



Subprime cohorts and loan performance [☆]

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ABSTRACT

Loan performance of subprime originations during the boom years of 2004–2006 is contrasted with that of subprime originations during the early period of 2000–2002. A counterfactual technique is developed to determine how originations during the early period would perform in a different environment, namely, the environment faced by originations of 2004, 2005, and 2006. In an environment where house prices are increasing rapidly, low credit score originations do not show high rates of default—as was witnessed for 2000–2002 cohorts. However, in an environment of stagnant or deteriorating home prices, low credit score originations show significantly higher rates of default than high credit score originations. With a greater proportion of low credit score originations, earlier cohorts of 2000–2002 were no less vulnerable to the environment faced by cohorts of 2004–2006. In essence, these results raise concerns about the viability of all cohorts of subprime originations because of their reliance on the appreciation of the underlying collateral rather than the creditworthiness of the borrower.

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1. Introduction

“Paulson did not see the size of the coming crisis. Nor did the others. At one point, having put on a large position, Paulson and his team thought they had made a fatal mistake because with their trades the firm had bet against [subprime mortgages that] were handed out before 2006, and were for homes that already had appreciated in value (emphasis added; Zuckerman, p. 159). They traded out of those positions and into later vintages, thinking they dodged a bullet. This was a widespread view, that subprime vintages prior to 2006 were much safer; it was supported by the data,

as Paulson and Pellegrini found out. But, when the crisis came, there was no distinction between pre- and post-2006 vintages. Everything went down in value, including bonds linked to the earlier subprime vintages!”³

Defaults on subprime mortgages in 2006 and 2007 precipitated the current housing crisis. The sheer magnitude of this problem has called into question many of the lending practices that led to this downturn. Most of the existing literature on subprime mortgages has focused on poor quality of loans originated during 2004–2006, the peak of the housing boom.⁴ The typical evidence presented relates to a widespread deterioration in subprime mortgage quality since 2004. However, even after almost half a decade since the first problems in housing, the market for housing continues to deteriorate. The collapse and the consequent near disappearance of subprime originations have led many to reassess the depth of the subprime malaise and mortgage securitization in general. Additionally, some of the lending practices that were in vogue even before the peak of the housing bubble are now being scrutinized (Pinto, 2010).

This paper is an investigation of the viability of subprime mortgage originations from 2000 through 2006. In particular, our study contrasts securitized subprime originations during the boom years of 2004–2006 with loans originated during an early period of

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² The views expressed are those of the individual author and do not necessarily reflect official positions of the Federal Reserve Bank of Kansas City, the Federal Reserve System, or the Board of Governors.

³ Gorton (2011, pp. 452–453).

⁴ See Mayer et al. (2009) and Levitin and Watcher (2010) for a survey of this literature.

2000–2002. As mentioned above, there is widespread agreement about the non-viability of subprime mortgages originated during the boom years of 2004–2006. In comparing originations from the same securitized subprime universe over different cohorts, our study is particularly vulnerable to the criticism in [Summers \(1985\)](#).⁵ Nevertheless, this study helps gain a better understanding about the viability of subprime mortgages as they existed during 2000–2006. These questions assume greater importance given their role in the recent financial crisis and the resurgence of FHA-insured mortgage loans.⁶

We begin by studying important trends in observable origination characteristics of subprime mortgages during 2000–2006. Over these years, the significant decline in origination characteristics in terms of loans with higher loan-to-value (LTV) ratios or lack of full documentation on the origination has been well documented (see [GAO \(2010\)](#) and references therein).⁷ In this study, we begin by pointing to evidence that have not received much attention in the literature.

First, we demonstrate that there was a significant increase in the credit quality on subprime originations as measured by their origination credit scores. We also note that this change is a subprime phenomenon and not a result of changes in credit scores of the US population. Second, over the years we find evidence of increasingly higher credit scores on mortgages with other riskier attributes on the origination. This result seems to suggest that over the cohorts, higher credit scores were used to offset other riskier attributes on the origination. We are not the first to point this out: Early indications of these trends were first observed in [Chomsisengphet and Pennington-Cross \(2006\)](#). Moreover, we find that origination credit scores on later cohorts are higher even after one adjusts for other originations characteristics. Third, we find that in terms of some basic observable origination characteristics, the minimum criterion to obtain a subprime loan actually strengthened over the two periods. Contrary to perceived wisdom, we find that the proportion of mortgages originated below certain minimum criteria was higher during the early period of 2000–2002 than the boom years of 2004–2006. In fact, several observers and practitioners in the industry have also commented on this trend as a move away from borrowers that were designated as subprime towards those that were more likely to be Alt-A. We provide anecdotal evidence showing that some observers have described this phenomenon in terms of the creation of an Alt-B sector of the economy (see Section 3.4 for details). In summary, we observe that the decline in loan quality that is attributed to the demise in subprime mortgages was not observed throughout this market segment.

Following this, we demonstrate that the trend of increasing credit quality (as measured by credit scores on the origination) is non-trivial especially in terms of loan performance. We use a competing risk hazard model to study the determinants of default and prepayment for each cohort of subprime originations from 2000 to 2006. We are interested in comparing and contrasting the effect of

different origination characteristics on loan performance. This is in keeping with our observations of trends on subprime originations—the attempts to offset riskier origination characteristics by originating such loans to borrowers with higher credit scores. Not surprisingly, we find that increases in credit scores reduce the default hazard and increase the prepayment hazard whereas the converse is true for increases in CLTV.⁸ More important, we observe that for every cohort in our sample, the effect of credit scores on the default hazard is stronger than the effect of LTV. In essence, we observe that origination credit scores are indeed an important and robust predictor of loan default.

Finally, we introduce a counterfactual technique to determine how originations during the early period would perform in a different environment, namely, the environment faced by originations in 2004, 2005 and 2006.⁹ In so doing, we observe that representative originations during the early period of 2000–2002 would not have performed significantly better than originations in 2004, 2005 and 2006. This result is robust to counterfactual exercises for originations with different values of the combined loan to value ratio (CLTV). In fact, earlier cohorts show significantly worse performance especially for high-CLTV originations (CLTV > 90). This is largely due to fact that high-CLTV originations of later cohorts had significantly higher credit scores on these originations.

Our results from both the competing risk hazard estimation and the counterfactual exercise confirm that origination credit scores are an important driver of loan performance. While an environment of declining house prices can adversely affect loan performance for high credit score originations—the effect on low credit score originations can be particularly severe. Consequently, low-credit score originations of later cohorts have significantly lower survival rates. Moreover, originations of later cohorts have higher credit scores—not only in absolute terms, but also after adjusting for other attributes on the origination. In essence, this explains why the estimated survivor functions of later cohorts demonstrate higher survival rates than their corresponding counterfactual survivor functions.

These results also suggest that the differences in real performance of originations between the two periods can largely be attributed to factors *ex post* to the origination than those *ex ante*. In essence, our results demonstrate that we should not ignore the possibility that problems on subprime mortgages were not a recent phenomenon and that serious design flaws in subprime originations make them especially vulnerable to a downturn in home prices ([Gorton, 2008](#); [Pennington-Cross and Ho, 2010](#)). Taken to its logical conclusion, this paper raises doubts on any model of subprime mortgages that relies more on the appreciation of the underlying collateral rather than the creditworthiness of the borrower to make payments on the mortgages. In this respect, we argue that it may not be desirable to revert to underwriting from the “earlier period of 2000–2002” in reviving a model of subprime lending.

Our assessment of loan performance of subprime mortgages treats house prices as exogenous. With the benefit of hindsight, skeptics are quick to point out that in comparison with the early period of 2000–2002, agents involved in the origination process should have been more cognizant of the risk of a downturn in home prices—especially in the boom period of 2004–2006. But, as [Rajan \(2011\)](#) argues persuasively, it makes little sense to assign blame on market participants when professional economists did not share this opinion:

⁵ [Summers \(1985\)](#) is generally critical of studies in finance that compare similar assets (products). Our paper compares similar assets of different vintages—merely to raise concerns about the viability of all cohorts of subprime originations. Given the objective of our paper, this criticism is not directly applicable to our central hypotheses. See [Pennington-Cross \(2003\)](#) for a comparison of subprime mortgages with other mortgage products such as prime loans.

⁶ Moreover, [Andriotis \(2011\)](#) presents anecdotal evidence suggesting a resurgence of subprime (portfolio) loans. The disappearance (and partial-resurgence) of subprime has been linked to the resurgence (and disappearance) of FHA-insured loans. The market shares of subprime and FHA-insured loans taken together have been fairly consistent over time, suggesting a flow from the former to the latter ([Karikari et al., 2011](#)).

⁷ It is important to point out that neither high-LTV loans nor low documentation mortgages are a recent phenomenon. Both high-LTV and low documentation mortgages have existed since the mid-1980s. For a detailed history of such lending practices in the US, see [Pinto \(2010\)](#).

⁸ Throughout this study, we use the combined loan to value ratio or CLTV. Therefore, the terms LTV and CLTV are used interchangeably.

⁹ Important to point out here that we are NOT “estimating models of earlier cohorts and then using these models to forecast the survivor functions of this cohort in the environment of later cohorts.” Rather, we are doing the converse.

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