Adverse Selection in Mortgage Securitization

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Disclaimer

- The comments here reflect only the authors' views and not those of Freddie Mac or its Board of Directors.

Introduction

- One of the worst financial and economic crises since the Great Depression
- Total volume of outstanding mortgage debt in the U.S.,
  - has grown three times as fast as the GDP over the last decade,
  - is about $14.6 trillion
  - With more than $8.8 trillion in mortgage-related securities
- Jump in default rates in the mortgage market can have dramatic consequences for the real economy.
  - important to identify and investigate the factors that may be contributing to higher default rates in mortgage markets.
- Purpose: to empirically examine potential adverse selection problems in mortgage securitization.
  - whether the loans lenders sell into the secondary mortgage market are riskier than the loans they retain in their portfolios.

Adverse Selection

- The conventional wisdom – Adverse Selection due to asymmetric information
  - Hard data – securitizers cannot directly observe and compare the quality of loans lenders choose to keep for themselves
  - Soft data – lenders may know more about the risk of the loan than captured/disclosed in observable variables
- Mortgage loans involve three kinds of risk:
  - Interest rate risk
  - Prepayment risk
  - Default risk
- We focus on the prepayment risk and default risk and compare portfolio loans with securitized loans with respect to these two risk types.
  - interest rate risk is independent of the borrower's characteristics, and not subject to potential adverse selection concerns.

Secondary Mortgage Market

- GSEs and Private label securities
  - Of the total volume of $7.6 trillion in pooled mortgages at the end of 2008, about $5 trillion is securitized or guaranteed by GSEs while the remaining $2.6 trillion pooled by private mortgage conduits.
- Difference between GSEs and Private labels
  - Risk guarantee – GSEs offer investors guarantees against default risk while private issuers often pass the default risk onto parties willing to bear it.
  - Loan products – GSEs have historically purchased only traditional FRM products and only recently begun purchasing alternative mortgages. Private label issuers have been purchasing these alternative mortgages at much larger scales and for a longer period of time.
  - Securities offered –GSE securities typically involve a single form of an investment bond called Pass-Through Certificates, private label mortgage backed securities involve multiple forms of investments created by splitting the P and I components of the mortgage pool into various tranches.

Literature Review – Securitization, Servicing and Screening

- A number of recent studies investigate the impact of securitization on the quality of loan screening and servicing in mortgage markets.
- Securitization and servicing
  - Piskorski, Seru, and Vig (2008) find evidence of **moral hazard**: significantly lower foreclosure rates for portfolio loans than for securitized loans.
  - Agarwal et al. (2010) find similar evidence: lower probability of modification for securitized loans than portfolio loans
  - Adelino, Gerardi and Willen (2009) offer evidence that servicers renegotiate similar fractions of portfolio loans and securitized loans.
- Securitization and screening
  - Keys, Mukherjee, Seru and Vig (2009) test whether lenders will apply weaker screening standards to applicants with credit scores just above the cutoff point for securtization and find that loans with credit scores just below the cutoff point of 620 FICO are less likely to default.

Literature Review – Securitization and Default

- Elul (2009): securitized prime loans have higher default rates than portfolio loans. However, securitized subprime loans do not perform worse than portfolio loans.
- Ambrose, LaCour-Little and Sanders (2005): loans with lower probability of default are more likely to be securitized.
  The authors attribute their result to two factors: reputation concerns and regulatory capital requirements.

- We:
  Use data that covers more than 4500 lenders
  Consider two alternative models of expectations
  Analyze prepayment as well as default risk
  Compare GSEs and private issuers
  Large vs. Small Lenders

Data Source

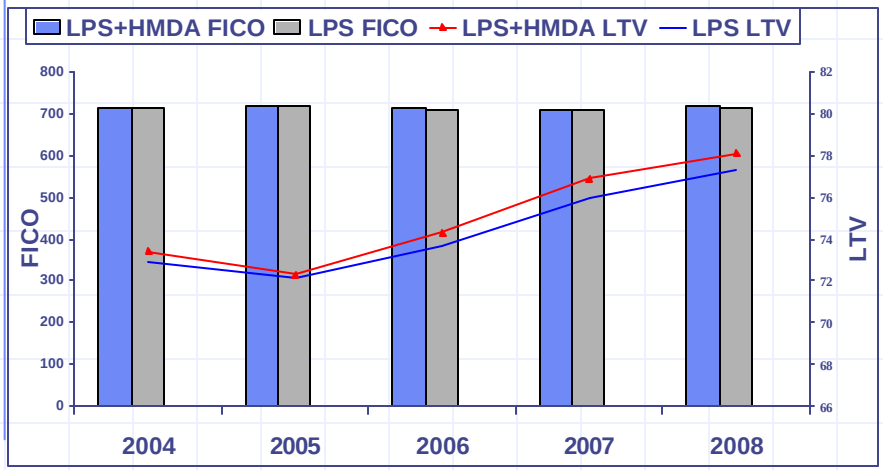
- Lender Processing Services Applied Analytics (LPS / McDash) dataset
- As of July 2008, the dataset included loans from 9 of the top 10 servicers and represented around two-thirds of the mortgage market in the United States.
- Includes agency and non-agency mortgage-backed securities as well as portfolio loans
- Has extensive information about the loan, property and borrower characteristics at the time of origination as well as how the loans subsequently performed.
- Merged with Home Mortgage Disclosure Act (HMDA) data for additional information about the borrower and the lender (income of the borrower, demographic information, differences across lenders)

Data – Issues

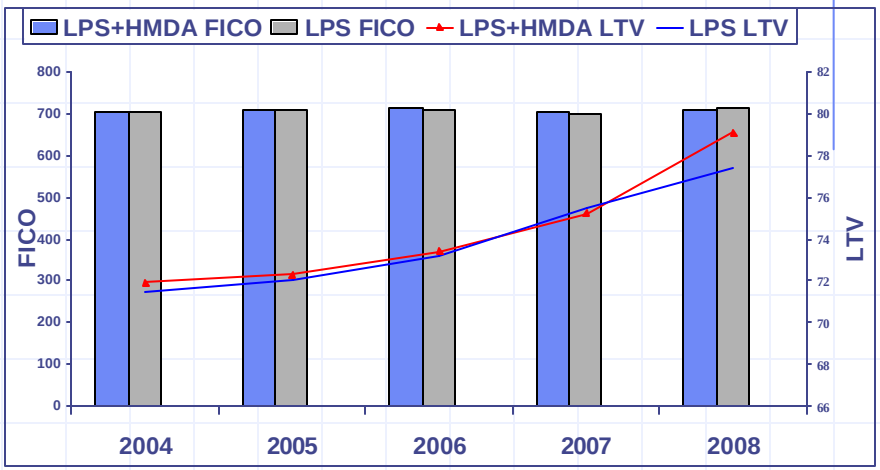
- Coverage
  - Coverage increases over the years - coverage before 2005 not reliable; hard to make inference on time series information
  - Left censoring – Addition of new servicers to the dataset over time means that both loans that have been serviced for years as well as new loans are included in the dataset.
    - We eliminated loans that entered LPS a year after origination.
- Representative sample of the market
  - Primarily large servicers reporting
  - Merge with HMDA further compounds the issue

LPS/HMDA Merge Largely Does Not Change Sample Credit Profile

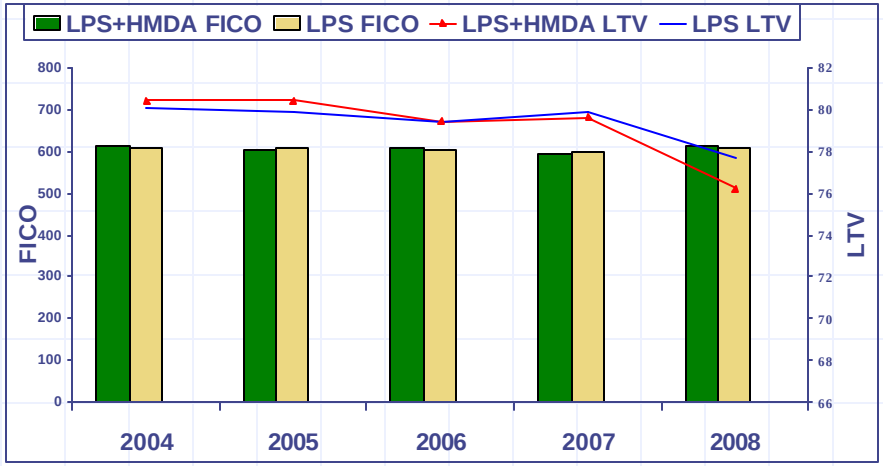
Prime Full Doc



Prime Low/No Doc



Subprime Full Doc



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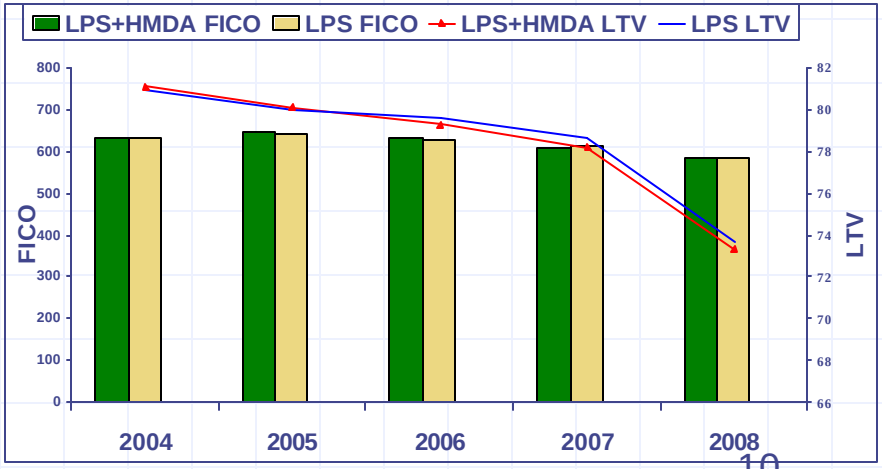


Methodology – 4 steps

1. For prime and subprime loans and for each year of origination, divide the sample population into a random 75% estimation sample and a 25% holdout sample.
   Estimate a competing risk hazard model using the observed default and prepayment outcomes in the following 24 months based on the 75% estimation sample.
2. Score the holdout sample to calculate their expected default and prepayment probabilities.
3. Account for the degree of over- or under-pricing for the loans in the holdout sample.
4. Regress the securitization choice for the loans in the holdout sample on their expected default probabilities, prepayment probabilities, over-pricing and under-pricing indicators obtained from the previous 2 steps, and other variables controlling for the market environment at the time of origination.

Modeling Lenders' Expectations

- Our approach approximates lender's ex ante information at the time the securitization decision is made.

- We consider two types of expectation models:

  1) Perfect Foresight where lenders are assumed to have perfect foresight on how loans with similar characteristics will perform

  2) Adaptive Expectations where the lenders form their expectations according to previous two years' experience.

Segmented Analysis – Sample Loan Characteristics

Methodology – segment prime and subprime sectors first and perform separate analysis in Each sector

Verify loans partitioned correctly – Loans in prime (subprime) portfolio generally resemble loans securitized through prime (subprime) channel

Prime

	Kept in Portfolio				Sold to GSEs				Sold to Private Label			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
FICO	728	731	731	734	731	727	726	724	733	728	720	726
LTV ratio	69	70	70	70	65	67	68	70	69	70	70	70
Jumbo	0.17	0.11	0.05	0.09	0.01	0.01	0	0	0.29	0.28	0.26	0.29
Low/No Documentation	0.13	0.07	0.06	0.05	0.18	0.25	0.3	0.28	0.21	0.22	0.26	0.24
Coupon Rate	5.59	5.68	6.24	6.19	5.66	5.83	6.47	6.31	5.9	6	6.64	6.42

Subprime

	Kept in Portfolio				Sold to GSEs				Sold to Private Label			
	2004	2005	2006	2007	2004	2005	2006	2007	2004	2005	2006	2007
FICO	607	616	623	611					641	620	625	619
LTV ratio	79	80	84	77					78	80	79	77
Jumbo	0.11	0.1	0.13	0.11					0.08	0.08	0.08	0.09
Low/No Documentation	0.21	0.24	0.24	0.16					0.32	0.28	0.21	0.17
Coupon Rate	7.46	7.42	8.69	8.62					7.48	7.92	8.28	8.26

Competing Risk Model Results – Default Model Estimates

Prime

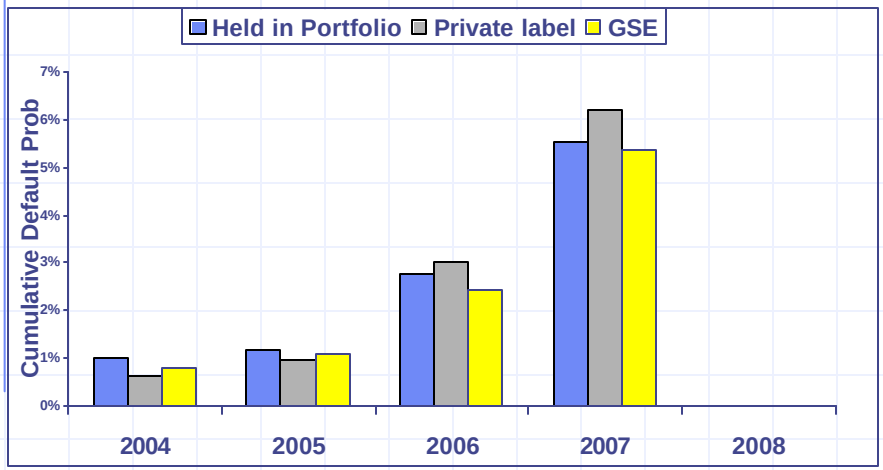
	2004		2005		2006		2007	
Default Outcome	**Coefficient**	**P > |z|**	**Coefficient**	**P > |z|**	**Coefficient**	**P > |z|**	**Coefficient**	**P > |z|**
Constant	0.04	0.923	1.068**	0.001	-0.329	0.497	-0.615**	0
FICO	-0.018**	0	-0.018**	0	-0.016**	0	-0.015**	0
Income	-0.007**	0	-0.005**	0	-0.001**	0	0.000*	0.024
LTV ratio	0.034**	0	0.034**	0	0.034**	0	0.031**	0
Conform	-0.101	0.263	-0.207**	0.001	-0.330**	0	-0.342**	0
Time (in months)	0.342**	0	0.184**	0	0.252**	0	0.262**	0
Time ^{2}	-0.009**	0	-0.004**	0	-0.005**	0	-0.004**	0
Jumbo	-0.213	0.217	-0.19	0.066	0.07	0.168	0.136**	0.007
Low Documentation	0.07	0.228	0.222**	0	0.125**	0.001	0.206**	0

Subprime

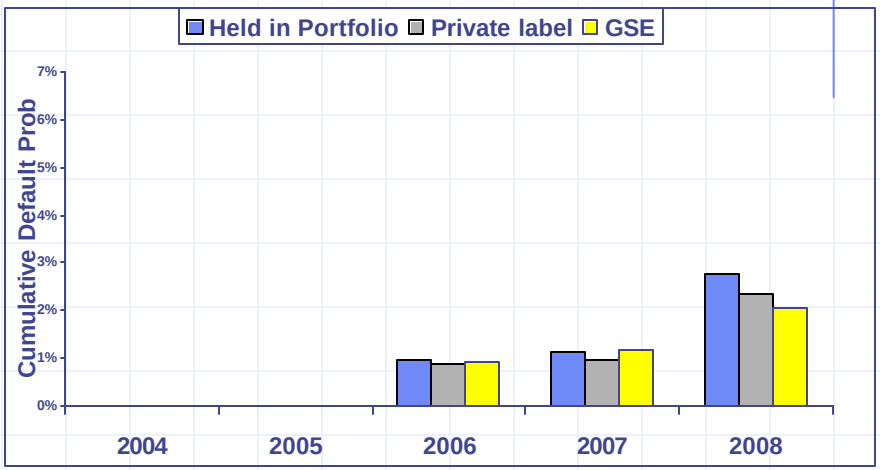
	2004		2005		2006		2007	
Default Outcome	**Coefficient**	**P > |z|**	**Coefficient**	**P > |z|**	**Coefficient**	**P > |z|**	**Coefficient**	**P > |z|**
Constant	-2.766**	0	-3.835**	0	-3.931**	0	-3.450**	0
FICO	-0.011**	0	-0.008**	0	-0.008	0.414	-0.009**	0
Income	-0.003**	0.004	0	0.229	0.000**	0	0.001*	0.02
LTV ratio	0.027**	0	0.021**	0	0.029**	0	0.028**	0
Conform	-0.705**	0.01	-0.690**	0	-0.628**	0	-0.389	0.128
Time (in months)	0.262**	0	0.279**	0	0.300**	0	0.257**	0
Time ^{2}	-0.007**	0	-0.008**	0	-0.009**	0	-0.007**	0
Jumbo	0.296	0.177	0.067	0.491	0.375**	0	0.258	0.074
Low Documentation	0.454**	0.001	0.479**	0	0.823**	0	0.678**	0

Score Results – Expected Default Rates

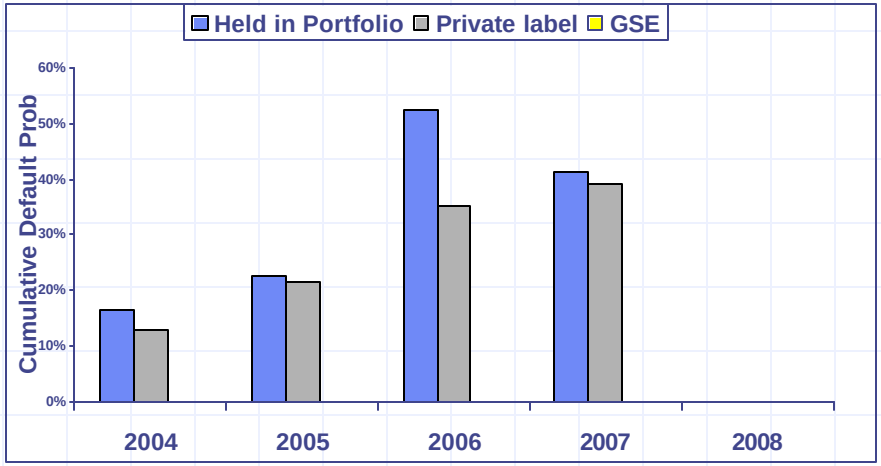
Prime Perfect Foresight



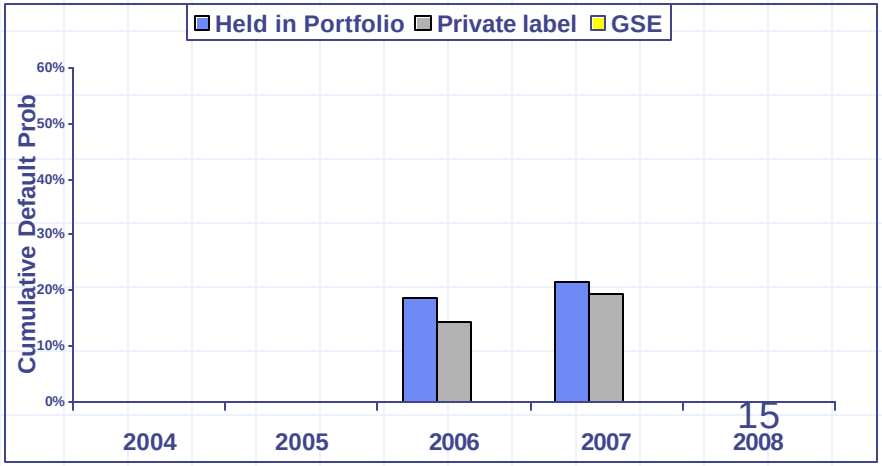
Prime Adaptive Expectations



Subprime Perfect Foresight

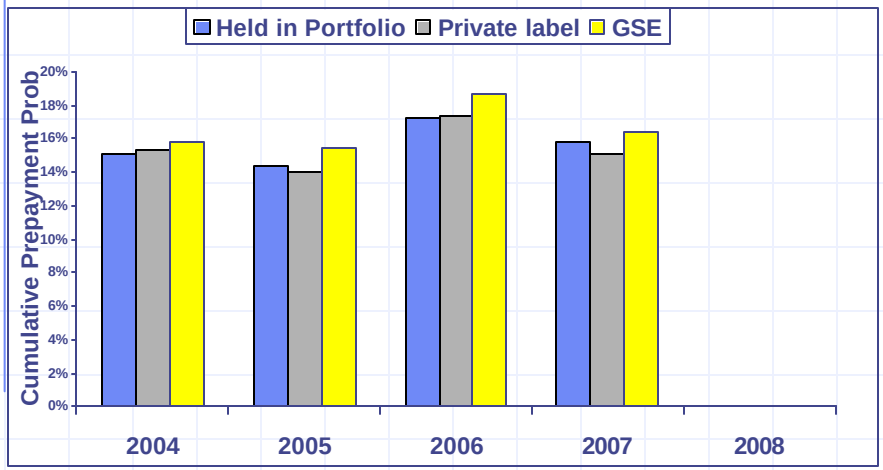


Subprime Adaptive Expectations

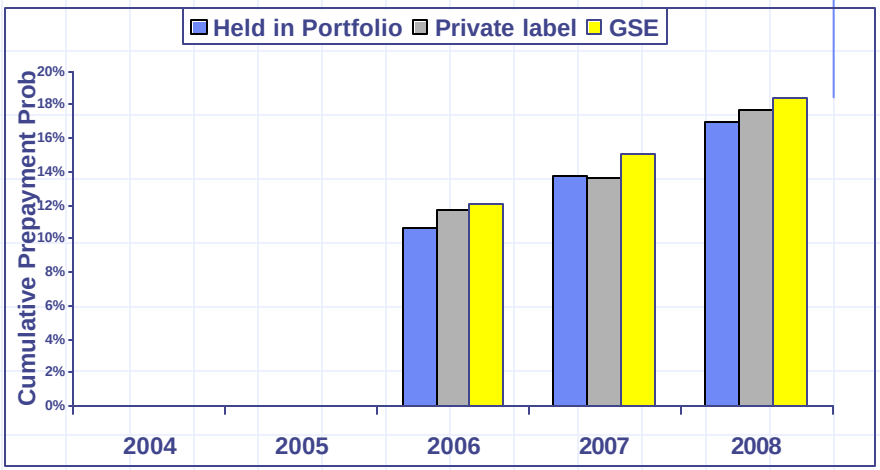


Score Results – Expected Prepayment Rates

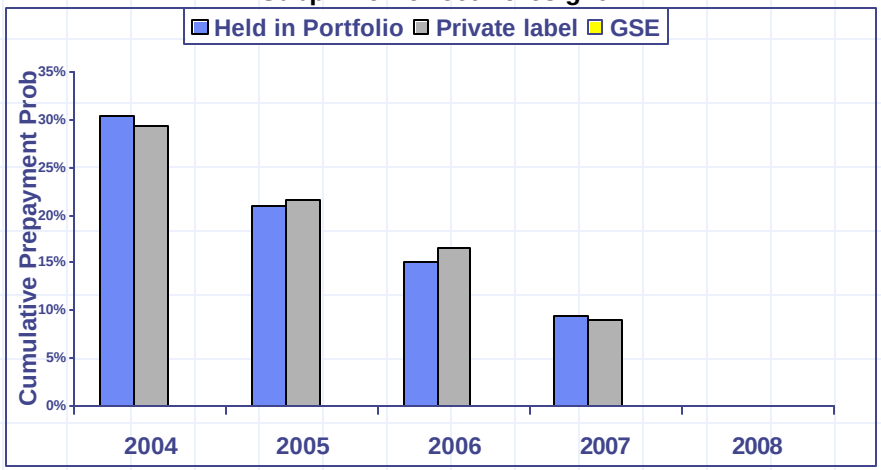
Prime Perfect Foresight



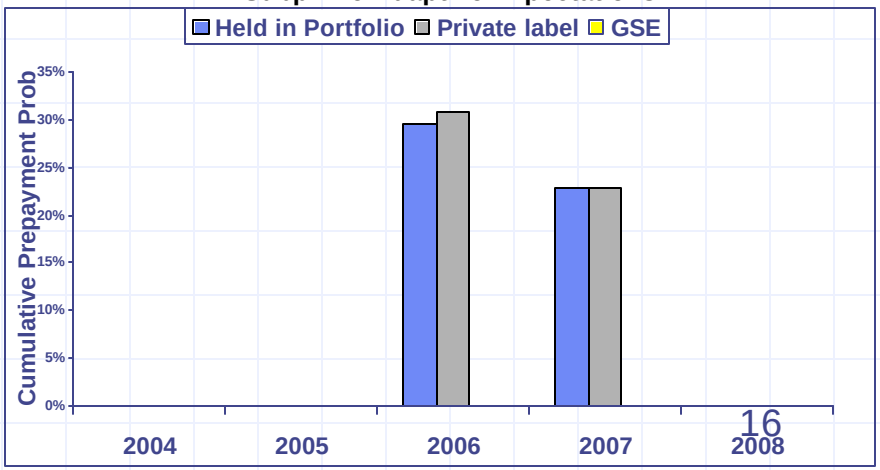
Prime Adaptive Expectations



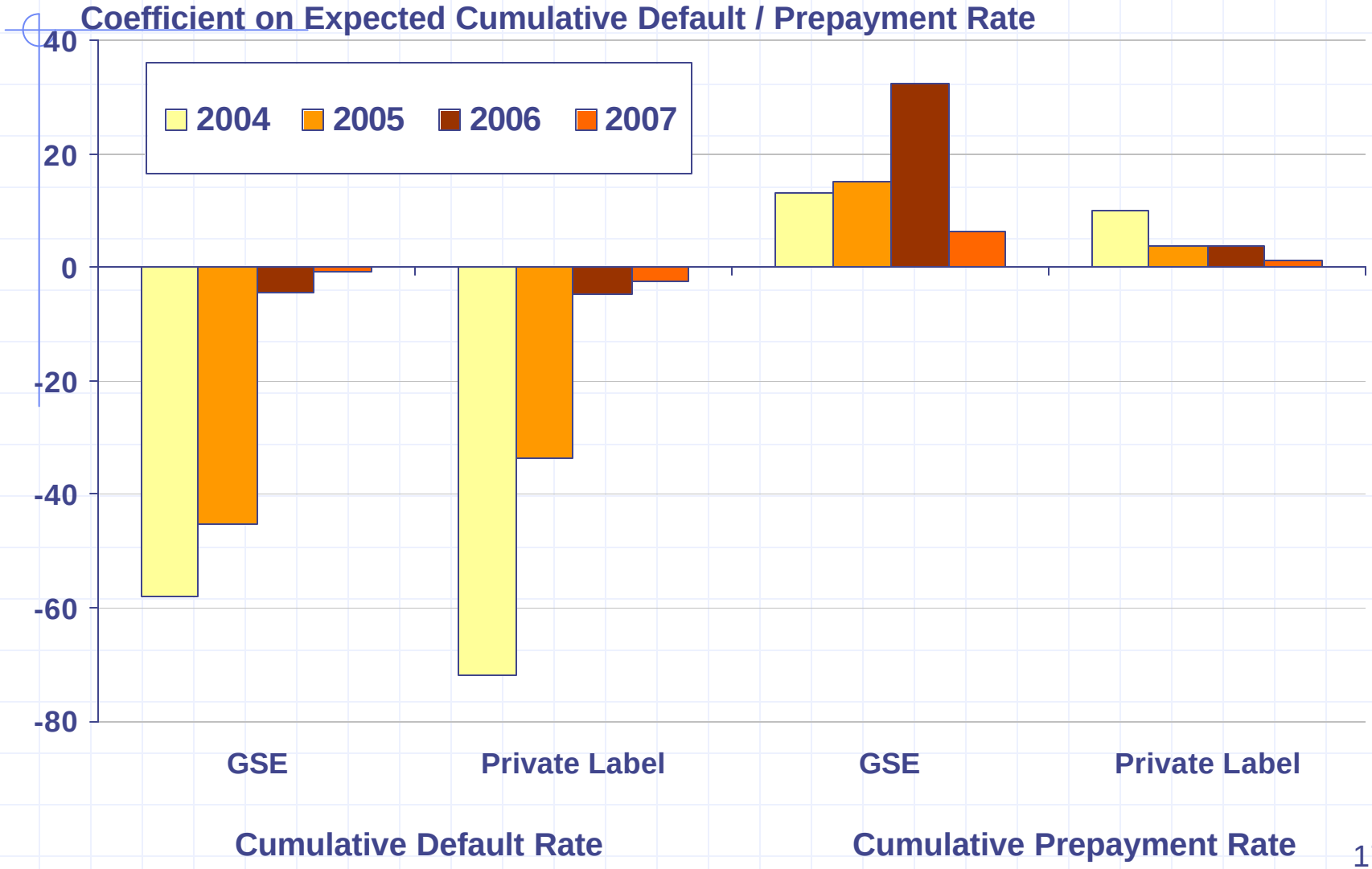
Subprime Perfect Foresight



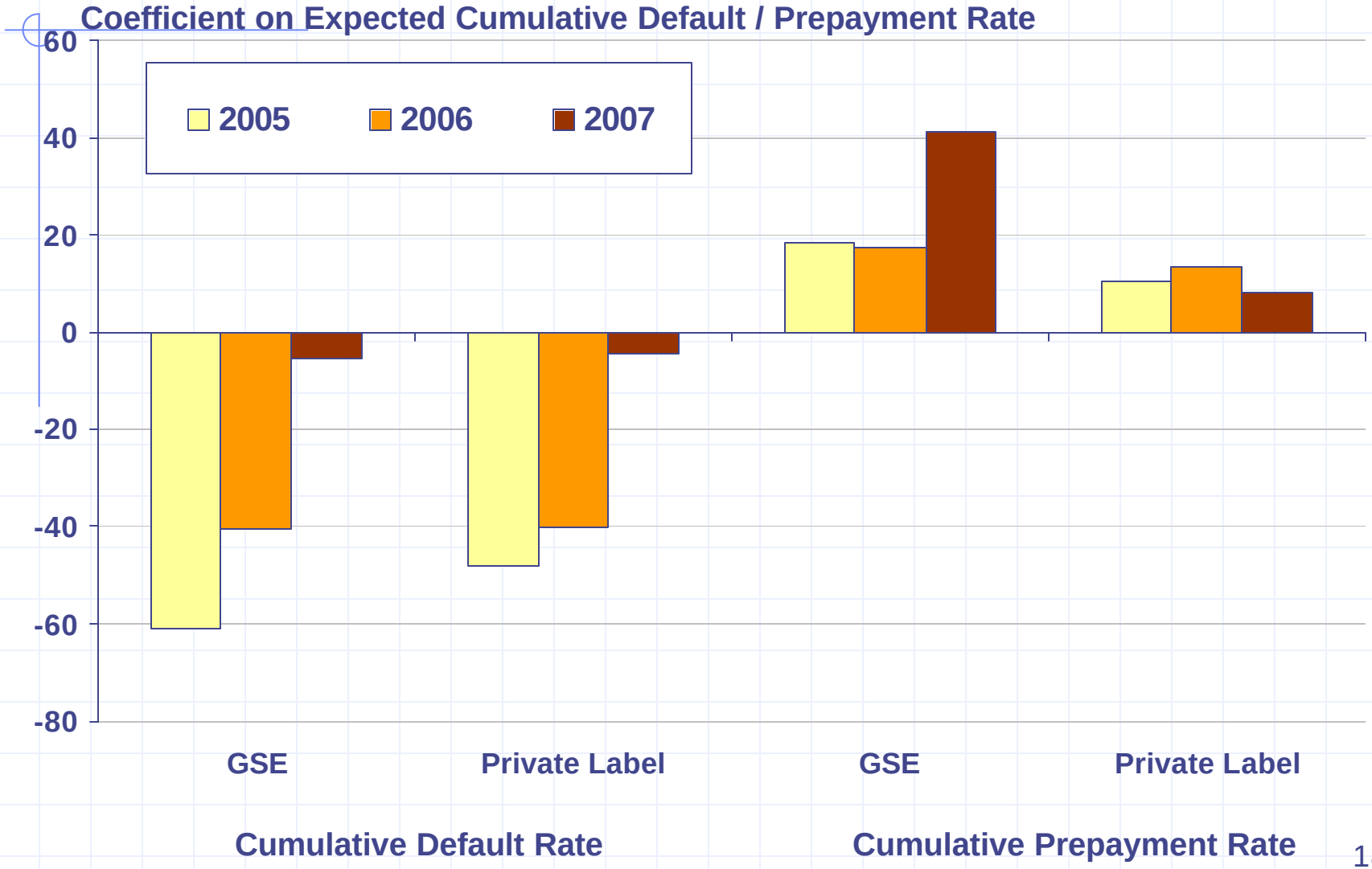
Subprime Adaptive Expectations



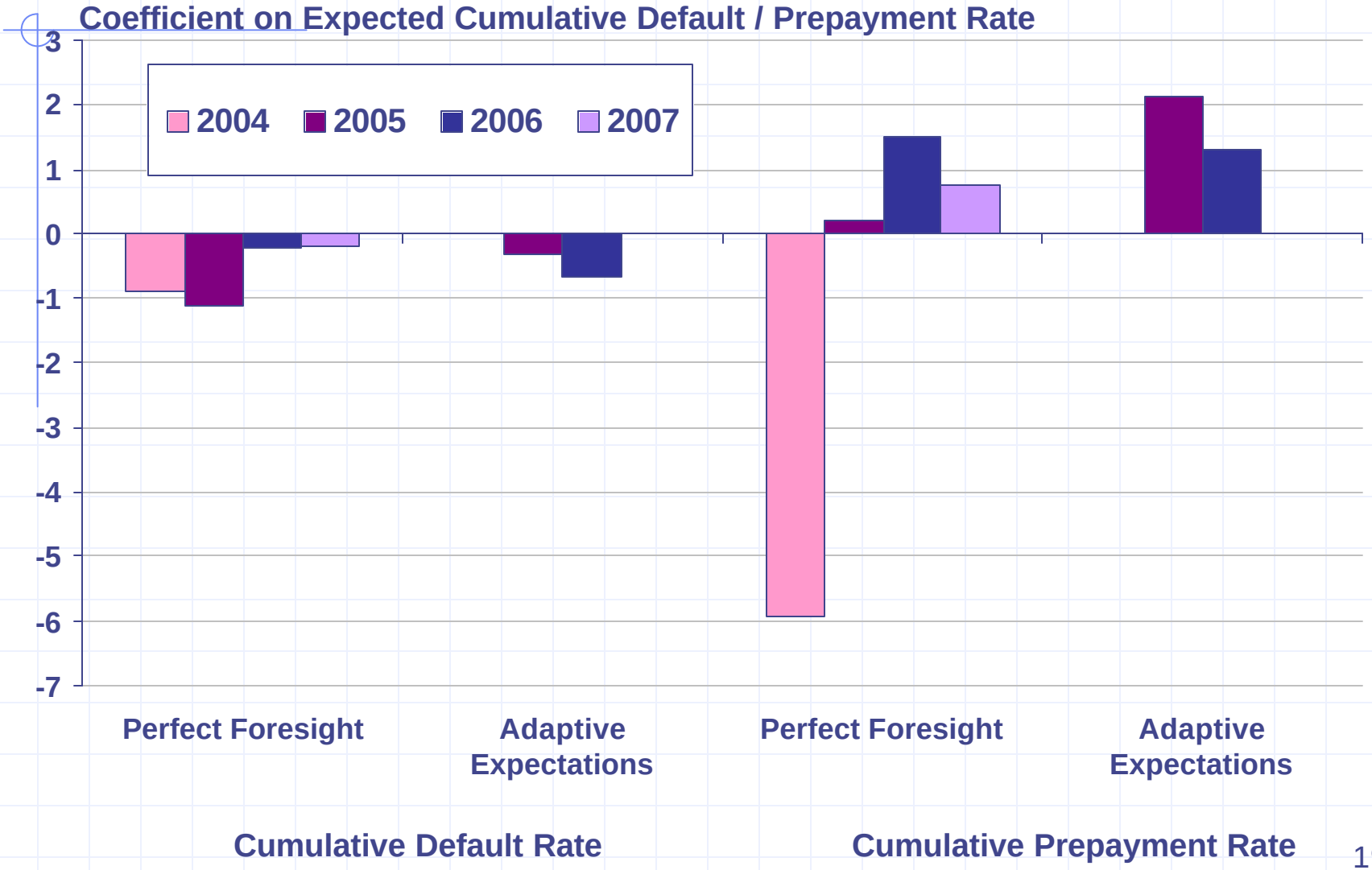
Securitization Results – Prime Sector Perfect Foresight



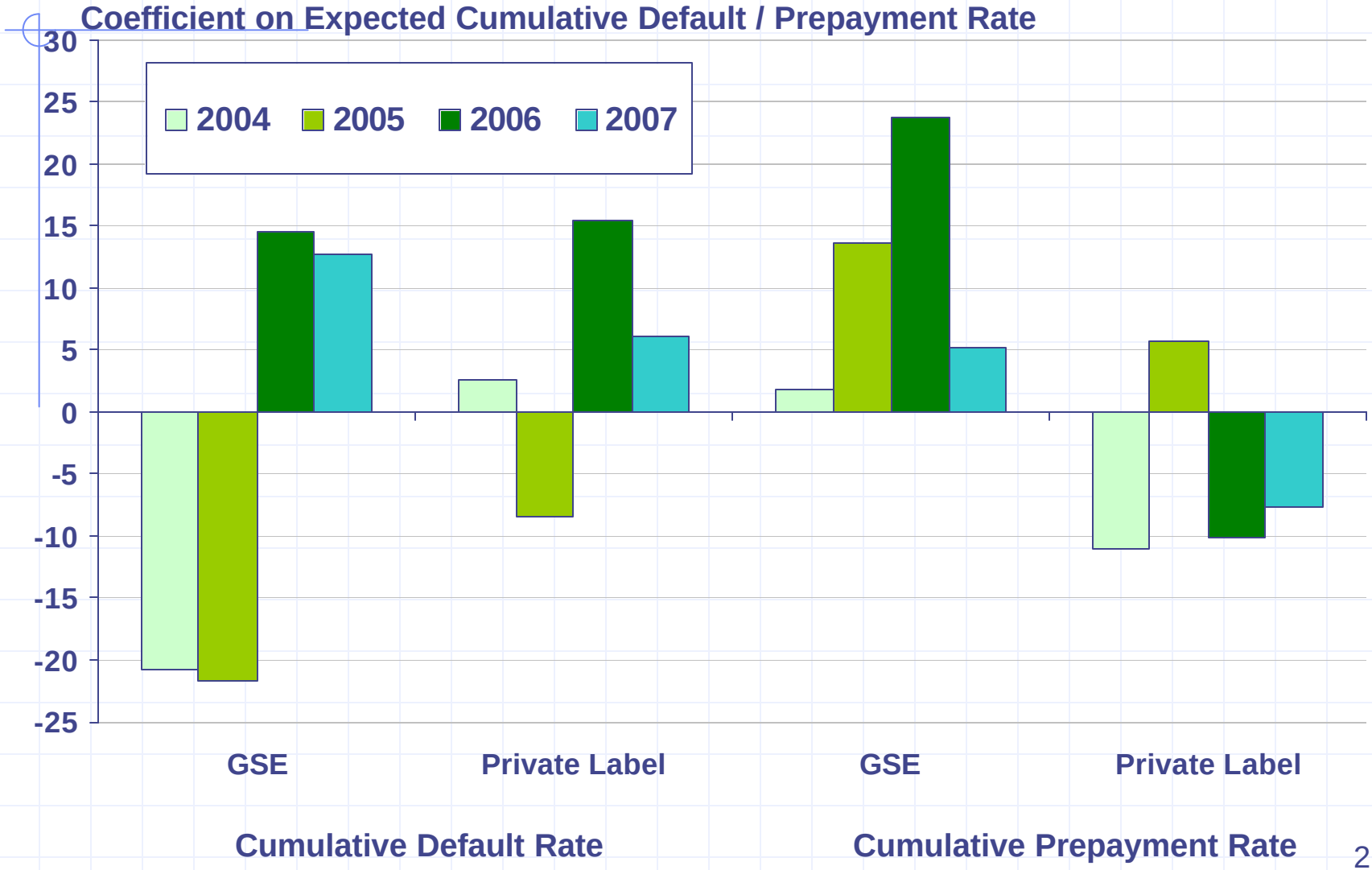
Securitization Results – Prime Sector Adaptive Expectations



Securitization Results – Subprime Sector



Securitization Results – Prime Sector Perfect Foresight Small Lenders



Conclusion

- Strong evidence that banks sold low default risk loans into the secondary market and retained higher default risk loans on their portfolios.
  - The result holds for subprime as well as prime loans, although the difference is smaller for subprime loans.
- Support for adverse selection with respect to prepayment risk; securitized loans had a higher prepayment risk than portfolio loans.
- Lenders became less and less likely to hold high default loans from 2004 to 2007.
- Further indicator of adverse selection: Small lenders behave differently.
- Compared to loans sold to GSEs, loans sold to private issuers have lower prepayment rates while relative default rates show variations across years.

Discussion-1

- Reputation concerns alone cannot explain these results.
  - Lenders could presumably maintain good reputation by simply randomizing their decisions of which loans to securitize.
- Swap programs do not fully explain the results.
  - Owning securities backed by a pool is different than owning the loans directly because while the GSE bears the default risk in the former case, the originator bears the risk in the latter case.
  - Not all mortgage loan sales take place through a swap program.
- One compelling argument: GSEs and private labels have very high underwriting standards. It is possible that a subset of the loans that fail to meet the GSE and private issuer criteria are still acceptable to lenders.
- In addition, enforcement of GSEs' repurchase policy raises cost to lenders for securitized loans going into default

Discussion-2

- The most compelling explanation: in return for selling loans with lower or comparable default risks, lenders retain loans with lower prepayment risk on their portfolios.
- During the high refinancing years, retaining loans with lower expected prepayment rate might have been a much more profitable strategy than retaining the loans with lower expected default rate.
- Furthermore, trading low default risk for low prepayment risk also helps originators maintain their reputation, minimize the probability and the cost of being required to repurchase loans, and satisfy high underwriting standards of the secondary market, as these concerns all pertain to default risk, but not to prepayment risk.
- All of this further supported by our results for Small vs. Large lenders

Issues and Next Steps

- Current approach imposes strong assumption that lenders ultimately decides what to securitize.
  - Enhancement 1: delete loans delinquent before average time to securitization
  - Enhancement 2: instrument securitization and repeat analysis with default
- Single out low/no doc part of the market.
- Further robustness checks from other datasets.
  - Define subprime by HMDA lender list
  - Repeat analysis using LoanPerformance data