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Model Conversion 1: Plug & Play

The first in a series of white papers designed to aid lenders in implementing a new credit score model.

Introduction

In response to industry demands for credit and risk tools that are optimized for post-recessionary consumer behaviors and lending strategies, VantageScore Solutions LLC released the VantageScore® 3.0 credit scoring model in March 2013.

The model was developed on 45 million consumer credit files and uses more granular data, representative of the 2009-2012 timeframe. In validations, VantageScore 3.0 outperforms all other versions of the VantageScore model and the credit reporting companies' (CRCs) proprietary generally available models. Unique to the VantageScore credit scoring model, the identical model is in production at all three national CRCs—Equifax (EFX), Experian (EXP) and TransUnion (TU). The value of this identical model is that consumer scores are highly aligned across the three CRCs, with 90 percent receiving scores that are within a 40 point range across the three CRCs.[1] Additionally, over 30 million consumers are now scored by VantageScore 3.0, and where those same consumers are typically unscoreable by conventional scoring models.

To take advantage of the strengths of VantageScore 3.0, lenders should execute a model conversion process to transition from their incumbent credit risk score to a new model, for example from VantageScore 2.0 to VantageScore 3.0. The model conversion process is driven by a number of factors, such as the complexity and design of the strategy that uses the model and the available resources and data applied to strategy design and transition.

Contents

[1] Every 40 points on the VantageScore scale represents a doubling (or halving) of the odds.

Introduction cont.

This series of papers presents a variety of methods and approaches for model conversion. A team of more than 20 experts in model conversion at major lending institutions took part in providing the information for these conversion processes. The series begins with simple conversion options, titled "Plug & Play." These options are typically the easiest to apply and allow lenders to realize the value of VantageScore 3.0 within three to six months.

As credit and risk strategies become more complex, more sophisticated conversion processes are required. These processes are presented in the Business Optimization white papers offering guidance on simple score cut-offs and complex strategies with overlays. Finally, the fourth white paper offers guidance for building a strategy from scratch that takes advantage of VantageScore 3.0's strengths. Each whitepaper progressively addresses the increased complexity and analytic design of the lender strategy and discusses key analytic, procedural and testing, monitoring and reporting steps. The merits and relevant application for each process is also discussed to aid lenders in determining which conversion process is most appropriate for their business.

Plug & Play Model Conversion

Implications of using a new model

Even though credit score models are generally designed to perform the same function, i.e., separate good performing consumers from poor performing consumers, the scores that consumers receive based on different models are likely to reflect variances due to differences in rank ordering, significant differences in the way each model factors behaviors and risk assessment.

Even when the score ranges of two risk scores from different models are identical, a second driver of different scores is the process that the score developers use for distributing the population across the range.

The combined effect of these drivers is that:

- The probability of default, or PD, at a given score may differ.
- The volume of consumers in each score band may differ.
- Consumer behaviors may vary by score band, such as prepayment, spend and utilization rates.
- And finally, the same consumer may receive a very different score due to variances in the factors used to assess the consumer in the different models.

A successful model conversion process must understand these variances and take them into consideration when the new model is implemented in the strategy.

With any conversion strategy, including "Plug & Play", it is important to understand the contractual and legal restrictions applicable to the old and new models, and any other terms and requirements that may be imposed by the score providers. Certain score license terms or other restrictions imposed by score providers and CRCs may prohibit use of those scores in connection with the strategies presented in this white paper. Before beginning any model conversion process, the lenders should ensure compliance with all applicable contractual and legal terms for each model.

When is Plug & Play appropriate to use?

The Plug & Play processes are most applicable when the variances mentioned above are relatively minor or well understood in terms of anticipated changes to risk levels and population composition. Plug & Play conversion can often be used in strategies that use a single score cut-off as the decision criteria.

Plug & Play conversion works by simply bringing into line a lender's credit and risk strategy between the incumbent model and the new model, typically using one of two key variables, probability of default or population volume. Arranging the credit and risk strategy between two models by one of these variables allows the lender to develop a score cut-off strategy with the new model that is consistent with the OldScore cut-off strategy as it related to a lender's credit and risk tolerance.

What information is needed for Plug & Play?

The critical data requirement for using Plug & Play is that both the old model and the new model have scored out a population of consumers that are representative of those in the lender's product strategy. Specifically, the product, range of credit risk and population demographic should be similar to the population considered by the lenders' product strategy. The population should be scored by both models, over the same time period, using a consistent definition of default rate. Often these criteria are met and all of this information is available as a result of the retro-validation that was conducted by the lender when evaluating the new model.

Alternatively, a number of other readily available sources can effectively satisfy the data requirement. These are:

1. Product performance (odds) charts
2. PD Maps generated through the FDIC Higher Risk assessment rule[2] (see page 6)
3. Custom scored lender portfolios (obtained from retro-score validation initiatives)[3]
4. FACT Act Risk Based Pricing tables

Sources 1-3 enable model conversion by coordinating the credit and risk strategy on probability of default. Source 4, Risk Based Pricing tables, enables arrangement by population volume. However, as was noted above, lenders should ensure that licenses and other contractual terms with respect to the listed source materials permit the use of those materials for model conversation purposes.

[2] FEDERAL DEPOSIT INSURANCE CORPORATION, 12 CFR Part 327, (RIN 3064-AD92), Final Rule,"Assessments in Large Bank Pricing," Pg. 20; October 9, 2012
[3] FEDERAL RESERVE SYSTEM, 12 CFR Part 222 [Regulation V; Docket No. R–1407] RIN 7100–AD66; FEDERAL TRADE COMMISSION, 16 CFR Parts 640 and 698 RIN R411009: Fair Credit Reporting Risk-Based Pricing Regulations

1. Arrangement by Probability of Default Using Product Performance Charts

Standard product performance charts are typically generated by model developers on an annual basis. They are made available to the industry through the CRCs or directly from some model providers. The charts are typically run on the entire U.S. population and categorized by product such as bankcard, first mortgage, auto, etc. The population is ranked by credit score from high to low score and default rates calculated by 20 point bands or 5% population tiers. Default rates based on a variety of definitions are provided, such as 60 days past due (DPD), 90 DPD, charge-off and bankruptcy.

For the purposes of this example, the score ranges and 90+ DPD probability of default value, PD, are included for both the OldScore and NewScore in the table below.[4]

October 2013 Performance Charts

OldScore	OldScore PD	NewScore PD	NewScore
811-850	0.1%	0.1%	811-850
791-810	0.3%	0.2%	791-810
771-790	0.5%	0.4%	771-790
751-770	0.8%	0.7%	751-770
731-750	1.5%	1.1%	731-750
711-730	2.7%	2.0%	711-730
691-710	3.5%	2.7%	691-710
671-690	4.8%	4.2%	671-690
651-670	6.0%	5.7%	651-670

The coordination of strategy between the two scores is simple. The lender's strategy allowed for a PD risk threshold of 2.7%. To manage to this level of risk, the score cut-off using the OldScore was set in the 711 to 730 range. Under NewScore, a PD risk threshold of 2.7% is achieved by using a NewScore cut-off in the 691 to 710 range. Linear interpolation between PD values and score bands can be used if greater specificity is needed for the score cut-off or default rate values.

The next two methods follow the same approach as described using the Product Performance Charts but provide greater specificity.

[4] The score ranges for "OldScore" and "NewScore" in this example are represented as the same range for the sake of simplicity.

2. Coordination of Strategy by Probability of Default Using the FDIC PD Maps

In February 2011, the FDIC published a new method for assessing higher-risk loans at large banks with more than $10 billion in assets. The FDIC's purpose for the new method is to redefine how risk is calculated for a large lender's FDIC deposit insurance assessment. The rule became effective in April 2013.

[The FDIC and VantageScore Solutions presented a webinar to explain the new method and discuss its impact. A white paper from the webinar is also available on the VantageScore Solutions website.

The new rule allows lenders to use any valid credit score model, provided the model has been aligned with the FDIC-prescribed probability of default tables, known as a **PD Map**. Simply, a PD Map is an enhanced version of the traditional odds or performance charts that credit score model developers, such as VantageScore Solutions, provide to the users of the model. Using such a performance chart as a starting point, the FDIC provided specific guidance regarding the product types, credit score model design, calculation of the PD and time periods of data to be used in the calculation. Using this guidance, PD Maps can be generated which uniformly position any credit score to a standard interpretation of probability of default.

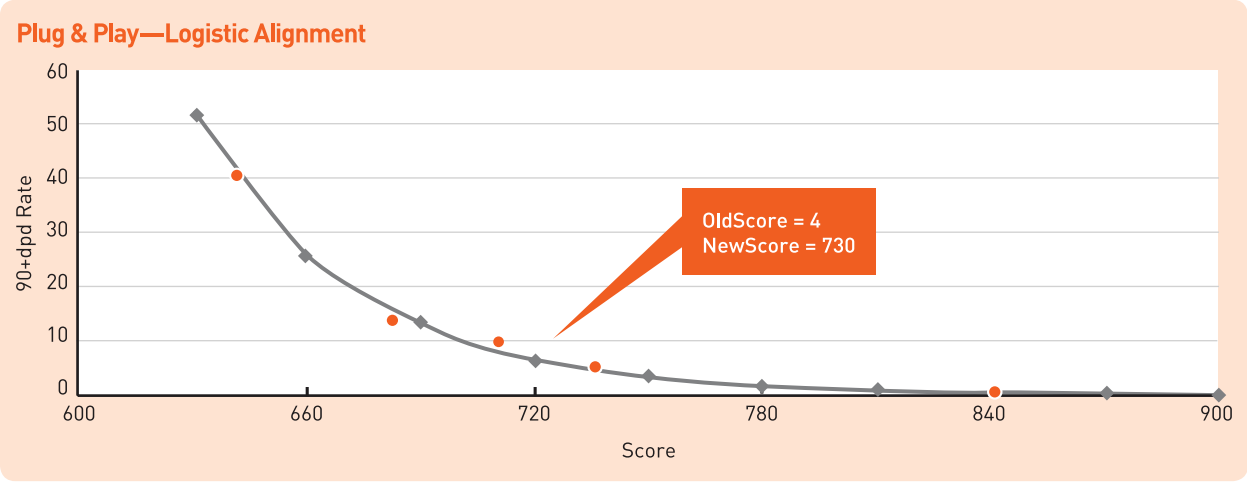
For the purposes of Plug & Play conversion, positioning the PD Maps for the OldScore and the NewScore by default rate enables the OldScore cut-off to be precisely converted to the appropriate value on the new score range.

FDIC PD Maps

OldScore	OldScore PD	NewScore PD	NewScore
808	0.77%		
807	0.78%		
806	0.79%		
805	0.80%		
804	0.81%		
803	0.82%		
802	0.82%		
801	0.83%		
800	0.84%	**NewScore PD**	**NewScore**
799	0.85%	0.85%	820
798	0.86%	0.86%	819
797	0.87%	0.87%	818
796	0.88%	0.88%	817
795	**0.89%**	**0.89%**	**816**
794	0.90%	0.90%	815
793	0.91%	0.91%	814
792	0.92%	0.92%	813
791	0.93%	0.93%	812

Under the OldScore, 795 represented a PD threshold of 0.89%. Using the NewScore, a PD of 0.89% is achieved by a cut-off of 816.

3. Coordination of Strategy by Probability of Default Using a Simple Logistic Arrangement on a Lender Portfolio.



OldScore	OldScore PD
5	0.4%
4	4.5%
3	8.0%
2	16.0%
1	40.0%

NewScore PD	NewScore
0.4%	840
0.8%	810
1.6%	780
3.2%	750
6.4%	720
12.8%	690
25.6%	660
51.2%	630

This method provides a custom conversion method based on a lender's portfolio and its implicit credit and risk dynamics. Similar to prior Plug & Play approaches, the approach requires that the lender portfolio is scored using both the OldScore and NewScore. Portfolio-specific performance charts are created using both scores and a consistent definition for probability of default.

For this example, OldScore has a range of 1 to 5 and NewScore has range of 630 to 900. Both scores rank order based on the propensity for consumers within the population to become 90 days or more delinquent (90+ DPD). Performance charts reflecting the positioning between the score values and propensity to default are provided in the table above.

The logistic regression relationship can be determined using a simple Excel spreadsheet formulation. In this example, the conversion formula is calculated using a simple logistic regression relationship pivoting on the 90+ DPD values.

NewScore value = -43.2809*LN(90+ DPD value for OldScore) + 800.3422

Applying this method to OldScore and NewScore, the conversion of score values can be seen on the graph on page 8. Using a score value of "2" from OldScore and applying the logistic regression calculation (-43.2809*LN(16)+800.3422), the equivalent value for the NewScore is determined to be 680. The conversions for the remaining score values are similarly plotted.

The strength of this method is that the default rate-to-score value relationship is customized to the lender's portfolio, delivering a more precise relationship between the score values and default rates.

4. Coordination of Strategy by Population Volume Using FACT Act Risk Based Pricing Tables

The availability of these "Risk-Based Pricing"(RBP) distributions offers an alternative approach for mapping one score range to another, while maintaining a consistent population volume.

The "Risk-Based Pricing notice" rule adopted into the Fair and Accurate Credit Transactions Act (FACT Act) requires the generation of tables showing the distribution of credit score ranges across the U.S. population for every credit score model on the market used by lenders in evaluating consumer credit applications.

RBP tables classify the U.S. population of consumers with credit files from the credit reporting company providing the score into percentiles based on consumer scores using a specific algorithm. In the table on page 10, a representative sample of this U.S. population is scored using the OldScore and NewScore models. The population is then grouped into percentiles and the minimum and maximum score values are arranged by percentile for each score. For example, consumers with OldScore values between 705 and 709 rank higher than 46% of the population but lower than 45% of the population. In other words, consumers rank in the 45.01% to 45.99% range.

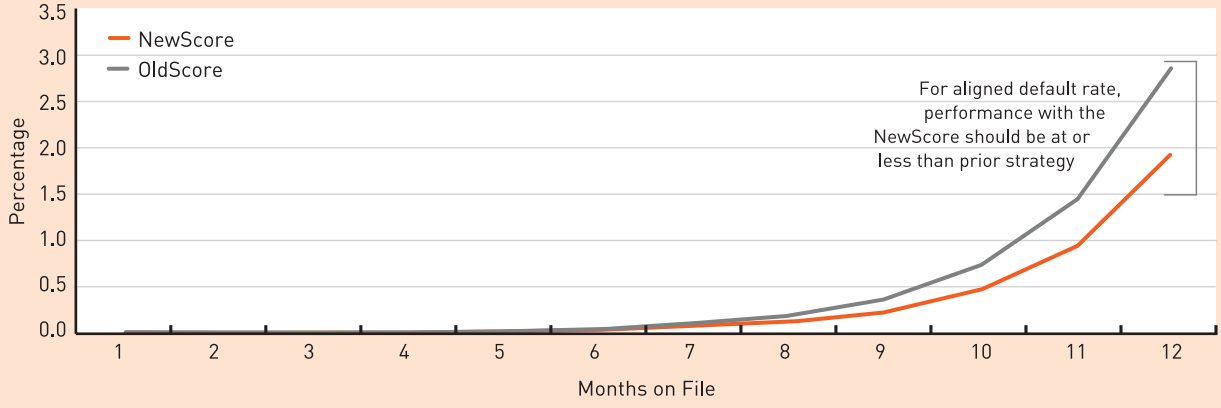
Using the table below, scores can be translated from one range to the other by cross-referencing the same population percentile value on both ranges to find the equivalent scores. For example, a strategy with an OldScore cut-off of 700 approves 47% of U.S. consumers with credit files. To continue approving 47% of the population using NewScore would require a NewScore cut-off of 706. Note that due to a population coordination approach, it's advisable to closely monitor default rates under the NewScore to ensure that additional risk has not been introduced into the approved population.

OldScore Min	OldScore Max	Ranks Higher than X% Cumulative	Ranks Higher than X% Cumulative	NewScore Min	NewScore Max
710	714	45%	45%	716	720
705	709	46%	46%	711	715
700	704	47%	47%	706	710
695	699	48%	48%	701	705
690	694	49%	49%	696	700

Ongoing monitoring....

As previously stated, the core assumption with these methods for model conversion is that the behaviors of consumers identified under the OldScore and NewScore do not substantially differ. Using the organizations' standard performance tracking procedures such as a 'default rate by cohort report' can confirm this assumption. Default rates by month on file for the cohort under the NewScore should be at or below the default rates using OldScore.

Test Tracking: Cumulative Default Rate



Downstream implications

Implementing a new model may cause changes in population volumes, risk profile and behaviors that have implications for downstream business functions. For example, a major change in population volume could require staffing adjustments in customer service and collections departments. Notifying downstream functions of these changes in advance facilitates a successful conversion to the new model.

All changes in credit and risk analytic tools should be reviewed with the chief credit officer (CCO). Assuming minor shifts to population volumes and behaviors, there should be minimal downstream implications to business functions such as portfolio marketing, account management, customer service, collections, host processing, etc., as seen in the chart below. A simple notification of change to risk and credit processes may be sufficient. However, all communication and notifications should conform to the policies established by the lender's CCO, audit and compliance teams.

	Acquisition Market & Credit	Portfolio Market & Credit	Customer Service	Collections & Recoveries	Fraud & Risk	Finance & Accounting	Compliance & Audit
Notification		X	X	X		X	
Business/ Volume Change							
Review					CCO/X		X

Conclusion

Pros	Cons
Easy and fast to implement	May miss hidden risk
Capture 80% of the value with 20% of resource	May not gain all opportunity
Allows for progressively working into best strategy	

The model conversion methods presented in this paper provide a number of proven, simple ways to convert from one model to another.

The core assumption that determines whether these Plug & Play approaches can be used is that there is only a relatively minor shift in population default rates and behaviors. If this is not the case, additional risk may be introduced into the portfolio. Future white papers will discuss model conversion methods for situations where more substantial shifts in population default rates and behaviors are expected.

However, for many strategies and lenders, these approaches are perfectly suited for a fast and easy implementation and require minimal analytical resources to determine how to convert to the NewScore cut-offs. Assuming the lender has a robust ongoing performance monitoring process in place, minimal additional resources are required to track performance and refine the strategy as necessary.

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