whether house price changes are slowing (point in the cycle)
- Need 2-stage method:
 - Probability of default
 - Value of default

Comments on Bhutta, Dokko, and Shan

- What was the “value” of default?
 - Simulated using Ambrose, Capone, and Deng (2001) model for interest-only, 100% LTV mortgage originated in California in 1st quarter of 2006



References

- Ambrose, Brent W., Michael LaCour-Little, and Zsuzsa Huszar, "A Note on Hybrid Mortgages," *Real Estate Economics*, 33:4 (2005) 765-782.
- Ambrose, Brent W., Charles A. Capone, Jr., and Yongheng Deng, "Optimal Put Exercise: An Empirical Examination of Conditions for Mortgage Foreclosure," *Journal of Real Estate Finance and Economics*, 23:2 (2001) 213-234.
- Ambrose, Brent W., and Richard J. Buttimer, Jr., "Embedded Options in the Mortgage Contract," *The Journal of Real Estate Finance and Economics*, 21:2 (2000) 95-111.
- Ambrose, Brent W. and Charles A. Capone, Jr., "The Hazard Rates of First and Second Default," *The Journal of Real Estate Finance and Economics*, 20:3 (2000) 275-293.
- Ambrose, Brent W. and Charles A. Capone, Jr., "Modeling the Conditional Probability of Foreclosure in the Context of Single-Family Mortgage Default Resolutions," *Real Estate Economics*, 26:3 (1998) 391-429.
- Ambrose, Brent W., Richard J. Buttimer, Jr., and Charles A. Capone, Jr., "Pricing Mortgage Default and Foreclosure Delay," *Journal of Money, Credit, and Banking*, 29:3 (August 1997) 314-325.
- Ambrose, Brent W. and Charles A. Capone, Jr., "Cost-Benefit Analysis of Single Family Mortgage Foreclosure Alternatives," *The Journal of Real Estate Finance and Economics*, 13:2 (1996) 105-120.
- Cunningham, D.F. and C.A. Capone, Jr., 1990. "The Relative Termination Experience of Adjustable to Fixed-Rate Mortgages." *Journal of Finance* 45:5 1687-1703.
- Deng, Yongheng. 1997. "Mortgage Termination: An Empirical Hazard Model with a Stochastic Term Structure," *Journal of Real Estate Finance and Economics*, 14 (3), 309-331.
- Deng, Yongheng, John M. Quigley, and Robert Van Order. 1996. "Mortgage Default and Low Down-payment Loans: The Cost of Public Subsidy," *Regional Science and Urban Economics* 26, 263-285.
- Deng, Yongheng, John M. Quigley, and Robert Van Order. 2000. "Mortgage Terminations, Heterogeneity and the Exercise of Mortgage Options," *Econometrica* 68 (2), 275-307.
- Elmer, P. 1997. "A Choice-Theoretic Model of Mortgage Default." Working paper, Federal Deposit Insurance Corporation.
- Foster, Chester, and Robert Van Order. 1984. "An Option-Based Model of Mortgage Default," *Housing Finance Review* 3, 351-372.

References

- Gardner, M.J. and D.L. Mills. 1989. "Evaluating the Likelihood of Default on Delinquent Loans." *Financial Management* 18:4 55-63.
- Kau, James B., Donald C. Keenan, Walter J. Muller III, and James F. Epperson. 1992. "A Generalized Valuation Model for Fixed-Rate Residential Mortgages," *Journal of Money, Credit, and Banking* 24(3), 279-99.
- Kau, James B., Donald C. Keenan, and T. Kim. 1993. "Transaction Costs, Suboptimal Termination, and Default Probabilities for Mortgages," *AREUEA Journal* 21(3), 247-63.
- Kau, James, and Donald C. Keenan. 1995. "An Overview of the Option Theoretic Pricing in Mortgages." *Journal of Housing Research* 6:2 217-244.
- Kau, James, and Donald C. Keenan. 1999. "Patterns of Rational Default," *Regional Science and Urban Economics*, 29, 217-244.
- LaCour-Little, Michael. 2007. "Default and Prepayment Risk in Residential Mortgage Loans: A Review and Synthesis." in *Household Credit Usage: Personal Debt and Mortgages*, Edited by Sumit Agarwal and Brent Ambrose, Palgrave/MacMillan: New York, NY.
- Lekkas, Vassilis, John M. Quigley, and Robert Van Order. 1993. "Loan Loss Severity and Optimal Mortgage Default," *AREUEA Journal* 21(4, Winter), 353-372.
- Quigley, John M., and Robert Van Order. 1995. "Explicit Tests of Contingent Claims Models," *Journal of Real Estate Finance and Economics* 11, 99-117.
- Riddiough, T.J. and S.B. Wyatt. 1994. "Wimp or Tough Guy: Sequential Default Risk and Signaling with Mortgages." *Journal of Real Estate Finance and Economics* 9:3 299-322.
- Schwartz, E.S. and W.N. Torous. 1992. "Prepayment, Default and the Valuation of Mortgage Pass-through Securities." *Journal of Business* 65:2 221-239.
- Titman, S., and W. N. Torous. 1989. "Valuing Commercial Mortgage: An Empirical Investigation of the Contingent Claims Approach to Pricing Risky Debt," *The Journal of Finance*, 44, 345-373.
- Vandell, Kerry. 1995. "How Ruthless is Mortgage Default?" *Journal of Housing Research* 6 (2), 245-264.
- Vandell, Kerry and T. Thibodeau. 1985. "Estimation of Mortgage Defaults Using Disaggregate Loan History Data." *Journal of the American Real Estate and Urban Economics Association*. 13:2 292-316.

