WHITE PAPER

Scoring

Credit Risk

Measuring consumer resilience to economic stress using the FICO® Resilience Index

Introduction to the FICO® Resilience Index

FICO® Scores are designed to rank-order the expected future payment performance of consumers' credit obligations based on their credit bureau characteristics, irrespective of the economic environment. Lenders may calibrate FICO Scores based on their own loan portfolios' recent performance to predict the odds of satisfactory payment performance.

However, disruptions to the economic environment put stress on consumers that can change these repayment odds in a way that differs from a lender's calibrated estimates, leading to discrepancies between predicted and actual future default odds, and ultimately to sub-optimal credit decisions. Such disruptions reveal "latent risks" within portfolios that only manifest during periods of economic stress. A formidable challenge for credit risk management is that disruptions can be extremely difficult if not impossible to anticipate as the COVID-19 pandemic again demonstrates. This leads to the basic question: "How can we measure, and then manage, latent risks?"

It is intuitive that some consumers are impacted by economic disruptions less than others. Some can quickly adjust spending and saving habits, identify other sources of income, or liquidate assets to weather the downturn. Others may become over-extended and may default on one or more obligations.

Two practical questions naturally arise:

- How can I identify economically resilient consumers from readily available credit bureau data?
- How should I factor knowledge of consumers' economic resilience into my lending decisions and portfolio management approach?

In the past, lenders have struggled to answer these questions. A tool that rank-orders consumers by their resilience to stressed economic conditions would allow lenders to manage latent risks within groups of consumers bearing similar FICO® Scores, while maintaining a healthy flow of credit to resilient consumers during all economic cycles. This prospect inspired the development of the FICO® Resilience Index.

After introducing the new index and how it was developed, we will describe key analysis results including credit behaviors associated with resilience, validation performance of the index during the previous economic cycle, and our most recent findings evidencing effectiveness of the index in the pandemic. We will further discuss a spectrum of use cases relevant to lenders, regulators, and investors.

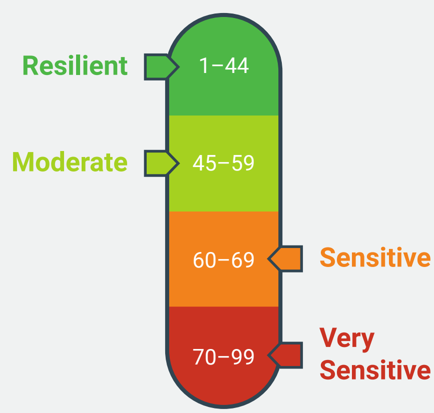
Model Overview

It is well understood that payment odds for a given FICO® Score tend to worsen in a stressed economy. We sought to stratify consumers within FICO Score bands based on their performance under "stressed" vs. "normal" economic conditions.

Our resulting FICO® Resilience Index is designed to provide a ranked ordinal scale ranging from 1 (most resilient to economic stress) to 99 (least resilient). As we will illustrate, this new metric may be used in two ways:

1. As a complementary decision key, predictive variable, or segmentation variable, to be used in conjunction with the FICO® Score
2. As a basis for adjusting the FICO® Score (up or down), resulting in a "stress-adjusted FICO Score"

Consumers with a lower FICO® Resilience Index are more resilient to stressed economic conditions.



Design and Development

We designed the FICO® Resilience Index model to measure consumers' resilience to an economic disruption, which we define as the difference in their payment performance under "stressed" vs. "normal" economic conditions.

In our model framework, normal and stressed conditions appear as two arms of a thought experiment (see Figure 1). Naturally, consumers can only travel along one arm of the experiment for which their performance can be observed.

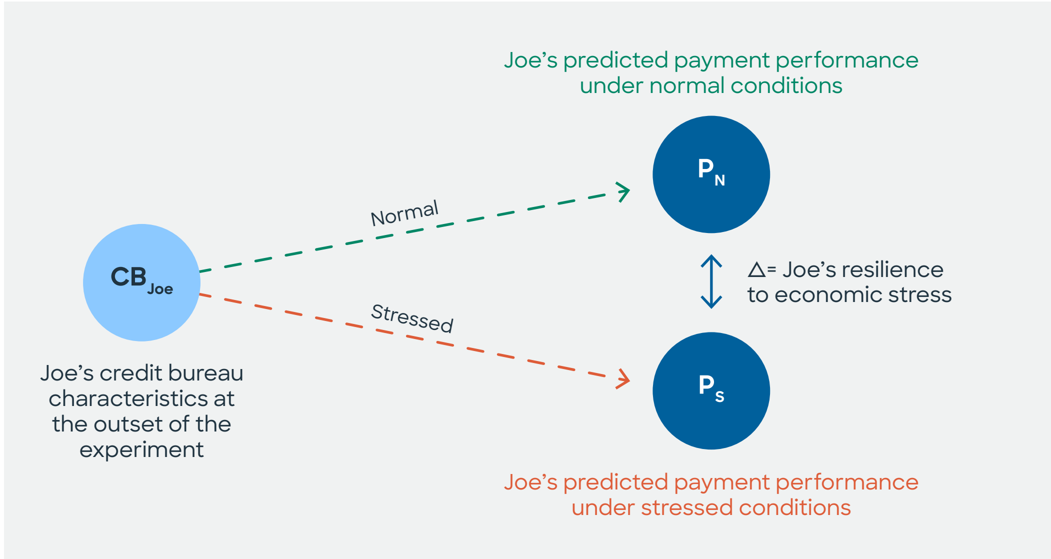


Figure 1: "Resilience" is defined as the difference in predicted payment performance under contrasting economic conditions.

We developed the FICO® Resilience Index model based on US credit bureau data collected during two starkly contrasting phases of the economy. First, we measured payment performance for a set of consumers who experienced the stable, benign economy between October 2013 and October 2015 (the "normal condition" in Figure 1). Through established modeling methods, we then composed an identically sized set of "twin" consumers who shared very similar characteristics but instead experienced the Great Recession between October 2007 and October 2009 (the "stressed condition").

The difference in payment performance for these sets of "twin" consumers under normal vs. stressed conditions quantified their resilience to economic stress and provided the analytical basis for the FICO® Resilience Index model.

Validation

To validate the FICO® Resilience Index model, we need to show that it rank-orders payment performance within narrow FICO® Score bands during a stressed economy. In the auto finance origination example in Figure 2a, we see the expected dynamic, as the most resilient consumers in each FICO Score band (as measured by the FICO Resilience Index) consistently experienced the lowest 90+ days past due (DPD) delinquency rates over the 2007–2009 period, while the least resilient consumers experienced the highest rates. For some FICO Score bands, the observed 90+ DPD delinquency rates of the least resilient consumers were more than double those of the most resilient consumers.

Conversely, in the benign economic conditions of 2013–2015 we do not observe rank-ordering by the FICO® Resilience Index, as expected (see Figure 2b for a contrasting auto finance account origination example).

Our results illustrate the considerable heterogeneity of consumers and their resilience to stress even within very narrow credit risk score bands.

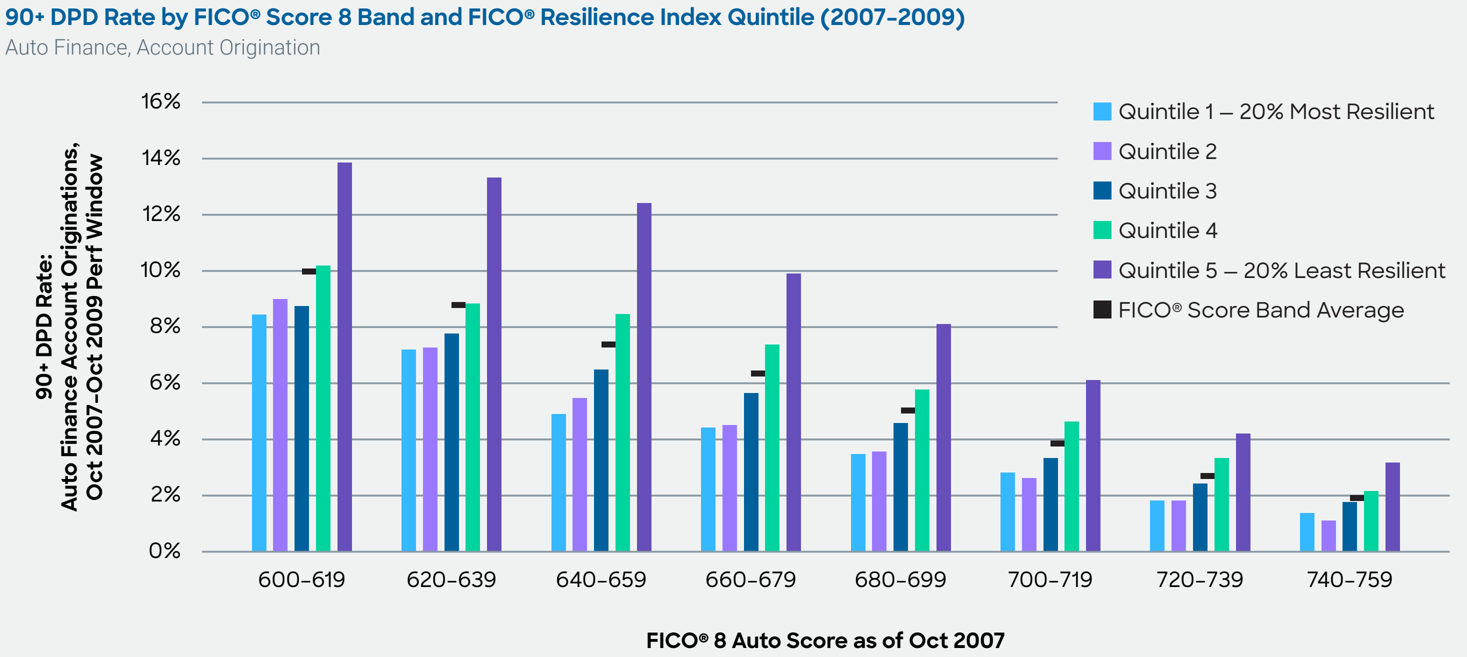


Figure 2a: The FICO® Resilience Index rank-ordered payment performance within narrow FICO® Score bands during the Great Recession (October 2007–October 2009). In each FICO Score band, more resilient consumers experienced substantially lower rates of serious delinquency.

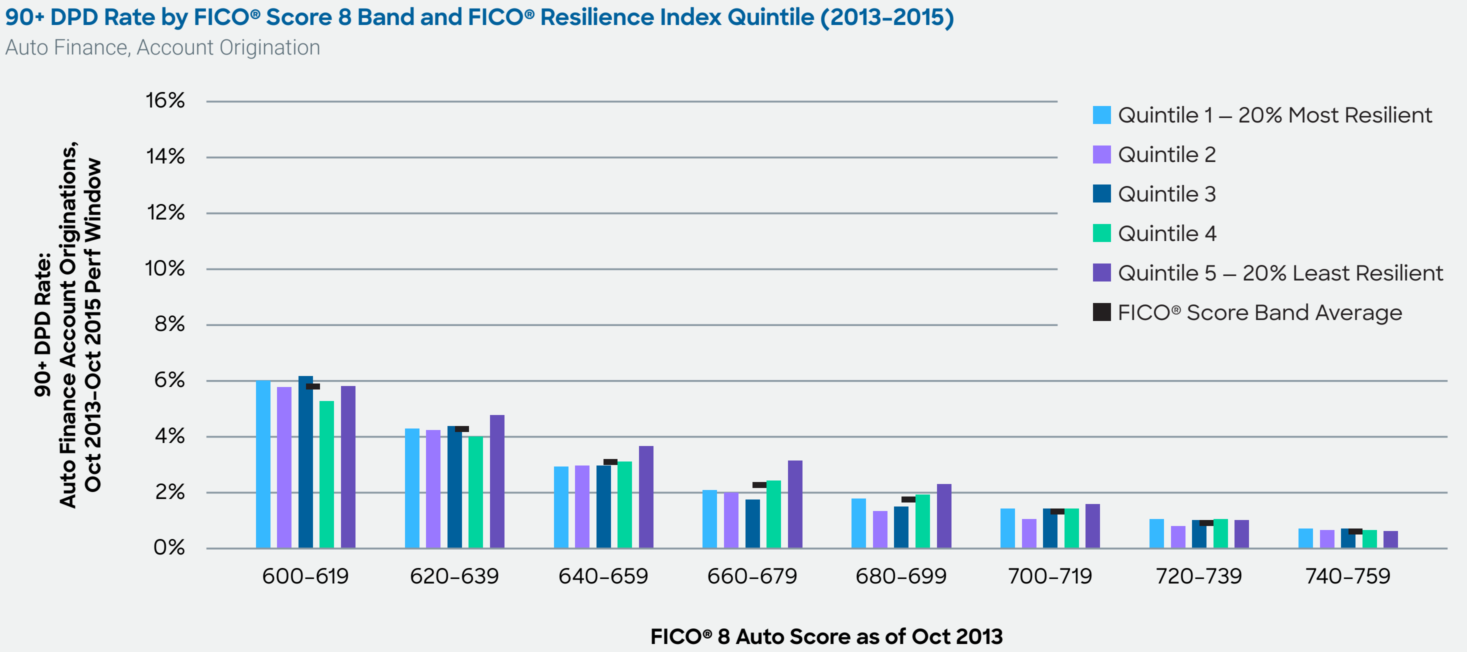


Figure 2b: As expected, the FICO® Resilience Index did not rank-order payment performance within narrow FICO® Score bands in the absence of economic stress (October 2013–October 2015).

Behavioral Profiles of Resilient vs. Non-Resilient Consumers

The FICO® Score combines numerous characteristics to arrive at a single metric; as a result, multiple paths exist to achieve a given FICO Score value, and different consumer segments within even narrow FICO Score bands may have significantly different behavioral profiles.

We analyzed FICO® Resilience Index quintiles within narrow FICO® Score bands to identify the characteristics that differed significantly between the most resilient and least resilient consumers. As illustrated in Figures 3a to 3d, higher resilience was associated with:

- Fewer recent credit inquiries
- Fewer recently active accounts
- Lower total revolving balances
- More experience managing different types of credit

Quintile 1 – 20% Most Resilient   Quintile 5 – 20% Least Resilient

Number of Inquiries in Last Year

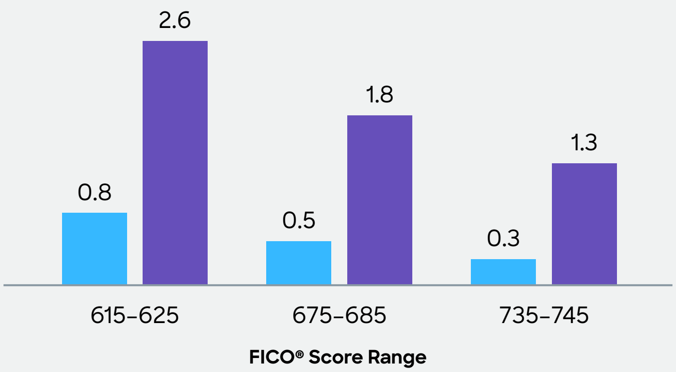


Figure 3a: Having fewer credit inquiries in the last year is associated with higher economic resilience.

Total Revolving Balances

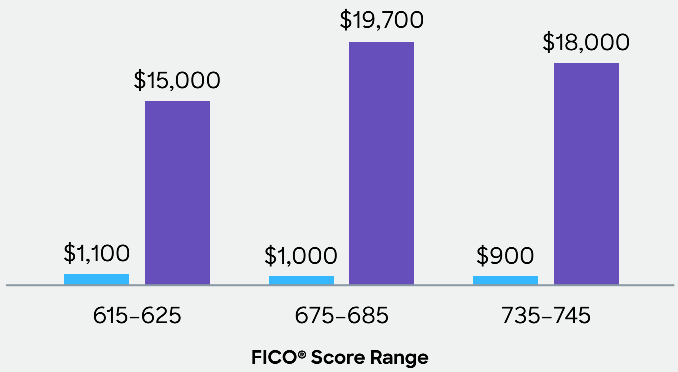


Figure 3b: Having lower total revolving balances is associated with higher economic resilience.

Number of Accounts Active in Last Year

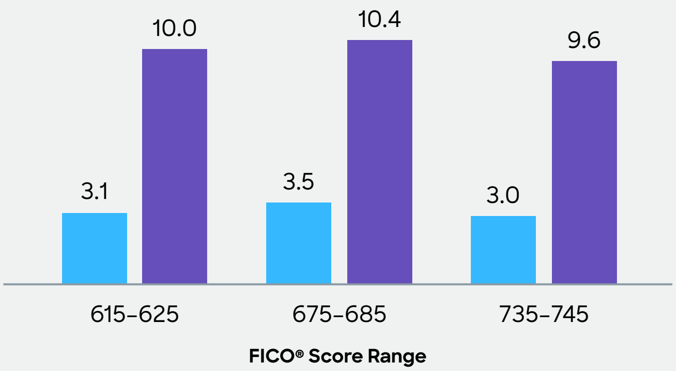


Figure 3c: Having fewer active accounts in the last year is associated with higher economic resilience.

Percent of Consumers with Installment Loans Comprising at Least Half of All Trade Lines

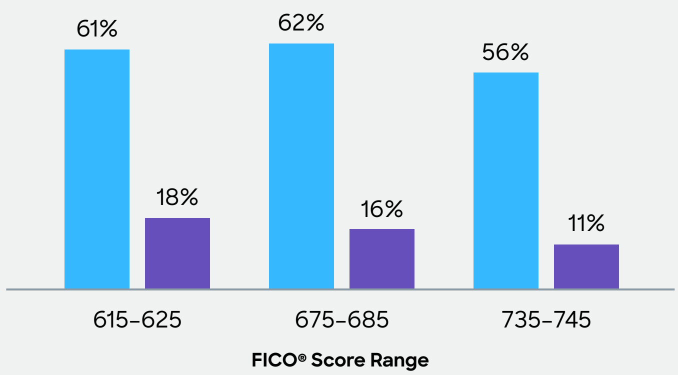


Figure 3d: Having more experience managing different types of credit is associated with higher economic resilience.

Validating the FICO® Resilience Index in the Current Economic Downturn

In the sharp 2020 economic downturn triggered by the COVID-19 pandemic, serious delinquencies could take months to materialize, driven in part by accommodations such as forbearance and deferred payment programs. We can turn to different measures of consumer financial stress such as requests for accommodations in such a scenario rather than relying upon 90+ DPD rates. In Figure 4, we see that the FICO® Resilience Index effectively rank-orders the percentage of consumers who have received accommodations in each FICO® Score band, providing an early positive indicator of the model's efficacy in a new recessionary period.

Lenders seeking to validate the FICO® Resilience Index on their own portfolios may adopt a similar approach — testing alternative financial stress indicators and shorter performance windows compared to the more traditional 90+ DPD metric and one- to two-year performance windows — to complement validations based on performance through prior stressed periods such as the Great Recession.

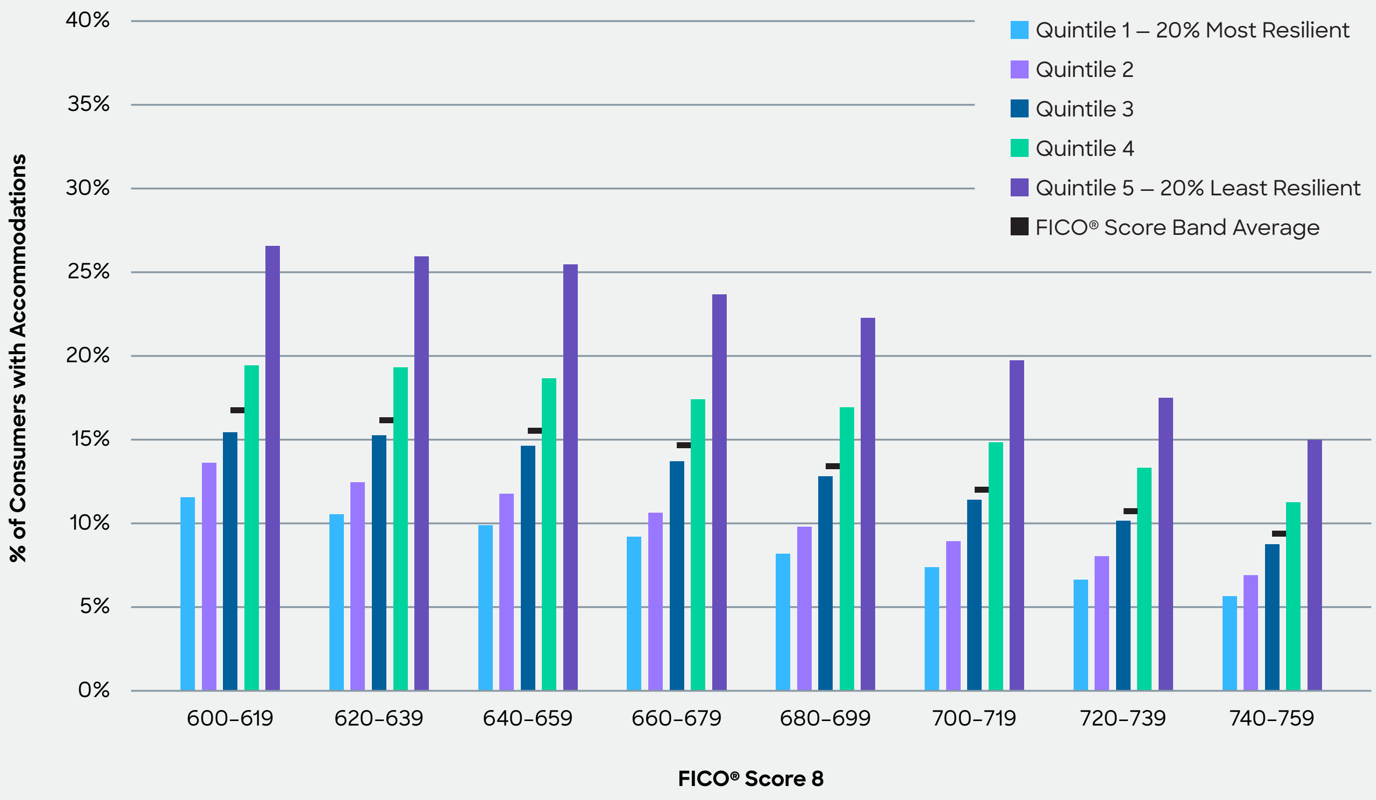


Figure 4: The FICO® Resilience Index rank-ordered consumers who received payment accommodations within narrow FICO® Score bands as the COVID-19 pandemic began to disrupt the economy (January 2020–July 2020, combined account management and account origination view).

Implementation Considerations

The FICO® Resilience Index may be incorporated in decision strategies, portfolio analyses, and business planning activities as either an independent metric or as the basis for an adjustment to the FICO® Score.

As a standalone metric, the FICO® Resilience Index provides a measure of resilience to economic stress, independent of the FICO® Score. It may be used as a decision key in strategy development or as a segmentation variable in portfolio analysis. It may also be combined with FICO Scores to differentiate consumer resilience to economic stress.

Using the FICO® Resilience Index to Create Stress-Adjusted FICO® Scores

The FICO® Resilience Index can also be used to generate a stress-adjusted FICO® Score on the same scale as the FICO Score, which may be used for stress modeling applications such as stress testing or portfolio-level credit loss forecasting. The magnitude of "stress adjustment" should reflect each lender's assumptions about the economy and their business objectives.

FICO provides stress adjustment benchmarking resources via the FICO Score Support website to assist lenders who wish to calculate stress-adjusted FICO® Scores based on the FICO® Resilience Index. The "stress adjustment" values — provided as a formula or simple table — simulate the effect of severe economic stress on credit risk, in the form of FICO Score adjustments based on a consumer's recent FICO Score and FICO Resilience Index value. The first release of benchmark values is anchored in two specific performance periods: (i) the Great Recession period of October 2007 to October 2009; and (ii) a relatively recent performance window of October 2017 to October 2019. The stress adjustment calculation is driven by the **difference in repayment odds** between the two reference periods.

Figure 5 illustrates the difference in repayment odds for newly originated auto loans in the two reference periods (with a third reference period of October 2016 to October 2018 for comparison). Because the difference in repayment odds increases for higher FICO® Auto Score 8 values, we expect larger FICO® Score stress adjustment values at this end of the spectrum.

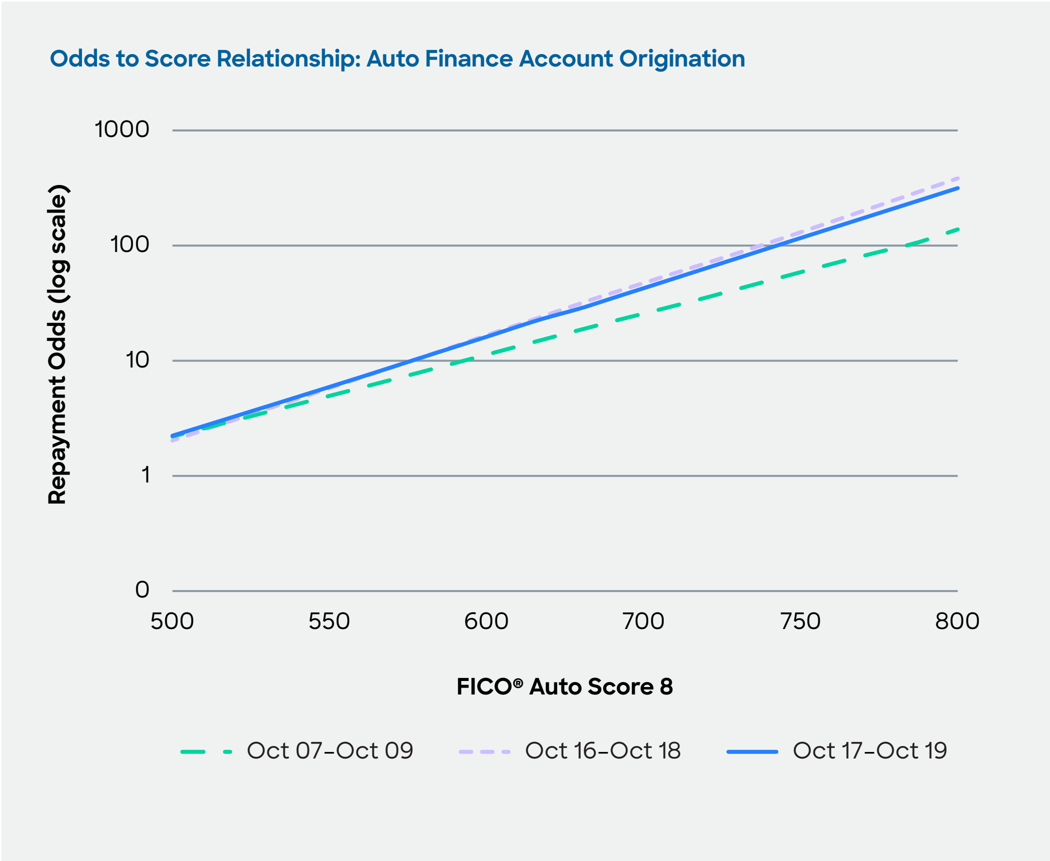


Figure 5: Although FICO® Scores continue to rank-order risk at all points in the economy, the odds-to-score relationship varies between stressed and unstressed periods. In this example, we observe a larger change in the odds-to-score relationship when FICO Scores are higher.

The corresponding FICO® Score stress adjustment benchmark formula and table are provided in Figure 6. A negative FICO Score stress adjustment indicates that consumers may perform worse in a stressed economy than their current FICO Score alone indicates. For example, a consumer with a FICO® Auto Score 8 of 660–679 whose FICO® Resilience Index falls into the "Sensitive" 60–69 range would have a FICO Score stress adjustment of -53 based on the lookup table. In other words, during a period of severe economic stress similar to the Great Recession, we would expect such a consumer to repay a newly originated auto loan more in line with consumers that had a FICO Score 53 points lower during a recent (unstressed) period.

Industry/Lifecycle: Auto Finance, Account Origination

Stressed Period: October 2007 to October 2009 performance (Great Recession)

Recent Period: October 2017 to October 2019 performance

Formula:

Benchmark FICO® Score Stress Adjustment =
(-1.728 x FICO® Resilience index) +
(-0.110 x FICO® Auto Score 8) + 132.329

Table:

Benchmark FICO® Score Stress Adjustment By FICO® Resilience Index Segment and FICO® Auto Score 8 Band

FICO® Resilience Index Segment	FICO® Auto Score 8									
	<600	600-619	620-639	640-659	660-679	680-699	700-719	720-739	740-759	>=760
Resilient (1-44)	>=-1	-2	-4	-6	-8	-11	-13	-15	-17	<=-18
Moderate (45-59)	>=-23	-24	-26	-29	-31	-33	-35	-37	-40	<=-41
Sensitive (60-69)	>=-45	-46	-48	-50	-53	-55	-57	-59	-61	<=-62
Very Sensitive (70-99)	>=-63	-64	-66	-68	-71	-73	-75	-77	-79	<=-80

Note: Stress adjustment benchmark formulas and look-up tables are for permitted use of the FICO® Resilience Index for stress modeling purposes only, and are not intended to be applied directly by lenders for credit decisions – rather, they are provided as a point of reference which lenders should adjust according to their own data, macroeconomic forecasts and assessment.

Figure 6: Benchmark FICO® Score stress adjustments can be expressed as either a formula (as a function of FICO Score and FICO® Resilience Index), or as a lookup table based on a range of FICO Scores and FICO Resilience Index values.

Use Cases & Benefits

The primary benefit from using the FICO® Resilience Index (either in conjunction with the FICO® Score or as the basis for an adjuster to the FICO Score) is to enhance portfolio resilience over time. Lenders can maximize this benefit by incorporating the FICO Resilience Index into account- and consumer-level decision strategies, portfolio management activities, and secondary market applications.

Decision Strategies

- Pre-screen
- Underwriting
- Pricing
- Initial line / loan assignment
- Credit line management
- Authorizations
- Early stage collections
- Staffing planning

Portfolio Management

- CCAR, DFAST, or internal stress tests
- Expected credit loss forecasting
- Credit loss allowance estimation
- Credit risk capital / RWA calculations
- Risk appetite
- Financial volatility

Secondary Market

- Asset valuations
- Debt sales
- Portfolio acquisitions
- Due diligence support
- Securitization
- Mortgage servicing

Decision Strategies

Knowledge of consumer resilience enables lenders to reduce volatility and stabilize portfolio credit risk and profitability through different economic cycles.

Decision strategy refinements based on the FICO® Resilience Index can generate favorable "swap sets" of consumers on either side of cutoffs currently based on FICO® Scores, as shown in Figure 7.

Such strategy refinements may include marketing, setting of initial line or loan amounts, credit line management, pricing, collections, and other account- or consumer-level decisions.

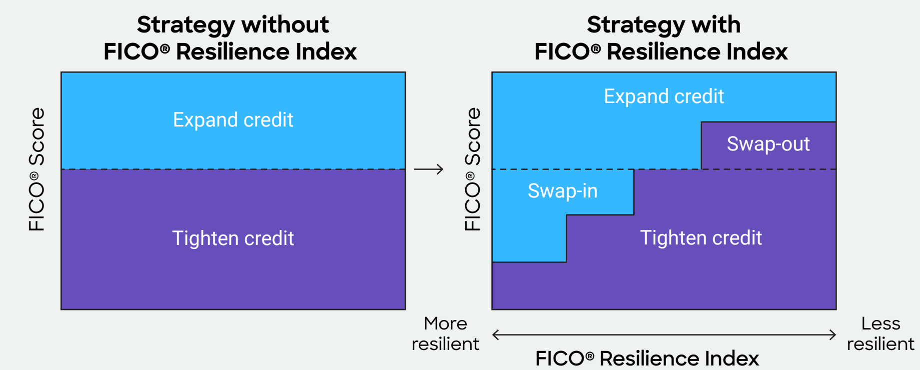


Figure 7: Traditional strategies that leverage the FICO® Score cutoffs (left) may be refined by incorporating the FICO® Resilience Index (right), allowing lenders to "swap- in" more resilient consumers with lower FICO Scores and to "swap-out" less resilient consumers with higher FICO Scores.

Portfolio Management

Consistent monitoring and management of metrics based on FICO® Resilience Index demonstrates to key stakeholders that portfolio resilience and contingency planning are considered in daily decision-making, not just in response to, or in anticipation of, periods of economic stress.

As described previously, lenders may also combine FICO® Scores and the FICO® Resilience Index into a new stress-adjusted FICO Score. It is common for lenders to adjust strategies in a stressed economy by simply increasing FICO Score cutoffs. This approach typically achieves the desired reductions in serious delinquency rates but depresses accept rates and resulting volumes. Refining such strategies by using a stress-adjusted FICO Score instead can yield more favorable trade-offs between volume and risk/profitability, depending on a lender's business objectives.

FICO® SCORE

Further, active management of the FICO® Resilience Index can support favorable outcomes in stress tests such as the Comprehensive Capital Analysis and Review (CCAR) and Dodd-Frank Act Stress Test (DFAST), including lower loan losses, higher profitability, and higher capital coverage.

The FICO® Resilience Index can provide a basis for adjusting expected credit loss estimates, especially under adverse economic conditions, whether as an explicit input into probability of default models or as a segmentation variable to support higher-level forecast methodologies.

Under the Current Expected Credit Loss (CECL) update to US GAAP accounting, reported credit loss allowances must consider lifetime expected credit losses based on economic forecasts over a reasonable and supportable period. As the expectation of economic stress grows, the ability to identify and quantify the performance of sub-populations with higher latent risk within a lending portfolio increases in importance.

Providing CECL-compliant allowance forecasts will eventually become a requirement of CCAR, DFAST, and other stress tests, so developing the tools and techniques required to accurately develop these forecasts will soon become imperative.

Secondary Market Applications

Population and portfolio distributions of credit risk scores such as the FICO® Score are routinely used by rating agencies, investors, and regulators to assess the relative credit risk of populations within loan portfolios and securitized assets over the economic cycle.

Similarly, tracking FICO® Resilience Index distributions over time can inform secondary market stakeholders about latent risks due to possible future economic disruptions that FICO® Scores and other credit risk scores alone may not capture. The FICO Resilience Index can provide an additional way to monitor and assess the resilience of loan portfolios and securitized assets, as well as whether actions being taken to improve their resilience are effective or not.

Conclusion

The FICO® Resilience Index is an innovative new metric designed to provide insight into consumers' resilience to economic stress. Regardless of the current economic environment, the FICO Resilience Index can be paired with the industry-leading FICO® Score as an "always on" tool to help enhance banks' loan portfolio resilience and reduce the financial volatility caused by economic stress.

Lenders interested in learning more can contact us at ficoscoreinfo@fico.com or visit the FICO® Resilience Index learning site at www.fico.com/en/fico-resilience-index-learning/fico

To keep tabs on the latest FICO research on scoring best practices and credit risk trends, visit the FICO Blog

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