Scoring
Credit Risk

WHITE PAPER

A Tale of Two Portfolios:

How resilience profiles can benefit the RMBS market

FICO® SCORE

Introduction

Nearly all public residential mortgage-backed securities (RMBS) prospectuses disclose FICO® Score information, providing a consistent measure of underlying portfolio credit risk that allows stakeholders to compare the quality of similar portfolios or vintages over time.

With the introduction of the FICO® Resilience Index, RMBS issuers and investors can gain additional insight about portfolio risk under stress. The FICO Resilience Index is a new analytic designed to rank-order consumer resilience to economic stress. It differentiates and rank-orders "latent" credit risk that may manifest during economic downturns, offering a powerful complement to the FICO® Score for deeper credit risk insights and more refined consumer decisions.

Using a series of simulations based on a hypothetical prime jumbo RMBS, this white paper demonstrates how two portfolios with identical FICO® Score distributions but different resilience profiles (as measured by FICO® Resilience Index) exhibit a wide range of performance outcomes through a period of economic stress. Such RMBS resilience profiles add a new dimension of identifying credit risk not captured by FICO Scores or historical performance alone, and should be of interest to investors, issuers, credit rating agencies, or other stakeholders interested in the potential impact of stressed economic conditions on RMBS performance.

After a brief overview of the FICO® Resilience Index, we will walk through a performance simulation for a hypothetical RMBS based on data about its FICO® Score distribution, but assuming varying levels of portfolio resilience. Although this simulation is based on a prime jumbo RMBS, the methodology translates well to all RMBS and whole loan credit analysis.

We will close by considering a range of potential applications for RMBS resilience profiles, powered by FICO® Resilience Index in conjunction with FICO® Scores.

How can RMBS resilience profiles help?

RMBS resilience profiles can help investors make more well-informed investment decisions by providing better insight into the downside risk associated with economic downturns.

A brief overview of the FICO® Resilience Index

To understand the purpose of the FICO® Resilience Index, it is useful to first review the main objective of the FICO® Score.

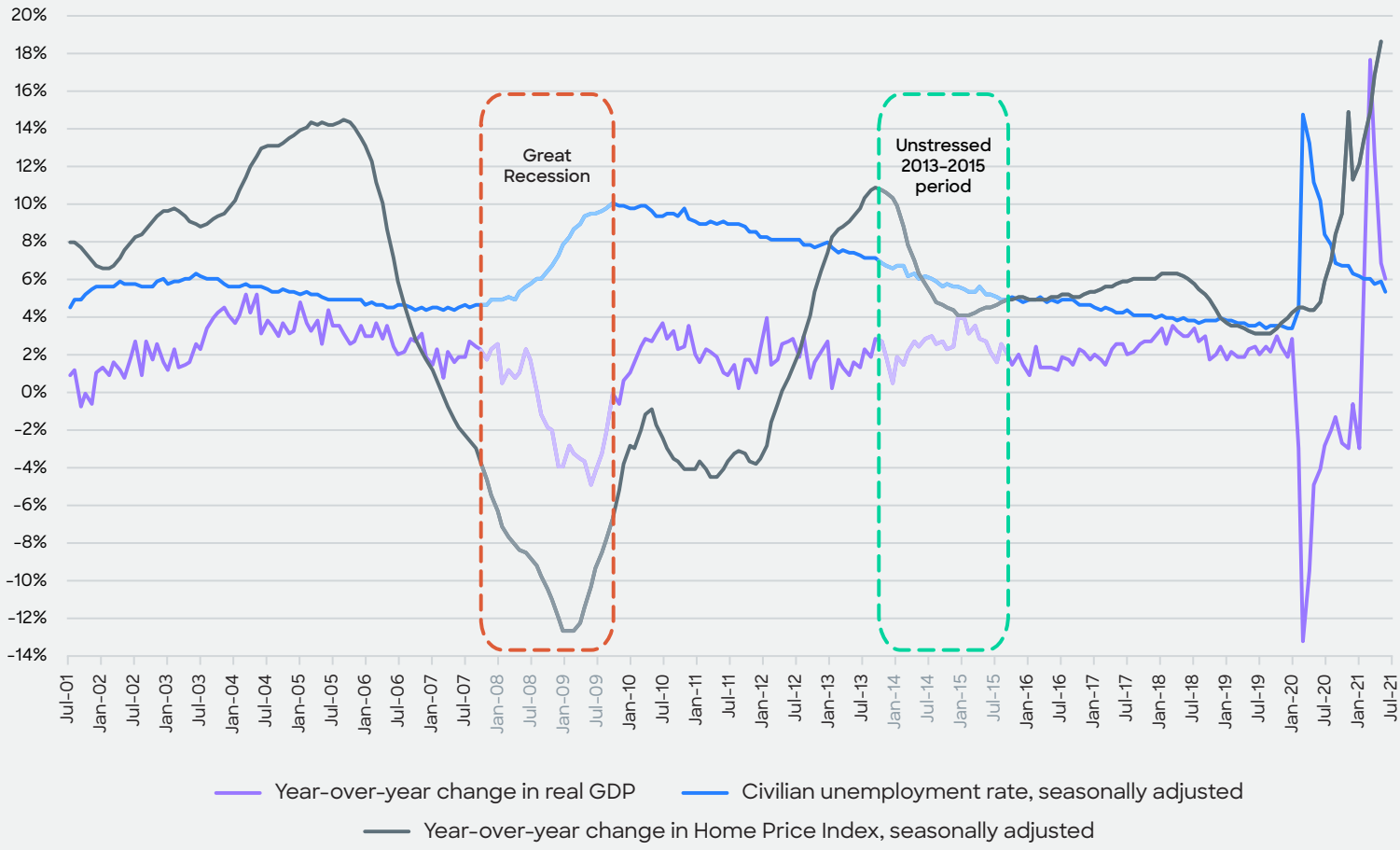
The FICO® Score is designed to rank-order consumer credit risk at all stages of the economy, not to directly forecast repayment odds at a point in time. A specific FICO Score will therefore correspond to differing repayment odds across different portfolios and lenders and through different economic environments over time.

FICO analysis has confirmed that the repayment odds associated with a given FICO® Score tend to worsen on average during a stressed economy as compared to an unstressed economy. The FICO Scores team sought to understand whether modeling insights drawn from credit bureau data alone could help identify consumers who were more or less resilient than average (in terms of credit repayment performance) for their FICO Score band during a highly stressed economy.

Our research led to the development of the FICO® Resilience Index, which rank-orders consumer credit risk within narrow FICO® Score bands during periods of economic stress.

FICO® Resilience Index was developed based on the comparative performance of similar consumers through two different phases of the economy, one "stressed" and the other "unstressed" or "benign." As highlighted in Figure 1, the stressed economy was based on the Great Recession of 2007–2009, which was marked by a significant reduction in gross domestic product (GDP), a rapid increase in the unemployment rate, and a large drop in home prices. In contrast, the unstressed/benign economy was based on 2013–2015, where GDP showed steady improvement, unemployment consistently decreased, and home prices increased.

Year-Over-Year GDP Growth Rate Versus US Unemployment Rate Versus Year-Over-Year HPI Growth Rate, 2001-2021



Sources (data as of 9/10/2021)
Year-over-year change in real GDP: https://ihsmarkit.com/products/us-monthly-gdp-index.html
Civilian unemployment rate, seasonally adjusted: https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm
Year-over-year change in Home Price Index, seasonally adjusted: https://fred.stlouisfed.org/series/CSUSHPISA

Figure 1: Comparison of year-over-year GDP growth rate, US unemployment rate, and year-over-year HPI growth rate between 2001 and 2021, highlighting the stressed October 2007–October 2009 period covering the Great Recession and the unstressed October 2013–October 2015 period covering a stable part of the subsequent economic recovery.

FICO® Resilience Index performance for mortgage lending

FICO® Scores and FICO® Resilience Index together provide greater insight about consumer credit risk under stressed economic conditions than FICO Scores alone. We observe in Figure 2a how FICO Score 5 (the version most widely used for residential mortgage underwriting) and FICO Resilience Index 2 (the latest version, released in 2021) rank-ordered credit risk during the Great Recession across the residential mortgage industry.[1]

We scored consumers with residential mortgage tradelines using both FICO® Score 5 and FICO® Resilience Index as of October 2007 and tracked the rate at which they became 90 or more days past due (or experienced other derogatory credit events such as bankruptcy) on at least one residential mortgage trade by October 2009. While FICO Score 5 overall rank-ordered credit risk, within each narrow FICO Score 5 band we also see that the most resilient consumers consistently had much lower serious delinquency rates than the least resilient consumers.

90+DPD Rate by FICO® Score 5 Band and FICO® Resilience Index 2 Quintile (2007-2009)
Mortgage, Account Origination

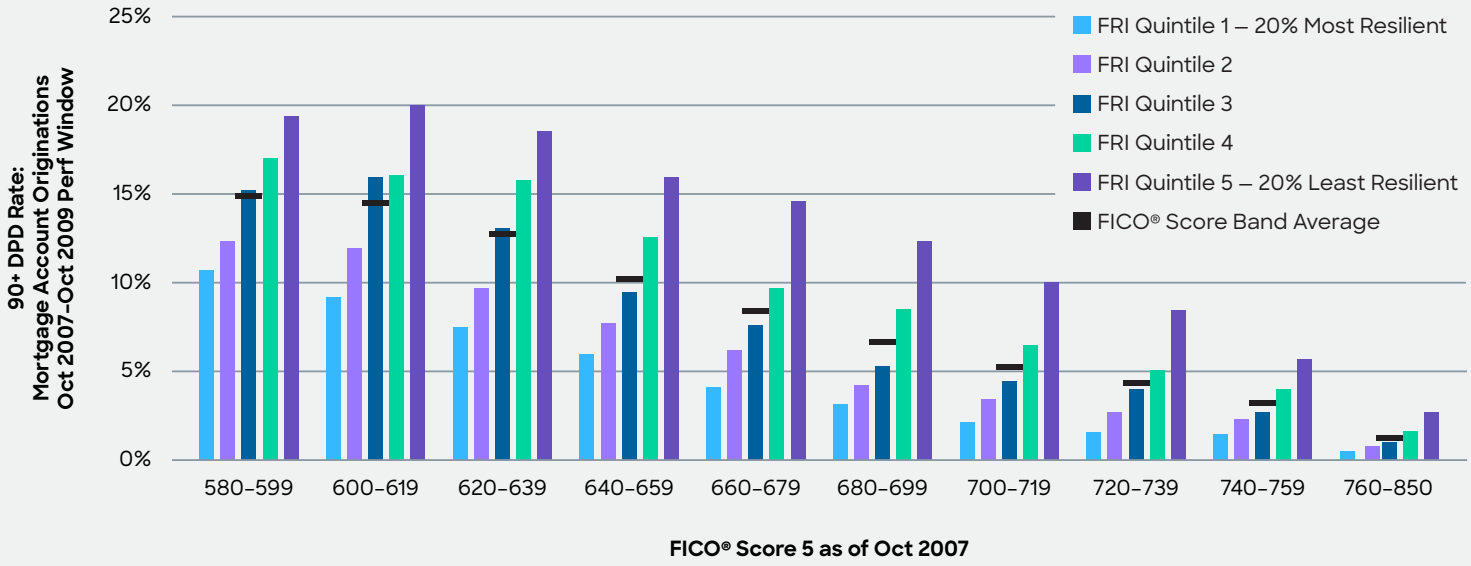


Figure 2a: FICO® Resilience Index rank-ordered payment performance within narrow FICO® Score bands during the Great Recession (October 2007–October 2009). In each FICO Score band, more resilient consumers experienced substantially lower rates of serious delinquency.

[1] Note that FICO® Resilience Index is not designed to provide additional rank-ordering during benign periods of the economy, nor when viewed as a standalone metric.

Conversely, Figure 2b confirms that FICO® Resilience Index provided no additional rank-ordering of credit risk within narrow FICO® Score 5 bands during the benign period from October 2013 to October 2015, as expected.

90+ DPD Rate by FICO® Score 5 Band and FICO® Resilience Index 2 Quintile (2013-2015)
Mortgage, Account Origination

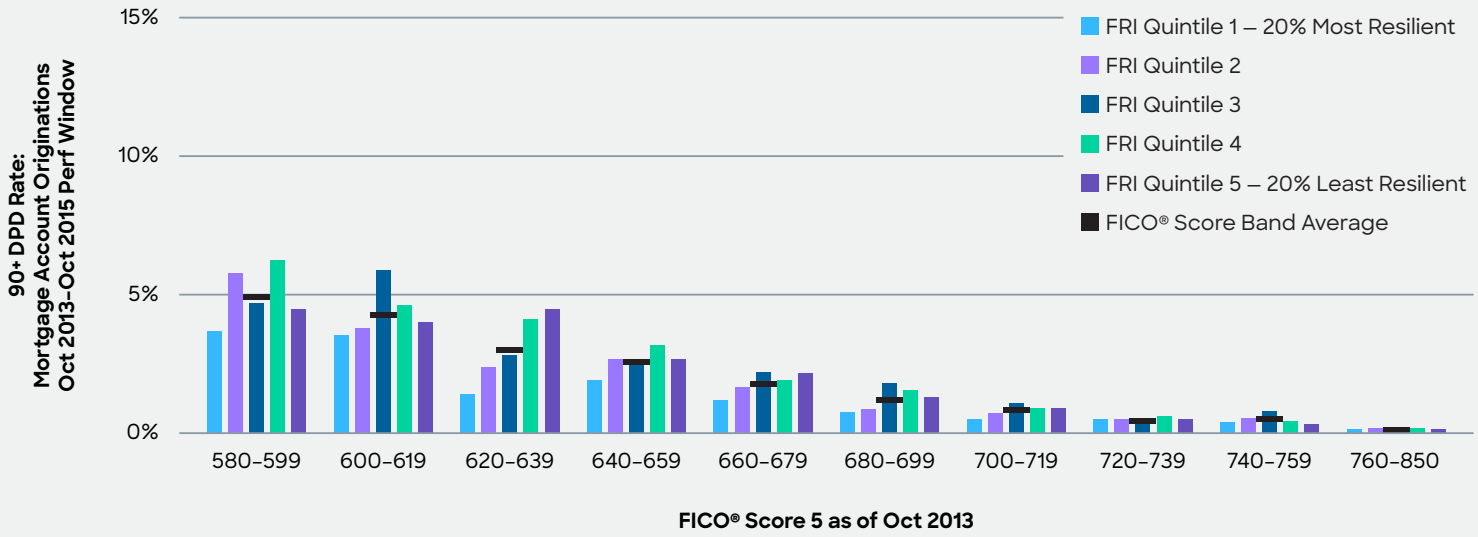


Figure 2b: As expected, FICO® Resilience Index did not rank-order payment performance within narrow FICO® Score bands in the absence of economic stress (October 2013–October 2015).

During previous periods of economic stress, lenders and investors have responded to the uncertainty of outcomes by restricting access to credit or implementing pricing premiums more than they would have preferred, cutting off much-needed liquidity for consumers and financial markets. By providing additional insight into borrower resilience and latent credit risks that may manifest during an economic downturn, FICO® Resilience Index (paired with the FICO® Score) can reduce uncertainty and volatility throughout the economic cycle. This enables lenders to offer more precise and competitive pricing, and investors to predict pool performance more accurately.

Hypothetical RMBS resilience case study: Prime Mortgage Receivables Trust 202X

To quantify the potential impact of resilience on RMBS performance, we performed a simulation exercise based on the FICO® Score distribution of a hypothetical RMBS, Prime Mortgage Receivables Trust 202X (PMRT 202X), that issued $1 billion of notes backed by receivables secured by prime jumbo residential mortgages for homes across the United States.

Underlying FICO® Score distribution of trust receivables

Assume that PMRT 202X disclosed the FICO® Score 5 distribution shown in Figure 3, with 85% of the portfolio coming from borrowers with FICO Score 5 of at least 740.

Twin portfolio simulations: same FICO® Score distribution, different resilience profiles

Assume that information about borrower resilience is not shared in the PMRT 202X prospectus. We want to understand whether the underlying loans' expected performance under stress would vary substantially under a range of borrower resilience scenarios.

Based on industry-wide analysis of actual observed residential mortgage portfolio performance between 2007 and 2009, within any given FICO® Score 5 band, "stressed" 90+ days past due delinquency rates ranged considerably between the most resilient and most sensitive consumers, as measured by FICO® Resilience Index.

The simulations that follow consider the impact on base case proxy loss forecasts depending on the assumed level of economic stress. When economic stress is more likely, the difference in latent credit risk between these "twin" portfolios becomes increasingly clear.

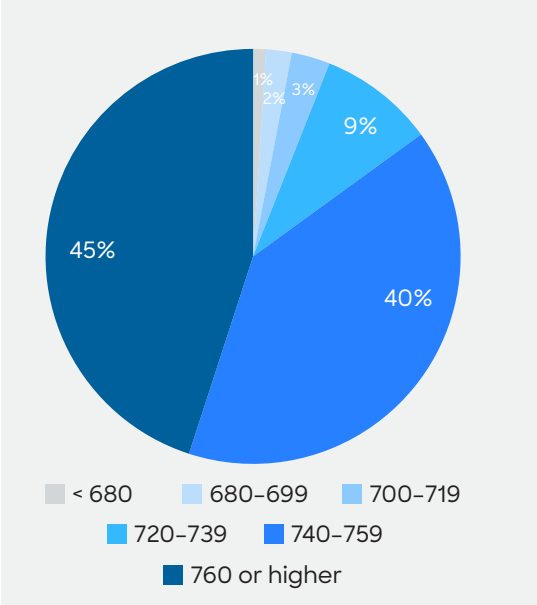


Figure 3: Distribution of hypothetical RMBS PMRT 202X's portfolio by FICO® Score 5.

FICO® SCORE

Step 1: Derive resilience multipliers for Resilient versus Sensitive portfolios

We estimated 90+ days past due delinquency rates for a portfolio with PMRT 202X's FICO® Score 5 distribution through a 24-month performance window during the Great Recession, using three different RMBS resilience profiles:

1. A **Resilient** portfolio with FICO® Resilience Index values aligned to the lowest 20% of industry values within each FICO® Score 5 band, based on PMRT 202X's hypothetical distribution (~50 or lower)
2. A **Moderate** portfolio with FICO® Resilience Index values aligned to the overall distribution of industry values within each reported FICO® Score 5 band
3. A **Sensitive** portfolio with FICO® Resilience Index values aligned to the highest 20% of industry values within each FICO® Score 5 band, based on PMRT 202X's hypothetical distribution (~70 or higher)

As shown in Figure 4, the resulting range of 24-month cumulative 90+ days past due delinquency rates was substantial — 1.1% for the Resilient portfolio, 2.6% for the Moderate portfolio, and 4.9% for the Sensitive portfolio. Refer to the Appendix for information about the methodology supporting these simulations, and for more information about the FICO® Resilience Index model design and development.

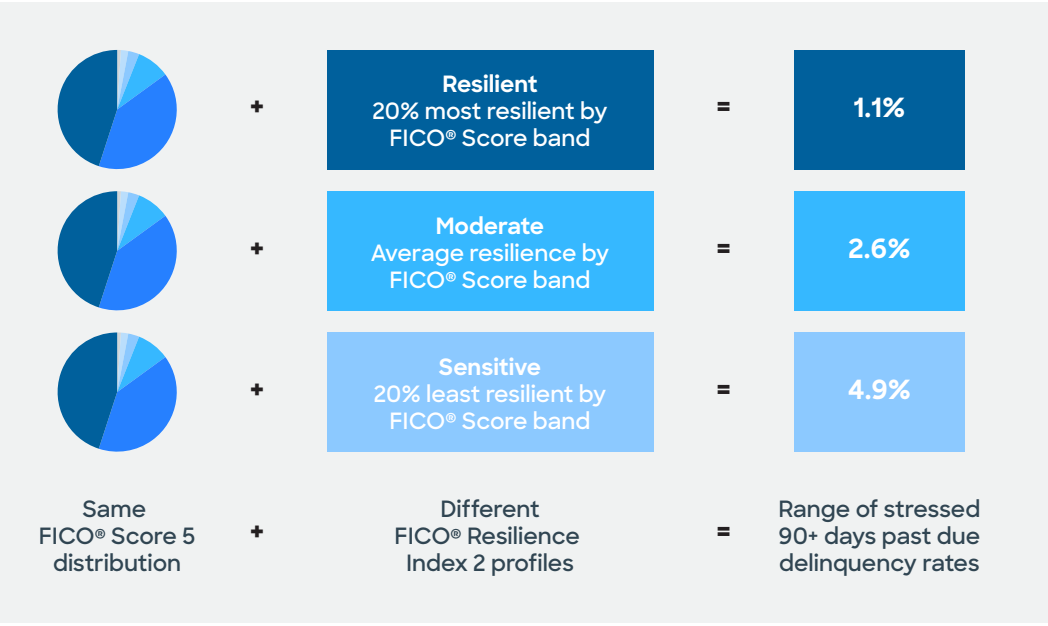


Figure 4: Range of stressed 90+ days past due delinquency rates assuming the PMRT 202X FICO® Score 5 distribution and a range of FICO® Resilience Index profiles.

Based on this range of stressed 90+ days past due delinquency rates, we calculated "resilience multipliers" for each hypothetical portfolio, comparing the projected stressed 90+ days past due delinquency rates of the Resilient and Sensitive portfolios to those of the Moderate portfolio, as shown in Figure 5. The resilience multipliers for the Resilient and Sensitive portfolios highlight the range in performance these seemingly identical twin portfolios could display under severe economic stress. The large variance in resilience multipliers directly reflects the observed divergence in actual stressed economy performance between the most and least resilient consumers in each FICO® Score 5 band, together with the assumed distribution of assets by FICO Score 5 band.

	Resilient	Moderate	Sensitive
Stressed 90+ days past due delinquency rate	1.1%	2.6%	4.9%
Resilience multiplier (calculation)	**0.41** (1.1% / 2.6%)	**1.00**	**1.90** (4.9% / 2.6%)

Figure 5: "Resilience multiplier" calculations reflecting the relative projected 90+ days past due delinquency performance of the PMRT 202X portfolio assuming a range of FICO® Resilience Index profiles.

Step 2: Calculate resilience-adjusted base case proxy loss estimates

Assume a base case proxy loss estimate of 0.45% has been derived from the probability-weighted average cumulative net losses (CNL) from a stressed period (20% likelihood of 1.25% CNL) and a benign period (80% likelihood of 0.25% CNL), as shown in Figure 6.

To estimate each portfolio's revised base case proxy CNL estimates, the resilience multipliers of 0.41 for the Resilient portfolio and 1.90 for the Sensitive portfolio were applied to the stressed CNL rate of 1.25% that contributed to the overall base case proxy estimate.[2] Resilience multipliers were not applied to the unstressed CNL rate of 0.25%, because FICO® Resilience Index is not expected to differentiate performance during an unstressed economy.

Assuming the same 20% stress scenario weight and applying the relevant resilience multiplier yields a range of revised base case proxy CNL estimates from 0.30% to 0.68%, as shown in Figure 7.

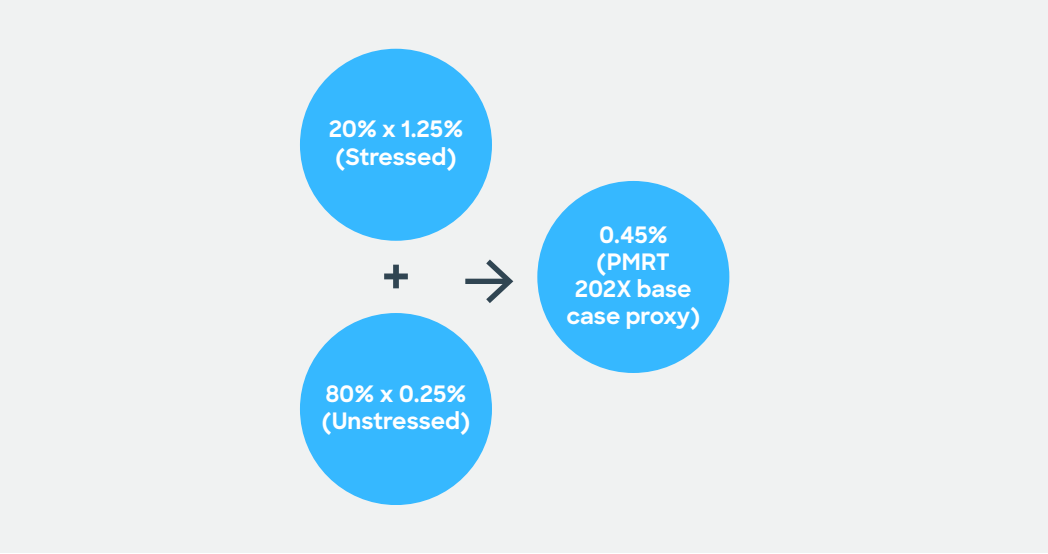


Figure 6: A base case proxy CNL estimate of 0.45% is based on 20% weight on stressed performance from the Great Recession and 80% weight on unstressed performance from a benign period.

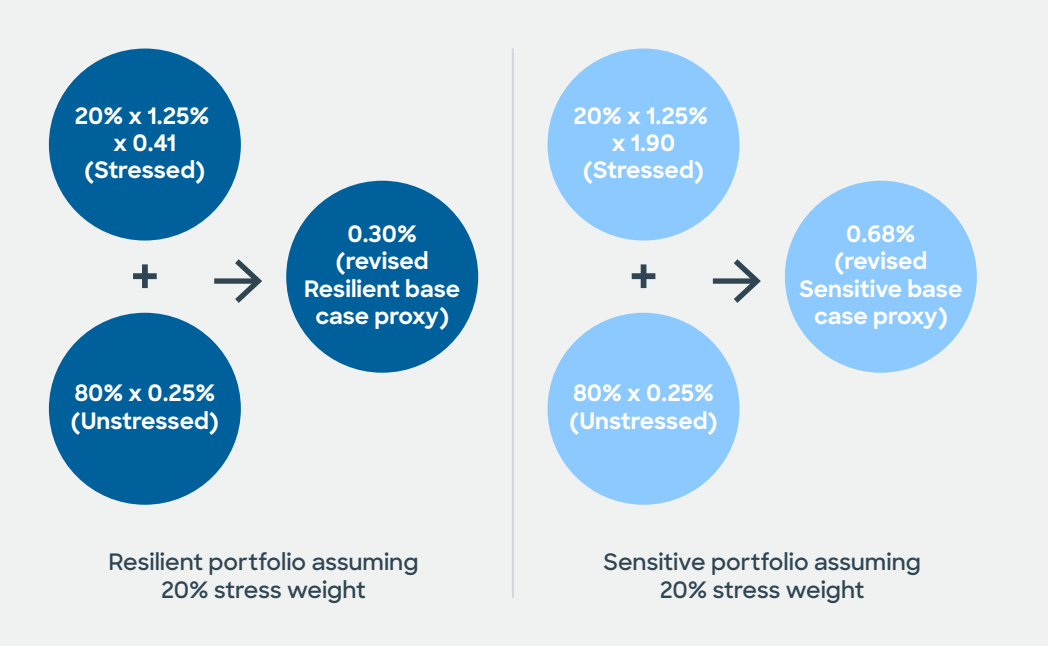


Figure 7: Revised base case proxy CNL estimates of 0.30% for the Resilient portfolio and 0.68% for the Sensitive portfolio, each assuming 20% weight on stressed performance from the Great Recession and 80% weight on unstressed performance from a benign period.

[2] Although resilience multipliers are derived based on relative 90+ days past due delinquency performance over 24 months, they have been applied to CNL estimates on the assumption that the relationship between 90+ days past due delinquency rates and default rates, the relationship between 24-month performance and lifetime loss performance, and the loss severity rate all remain constant across each hypothetical portfolio.

Step 3: Calculate resilience-adjusted stressed case loss estimates

The impact of borrower resilience is amplified in scenarios where economic stress is assumed to be likely or certain. For example, increasing the implied stress scenario weight from 20% to 50% expands the range of revised base case proxy CNL estimates to 0.38% to 1.31%, as shown in Figure 8.

Case study results and insights: not-so-identical twins under stress

As the above simulations demonstrate, two portfolios with similar FICO® Score distributions may have strikingly different resilience profiles and loss performance under stress. During "the best of times," these portfolio twins may still seem identical; during "the worst of times," though, their distinctive traits will become apparent.

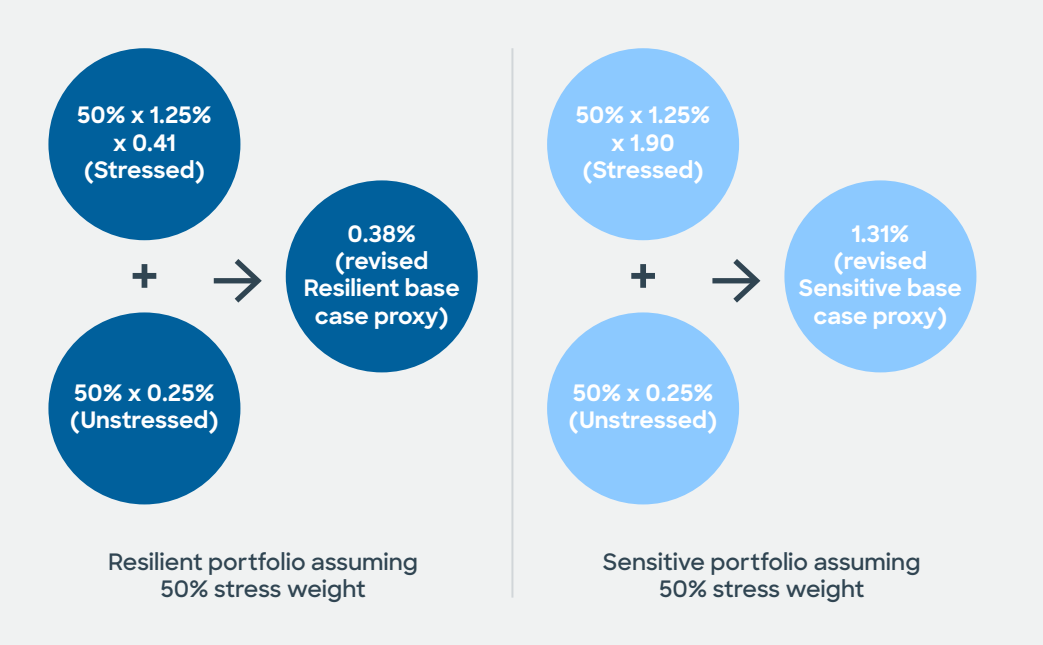


Figure 8: Revised base case proxy CNL estimates of 0.38% for the Resilient portfolio and 1.31% for the Sensitive portfolio, each assuming 50% weight on stressed performance from the Great Recession and 50% weight on unstressed performance from a benign period.

Without RMBS resilience profiles to differentiate such twin portfolios, stakeholders may miss key drivers of borrower performance under stress and make inaccurate risk assessments, leading to sub-optimal decisions regarding the portfolio.

Potential applications for RMBS resilience profiles

As the previous case study shows, disclosing more information about portfolio resilience enables all stakeholders interested in RMBS performance under different scenarios to make more informed decisions. We envision several opportunities for RMBS resilience profiles to enhance RMBS prospectuses and credit rating agency pre-sale documents:

1. Include FICO® Resilience Index as an explicit RMBS eligibility criterion, again ideally in combination with FICO® Score. For example, loans with certain combinations of FICO Score and FICO Resilience Index could be excluded from offerings to ensure a minimum level of combined credit quality and resilience.
2. Disclose statistics about portfolio resilience, ideally in the context of FICO® Score information. For example, rather than providing a distribution of assets by FICO Score band and average FICO Score alone, the prospectus could include a matrix showing the distribution of assets by both FICO Score and FICO® Resilience Index, as well as the average FICO Resilience Index by FICO Score band. Such additional details would allow comparison to industry benchmarks[3] and cross-investment comparisons between otherwise similar portfolios or FICO Score bands to differentiate expected credit loss performance based on a range of economic stress assumptions.
3. Incorporate FICO® Resilience Index into credit rating assessments as described earlier, reflecting the impact of portfolio resilience on both base case proxy and stressed scenario loss forecasts.

[3] FICO® Resilience Index benchmarking results for the mortgage industry feature average resilience values by FICO® Score band, as well as the distribution of borrowers across FICO Resilience Index and FICO Score segments. Visit the FICO ABS Portal at www.fico.com/abs or contact your account representative to access the most recent FICO® Resilience Index 2 Benchmark published by FICO for the mortgage industry.

A downturn like no other

The impact of COVID-19 on the US economy was even sharper and more sudden than the housing-driven Great Recession, but governmental and lender interventions have so far mitigated the effects on serious borrower delinquency, and home prices have risen substantially.

FICO® Resilience Index differentiates additional credit risk **when economic stress drives 90+ days past due delinquency rates substantially higher than the "benign" period that precedes it.** With mortgage delinquency rates held below pre-COVID levels, FICO turned to an alternative short-term indicator of borrower stress, the presence of mortgage payment accommodations following implementation of the CARES Act.

We found that **FICO® Resilience Index is very predictive of the likelihood that borrowers entered into mortgage accommodations in 2020,** with consistent and strong rank-ordering across a wide range of FICO® Score bands. This alternative validation provides evidence that FICO Resilience Index effectively identifies consumer resilience in a downturn of a very different nature than the Great Recession.

Conclusion

The FICO® Resilience Index is an innovative new metric designed to drive additional insight into consumer resilience to economic stress beyond what FICO® Scores and other standard credit risk scores can offer. RMBS resilience profiles based on the FICO Resilience Index in conjunction with FICO Score can provide issuers, investors, and credit rating agencies valuable information about the range of potential cumulative net loss estimates under a range of economic scenarios, allowing all RMBS stakeholders to make more informed decisions regarding pricing, investment value, and risk.

Appendix

Derivation of resilience multipliers

The "resilience multipliers" used in the simulation were based on a comparison of observed residential mortgage industry 24-month 90+ days past due performance of new accounts originated between November 2007 and April 2008, based on their FICO® Score 5 and FICO® Resilience Index 2 values as of October 2007, as shown in Figure 2a. The scoring date is prior to the range of account origination dates to remove the impact of originating the new account on either score.

The resilience multiplier for the Resilient portfolio was based on the relative performance of the most resilient FICO® Resilience Index quintile within each FICO® Score band (the left-most columns in Figure 2a labeled "FRI Quintile 1 – 20% Most Resilient"). Similarly, the resilience multiplier for the Sensitive portfolio was based on the relative performance of the least resilient FICO Resilience Index quintile within each FICO Score band (the right-most columns in Figure 2a labeled "FRI Quintile 5 – 20% Least Resilient").

To calculate the resilience multiplier for an individual FICO® Score band, divide the 90+ days past due delinquency rate of the simulated Resilient or Sensitive portfolio in that band by the 90+ days past due delinquency rate of the simulated Moderate portfolio, as indicated by the markers in Figure 2a labeled "FICO® Score band average." For example, in the 680–699 FICO Score 5 range, the 90+ days past due delinquency rate for the Sensitive portfolio was 12.2%, while the Moderate portfolio 90+ days past due delinquency rate reflecting the FICO Score band average was 6.6%, yielding a resilience multiplier of 12.2% / 6.6% = 1.85 for the Sensitive portfolio in that FICO Score band, as shown in Figure 9.

To derive a portfolio-level resilience multiplier, first calculate the overall 90+ days past due delinquency rates for each portfolio reflecting the assumed asset distribution weighting shown in Figure 2, then repeat the resilience multiplier calculation. For example, the Sensitive portfolio 90+ days past due delinquency rate of 4.9% was derived by weighting each FICO® Score band's Sensitive portfolio 90+ days past due delinquency rate by the assumed percentage of assets within that FICO Score band and totaling the result, as follows:

1% x 18.7% + 2% x 12.2% + 3% x 10.0% + 9% x 8.4% + 40% x 5.7% + 45% x 2.6% = 4.9%

Dividing 4.9% by the overall Moderate portfolio 90+ days past due delinquency rate of 2.6% yields the Sensitive portfolio resilience multiplier of 1.90 used throughout the analysis. Similarly, dividing the 1.1% Resilient portfolio 90+ days past due delinquency rate by 2.6% yields the Resilient portfolio resilience multiplier of 0.41 used throughout the analysis.

FICO® Score 5	Assumed % of assets	24-month 90+ days past due rate			Resilience multiplier	
		Resilient portfolio (A)	Sensitive portfolio (B)	Moderate portfolio (C)	Resilient portfolio (A ÷ C)	Sensitive portfolio (B ÷ C)
Less than 680	1%	8.6%	18.7%	13.0%	0.67	1.44
680–699	2%	3.1%	12.2%	6.6%	0.47	1.85
700–719	3%	2.1%	10.0%	5.2%	0.40	1.92
720–739	9%	1.5%	8.4%	4.2%	0.36	1.98
740–759	40%	1.3%	5.7%	3.1%	0.42	1.83
760 or higher	45%	0.4%	2.6%	1.2%	0.34	2.15
Weighted	**100%**	**1.1%**	**4.9%**	**2.6%**	**0.41**	**1.90**

Figure 9: Derivation of resilience multipliers for the hypothetical Resilient and Sensitive portfolios, based on the assumed asset distribution of PMRT 202X.

FICO® Resilience Index model overview

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

In our model framework, normal and stressed conditions appear as two arms of a thought experiment (see Figure 10). Naturally, consumers can only travel along one arm of the experiment for which their performance can be observed.

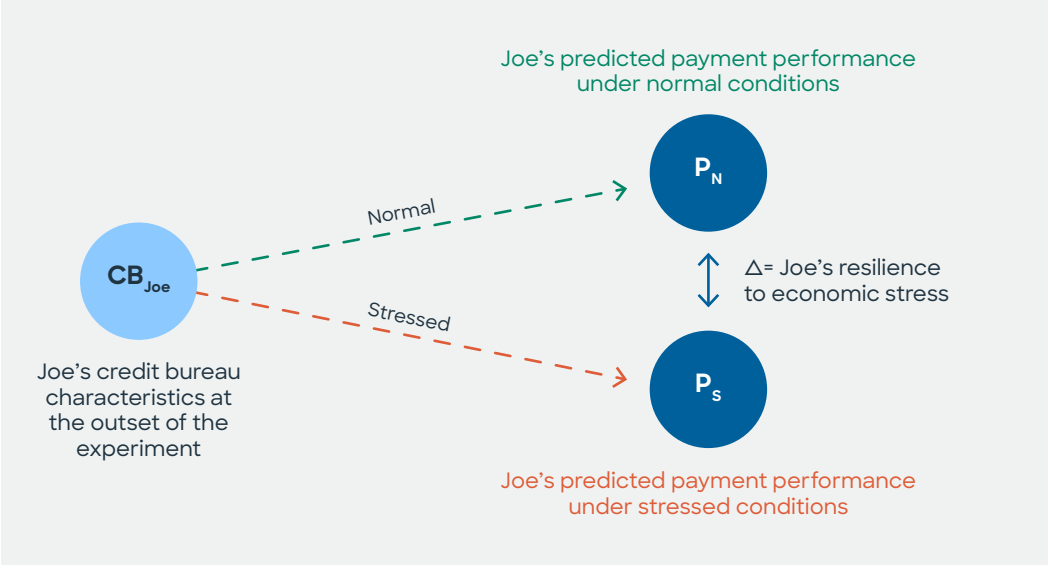


Figure 10: Definition of resilience as the difference in predicted outcomes under contrasting economic conditions.

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 10). Through established modeling methods, we then composed an identically sized set of "twin" consumers who shared very similar attributes at the outset, but instead experienced the Great Recession between October 2007 and October 2009 (the "stressed condition").

We began each FICO® Resilience Index model development by randomly sampling very large (> 10 million) representative sets of consumers who experienced the two economic conditions. However, using these full samples may introduce selection bias, because the typical behavior of consumers at the outset of the stressed economy differs from that of consumers at the outset of the normal economy. The twinning process is designed to eliminate this selection bias, by only retaining those consumers in a twinned sample for whom a similar consumer can be found who experiences the opposite economic condition.

Twinning reduces the original sample size but still yields a large (typically > 1 million) unbiased sample of consumer credit records from both economic conditions. Each FICO® Resilience Index model is developed based on the twinned sample, by essentially using the difference in payment performance for these sets of twin consumers under normal versus stressed conditions to quantify their resilience to stress.

Investors interested in learning more can visit the FICO ABS portal or contact us at ficoscoreinfo@fico.com. To keep tabs on the latest FICO research on scoring best practices and credit risk trends, visit the FICO Blog.

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