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Introducing the VantageScore Default Risk Index – Powered by TransUnion

Using credit scores to evaluate pools of loans

Contents

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INTRODUCTION

The three-digit credit score has come to seem practically inevitable. At almost every link in the consumer finance supply chain, there is a clear need to summarize credit characteristics. By default, that need is often met using some representation of credit scores.

When it comes to pools or categories of loans, however, there is an important information gap. Today's common practices—using "weighted average" or "distribution by score band" as yardsticks—are fundamentally flawed. As this report will demonstrate, these metrics can miss the true credit quality of a loan pool, obscure meaningful trends, and lead a well-intentioned analyst to the wrong conclusions. In the secondary market, it's time to reconsider the status quo when it comes to credit scores.

The VantageScore Default Risk Index (DRI) illustrates a more accurate way to use credit scores to evaluate and compare pools of loans. Each quarter, the DRI is made available on the VantageScore website using data from TransUnion. This free, interactive data series compares the total volume and weighted-average risk profile of quarterly originations in the bankcard, mortgage, auto, and student loan industries. Rather than using credit scores to directly examine risk profiles, the DRI translates each score into an estimated probability of default using the most recent score-to-probability of default mapping tables available at the time.

In a single number, the Default Risk Index summarizes the risk profile of new originations in a way that is mathematically accurate and consistent over time. More important, however, is the methodology behind the DRI. This approach represents a powerful new way for investors and ratings analysts to look at loan pools using data that are already at their disposal.

This whitepaper begins with a discussion of the two primary challenges to today's conventional approach, including the practical implications for analyzing industries or loan pools. It continues by demonstrating how the Default Risk Index addresses those challenges and details its methodology. It concludes with some brief commentary on the first two years of DRI data available.

CHALLENGE #1: THE RELATIONSHIP BETWEEN CREDIT SCORE AND UNDERLYING RISK CHANGES OVER TIME

A credit score does not predict a fixed level of risk. At any point in time we can translate the score into an estimate of risk, based on recent performance; but this relationship changes meaningfully over time. Today, an auto loan application with a score of 620 indicates just under a six percent probability of default; but that six percent estimate will almost certainly change. To illustrate, first consider how scoring models work.

The process begins with a sample of consumer credit files at the beginning and end of a two-year performance window. Through a process called logistic regression, modelers determine the credit attributes at the beginning of the window that were predictive of actual performance over the following two years. These attributes form the model algorithm. Next, they apply the resulting algorithm to rank order consumers based on their probability of default (PD), where default is typically defined as missing a payment on any obligation by 90 days or more.

The three digit credit score is only a representation of rank order: rather than have 220 million people, each with his or her own individual ranking (i.e., 1 to 220 million!), credit score models compress the consumer ranks into twenty point bands. For VantageScore 3.0, score bands begin with a score of 300 (representing high risk) and end at a score of 850 (representing low risk).

For models that perform well, that rank order will hold across the economic cycle such that a score of 600 always suggests a higher level of risk than a 700 and a lower level than a 500. The specific PD at each of those scores, however, will change with the overall economy.

This is the source of common and widespread misunderstanding. The relationship between a credit score and PD is dynamic: it is defined at the time the model is initially developed but changes over time as the overall risk level in the economy ebbs and flows. The rank order, however, is stable over time.

As you can see in Figure 1, these changes in underlying risk can be meaningful. A score of 660 indicated a PD of approximately 6.0 percent in 2006, of 8.1 percent at the height of the crisis, and of 3.8 percent today. Prime consumers demonstrated this same dynamic, with risk levels more than doubling and then halving again through the course of this most recent credit cycle. This is precisely the reason that sophisticated lenders will periodically adjust their credit policies based on their actual and projected credit experiences.

Clearly this suggests a practical limitation to the use of credit scores to compare risk at different points in time. Consider the implications for two common (fictionalized) scenarios:

Figure 1: Shifting PD

- In 2014, an automotive investor noticed that the volume of loans to borrowers with credit scores below 620 had doubled from 2010. Taken at face value, this suggested a loosening of credit standards and potential cause for concern. However, this increase in volumes coincided with a period in which the aggregate level of risk (and therefore the risk level associated with that 620 yardstick) was in decline. Was the industry actually taking on more risk?

- In 2007, an analyst looked at the latest securitization from a private-label MBS conduit. He saw that the distribution of credit scores was consistent with that conduit's past deals, which had performed as expected. However, the system as a whole had seen its first upticks in default rates (and therefore the risk level associated with each breakpoint in the score distribution had increased). Despite the consistent credit score summary, did this deal actually reflect the same risk as its predecessors?

Using a score summary to compare credit quality across cycles is like throwing a towel on the beach at low tide and hoping it's still dry six hours later. To make comparisons over time, one must consider the tide of the credit cycle; and to do that, one must use the most recent estimate of underlying risk.

CHALLENGE #2: WEIGHTED AVERAGE CREDIT SCORE IS A MATHEMATICALLY FLAWED METRIC

What's the quickest way to summarize the credit quality of a pool of loans? In most cases, analysts defer to average or weighted average credit score. It's succinct, readily available, easy… and wrong.

For a given pool of loans, each borrower's credit score will fall somewhere on a linear scale between 300 and 850. As described in the preceding section, each of those credit scores has an associated level of risk at a given point in time. Taken together, these risk levels can be represented as a probability of default curve. Unlike the score range, which is represented linearly for ease of use in strategy design, the underlying risk curve is an exponential function. Taking an average of the credit scores (a linear function) and using it to represent risk (an exponential function), misrepresents the true risk profile. As demonstrated below, this can lead to surprisingly incorrect conclusions.

Consider two hypothetical pools of loans (Figure 2): Pool 1 and Pool 2. Both pools consist of ten loans and both have an average credit score of 660. Using this measure, these pools represent ostensibly the same risk profile. As illustrated below, however, the average risk of Pool 2 is actually double that of Pool 1.

Using average credit scores to summarize the riskiness of a loan pool is mathematically flawed. In order to correct the course, analysts should convert each loan into an estimate of risk and then take the average of those estimates. While this may sound daunting, the next section will demonstrate a straightforward methodology to do this using freely available information.

THE VANTAGESCORE DEFAULT RISK INDEX

While many analysts already appreciate the challenges described above, they have historically had little choice. We are each limited by the information available. As the availability of loan-level data continues to grow, however, there is an opportunity to transform the status quo.

The DRI accounts for changes in underlying risk in a mathematically accurate way, creating a yardstick that can be used to characterize and compare pools and categories of loans. Each quarter, using a national sample of consumer credit files from TransUnion, the DRI presents the following:

- Total new originations of bankcard, mortgage, auto, and student loans
- The weighted average probability of default ("risk level") for each category of loans
- The risk level for each category of loans indexed to the beginning of the series

Figure 2: Hypothetical Loan Pools: Same Average Score, Double the Average Risk

HYPOTHETICAL POOL 1*		
Loan	Credit Score	PD
Loan A	660	4.00%
Loan B	660	4.00%
Loan C	660	4.00%
Loan D	660	4.00%
Loan E	660	4.00%
Loan F	660	4.00%
Loan G	660	4.00%
Loan H	660	4.00%
Loan I	660	4.00%
Loan J	660	4.00%
Average	660	4.00%

HYPOTHETICAL POOL 2*		
Loan	Credit Score	PD
Loan A	600	15.25%
Loan B	600	15.25%
Loan C	620	10.92%
Loan D	620	10.92%
Loan E	620	10.92%
Loan F	640	8.50%
Loan G	660	4.00%
Loan H	700	3.43%
Loan I	720	3.11%
Loan J	820	0.52%
Average	660	8.28%

* *Numbers are for illustrative purposes only.*

Taken together, these data represent the risk profile of all new originations within each major category of consumer loans each quarter. While this data series is only available at the national level, the approach taken can be replicated on any subset or pool of loans.

Methodology

To begin, the DRI generates a credit score for each loan in the sample using VantageScore 3.0—a generic credit scoring model designed to provide superior predictive performance, greater consistency across all three credit reporting companies (Equifax, Experian and TransUnion), and the ability to score more people. Each credit score is calculated at the end of the quarter immediately preceding each loan's origination and in instances where a loan has multiple borrowers, the lowest score is used. Next, the DRI maps the credit score for each loan to a risk level using the newest available performance charts for VantageScore 3.0. The risk level is defined as the probability of the borrower defaulting by 90 days or more on any obligation.

Next, the DRI summarizes the aggregate risk profile of the sample by calculating the sample's average risk level weighted by the size of each loan. Finally, the DRI calculates an index value by comparing each quarter's weighted risk level to the beginning of the series in the third quarter of 2013.

Concluding thoughts

While credit scores are familiar, they are too frequently misused or taken out of context. When working with more than one loan— whether an ABS pool or a national sample— it's critical to base analyses not on the credit scores themselves, but on the underlying risk levels.

We are proud to offer the Default Risk Index free of charge. We believe it represents a unique and much-needed perspective on the risk profile of new originations within each major category of consumer loans. An interactive version of the DRI will be available each quarter at DefaultRiskIndex.com along with occasional commentary. Perhaps more importantly, we are hopeful that the DRI will start a conversation among secondary market participants. If you have questions about how to apply this methodology to your business, please do not hesitate to reach out to VantageScore, Equifax, Experian, or TransUnion.

WORKING WITH PERFORMANCE CHARTS

Performance charts summarize the actual performance of borrowers, during some window of time, in terms of their credit scores. There are many variations, and many lenders will create their own charts using their actual portfolios. VantageScore publishes performance charts every year based on a national sample over a two year look-back. These charts summarize the percentage of consumers at each of 20 different score intervals to default. The DRI uses the versions specific to new loan originations (as opposed to account management) for each industry type (i.e., bankcard, mortgage, auto, and student loans). VantageScore performance charts are available for free to end-users upon request. To receive a copy, please contact your representative at Equifax, Experian, or TransUnion.
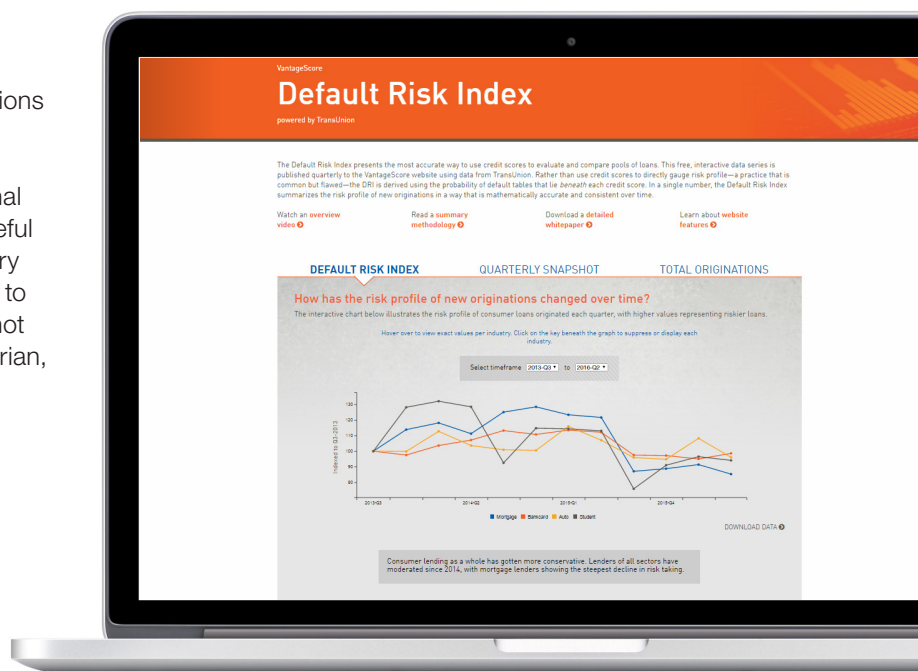
FIRST LOOK AT DRI HISTORY

As of publication, the DRI is live at DefaultRiskIndex.com with data running back to the third quarter of 2013. Below are a few early observations. We look forward to continuing and expanding these analyses as the dataset grows.

Figure 3: Risk profile (DRI), by loan category
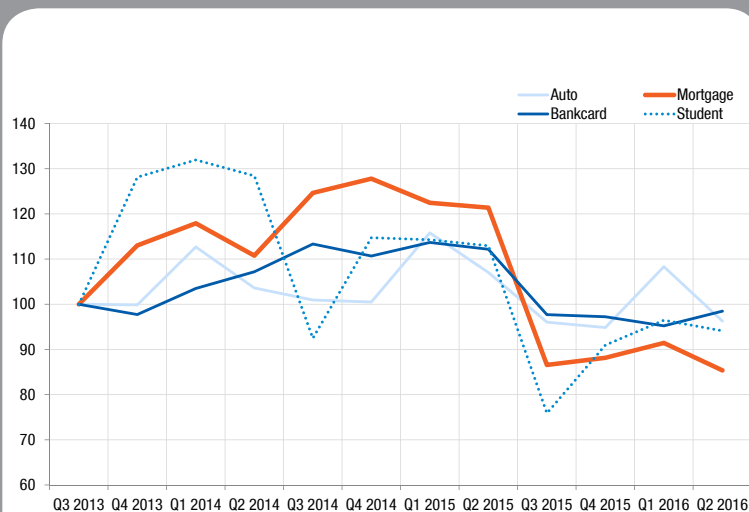
The overall risk profiles for consumer lending (Figure 3) have become more conservative over the past three years. Relative to the beginning of the series, risk-taking in student loans peaked in early 2014, followed by peaks in bankcard and mortgage lending later that year and a peak in auto lending at the beginning of 2015. While auto and student lending show strong seasonality, both industries are currently below their earlier peaks on both absolute and seasonally-adjusted bases.
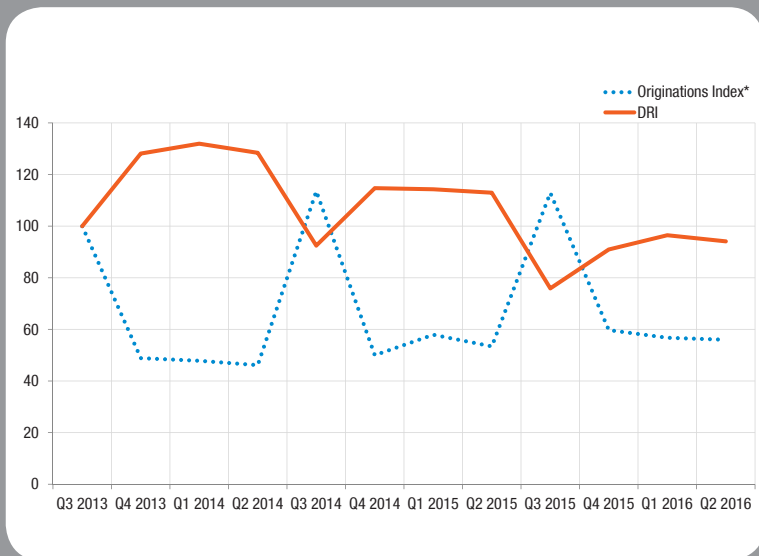

Figure 4: Mortgage
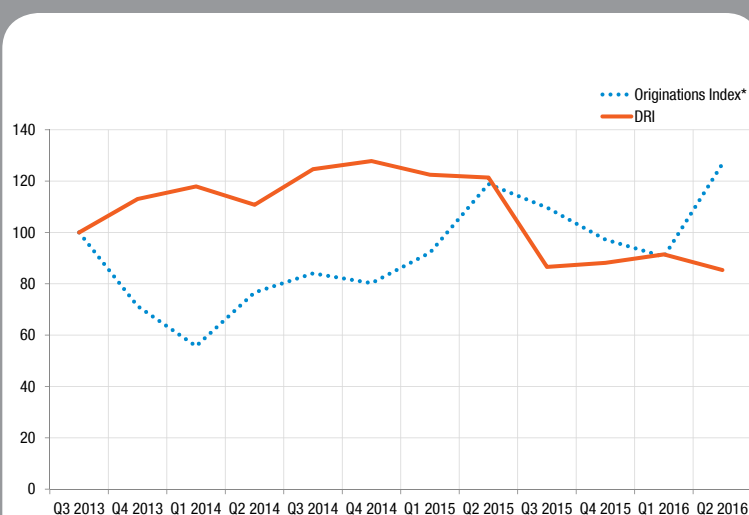
After peaking at an index value of 128 at the end of 2014, the mortgage DRI (Figure 4) is currently at 85. It is interesting to note that the decline in risk taking has coincided with a surge in origination volumes, with the third quarter of 2016 representing a 40 percent sequential increase and a seven percent increase relative to the third quarter of 2015.

* _Originations in $USD, indexed against Q3 2013, which is assigned a value of 100. Actual dollar volumes are also tracked at DefaultRiskIndex.com._

As discussed before, student lending (Figure 5) shows a strong seasonal pattern. It's notable that there is a strong negative correlation (-0.71) between originations and risk-taking (the DRI) in that industry.

Figure 5: Student

Legend: Originations Index* (dotted), DRI (solid)

X-axis: Q3 2013, Q4 2013, Q1 2014, Q2 2014, Q3 2014, Q4 2014, Q1 2015, Q2 2015, Q3 2015, Q4 2015, Q1 2016, Q2 2016

*   *Originations in $USD, indexed against Q3 2013, which is assigned a value of 100. Actual dollar volumes are also tracked at DefaultRiskIndex.com.*

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 3.0 credit score model, may contact one of the following CRCs listed for additional assistance:

EQUIFAX

Call 1-888-202-4025

http://VantageScore.com/Equifax

Experian

Call 1-888-414-4025

http://VantageScore.com/Experian

TransUnion

Call 1-866-922-2100

http://VantageScore.com/TransUnion

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