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Assessing the Risks:

Different Credit Scoring Models and Impacts on the Mortgage Market

Credit Risk Assessment and Scoring Models: A Comparative Analysis

This white paper provides an analysis of the rates of adverse credit occurrences across a range of populations, credit scores, and different credit scoring models. Specifically, this paper compares FICO® Score 10 T to FICO's Credit Bureau Data Research Score (Research Score) to evaluate the incidences of adverse credit events within each scoring model. The Research Score is a test benchmark score based on traditional credit bureau data only, developed by FICO to generate scores on only those individuals with sparse or stale credit files that do not meet the minimum scoring criteria to be assigned a FICO® Score based on traditional credit bureau data. This analysis provides an indication of the relative capabilities of the various scoring models to predict adverse credit events and to consider the potential impact on credit pricing when using various scoring models.

We find higher rates of adverse credit events, and therefore a higher credit risk, when using different credit scoring models to score borrowers that have been historically unscoreable. Using the benefit of hindsight, we find this to be the case even when different credit scores were aligned with traditional FICO Scores at a single point in time. Because the Research Score is based on sparse or stale data, the relationship between score and probability of default may be more volatile over time for those scored by the Research Score than would otherwise be for FICO scoreables. We find that the risk associated with scoring the historically unscoreable consumers using only traditional credit bureau data can result in a higher probability of default within a given score range.

In particular, the result of this study indicates that there is a higher rate of adverse credit events, and therefore a higher credit risk, for borrowers who are part of populations otherwise unscoreable by FICO as compared to borrowers who have traditionally qualified for FICO Scores.

Further, our analysis indicates that there are higher credit risks among the traditionally FICO unscoreable population model across the full range of credit scores scored by the Research Score, with significantly higher credit risks for those consumers in the lower score brackets.

We additionally observe that the higher credit risk within a given scoring range, particularly for borrowers who may be looking to obtain credit, can affect the risk acceptance and transfer in the secondary market for Residential Mortgage-Backed Securities. We find that the economics of securitization will necessarily be less efficient and may result in the transfer of the cost of increased default and prepayment uncertainty back to the consumer.

Credit Risk and Securitization in Non-Agency RMBS Transactions

This paper examines the impact to secondary mortgage market execution, and in particular to non-agency Residential Mortgage-Backed Securities (RMBS) transactions, of expanding access to credit beyond borrowers who have traditionally qualified for FICO Scores.

Our analysis focuses on whether limited-history scores capture the potential for a negative credit event with comparable reliability or predictability as compared to FICO Scores. We then estimate the potential impact on pricing and cost to a portfolio of mortgage loans containing or relying upon the different credit metrics.

Asset securitization is the "structured process whereby interests in loans and other receivables are packaged, underwritten, and sold in the form of 'asset-backed' securities."[1] Non-agency RMBS describes a form of asset securitization involving residential mortgage loans that are not guaranteed by government-sponsored enterprises (GSEs) or government agencies. These residential mortgage loans are considered "non-conforming" (i.e., not conforming to the GSE's loan size requirements or underwriting standards) and sold into the secondary market (also known as private-label securities).

In an asset securitization, one possible structure is that the investors are provided with an undivided interest in a specific pool of assets owned by a trust. In this case, the trust is created as a "Bankruptcy Remote" Special Purpose Entity (or a similar vehicle) so that the cash flows and claims due to the trust solely depend on the collateral sold into the trust. In other words, the amounts and timing of the payments paid to the securities (known as the RMBS bonds or, colloquially, "tranches") issued from the trust depends on the payments of principal, interest, and recoveries from the residential mortgage loans. The issuer of the trust is then able to structure the transaction to issue securities to isolate and distribute these cash flows.

Residential mortgage investments involve two key risks that non-agency RMBS deals are generally structured to manage: prepayment risk and credit risk. As will be described below, the trust is structured so that each tranche has a different expected time window for principal repayment. Each tranche also has a different level of seniority with respect to the risk of loss due to losses in the underlying collateral. These credit enhancements are internal to the trust structure; credit enhancements can also be accomplished externally. External credit enhancements are generally structured as "insurance" against losses up to a specified amount through a third-party.

The efficiency of the trust structure depends on the credit quality of mortgage loan collateral. Intuitively, trusts backed by higher credit quality loans will require fewer credit enhancements than trusts backed by lower credit quality loans.

As noted, the expected payment to the RMBS investors derives predominantly from the cash flows from the underlying mortgage loans and their expected collateral performance. Therefore, the expected performance of the collateral determines the overall capital structure of the securitization. Any changes in the risk profile of the collateral inherently impact the value of the securities in the capital structure.

[1] "Securitization," Office of the Comptroller of the Currency, available at https://www.occ.treas.gov/topics/supervision-and-examination capital-markets/financial-markets/securitization/index-securitization.html.

Credit scores are one of the primary indicators of borrower propensity to repay a mortgage. Investors primarily rely on credit scores and other loan-level analytics such as Debt-to-Income (DTI) and Loan-to-Value (LTV) ratios to make investment decisions and price loans, both of which ultimately determine the level of credit enhancement required to maximize the total deal proceeds. These loan characteristics, among others, are used to develop predictive models that forecast performance and cash flows based on how the mortgages were originally underwritten. A majority of credit investors rely on FICO as a critical input in the structuring of non-agency RMBS. FICO Scores are a universally accepted way to evaluate risk across industries and across country borders, providing a proven, explainable, and transparent way to predict repayment. Having a universally accepted score provides superior predictive value since having multiple scoring models can lead to inefficiency, less transparency, and unintended arbitrage manipulation.

We now turn to an analysis of the predictive power of different scoring models and the resulting impact on the issuance of RMBS securitizations.

Comparing Adverse Credit Events: FICO Scores vs. Research Scores

In this paper, we explore whether relaxing FICO's criteria to score a borrower, as represented by the Research Score, results in a rate of occurrence of adverse credit events[2] consistent with comparable populations of FICO-scored borrowers. Our analysis addresses whether extending scores to FICO-unscoreable individuals captures the potential for a negative credit event with comparable reliability or predictability to FICO Scores.

We conducted this study using the benefit of hindsight; we relied upon a dataset representing individuals[3] who had a FICO Score 10 T or Research Score as of April 2018 (the "Scoring Date") and had a new account opening from May 2018 until October 2018.[4] These individuals' credit activity was then monitored during the subsequent two years, through April 2020, to determine if they had at least one adverse credit event. (This was prior to the COVID Pandemic potentially impacting credit performance.) Using this information, it is possible to compare, across credit scoring models and across segments of the population, the rate of occurrence of adverse credit events associated with a given credit score model.

[2]*An adverse credit event is defined as a tradeline that is 90 or more days past due from required payment date.*

[3]*The dataset did not contain any personally identifiable information (PII).*

[4]*While FICO® Score 10 T did not become generally available until 2020, the algorithm can still be applied to historical data for analysis purposes.*

Exploring Variations: Scoring Models, Target Populations and Key Performance Indicators

The dataset received for this study included credit scores for more than 40 million individuals[5] who had either a FICO Score[6] or were deemed unscoreable by the FICO Score minimum scoring criteria and were assigned a Research Score.[7] For an individual to be scoreable by FICO, he or she must meet certain minimum scoring criteria, including having at least one tradeline account open for at least six months and having at least one tradeline account updated within the last six months.[8] The intent of this minimum scoring criteria is to ensure that FICO Scores are only delivered when sufficient data exists to provide a robust and accurate assessment of a consumer's credit risk.

Internally, FICO also developed a benchmark score using only credit bureau data, the Research Score. These scores are assigned based on a loosening of FICO's minimum scoring criteria such that FICO can provide Research Scores to roughly 26 million consumers who are otherwise unscoreable.[9] The Research Score, based on credit bureau data only, was aligned to have the same odds-to-score relationship as the traditionally scorable population at an earlier time period than the data used for this analysis.

Within the dataset, analysis of the occurrences of adverse credit events between the Scoring Date and April 2020 was based on the following Performance Variable:

"All Industries, Account Originations." This Performance Variable tracks the performance of all accounts open within six months of the Scoring Date (i.e., between May 2018 and October 2018), from the date of account opening through April 2020.

The outcomes for each individual account are binary; either there was one or more adverse credit events during the analysis period (indicated by a 1 in the data) or there were no adverse credit events (indicated by a 0 in the data).

[5]*The data in the dataset was provided such that a "score" or individual line item in the dataset represented multiple individual credit score holders grouped by score and category. For example, if there were 40 individuals in the dataset with a FICO Score 10 T score of 652 who had no adverse credit events over the two-year period, the dataset would provide only one entry, but that entry was noted as having a "new Sample Weight" of 40. In order to evaluate individually assigned credit scores, that "score" was weighted to reflect that it actually represented 40 individual score holders with the same score. The result of this disaggregation of "scores" had the impact of increasing the actual sample size of individual scores subject to analysis. We note that scores that were grouped together and weighted had to have all other characteristics represented in the dataset, such as number of months a tradeline account was open, in common as well.*

[6]*It is possible that one individual had multiple FICO Scores (i.e., they had a FICO 5, FICO 8, and a FICO 10 T score) as of the Scoring Date.*

[7]*This more-than-40 million individual sample is out of a population of more than 258 million US consumers who are scoreable by traditional FICO Scores and Research Scores. See "More than 232 Million US Consumers Can be Scored by the FICO Score Suite," FICO Blog, August 24, 2021, available at:* https://www.fico.com/blogs/more-232-million-us-consumers-can-be-scored-fico-score-suite.

[8]Black, Michelle, "FICO Vs. VantageScore Credit Score, What's the Difference," Forbes Advisor, March 8, 2021, available at: https://www.forbes.com/advisor/credit-score/fico-vs-vantagescore-credit-scores-whats-the-difference/.

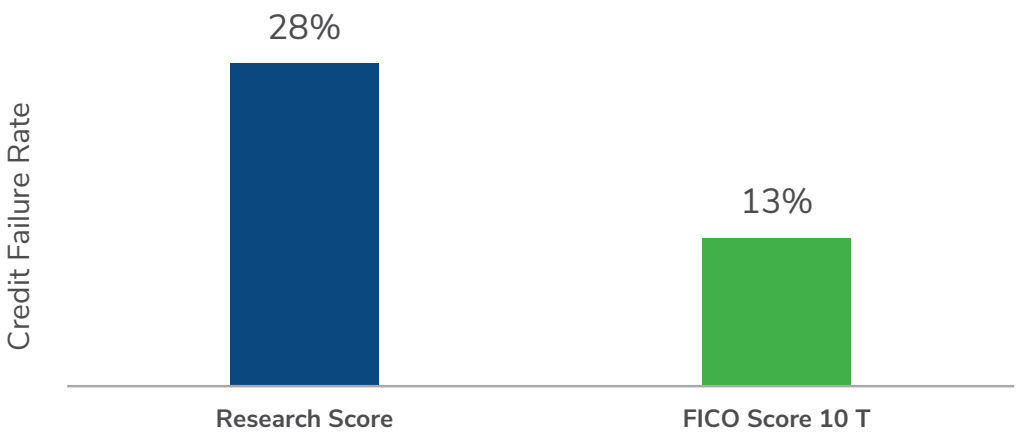
[9]*More than 232 Million US Consumers Can be Scored by the FICO Score Suite," FICO Blog, August 24, 2021, available at:* https://www.fico.com/blogs/more-232-million-us-consumers-can-be-scored-fico-score-suite.

Research Score Holders Had Substantially Higher Credit Failure Rates than the FICO Score Holders

Based on the Performance Variable, Research Score holders had substantially higher credit failure rates than the FICO Score holders. These results could have implications for pricing of credit vehicles by credit- granting institutions.

As shown in Figure 1, the Research Score holders experienced a 28% failure rate in the two-year period after account opening, whereas the FICO Score holders credit failure rate was 13%.

Figure One



Broadening the Scope: Analyzing Across Credit Score Tiers

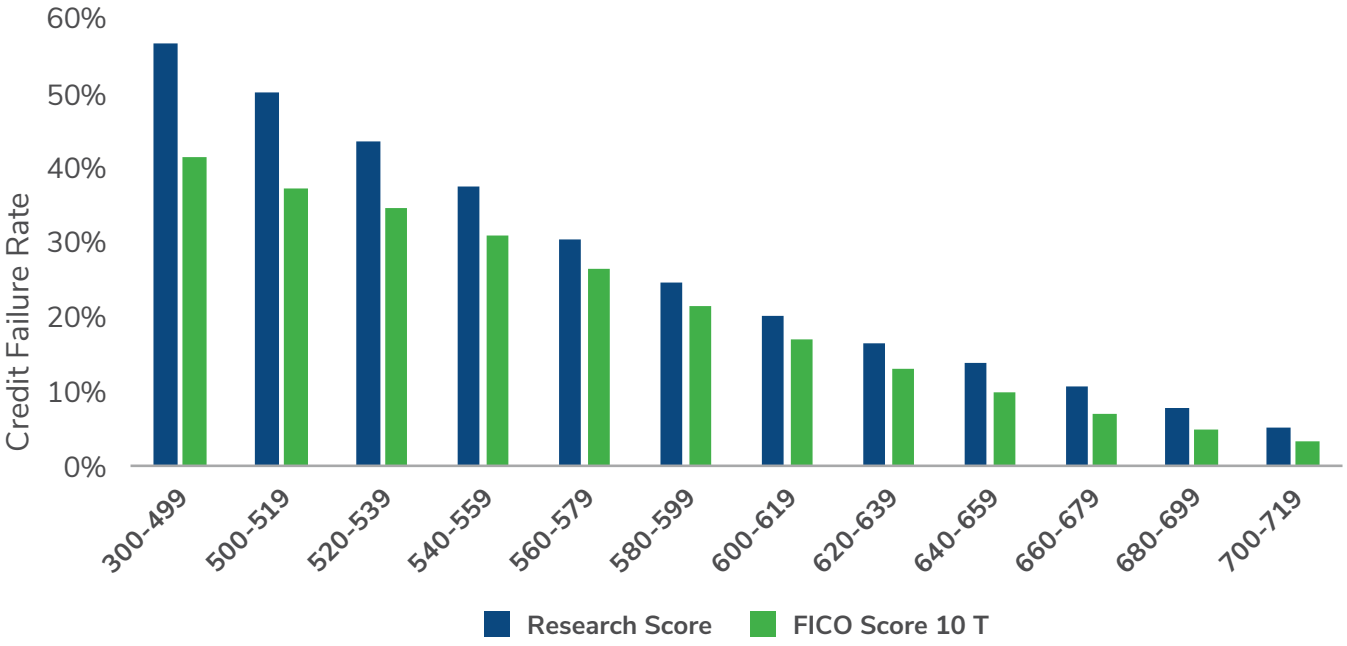
The analysis presented above provides insights into the differences in credit failure rates between the FICO-scorable and FICO-unscoreable populations and suggests the potential impact on credit pricing based on which credit score across the overall score range (i.e., 300-850) was assigned. We expanded the analysis to compare credit failure rates across the range of credit scores, subdivided into scoring brackets. This analysis provides further insight into the interpretation of credit scores based on different scoring models and the potential pricing impacts to those scored by the different models.

For this analysis we again focused on the "All Industries, Account Originations" Performance Variable and compared credit failure rates across the range of credit scores for those individuals with either a Research Score or a FICO Score 10 T.[10] We then subdivided the credit score data into strata of credit scores with the first stratum score range of 300 – 499 and each successive strata in twenty-point increments from 500 to 719. Scores of 720 or greater were excluded from the analysis due to low delinquency counts in those score ranges.

Within each credit score band, we then determined the proportion of the Research Score and FICO Score 10 T holders who experienced an adverse credit event.

Figure Two

Proportion of Score Holders with Adverse Credit Events



As shown in Figure 2, Research Score holders experienced a higher credit failure rate within each score stratum than FICO Score 10 T holders and this pattern was consistent across the entire spectrum of credit scores.

[10] *All industries originations performance was used instead of mortgage originations-specific performance because generating historical default rates on the mortgage originations population for the Research Score population is not representative of future practices, since it has been historically rare for consumers in the sparse or stale file Research Score population to be able to obtain a new mortgage.*

In the lower score strata, Research Score holders experience a significantly higher credit failure rate--9% to 15% higher--than what is experienced by FICO Score 10 T holders. As expected, the failure rate gap narrows in the higher score brackets. However, within each of the credit score strata, the Research Score holders' credit performance lagged that of the holders of FICO Score 10 T. These results suggest credit pricing implications for credit seekers who cannot be assigned a FICO Score or for portfolios of credit instruments consisting of debt instruments associated with FICO unscoreable individuals.

The results of this analysis suggest that the use of a score with looser minimum scoring criteria that uses solely what little credit bureau data is available will have ramifications for the risk acceptance and transfer of credit in the secondary mortgage market for Residential Mortgage-Backed Securities. We find that the economics of securitization will necessarily be less efficient and may additionally result in the transfer of the cost of both increased default and prepayment uncertainty back to the consumer, as we discuss as follows.

Impact on Non-Agency RMBS Pricing and Yield Assumptions

Using the results from the analyses outlined earlier, we estimate how higher default rates within a score range would impact the pricing and cost to a portfolio of mortgage loans containing or relying upon the different credit metrics (e.g., Research Score).

Based on our research, scores such as the Research Score based solely on the sparse or stale traditional credit data available for the FICO unscoreable population has lower predictive power than traditional FICO Scores. Therefore, the use of scores similar to the Research Score, such as those that score sparse or stale credit files that do not meet the traditional FICO minimum scoring requirements and have lower predictive power, could lead to higher required yields for securitizations issued based on those scores. Investors would need to assume a higher default rate of an implied downward shift in scores. This would likely lead to higher coupon requirements on the loan, and hence higher costs to consumers, and demand higher yields, which would result in higher costs to lenders.

The most direct approach to generate credit enhancement for senior tranches is through a senior/subordination-shifting interest structure. In this structure, the senior classes (AAA-rated) typically have six supporting classes (AA, A, BBB, BB, B, and unrated). The losses are absorbed from the bottom up, starting from the unrated piece, which is often called the first loss piece.

The figure below is an example to illustrate the capital structure of a prime jumbo fixed-rate RMBS deal.[11] In this deal, 95.4% of the total collateral was designated as senior AAA tranches. Those tranches are supported by 3.9% of mezzanine tranches and 0.7% of residual tranches.[12]

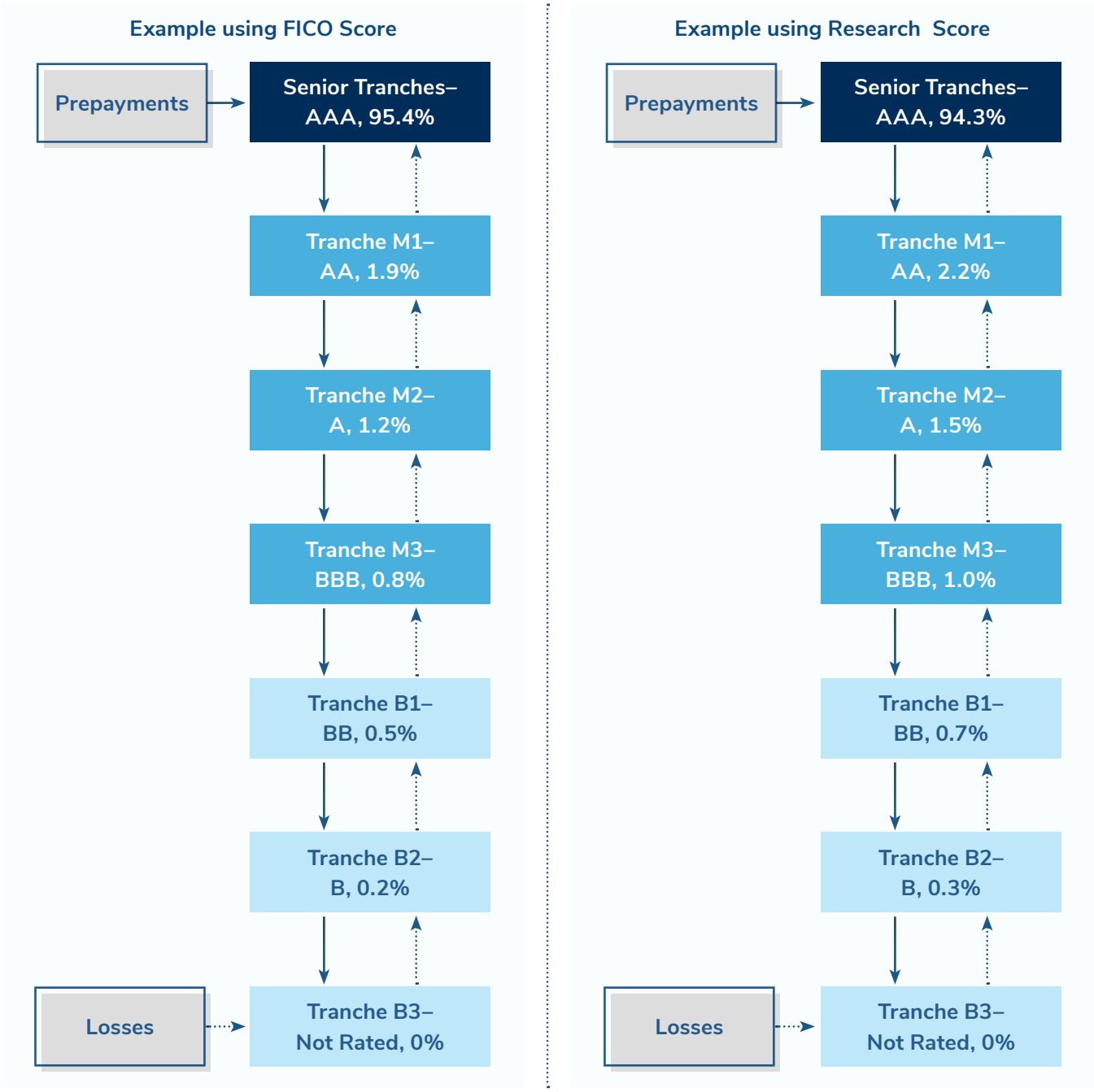
For example: Assuming that default rates are 4% to 5% higher than predicted, this would increase annual defaults by approximately 70 basis points on a pool with a mean FICO Score of 680. Assuming a 30% recovery on defaults, this increase in defaults would lead to an annual risk charge/increase in premium of approximately 50 basis points.

[11]*In mortgage origination, FICO Score is the most important variable to determine if a borrower is prime, subprime, or Alt-A. The average FICO Score is 735 for prime borrowers, but 620 for subprime borrowers.*

[12]*Example adapted from The Handbook of Nonagency Mortgage-Backed Securities, 2nd ed. (Frank J. Fabozzi Associates, 2000), Exhibit 31-7.*

A hypothetical non-agency RMBS transaction would require additional credit enhancement, resulting in a less efficient structure, as illustrated in Figure 3.

Figure Three



Whether the structure of the deal is supported by additional internal credit enhancements, or through external credit enhancements, the cost to the issuer of increased predicted defaults will result in the issuance of less efficient structures and additional risk transfer between the parties to the transaction. Risk transfer by capital markets (specifically securitizations) may transfer the cost of default uncertainty back to the consumer, likely raising pricing across the mortgage lending landscape to account for the increased risk and uncertainty of different credit scoring models.

Implications of Credit Risk Models: Consumers, Lenders and Securitization

This study indicates higher credit risks for Research Score holders, or holders of similar scores derived from limited credit information, across the spectrum of credit scores, with significantly higher credit risks for those score holders in the lower score brackets.

In summary, there are potential implications for both consumers and lenders. The implications of higher credit risks for Research Score holders will generally result in higher pricing for consumers. As the study suggests, the use of different credit scoring models could lead to higher default rates. This risk could be transferred to consumers in the form of higher prices for credit products, higher interest rates, and/or higher fees. Lenders might increase interest rates and/or impose additional fees to compensate for the increased risk associated with lending to consumers scored by different models and the potential increased risk of default.

Similarly, the implications of higher credit risks for Research Score holders will generally result in higher costs to lenders and a less efficient securitization structure. Lenders may need to set aside additional capital in their loan loss reserves to cover potential defaults and increase their risk repurchase reserves to cover the cost of buying back defaulted loans. This could tie up capital that could otherwise be used for lending or other profitable activities.

While different credit scoring models might extend credit to previously unscoreable consumers, they could also introduce additional risks and costs for both consumers and lenders. It's crucial for all parties involved to understand these potential implications before deciding to use these different models.

In conclusion, the goal of extending credit scoring to millions more consumers, thereby helping them establish or re-establish their creditworthiness, cannot be focused simply on generating more scores, but rather on generating scores that are reliable and robust enough to enable lenders to extend credit responsibly.

We have shown that a consequence of substituting different credit scoring models in place of FICO, a critical input in the structuring of non-agency RMBS, will affect the risk acceptance and transfer in the secondary mortgage market for Residential Mortgage-Backed Securities. We find that the economics of securitization will necessarily be less efficient and may additionally result in the transfer of the cost of both increased default and prepayment uncertainty back to the consumer.

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