CPR&CDR α

ATOMS™ Index R&D Scores

WWW.CPRCDRALPHA.COM

JULY 27, 2015

Background

We release new KDS agency R-score and D-score and associated pool-level analytics for Fannie Mae, Freddie Mac, and Ginnie Mae backed mortgage-backed securities (MBS). The R-score ranks the voluntary prepayment behavior, while the D-score ranks the involuntary prepayment behavior. In addition, we offer a host of associated pool-level analytics and speed vectors for clients to manage the agency MBS.

Our scores are based on a new scoring technology and offer significant improvements over other scoring models. One important innovation is the deconvolution of the macro-economic cycles of credit and market risks from the interacting characteristics of individual loan profiles, agency and servicer treatments, and lending standard.

The data used to develop our scores consists of all publicly available agency mortgages. The scoring models include multi explanatory factors, variable interaction terms, and segmentation sub-components. Both voluntary and involuntary prepayment scores are calibrated consistently across all sub-components and are refreshed on a monthly basis.

Our scores are so powerful that we have to introduce an innovative non-linear calibration to map all scores in between 100 and 999. By definition, the R-score predicts the probability of voluntary prepayment over the next 3 months, while the D-score predicts the probability of involuntary prepayment over the next 3 months.

New Technology

Our scores are based on a new proprietary scoring technology that solves not only the main effects but also the non-linear interaction terms among the multi-dimensional explanatory factors in odds manifold sub-spaces. This new technology offers significant advantages over traditional scoring techniques. A clustering segmentation scheme is used to generate the sub-component spaces on the multi-dimensional odds manifold. In addition, massive deconvolution of more than 3 billions of mortgage performance records spanning 30 years offers an unprecedented view of granularity into the interactions of customer voluntary and involuntary prepayment behaviors under different macro-economic conditions and different market and credit cycles.

Macro Economic Impacts

Under our technology, the macro-economic impacts are de-convolved and tied to market interest rate, state-level home price index, and regional-level housing sales activity. As a result, consumers exhibit different prepayment behaviors under different macro environments and at different geographic regions.

Figures 1a & 1b illustrate the de-convolved voluntary prepayment rates of the last twelve years in no-cash refinance and purchase segments, respectively, versus our macro model.

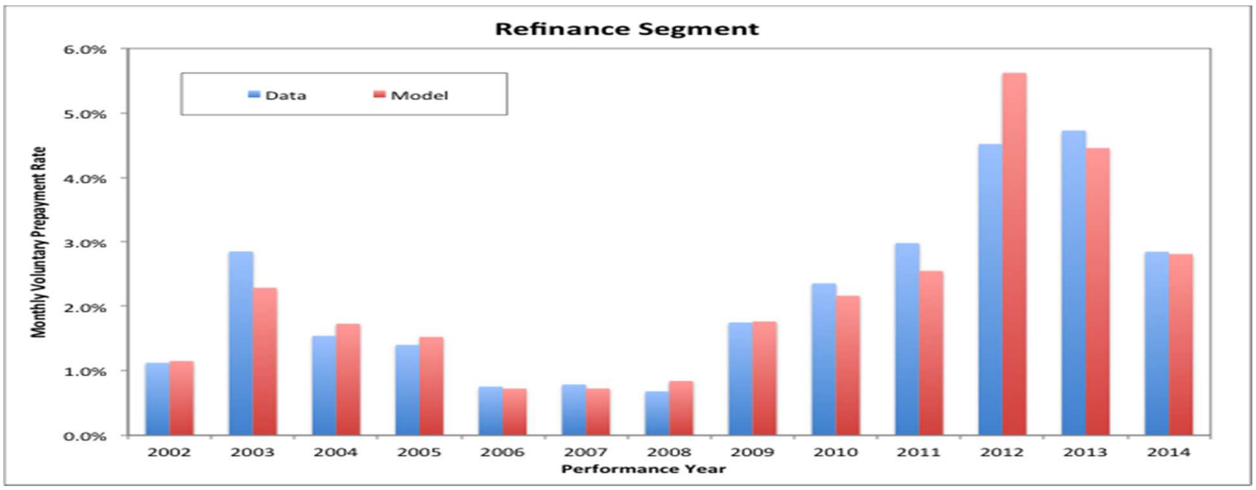
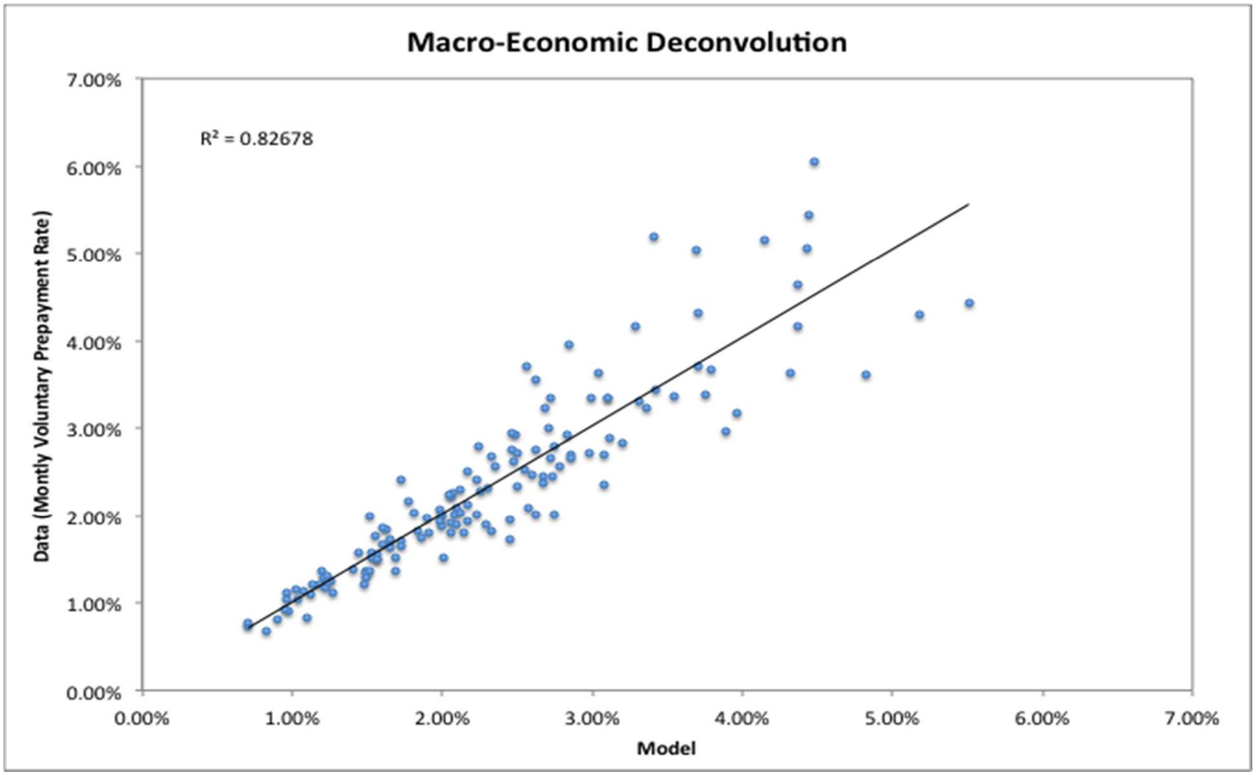


Figure 2 illustrates the de-convolved voluntary prepayment rates of the last twelve years in all sub-components versus our models.



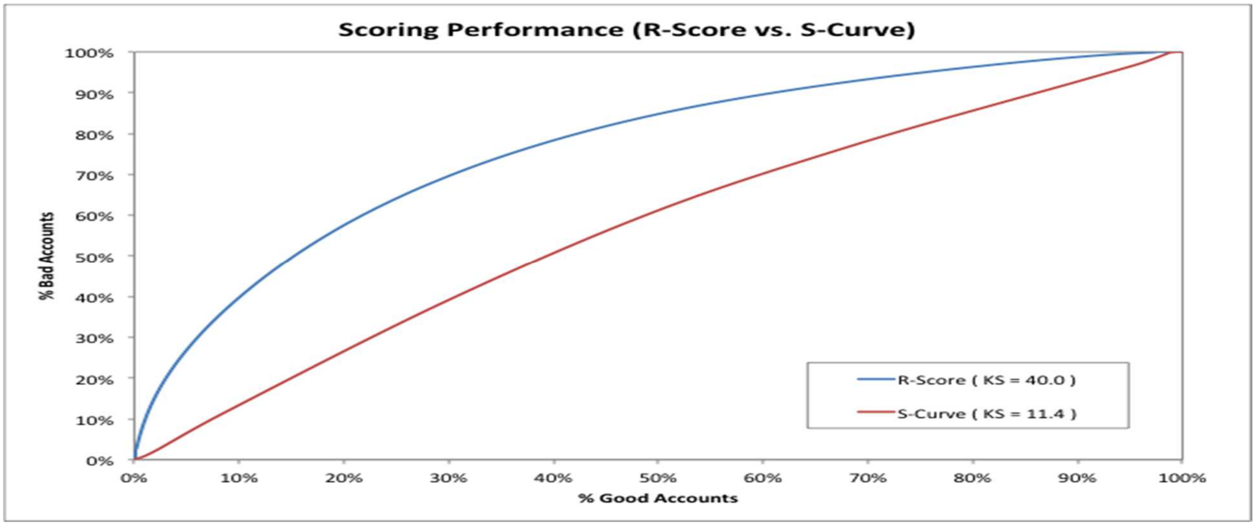
Roughly 82.7% of the de-convolved voluntary prepayment residuals are explainable by interest rate, house price index, and housing sales activity over a twelve-year window.

How Powerful

How powerful are our R-scores and D-scores in separating voluntary and involuntary prepaid loans respectively from the so-called "good" mortgage loans? For voluntary prepayment behavior, there are no benchmark scores available. We choose to compare R-scores against the usual "s-curve". For involuntary prepayment behavior, we simply compare D-scores against the benchmark FICO scores.

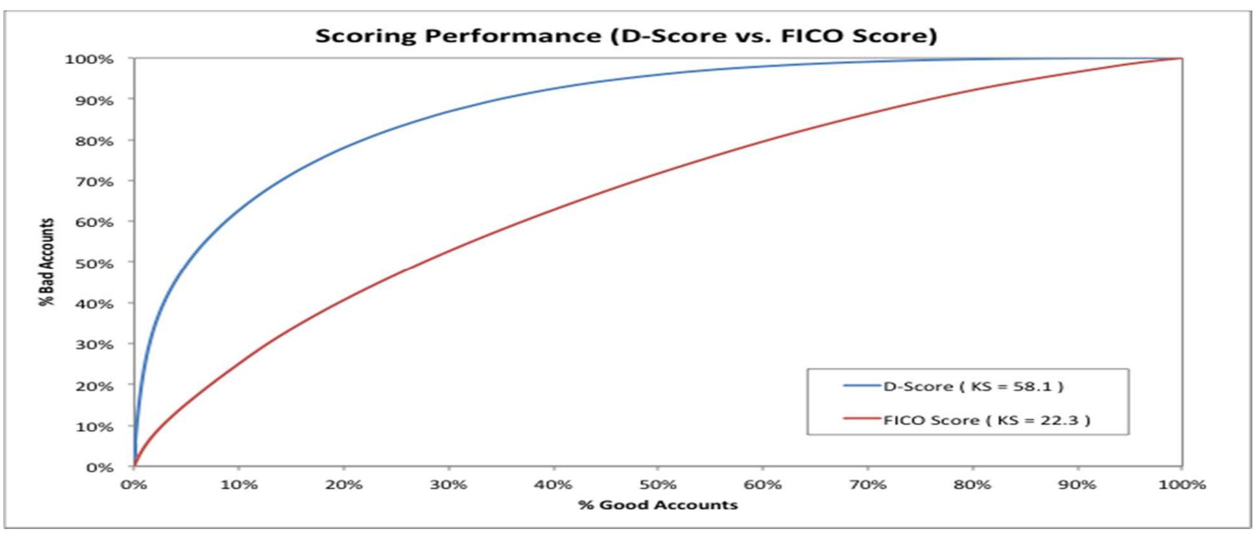
There are many statistical tools to measure the ranking power of scores. We adopt the most widely used KS statistic for illustration.

Figure 3 shows the KS performance between the R-score and the "s-curve" (the current coupon rate minus prevailing mortgage rate) in ranking voluntary prepayment behavior for conventional 30-year fixed-rate purchase mortgages originated through retail & correspondent channels.



In terms of KS statistics, R-score is 3.5x more predictive than the s-curve. When selecting the first 20% volume, R-score is able to capture 56.2% of the loans that paid off voluntarily.

Figure 4 shows the scoring KS performance between the D-score and FICO score in ranking involuntary prepayment behavior for conventional 30-year fixed-rate mortgages originated from retail channel.



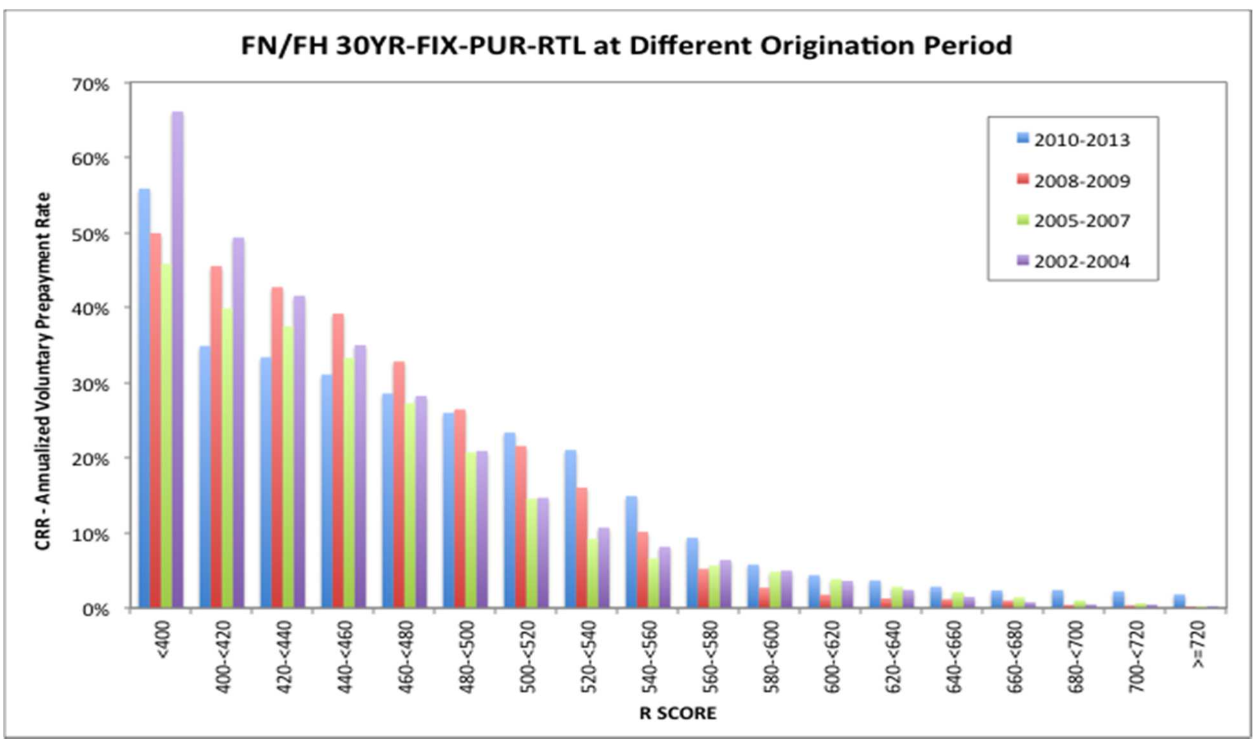
In terms of KS statistics, D-score is 2.6x times more predictive than the FICO score. When selecting the first 20% volume, D-score is capable to capture 78.0% of the loans that paid off involuntarily.

In summary, both of our scores are significantly more powerful than the available tools in analyzing voluntary and involuntary prepayment behavior of agency mortgage loans.

HOW CONSISTENT

How consistent are our scores during different economic environments? One key innovation in our new scoring technology is the deconvolution of macro-economic conditions from the characteristics of individual loan profiles, agency treatment, and lending standards. This proprietary deconvolution process ensures that our scores offer the same predictive power during economic cycles, even if there may be large shifts in the mortgage prepayment behavior during these different time periods.

Figure 5 shows the voluntary prepayment rate by R-score for four different origination periods during the most recent economic cycle.



Clearly, our R-scores demonstrate nearly constant predictive power for mortgage loans originated over a ten-year window.

How To Use

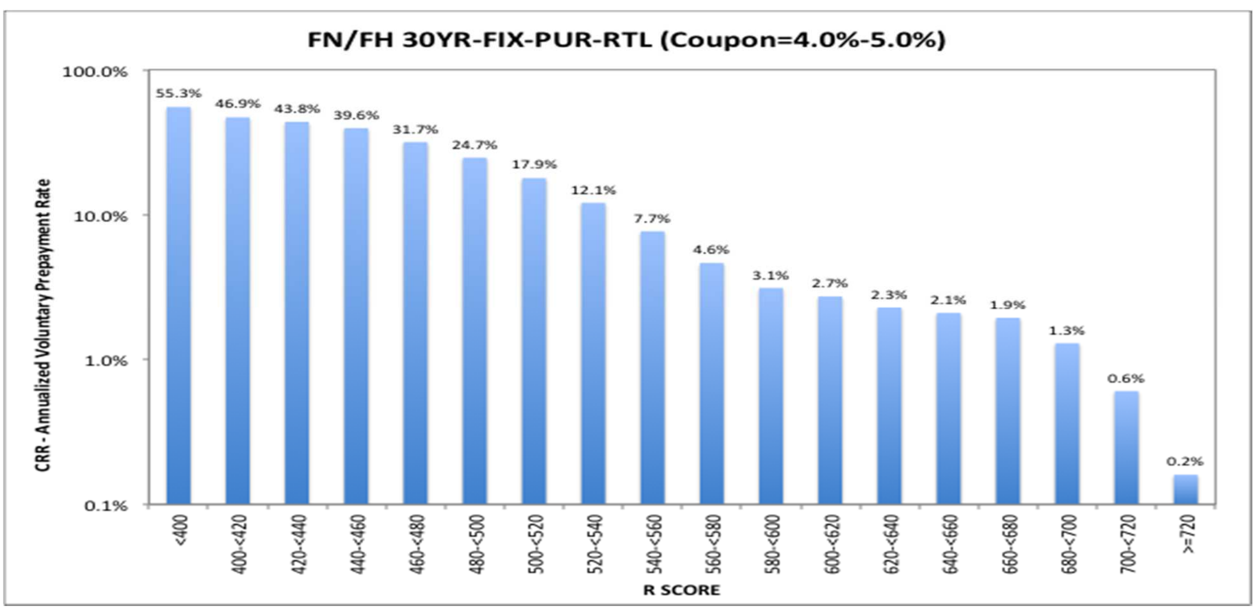
Our scores are powerful and consistent. The R-score is an industry first, while the D-score offers a superior advantage over the benchmark FICO score. There are many ways to use such scores, for example, to gain a competitive advantage, to improve performance, to implement new strategies, or to achieve portfolio management goals. Regardless of how you use them, we believe that our scores will help you to uncover new trading opportunities.

Let's look at a few cases on how to discover new territories.

R-score Inside S-curve

Our R-score is the first and only voluntary prepayment score available. It can provide a powerful tool to slice and dice agency mortgage data, but most importantly, it may offer a surprising new view of consumer voluntary prepayment behavior.

Figure 6 shows the voluntary prepayment rate by R-score within a narrow slice of coupon rates between 4.0% and 5.0%.

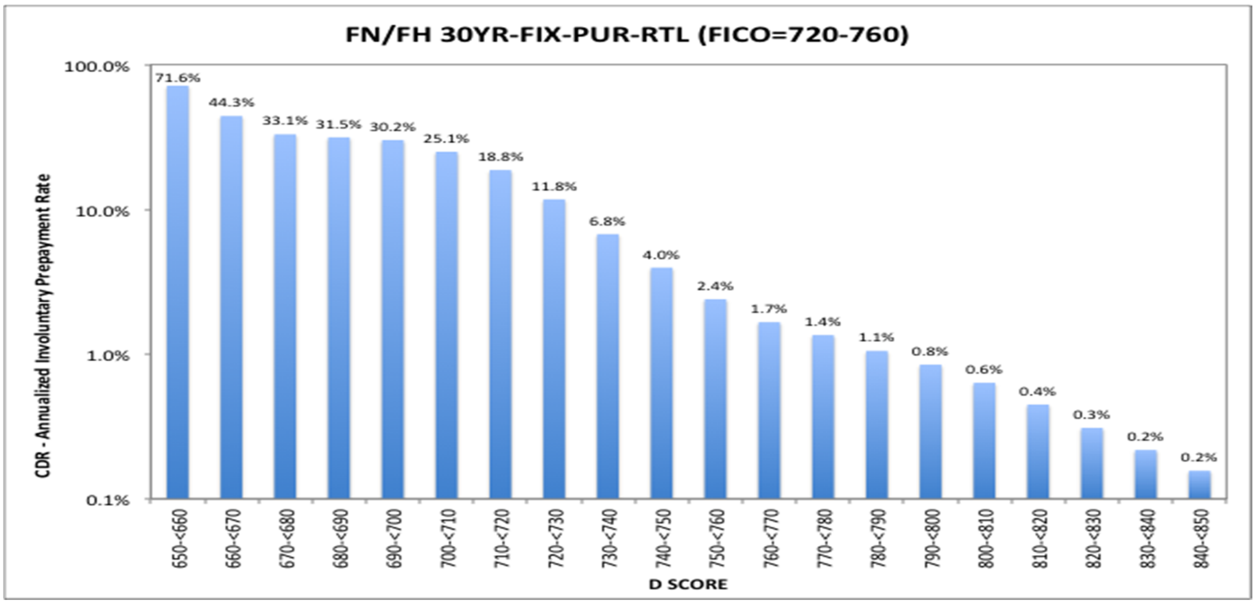


Surprisingly, there are still large differences in voluntary prepayment rates as uncovered by the new R-score.

D-SCORE TO OPEN UP FICO

Our D-score is significantly more powerful than the FICO score. It can provide many different ways to slice and dice agency mortgage data, but again, it may offer many insights into consumer involuntary prepayment behavior.

Figure 7 shows the involuntary prepayment rate by D-score within a narrow slice of the FICO scores between 720 and 760.

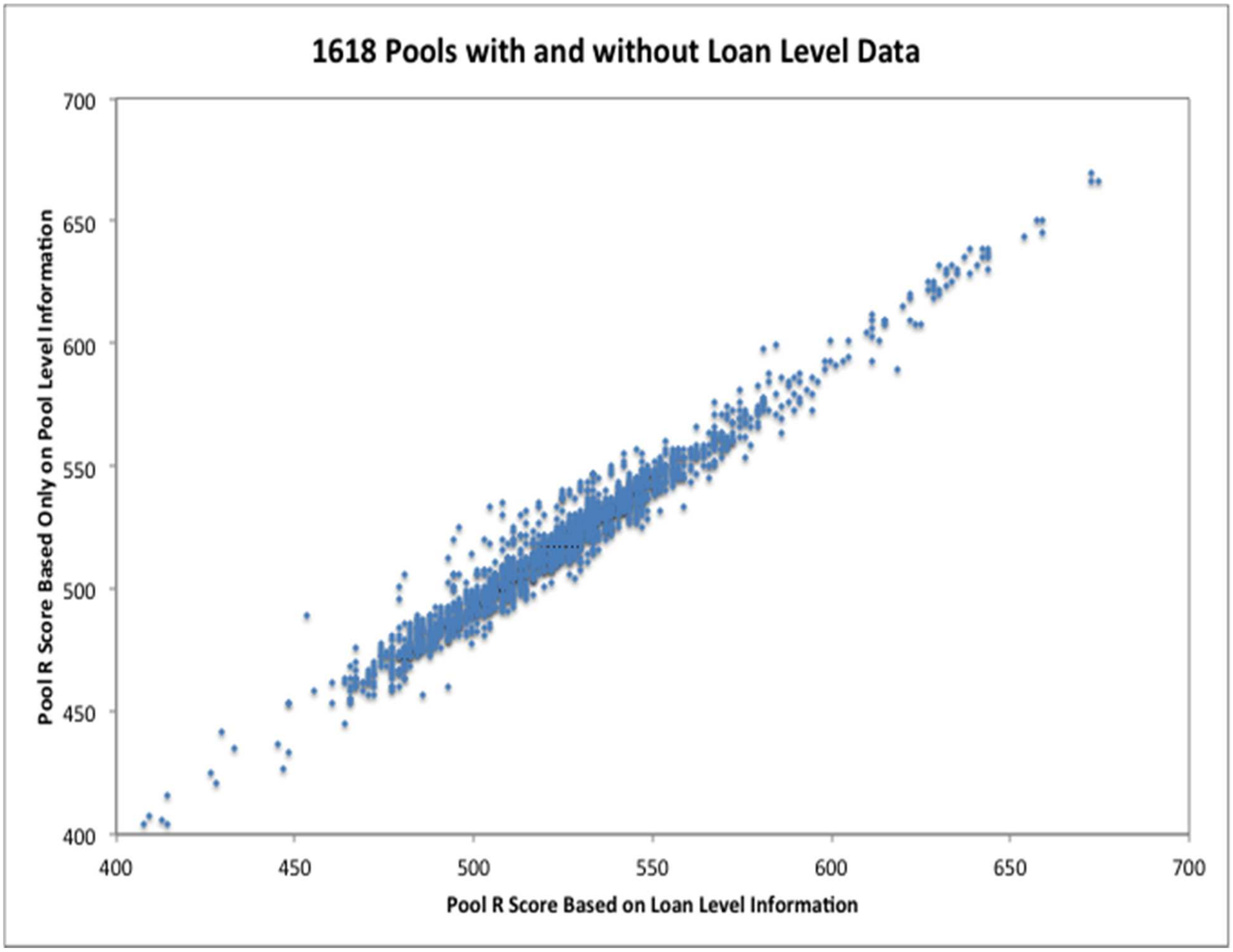


Because of its superior predictive power, the D-score now reveals the full spectrum of mortgages likely to involuntarily prepay, even for the FICO scores as high as 720-760.

POOL LEVEL SCORES

If a pool has loan-level information, the pool-level R-scores and D-scores are simply aggregated up from loan-level scores. For any pool that does not have detailed loan-level data, we use a Monte Carlo technique to simulate virtual loans that are drawn consistently from its pool-level characteristics so that the pool-level scores can be aggregated up from virtual loans.

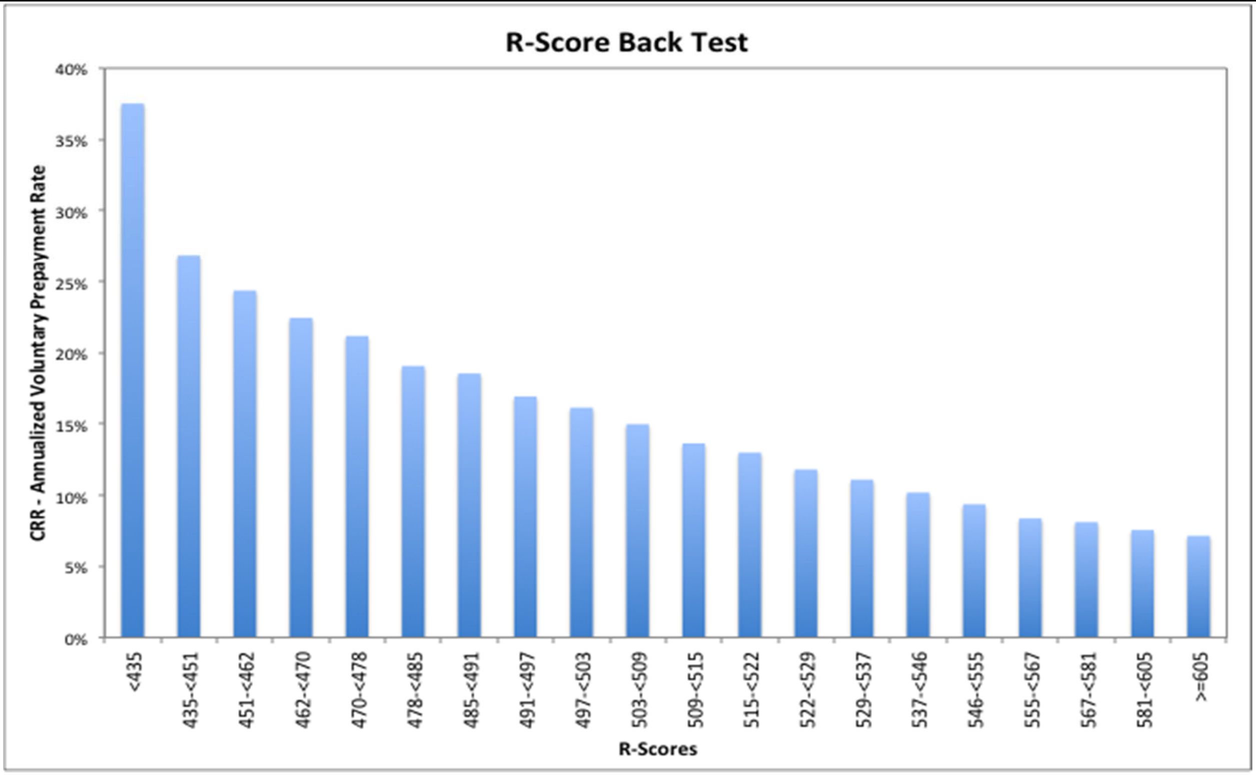
Figure 8 shows the comparison of pool R-scores based on loan-level data and based only on pool-level information.

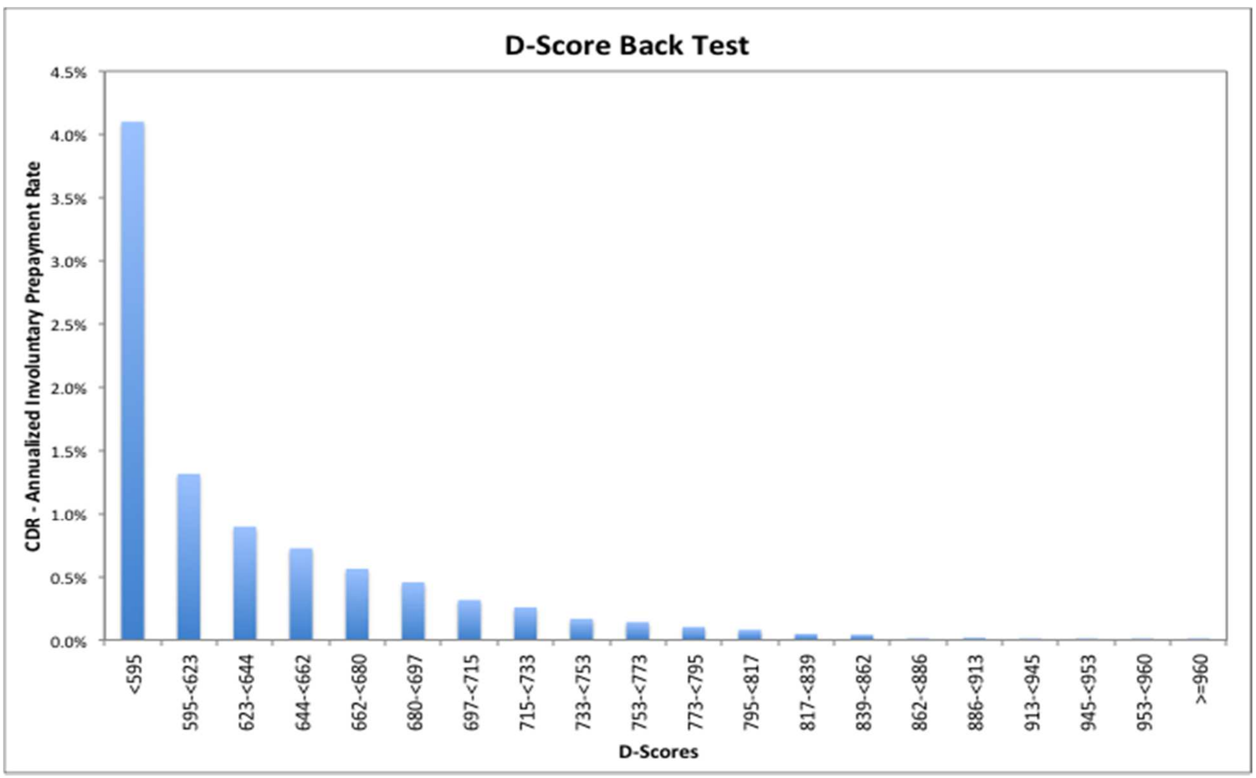


Clearly, our proprietary Monte Carlo technique can produce accurate pool scores even without loan level data. The average error is about 1.2% in R scores and 1.5% in D scores.

BACK TESTING

We have performed extensive back testing on various cohort populations. Figures 9 and 10 show respectively the performance of the R-scores and D-scores in 20 percentiles. The population is selected in June 2014 for all unpaid mortgage loans and the performance is for the next three months.





FINAL REMARK

The KDS agency R-scores and D-scores are the industry firsts. Undoubtedly, those who use them will discover possibilities to gain a competitive edge and be enriched with new trading opportunities in the agency MBS market.