

Vintage Effects in Loan Default Models

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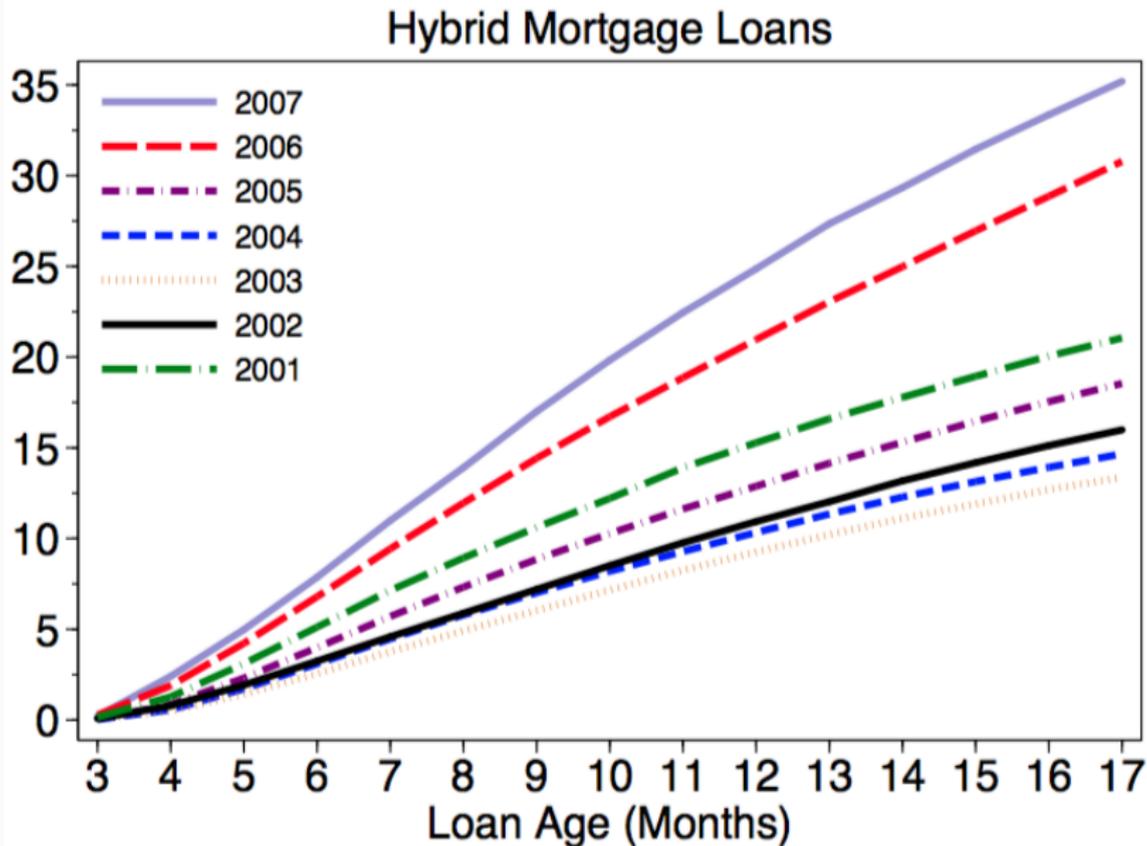
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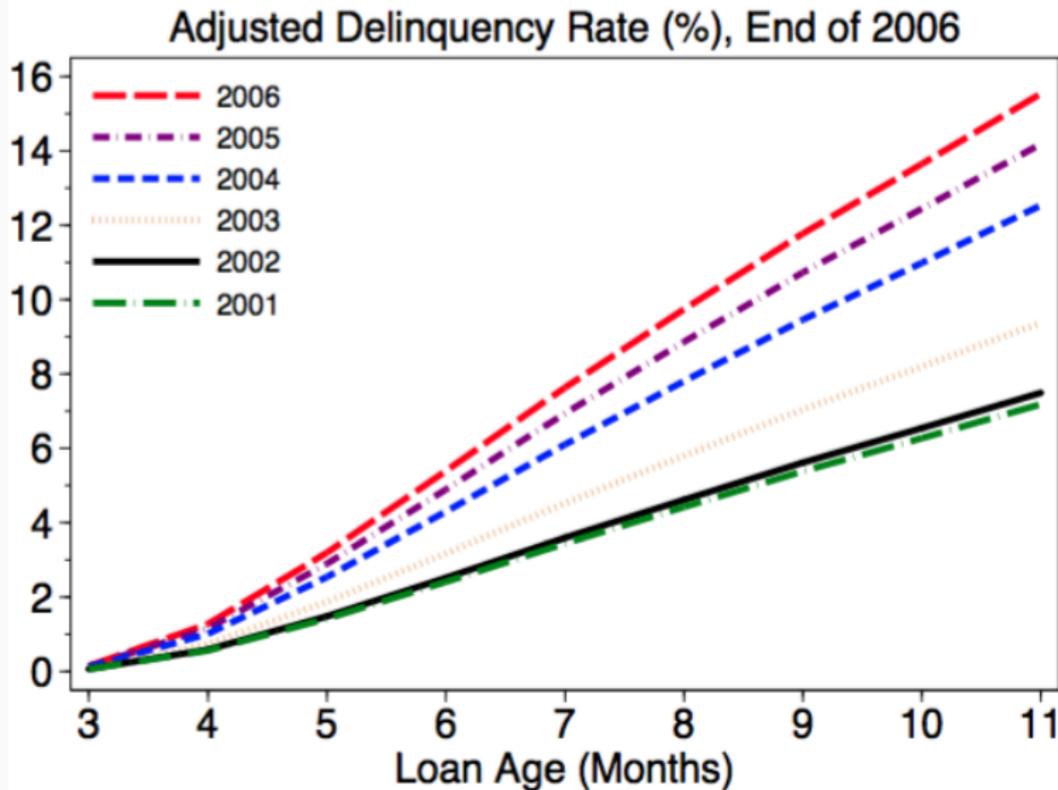
Overview of the Paper

- Loan performance depends on origination period, even when controlling for observables
- Commonly modeled using fixed effects
- Key insight: if these vintage effects due to unobserved heterogeneity, they will not remain constant
- Instead, modeled in competing hazard framework to better capture dynamic selection

From Demyanyk and Hemert (2011): Default Vintage Effects



From Demyanyk and Hemert (2011): Default Vintage Effects



Where do Vintage Effects Come From?

- Differences in loan performance, conditional on observables, by origination time period due to:
 - Data is bad (Piskorski et al. 2013, Haughwout et al. 2011)
 - Model is changing over time (ie, credit “thin files”)
 - Borrower type worsening (adverse selection)
 - Elasticity of default wrt prices is higher (moral hazard)
 - Greater prevalence to adverse shocks (ie, unemployment)
 - Dynamic selection (loan pools changing over time)
- In their framework, mortgages are drawn from distribution of unobserved heterogeneity at origination
- As mortgages with higher default, prepayment risk drop out: pools should become more similar

Vintage Effects not Constant over Time

	Last vintage included (+1yr extra data)							
Vintage	2005	2006	2007	2008	2009	2010	2011	2011*
2004	0.670	0.871	1.007	0.993	0.937	0.955	0.958	0.996
2005	0.460	0.681	0.747	0.842	0.898	0.928	0.925	1.005
2006		1.335	1.568	1.477	1.312	1.249	1.180	1.309
2007			1.532	1.486	1.419	1.284	1.247	1.395
2008				1.786	1.502	1.234	1.132	1.327
2009					1.419	0.946	0.726	0.828
2010						0.229	0.291	0.346
2011							0.338	0.443

Initially, 2003-2004 cohorts outperform 2003 (reference)

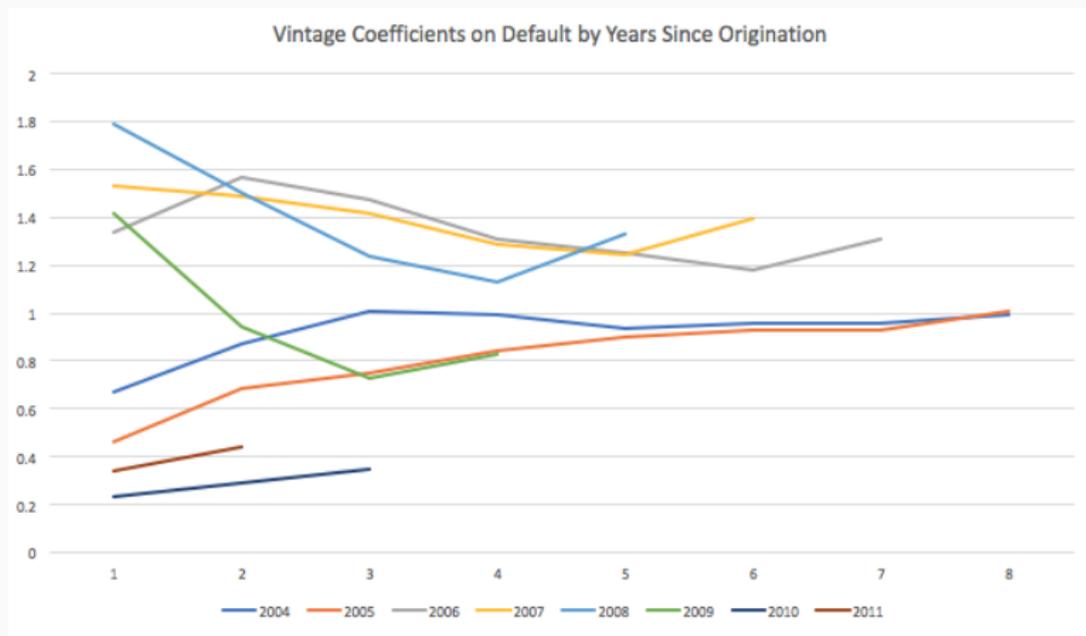
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Outperformance gone by end of sample

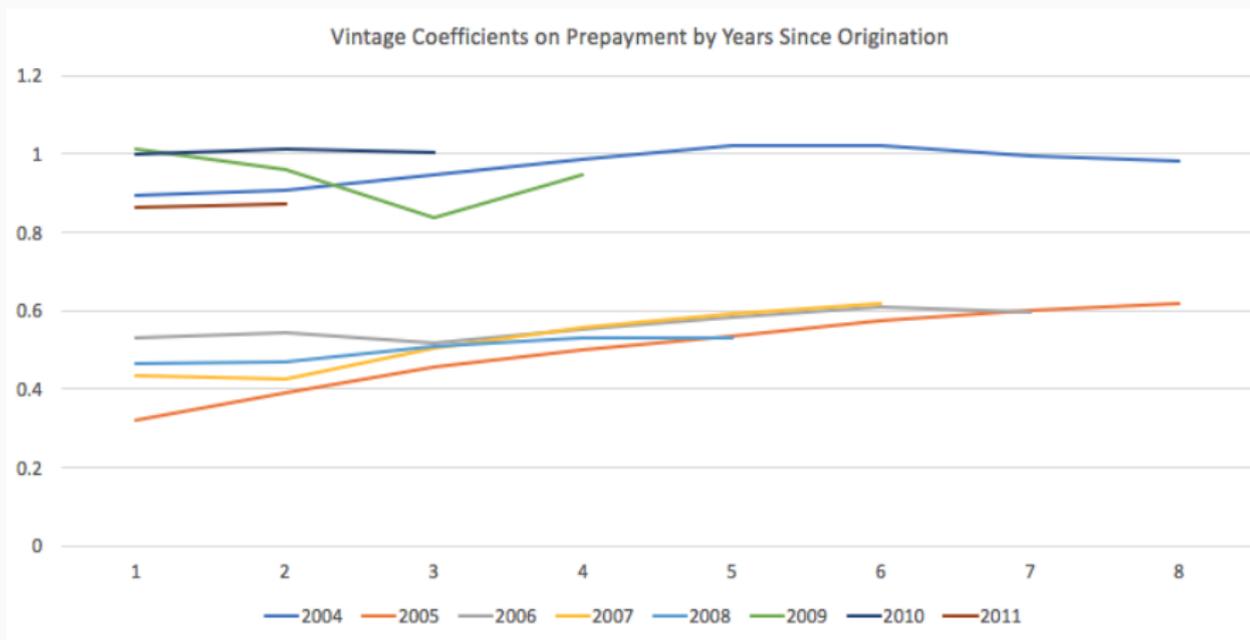
Whatever the source of unobservable differences, vintage fixed effect will not do well out of sample as worse loans exit

The Vintage Effects of Vintage Effects



Autoregressive coefficient = 0.77

The Vintage Effects of Vintage Effects



Autoregressive coefficient = 0.82

Competing Hazard Framework

- Borrowers from literature on modeling unobserved heterogeneity in duration models
- Two types of borrowers in terms of risk of default; risk of prepayment can be correlated
- Proportional hazard is discrete multinomial distribution over J points of support
- Vintage effects are mixture distributions which vary across vintages
- Comment: Default modeled only as borrower decision (and leading to exit in sample); but lenders make decision to modify (re-enter sample) or foreclose

What Do We Learn About Vintage Effects

- I am a little confused whether the goal is to estimate $\hat{\beta}$ or \hat{y} :
- If the goal is to understand borrower behavior:
 - What economic parameters is the paper measuring?
 - Would like to know why vintage effects decay in persistence
 - In particular, how much can be attributed to changes in underwriting standards vs. borrower behavior
- If the goal is to improve out-of-sample prediction (ie, for stress testing):
 - Would like to see cleaner comparison of vintage fixed effect null against this approach (and also random effects)
 - Already have mixture distribution, so why not hierarchical Bayesian model?
 - Machine Learning?

To Conclude

- Interesting preliminary paper: thinking about vintage effects from perspective of heterogeneous borrower quality and dynamic selection
- Would like to see greater analysis of what we learn economically about borrower behavior or loan underwriting from disentangling the blackbox of “vintage effects”
 - Revisit or corroborate the Demyanyk-Hemert stylized fact?
- Would also like to see innovation in mortgage modeling move to the frontier of statistical practice

Thank You!