

# Understanding the Subprime Mortgage Crisis

Yuliya Demyanyk<sup>1</sup> Otto Van Hemert<sup>2</sup>

<sup>1</sup>Federal Reserve Bank of St. Louis

<sup>2</sup>New York University, Stern School of Business

December 6, 2007

contact: Yuliya.Demyanyk@stls.frb.org

The views expressed are those of the authors and do not necessarily reflect the official positions of the Federal Reserve Bank of St. Louis or the Federal Reserve System.

Available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1020396](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1020396)

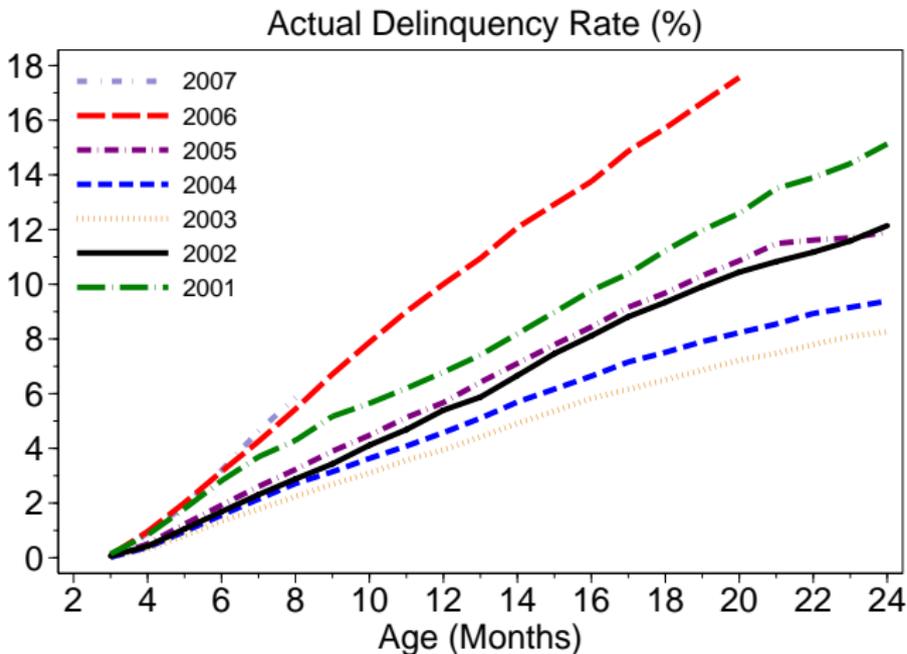
# What is a Subprime Mortgage?

- 1 Subprime borrowers<sup>1</sup>
  - previous delinquency, foreclosure, bankruptcy
  - credit score  $< 620$ ; debt-to-income  $\geq 50\%$
- 2 Subprime Lenders<sup>2</sup>
  - fewer originations, more refinances, sell less to GSEs, mostly high-cost loans
- 3 Subprime Securities
  - riskier than Prime and Alt-A
- 4 “Riskier” borrowers
  - “good” credit history but “zero-down” or “no doc” ...

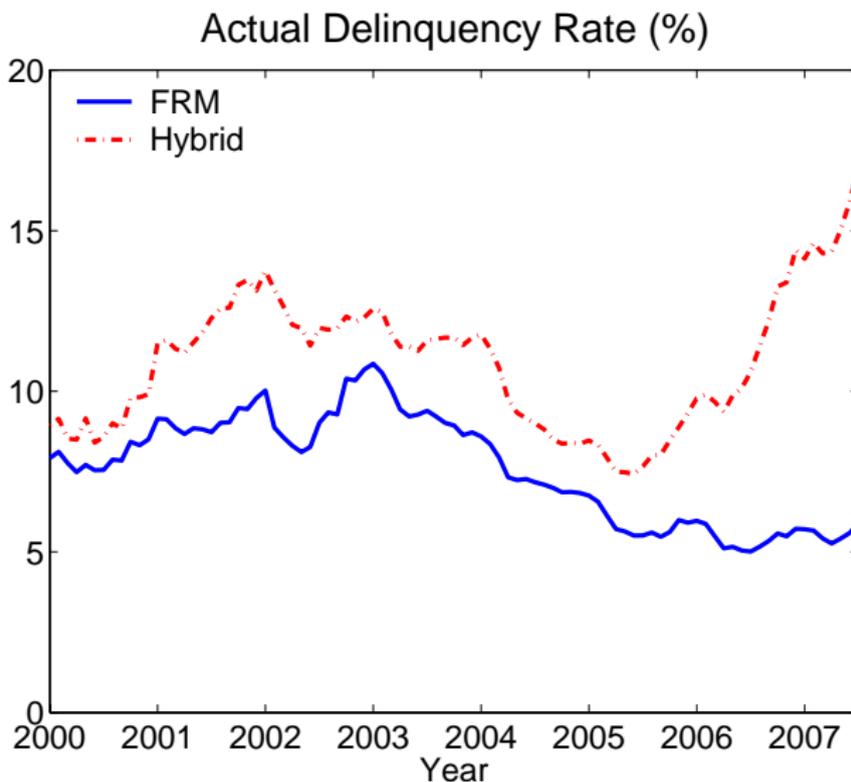
<sup>1</sup> Board of Governors FRS, OCC, FDIC, OTS

<sup>2</sup> HUD, HMDA. Issues: subprime lenders originate prime loans and prime lenders issue subprime loans; not all high-cost are subprime and not all subprime are high-cost

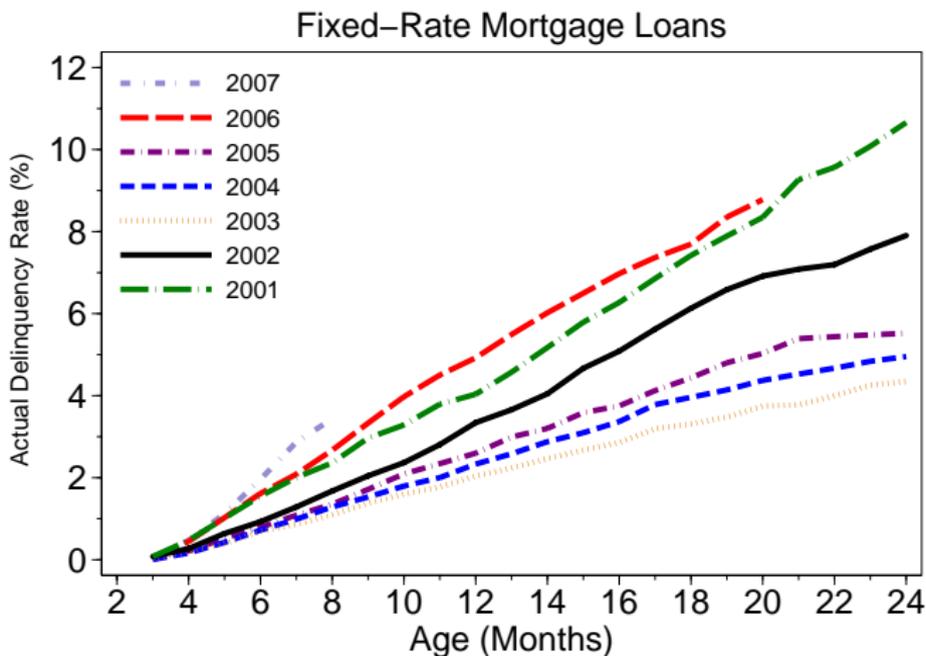
# The Crisis in Subprime Mortgage Market



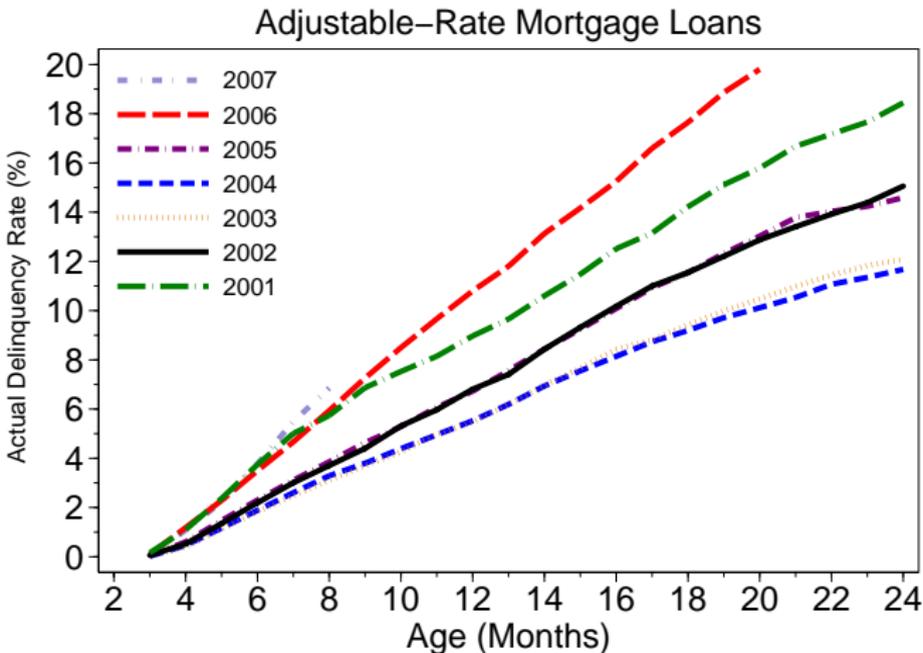
# Delinquency Rates of Outstanding Subprime Mortgages



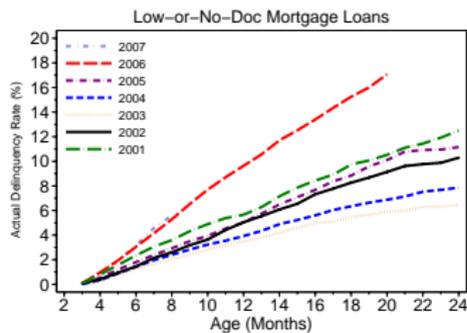
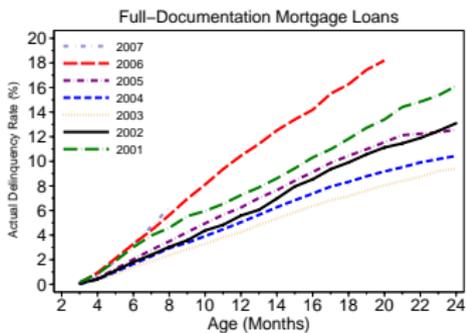
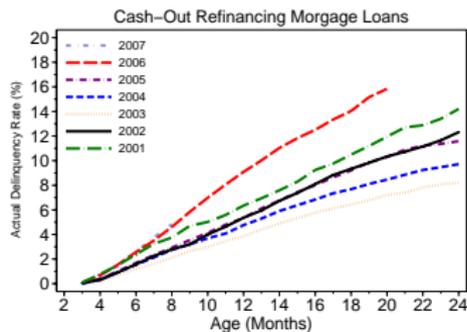
# Delinquency Rates of FRM Subprime Mortgages



# Delinquency Rates of ARM Subprime Mortgages



# Delinquency Rates by Purpose and Documentation



# Evolution of Subprime Mortgage Market

---

---

Year	2001	2002	2003	2004	2005	2006
Subprime Share (%)	7.8	7.4	8.4	13.5	21.3	20.1
Securitized Share of Subprime Loans(%)	54.1	62.9	61.1	75.7	76.3	74.8

---

---

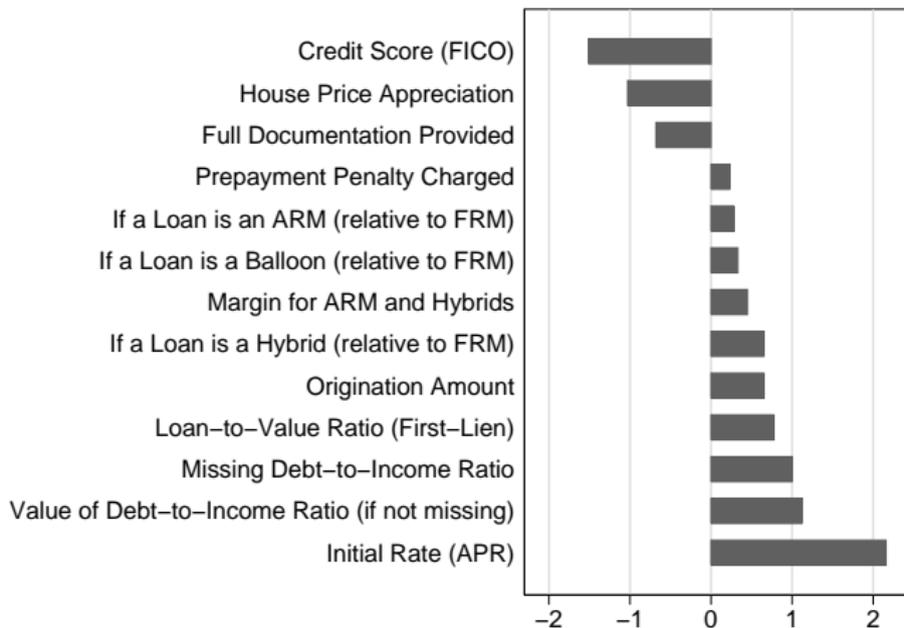
Source: Mortgage Market Statistical Annual, 2007

# Data: Loanperformance Inc. & OFHEO

- Loanperformance: “a self-standing division of First American CoreLogic, Inc., the nations largest and most comprehensive source of real estate business information.”
- Contains data on about 85% of all subprime securitized mortgage loans ( $\approx$  50% of all subprime loans)
- Information included: underwriting criteria, origination date, loan structure, loan status (monthly), property location.
- OFHEO data for the House Price Appreciation (MSA-level, quarterly)

# What “Explains” Delinquency and Foreclosure One Year After Origination

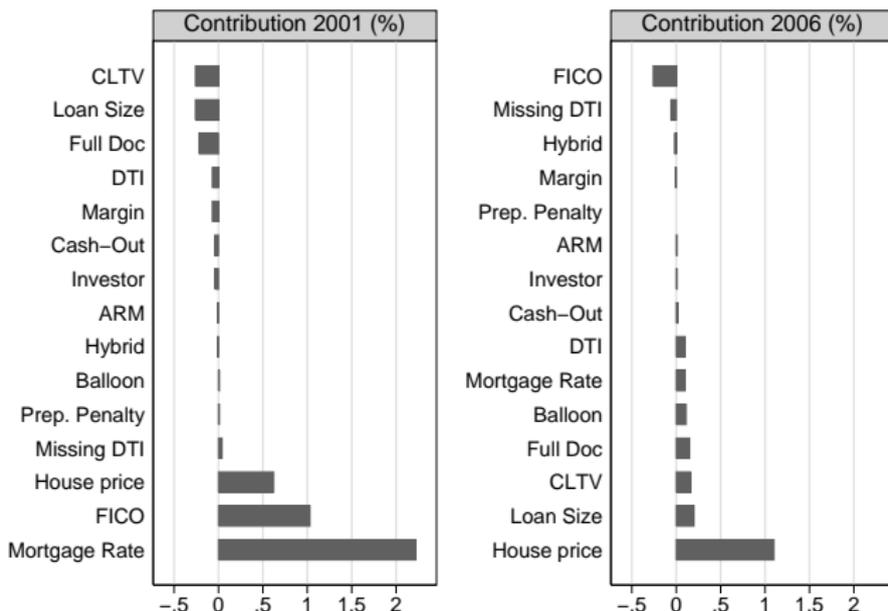
Marginal Impact of Individual Factors  
on Probability of Delinquency and Foreclosure, %



First-Lien Mortgages/Vintage	2001	2002	2003	2004	2005	2006
Number of Loans (*1000)	624	974	1676	2743	3440	2646
Average Loan Size (*\$1000)	151	168	180	201	234	259
FRM (%)	41.4	39.9	43.3	28.2	25.1	26.1
ARM (%)	0.9	1.9	1.3	4.3	10.3	12.8
Hybrid (%)	52.2	55.9	54.7	67.3	62.0	46.2
Balloon (%)	5.5	2.2	0.8	0.2	2.6	14.9
Purchase (%)	35.1	33.9	32.9	42.0	45.7	45.4
Refi. (cash out) (%)	52.1	51.2	51.6	47.9	45.7	44.8
Refi. (no cash out) (%)	12.3	14.6	15.1	10.0	8.6	9.8
FICO Score	620.1	630.5	641.4	645.9	653.7	654.7
Combined LTV (%)	80.0	79.9	80.6	82.8	83.5	84.4
DTI (%)	37.8	38.1	38.2	38.5	39.1	39.8
Missing DTI (%)	41.6	44.1	38.3	35.1	39.2	31.7
With Full Doc. (%)	68.5	63.4	59.8	57.2	51.8	44.7
With Prep. Penalty (%)	66.3	63.8	61.4	60.1	60.6	61.6
Mortgage Rate (APR) (%)	9.4	8.3	7.3	6.7	6.6	7.2
Margin (%)	6.2	6.3	5.9	5.3	5.0	4.9

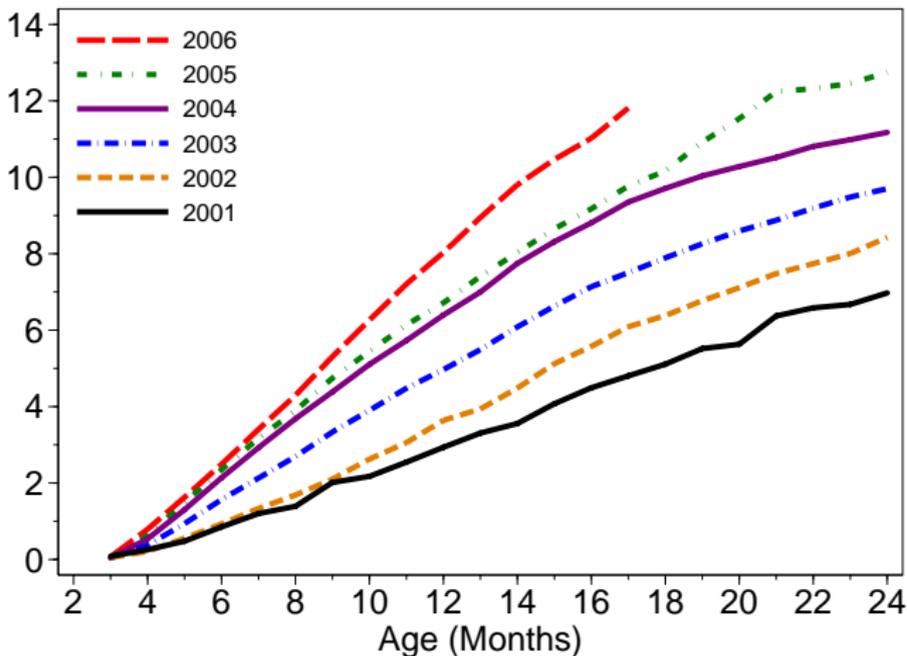
# “Contribution” of Individual Factors in 2001 and 2006 to Explaining Delinquency and Foreclosure

If individual factors equal their values in 2001 and 2006, what would be the change in probability of delinquency and foreclosure?



# "Adjusted" Delinquency Rates

Adjusting for the actual values of individual factors for each loan reveals GRADUAL DETERIORATION.



# International Evidence of Lending Booms Leading to Crises

- Argentina 1980
- Chile 1982
- Sweden, Norway, Finland 1992
- Mexico 1994
- Thailand, Indonesia, Korea 1997

“Lending Booms and Lending Standards”

by Dell’Ariccia and Marquez in JF2006

Sizable booms lead to:

- lowering underwriting standards, decreasing collateral requirement
- decreasing (lender’s) profit margin
- decreasing “unobserved” borrower quality

# Was there a “boom” in Subprime Mortgage Market?

- Market increased dramatically over the past 6 years
- “Accepted” CLTV increased
- “Unobserved” quality of borrowers deteriorated
- Price per unit of risk decreased

CLASSIC LENDING BOOM SCENARIO.

Historically, booms like that have often led to crises or distress.

# Could we Have Known in Advance?

Quality deterioration was a monotonic process over 2001-2006

- Masked by high house price appreciation in 2004-2005
- Could have been detected in 2005 with a statistical analysis
- Riskiness of high-LTV borrowers gradually increased
- Interest rates charged by lenders gradually became more sensitive to the LTV ratio...

# Concluding remarks

## Understanding the Subprime Mortgage Crisis:

- Investor's supply-driven increase in credit availability
- dramatic and monotonic increase in subprime mortgage market
- dramatic and monotonic increase in “unobserved” riskiness of borrowers
- decrease in the price of risk
- disaster was waiting to happen...
- why did it happen now? No more house-appreciation “mask”