2021 VantageScore Model Performance Assessment

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VantageScore Solutions conducts annual performance assessments of VantageScore credit score models used by each of the credit reporting companies (CRCs) - Experian, Equifax and TransUnion to render VantageScore credit scores. In keeping with its mission to promote transparency and aid in model governance, VantageScore Solutions publishes the results of these assessments annually, along with updated odds/performance charts.

All VantageScore models are empirically-derived as well as demonstrably and statistically-sound; using proven testing methods that are central to our own analytical approach.

This 2021 report represents the fourth annual model performance assessment of VantageScore 4.0 (which was launched in April 2017). The model is the first and only tri-bureau credit scoring model to incorporate both trended credit data and leverage machine learning for superior performance. Trended data supplements the static borrowing and payment activity which has been historically recorded in consumer credit files and used to develop risk models. Trended data captures the trajectory of borrower behaviors over time, thereby allowing additional insights into consumers' credit risk profile. As part of the annual assessment, VantageScore 4.0 performance results are compared with the performance results of credit scoring models that were developed earlier and contain only static credit attributes.

VantageScore 4.0 also scores approximately 40 million consumers who cannot obtain credit scores when legacy scoring models are used. The VantageScore model will score consumers whose oldest trade is less than six months old and the model is able to provide a score after the first tradeline update. To further enhance the accuracy of scores assigned to the population of conventionally unscorable consumers, VantageScore 4.0 model developers leveraged machine learning techniques in the development of scorecards for those with limited credit histories.

VantageScore
a higher level of confidence

VantageScore data scientists applied advanced methodologies to comprehensively examine the full spectrum of data elements available in the credit files. By employing machine learning techniques, tens of thousands of multidimensional combinations of these data elements were analyzed as part of the data exploration and model development process.

VantageScore's data science team then applied domain expertise alongside safety, soundness, transparency and model governance principles to develop compliant and structured attributes for inclusion in the model that can be easily explainable and reason coded.

A key benefit of VantageScore models is the high degree of consistency in the level of a consumer's credit scores obtained from each of the three CRCs. This consistency is achieved by using credit attributes that are levelled or measured consistently. Testing and comparisons related to score consistency are also included in the annual performance assessment of the VantageScore models.

Finally, a critical requirement of credit scoring is that there is no statistical bias in the calculated scores which would result in a significant difference in the observed default rates for consumers from different groups who are assigned the same or similar credit scores. The results of tests for such bias are also included in this document.

Similar to prior years, the model performance assessment is based on a sample of 15 million anonymized and randomly selected U.S. consumer credit files from the databases at each CRC, totaling 45 million files. The timeframe for the files used in the testing was from February 2018 to February 2020. This time period provides the most recent performance data available prior to the onset of the COVID-19 pandemic. Given the severe dislocation that the U.S. economy is currently experiencing due to COVID-19 and changes in consumers' credit data as a result of that, VantageScore is performing additional, more frequent model performance assessments covering the more recent timeframe. Those additional analyses are not in the scope of this document.

2021 REPORT HIGHLIGHTS

- On a U.S. population representative of Mainstream consumers (i.e., consumers conventionally scored by generic scoring models):
  - VantageScore 4.0 outperforms prior versions of VantageScore as well as benchmark CRC proprietary models within Originations and Account Management, across Bankcard, Auto, and Mortgage product types.
  - VantageScore 4.0 continues to significantly outperform VantageScore 3.0, prior VantageScore models as well as CRC proprietary scoring models across the Originations space.
  - VantageScore 4.0's use of trended credit attributes has brought significant improvements within both the lower scoring and higher scoring credit originations segments.
- On a U.S. population representative of Newly Scored consumers (i.e., consumers not conventionally scored by legacy, generic scoring models)[1] VantageScore 4.0 maintains its superior predictive power. This result reflects the positive performance impact of the attributes that were built to score these consumers using machine learning techniques.
- Aided by the proprietary VantageScore attribute leveling process (extended in VantageScore 4.0 to also apply to trended attributes), a high level of score consistency across the CRCs is maintained. VantageScore 4.0 continues to provide the most consistent scores of all of our models.
- VantageScore 4.0 continues to provide unbiased, consistent results across ethnic groups.

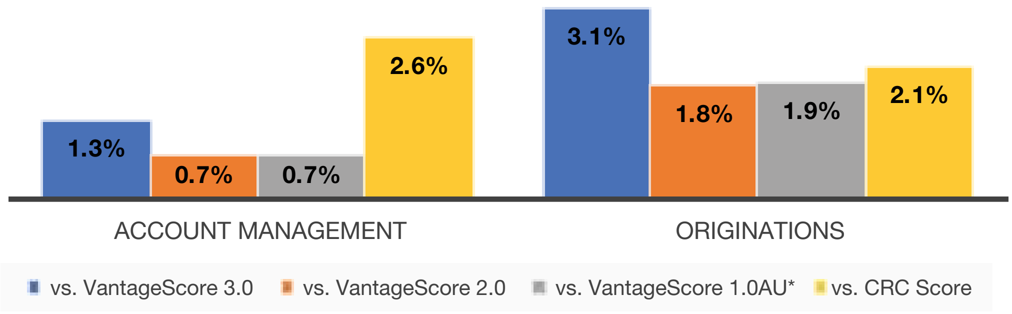
1 Consumers who have less information than is required in order to generate a legacy credit score (i.e., at least one account opened for six months or more, or at least one account that has been reported to the credit bureau within the past six months). These consumers make up the universe expansion population associated with the VantageScore model, and are sometimes referenced as those with limited credit histories or "credit invisibles."

SCORE PERFORMANCE – MAINSTREAM CONSUMERS

VantageScore 4.0 with trended attributes has maintained its improvement over prior VantageScore versions. This is true in the Account Management and especially in Originations where the incremental improvement is generally double that seen on existing accounts. VantageScore 4.0 also continues to outperform the CRCs' proprietary models.

Figure 1 shows the relative lift in Gini values[1] provided by VantageScore 4.0. It should be noted that all four VantageScore models continue to perform well and within expectations.

Figure 1: VantageScore 4.0: %Lift in Performance Mainstream Consumers

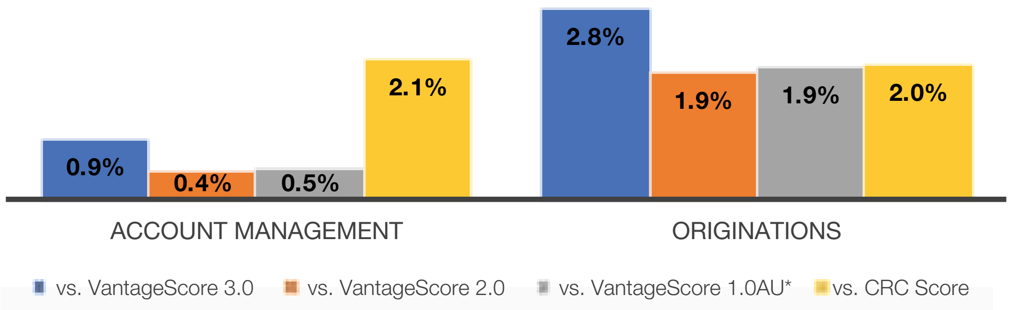


INDUSTRY RESULTS

Bankcard

- While all VantageScore models continue to perform well in bankcards, VantageScore 4.0 shows improved predictive performance compared with all previous versions of VantageScore especially in the Originations space (average of 2.2% lift in Gini value), as well as in the Account Management space (average of .6% lift in Gini values) (Figure 2).
- VantageScore 4.0 achieved predictive performance lift over VantageScore 3.0 of 2.8% within Originations.
- VantageScore 4.0 achieved an average predictive performance lift over CRC proprietary models of 2.1% within Account Management and 2.0% within Originations.

Figure 2: VantageScore 4.0: %Lift in Performance Mainstream Consumers - Bankcard



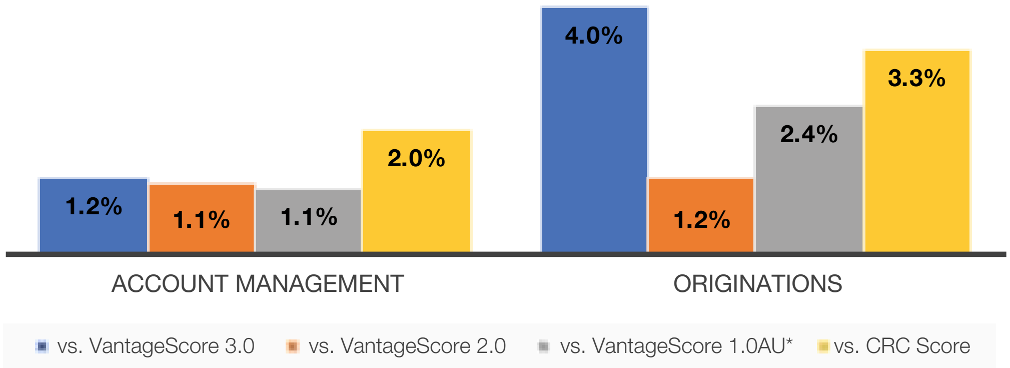
*VantageScore 1.0 Authorized User model

1 The Gini coefficient of a credit score compares the distribution of defaulting consumers with the distribution of non-defaulting consumers across the credit score range. The coefficient has a value of 0 to 100. A value of 0 indicates that defaulting consumers are equally distributed across the entire credit score range. In other words, the credit score fails to assign lower scores to consumers who default more frequently, and is thus not predictive. A coefficient value of 100 indicates perfect prediction ability.

Mortgage

- While all VantageScore models continue to perform well in mortgages, VantageScore 4.0's predictive performance lift over all previous versions of VantageScore averaged 1.1% and 2.6% in the Account Management and Originations spaces respectively (Figure 3).
- VantageScore 4.0 achieved predictive performance lift over VantageScore 3.0 of 4.0% within Originations.
- VantageScore 4.0 achieved an average predictive performance lift over proprietary CRCs models of 2.0% within Account Management and 3.3% within Originations.

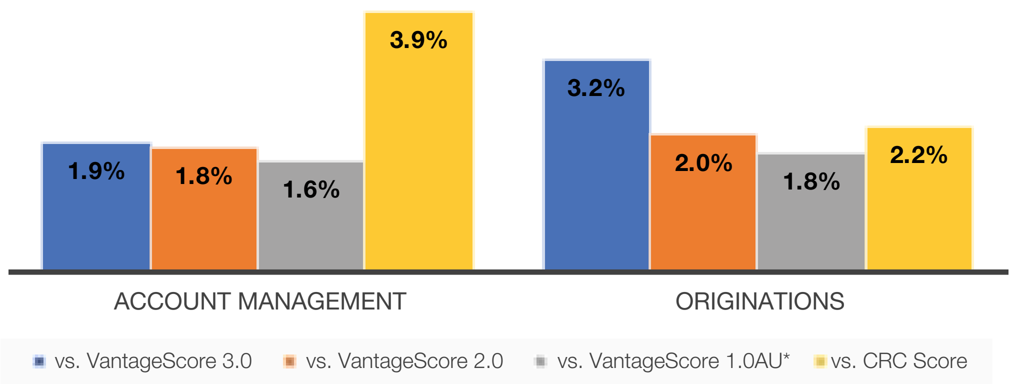
Figure 3: VantageScore 4.0: %Lift in Performance Mainstream Consumers - Mortgage



Auto

- All VantageScore models continue to perform well in the Auto product space. VantageScore 4.0's predictive performance lift over all previous versions of VantageScore averaged 1.8% and 2.3% in the Account Management and Originations spaces respectively (Figure 4).
- VantageScore 4.0 achieved predictive performance lift over VantageScore 3.0 of 3.2% within Originations.
- VantageScore 4.0 achieved an average predictive performance lift over proprietary CRCs models of 3.9% within Account Management and 2.2% within Originations.

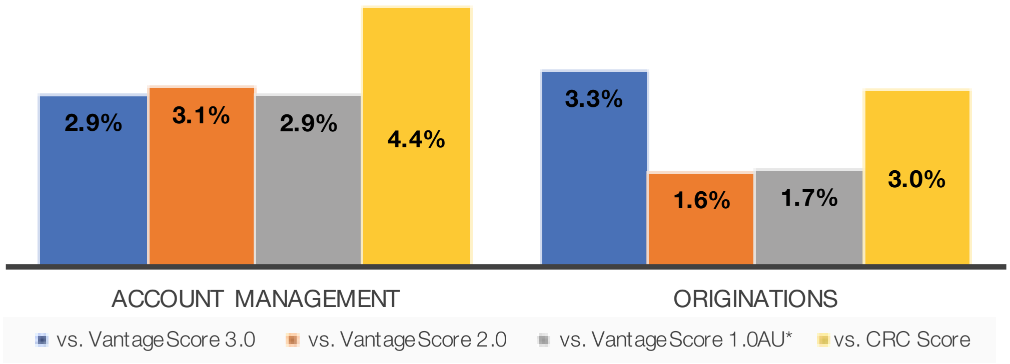
Figure 4: VantageScore 4.0: %Lift in Performance Mainstream Consumers - Auto



Installment

- All VantageScore models continue to perform well for installment type-products. VantageScore 4.0's predictive performance lift over all previous versions of VantageScore averaged 3.0% and 2.2% in the Account Management and Originations spaces respectively.
- VantageScore 4.0 achieved predictive performance lift over VantageScore 3.0 of 3.3% within Originations.
- VantageScore 4.0 achieved an average predictive performance lift over proprietary CRCs models of 4.4% within Account Management and 3.0% within Originations.

Figure 5: VantageScore 4.0: %Lift in Performance Mainstream Consumers - Installment



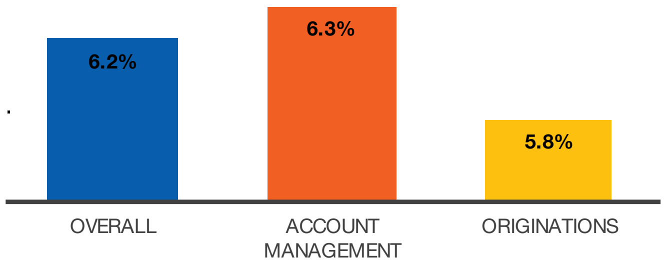
SCORE PERFORMANCE – NEWLY SCORED CONSUMERS

Newly scored consumers are consumers who, due to their unconventional use of credit, cannot be scored by legacy credit scoring methods. Based on the latest Census information available and credit data, out of the 252 million credit eligible adults, there are approximately 40 million consumers who fall into this category. These consumers can be further classified as:

- Young to Credit / New Entrants – consumers with trades that are six months or younger;
- Dormant / Infrequent Users – consumers who have not used credit within the last six months;
- No Trades – consumers with only public record collections records and inquiries.

VantageScore 4.0 outperforms VantageScore 3.0 by 5.8% for ***new*** account originations and 6.3% for ***existing*** account management trades, based on a comparison of the Gini values achieved (Figure 6).

Figure 6: VantageScore 4.0: %Lift in Performance vs. VantageScore 3.0 New Scoring Consumers

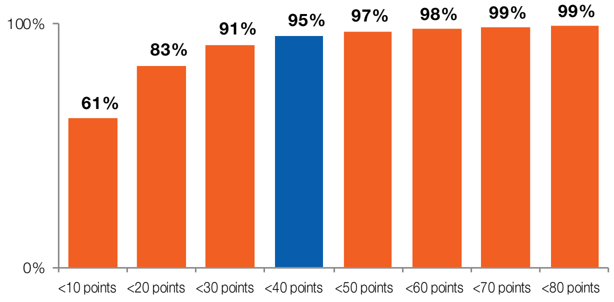


SCORE CONSISTENCY

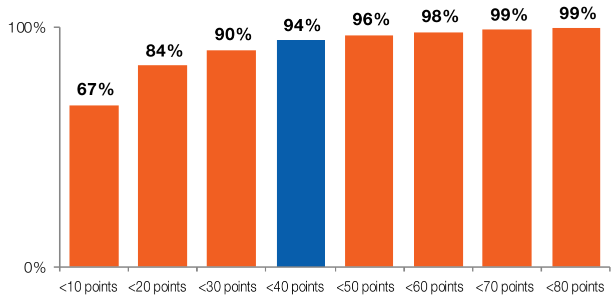
VantageScore 4.0 and earlier VantageScore models are the only credit score models to be developed at the same point in time as well as employ the same algorithm and levelled attributes at each of the three CRCs. Consequently, differences in credit scores are solely attributable to variances in the consumer's credit file data at the CRCs. On a sample of bankcard consumers with credit files at all three CRCs, 82% had three VantageScore 4.0 credit scores within a 20-point range and 95% of the consumers had three scores within a 40-point range. Likewise, comparing mortgage consumers across the three CRCs, 83% had the VantageScore 4.0 credit scores within 20 points and 95% had three scores within 40 points. The consistency of consumers receiving scores within 40 points using VantageScore 4.0 has improved slightly over VantageScore 3.0 within bankcard and mortgage (Figures 7-10).

Figures 7-10:

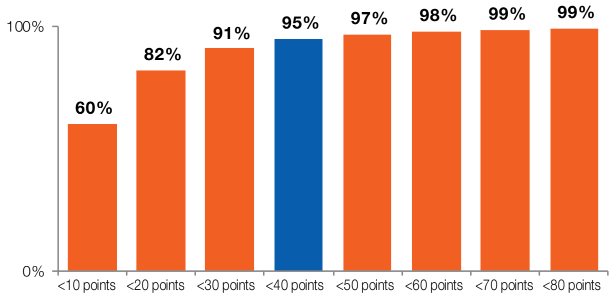
VantageScore 4.0 Score Consistency - Mortgage (18-20)



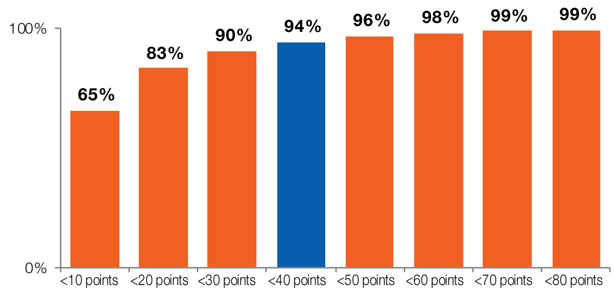
VantageScore 3.0 Score Consistency - Mortgage (18-20)



VantageScore 4.0 Score Consistency - Bankcard (18-20)



VantageScore 3.0 Score Consistency - Bankcard (18-20)



In terms of predictive consistency, VantageScore 4.0 Gini results among the three CRCs remain highly consistent for both Account Management and Originations (Figure 11). In terms of score risk alignment, the score-to-risk level relationship (90+days past due) is consistent across all CRCs for both Account Management rates (Figure 12) and Origination rates (Figure 13).

Figure 11: VantageScore 4.0: Performance Consistency OVERALL (18-20)

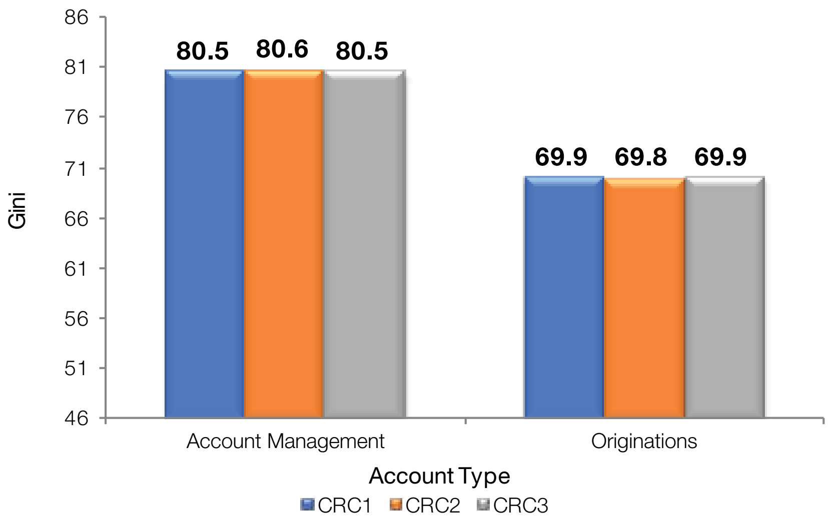


Figure 12: VantageScore 4.0 Odds Alignment – OVERALL ACCOUNT MANAGEMENT (18-20)

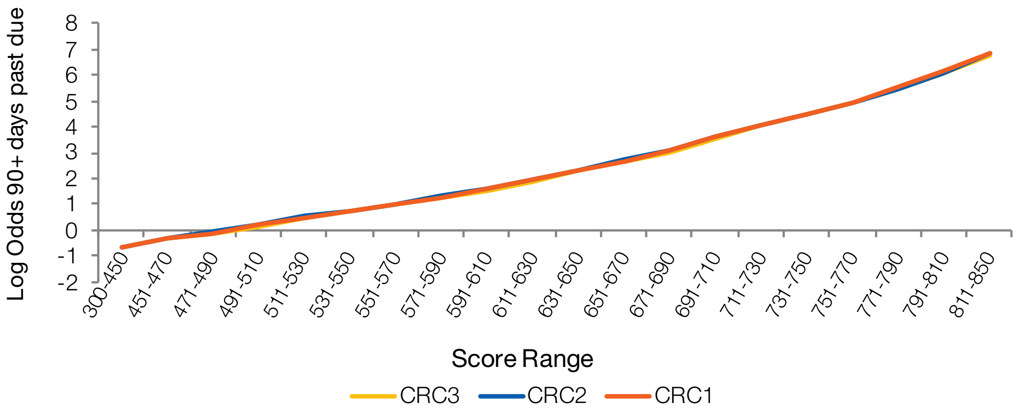
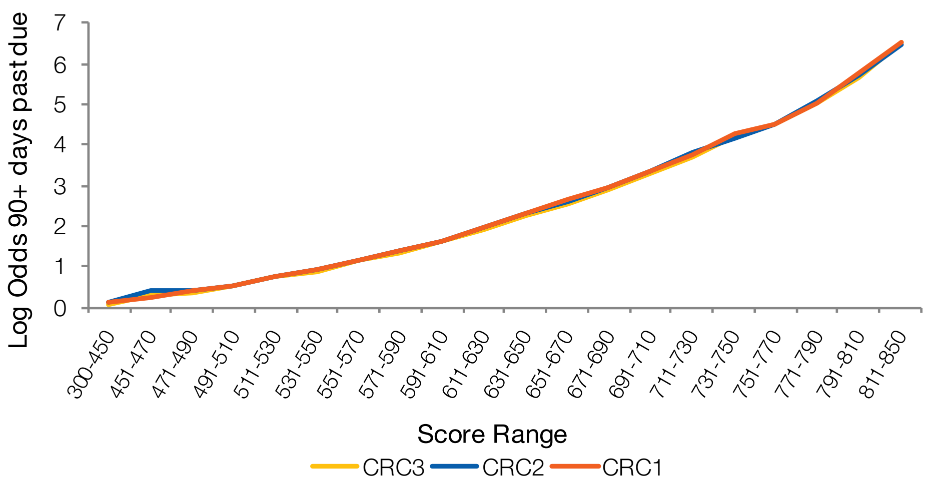


Figure 13: VantageScore 4.0 Odds Alignment – OVERALL ORIGINATIONS (18-20)



STATISTICAL BIAS TESTING – ETHNICITY

A regulatory requirement for any credit scoring model is that there is no statistical bias with regards to any protected classes. Therefore, a key element of the annual model performance assessment process is to ensure that VantageScore 4.0 continues to be free from any such statistical bias by comparing default rates observed for a given credit score between consumer ethnicity groups.

Specifically, a Chi-Square based formal statistical bias test was run on protected ethnic class population segments, i.e., African-American (AOMC) or Hispanic-American (AOHC) populations, to assess if there are statistically significant differences in the actual default rates between these different ethnic groups and other groups. Census data at the zip code-level was appended to the consumer data as a proxy for ethnicity. Bankcard and mortgage products were selected for this test based on their relative size and because they represented mainstream lending.

The results of the tests performed on a 2018-2020 sample indicate that there is no statistically significant difference in default rates between the groups at each credit score band and there is no statistically significant difference in the overall population default rates for bankcards or mortgages. For both bankcard and mortgage loans, default curves are statistically aligned among ethnic groups at each credit score value and among the overall population (Figures 14-15). For all ethnic groups, there is near alignment of default curves, indicating an unbiased model.

Figure 14: Disparate Impact: Bankcard default profiles by ethnicity with confidence intervals

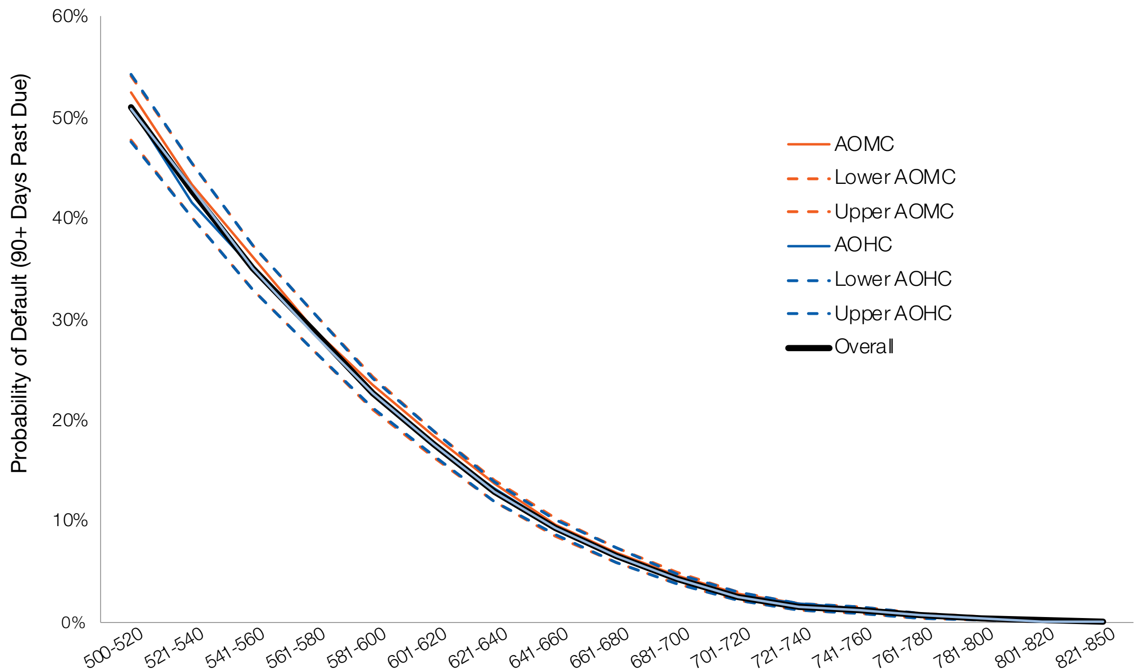
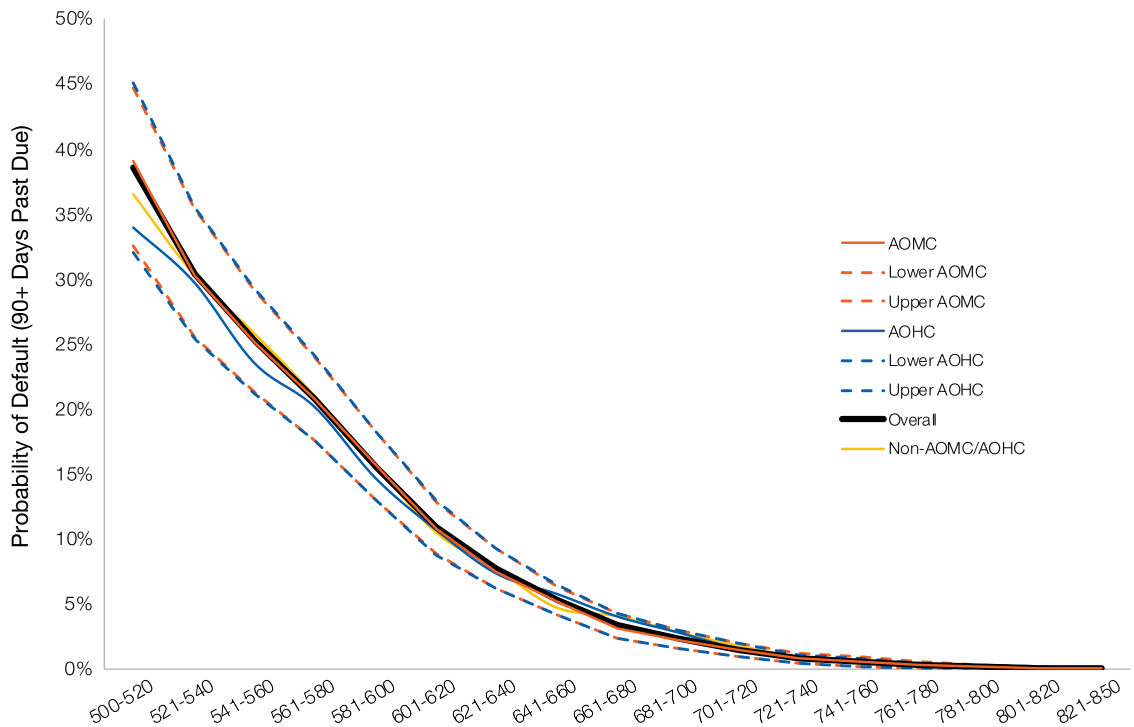


Figure 15: Disparate Impact: Mortgage default profiles by ethnicity with confidence intervals



CONCLUSION

The 2020 annual model performance assessment of VantageScore 4.0 has shown that the model continued to provide superior predictive performance and higher score consistency, when compared with benchmark credit scoring models. These benefits were found in both the Account Management and Account Origination functions. Similar to earlier years' assessments, the results reveal that the use of trended credit data for mainstream consumers and the use of newly designed machine learning attributes for non-mainstream consumers provide significant performance benefits to VantageScore 4.0. In both settings, VantageScore 4.0 continues to outperform all earlier VantageScore models.

Given the severe dislocation of the U.S. economy as well as significant impacts to consumers, their credit activity and reported credit data as a result of the COVID-19 pandemic, VantageScore will be supplementing this 2020 annual model performance assessment with additional, more frequent model performance analyses covering the more recent timeframe.

The VantageScore model is licensed to the three major CRCs, Equifax, Experian, and TransUnion, who each in turn market and sell the credit scores. Lenders and other commercial entities interested in learning more about the VantageScore models may contact one of the CRCs listed below for additional assistance.

The VantageScore credit score models are sold and marketed only through individual licensing arrangements with the three major credit reporting companies (CRCs): Equifax, Experian and TransUnion. Lenders and other commercial entities interested in learning more about the VantageScore credit score models, including the VantageScore 4.0 credit score model, may contact one of the following CRCs listed for additional assistance:

VantageScore
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