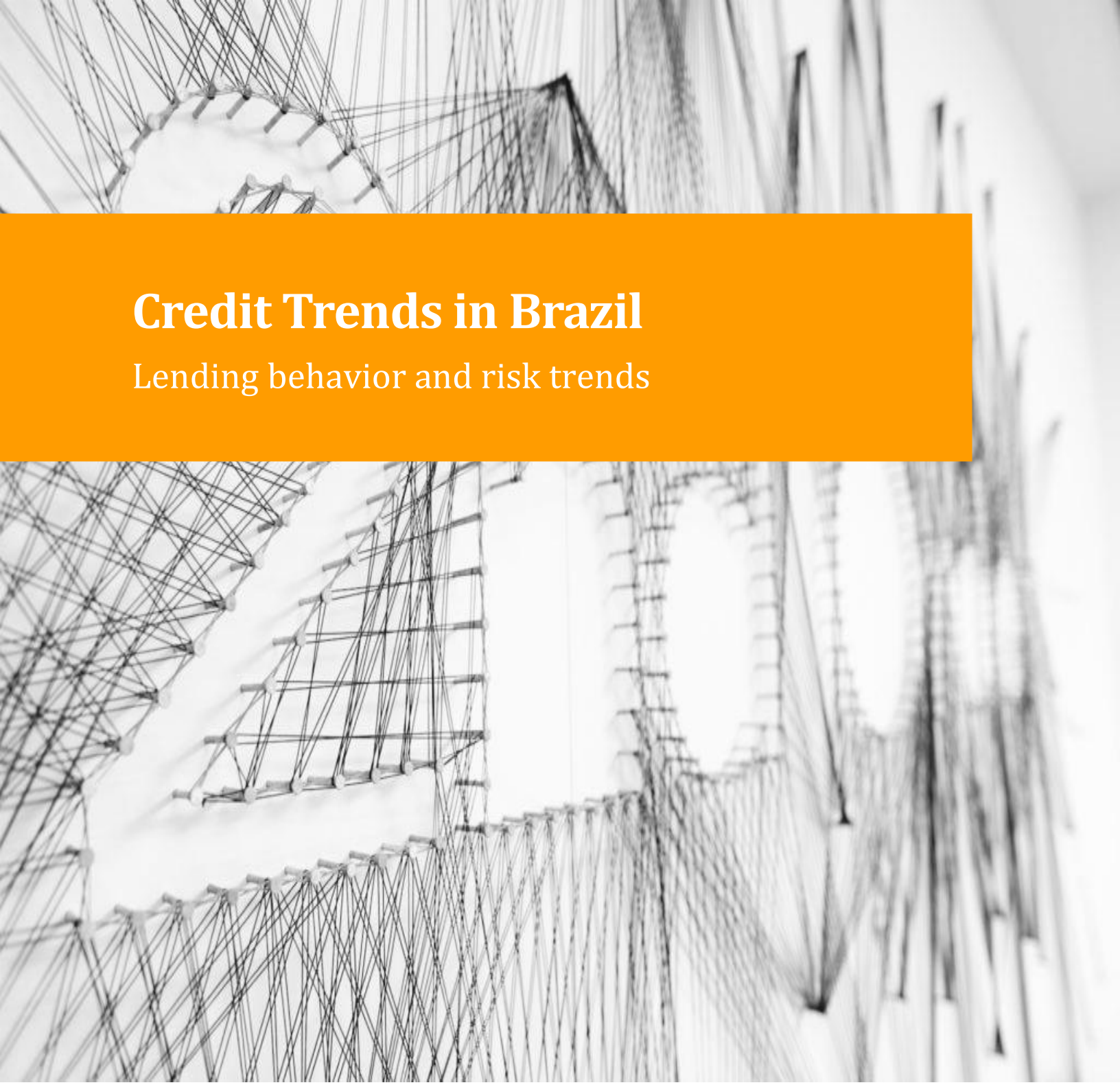

Credit Trends in Brazil

Lending behavior and risk trends

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2nd Order solutions

Executive Summary

2nd Order Solutions has seen a sharp rise in new credit acquisitions in Brazil amid a high interest rate environment, which has led to debt-to-income levels that are at an all-time high. This whitepaper explores the consequences of this rapid increase in debt-to-income, uncovering a concerning risk outlook ahead. In addition to deep diving into the delinquency trends, this report uncovers specific populations that have been hit the hardest and suggests what lenders should do to help mitigate the risk.

Lending is accelerating as debt-to-income levels reach an all-time high

- Despite the rising cost of loans, Brazilian new credit originations continue to grow, accelerating since 2020 and reaching decade high levels.

- The acceleration in originations has led to the highest household debt-to-income levels since the early 2000s. In the decade preceding COVID, this metric ranged between 35-40%, and it is now approaching 50%.

Delinquencies continue to increase, with some groups disproportionately impacted:

- Delinquencies are rising from their COVID plunge and are trending to pre-pandemic levels. This trend is most notable in credit cards, personal loans, and auto.

- The massive refinancing options that were offered during the pandemic only provided temporary relief in delinquencies. The muted delinquencies due to these programs are starting to rise once again.

- A steeper increase in delinquencies is observed for individuals in lower income brackets and for private banking institutions.

Lenders should invest in more advanced underwriting enhancements to carefully manage the credit risk

- Going forward, more sophisticated underwriting can be used to better identify which customer segments can afford the loans, improving lenders' risk and profitability dynamics.
- Strategies such as the following should be more surgically deployed:
    - More advanced risk modeling techniques, including machine learning
    - Better line sloping strategies based on a customer's risk level and ability to repay
    - Incorporation of alternative data sources to improve underwriting
    - Analysis of stress scenarios to combat model degradation during COVID

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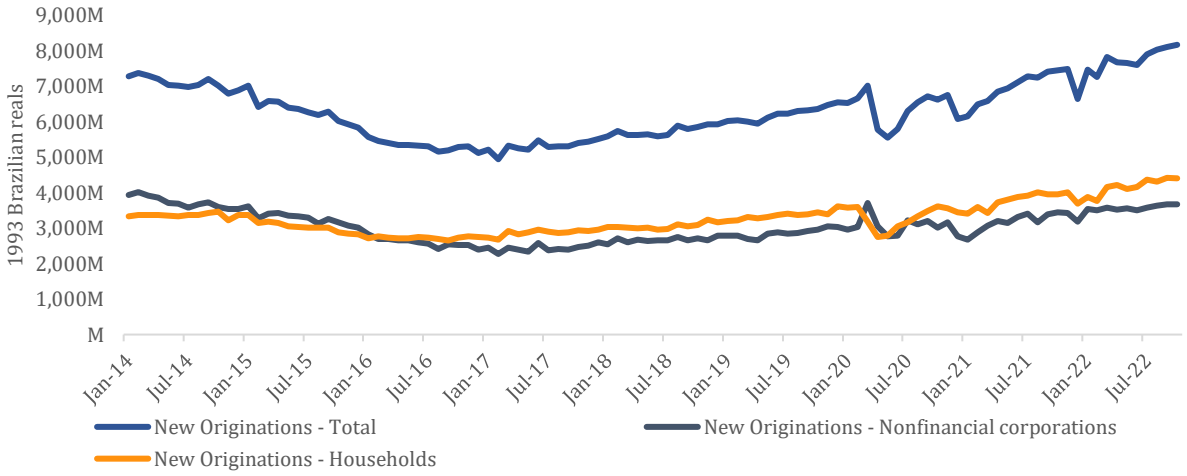
Lending Trends

New Acquisitions have been on the Rise

Amid a backdrop of high inflation and a high interest rate environment, lending in Brazil is accelerating. As seen in **Figure I,** new credit originations have been increasing since May 2020, even after accounting for inflation. In fact, since the BCB started tightening monetary policy in April 2021, inflation-adjusted new acquisitions have continued to rise from 6.8 billion 1993 Brazilian reals[1] to 8.2 billion as of October 2022, for a real increase of 20%. Moreover, since the May 2020 drop in new acquisitions, there has been an inflation-adjusted growth of 47% in total new originations. The growth over this period was greater for households (58% growth) compared to nonfinancial corporations (33% growth). As reflected in **Figure I**, inflation-adjusted originations in Brazil are surpassing levels prior to the 2014-2016 recession.

Figure I: Seasonally and Inflation Adjusted (in 1993 Brazilian reals) New Originations[2]

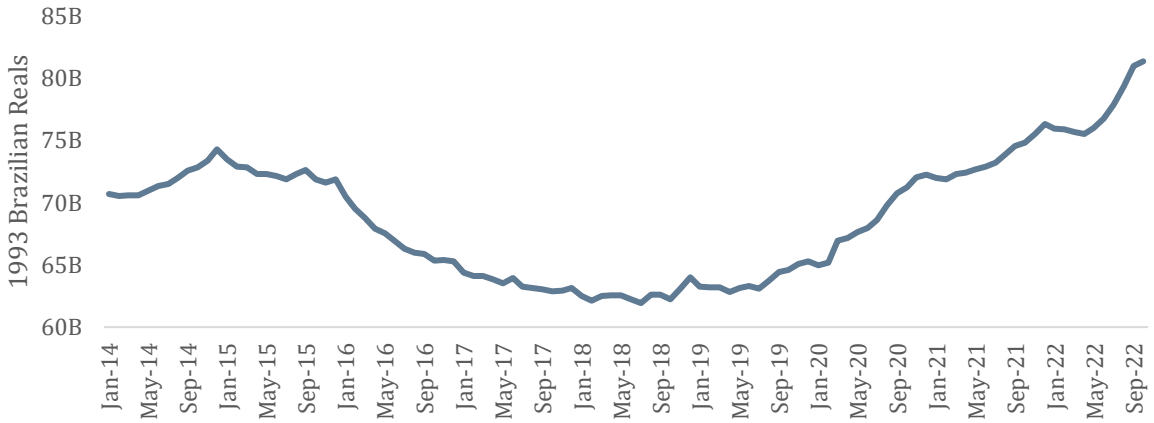


Debt and Debt-to-Income at an all-time high

The increase in new credit acquisitions has led to consumer debt reaching $24,075 Brazilian reals per person, the highest in the country's history. As seen in **Figure II**, Brazil's consumer debt has been rising in inflation-adjusted terms, reaching the highest value since the start of the series. As of October 2022, the overall debt increased 20% in real terms from May 2020, while the population only grew 1.9% during this time.[3]

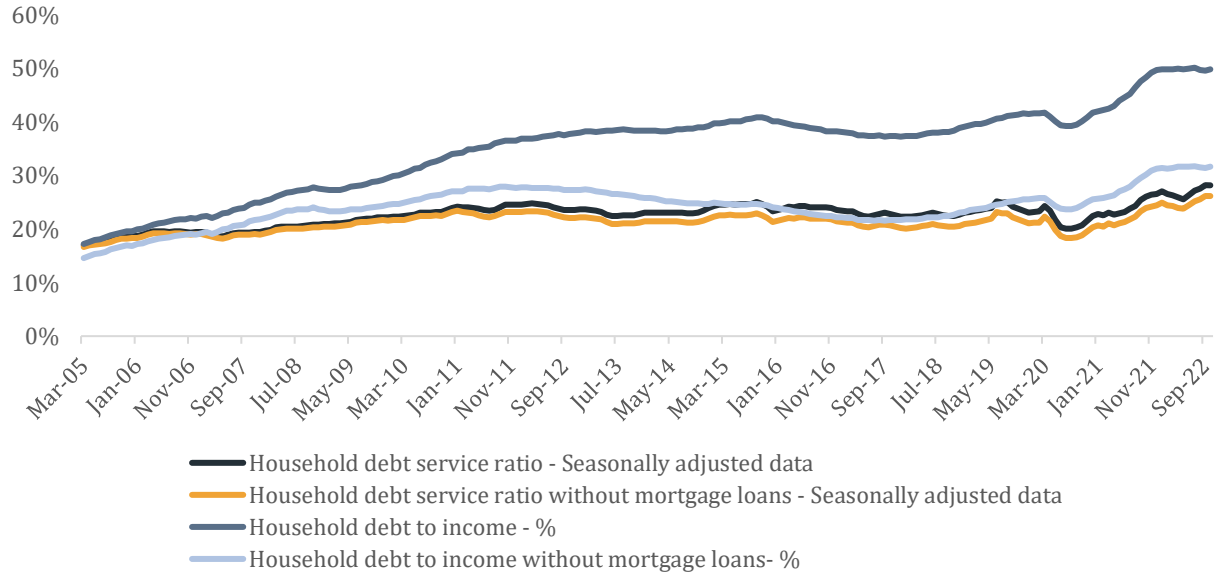
[1] 1993 is used as the reference period since it is the base year for the Consumer Price Index for Brazil (IPCA), the primary metric of Brazilian inflation.
[2] Obtained from BCB's Time Series Management System and then adjusted for inflation https://www3.bcb.gov.br/sgspub/localizarseries
[3] Data obtained from https://www.worldometers.info/world-population/brazil-population/

Figure II: Inflation-adjusted (in 1993 Brazilian reals) Overall Debt[4]



The ever-increasing debt will impact loan performance, as it puts a greater strain on Brazilian household finances. The household debt to income ratio[5] ranged between 35% and 40% throughout the last decade until the beginning of the pandemic (**Figure III**). However, this metric has risen overtime, reaching around 50%. Debt-service ratios[6] have also sprung back to pre-pandemic levels and are on the rise. The implications are that the debt burden is going up and is likely to further aggravate already rising delinquencies in the future. More details will be provided about rising delinquencies in the next section.

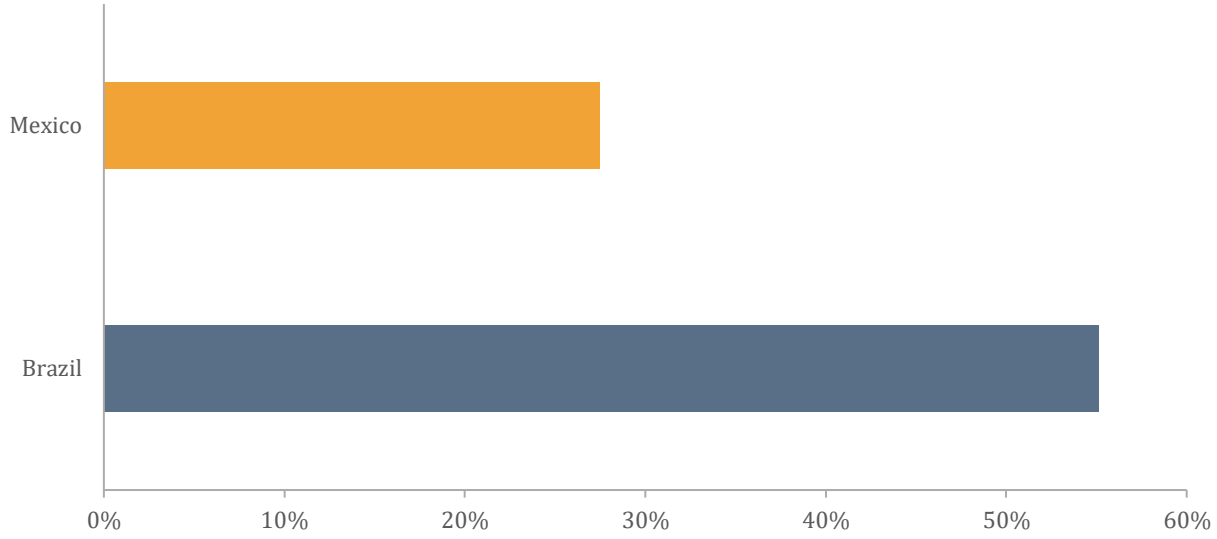
Figure III: Household debt to income and debt service ratios[7]



[4] Obtained from BCB's Credit Information System https://www.bcb.gov.br/estabilidadefinanceira/scrdata
[5] Debt-to-income ratio is calculated based on the Ratio of total household debt held by financial institutions to available income accumulated over the past twelve months
[6] Debt-service ratio is calculated as the ratio of expected household debt payments to available income as a quarterly moving average, seasonally adjusted.
[7] Obtained from BCB's Time Series Management System https://www3.bcb.gov.br/sgspub/localizarseries

Moreover, this rising trend of debt as a percentage of income (coupled with the high ratios of debt to income) is not prevalent in other Latin American countries, such as Mexico. Although Mexico and Brazil have similarities in terms of state of economic growth, Brazil's debt to net disposable income is twice the size of Mexico's (55% vs 27%) according to the OECD's latest reading as seen in **Figure IV**. This supports that Brazil's rising debt levels are not merely a result of credit becoming more accessible in the region. The levels of debt to income in Brazil exceed those of other Latin American countries.

Figure IV: Household debt as a percentage of net disposable income[8]



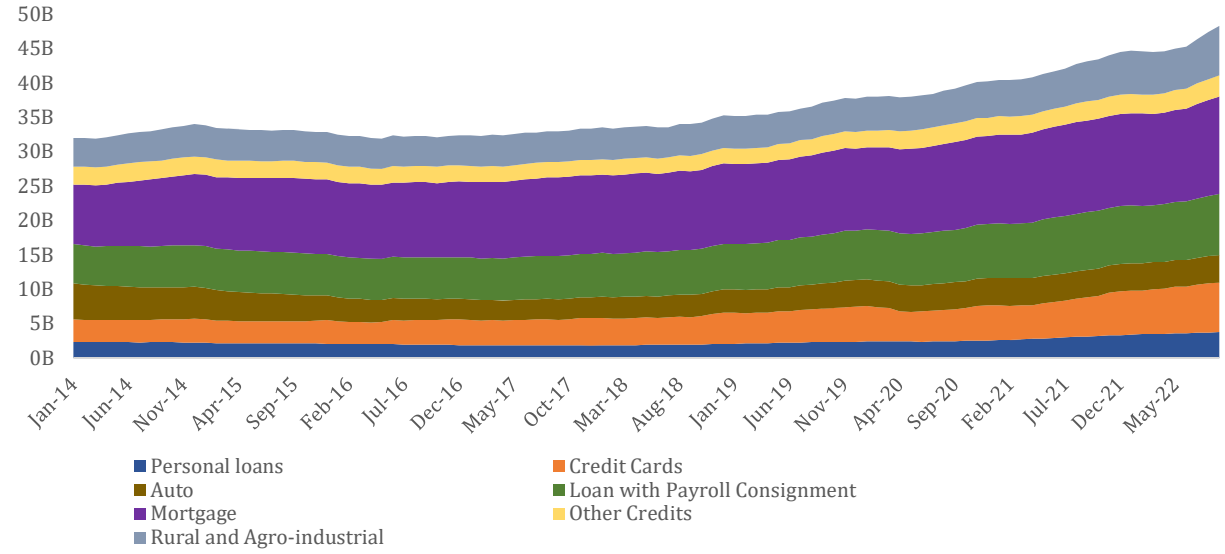
De-averaging Lending Trends by Subpopulations

Credit Balance and Acquisitions by Sector

The overall increase in lending in Brazil is more pronounced in some credit sectors. **Figure V** displays household outstanding credit balance by sector. While the overall series has been increasing since 2014, this growth has been more apparent in credit cards. In this period, credit cards have seen the highest inflation-adjusted growth (117%) compared to other credit types, greatly surpassing population growth in this time-period (5.8%)[9]. Most other credit sectors experienced growth between 55% and 75% during this period, with the exception of auto, which has seen a decrease of 23% in real growth. Moreover, currently credit cards make up a higher percentage of the total outstanding balance compared to 2014 (15% vs 10%), while other credit types make up a similar or lower percentage than before.

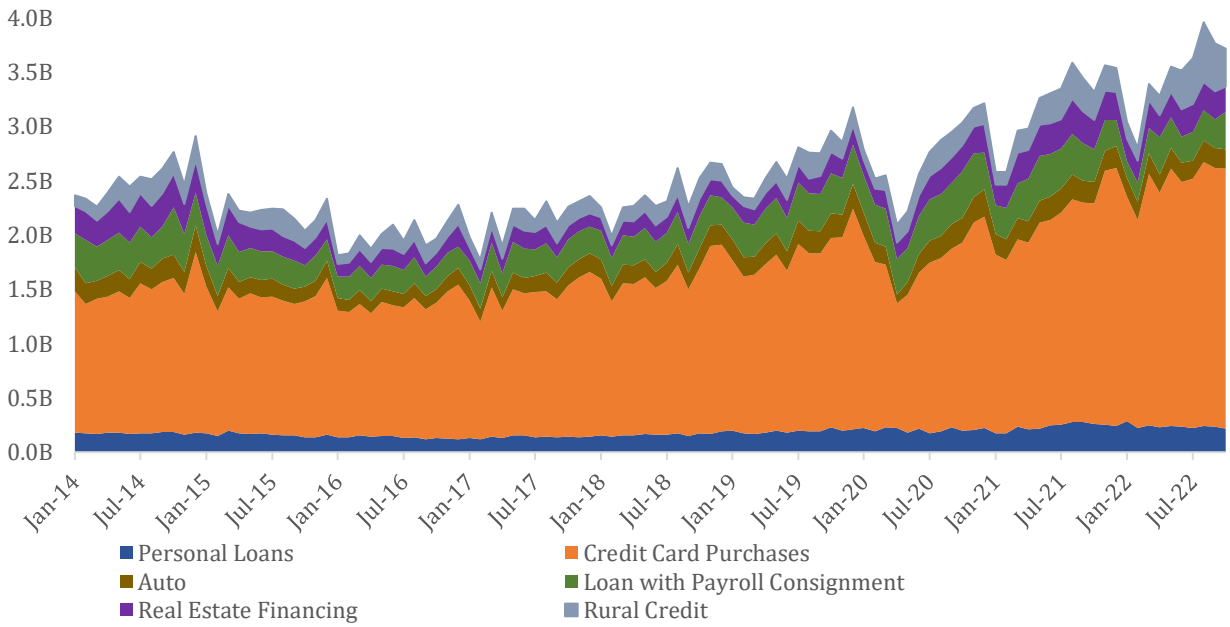
[8] Data obtained from the OECD https://data.oecd.org/hha/household-debt.htm#indicator-chart
[9] Data obtained from https://www.worldometers.info/world-population/brazil-population/

Figure V: Inflation-adjusted household outstanding balance (in 1993 Brazilian reals) by sector[10]



Further, **Figure VI** shows that the new acquisition acceleration has been driven by credit cards, while other sectors remain relatively unchanged. In May 2020 credit card purchases comprised 39% of the household new originations, whereas in October 2022 this value increased to 61%.

Figure VI: Seasonally and inflation-adjusted (in 1993 Brazilian reals) new originations – households



[10] Figures V through X were obtained from BCB's Time Series Management System https://www3.bcb.gov.br/sgspub/localizarseries

Delinquencies by Sector

Household credit risk is back on the rise since the COVID lows. As seen in **Figure VII**, delinquencies measured by percentage of credit outstanding that is between 15 and 90 days-past-due have been trending upwards. This increasing delinquency trend is prevalent in most credit sectors. **Figure VIII** shows that while 15-90DPD for personal loans (both with and without payroll consignment) have not shown a significant rising trend; credit-card purchases, auto, and real estate financing have been steadily rising, with credit-cards already surpassing the pre-pandemic average. This is particularly concerning, since the credit card sector has seen the most originations, suggesting that new credit card acquisitions might be skewed towards riskier segments. Moreover, credit card purchases, auto, and real estate financing combined make up 49% of the total credit outstanding in November of 2022, which dims Brazil's credit outlook if these trends continue.

Figure VII: 15-90 DPD Households – All credit types

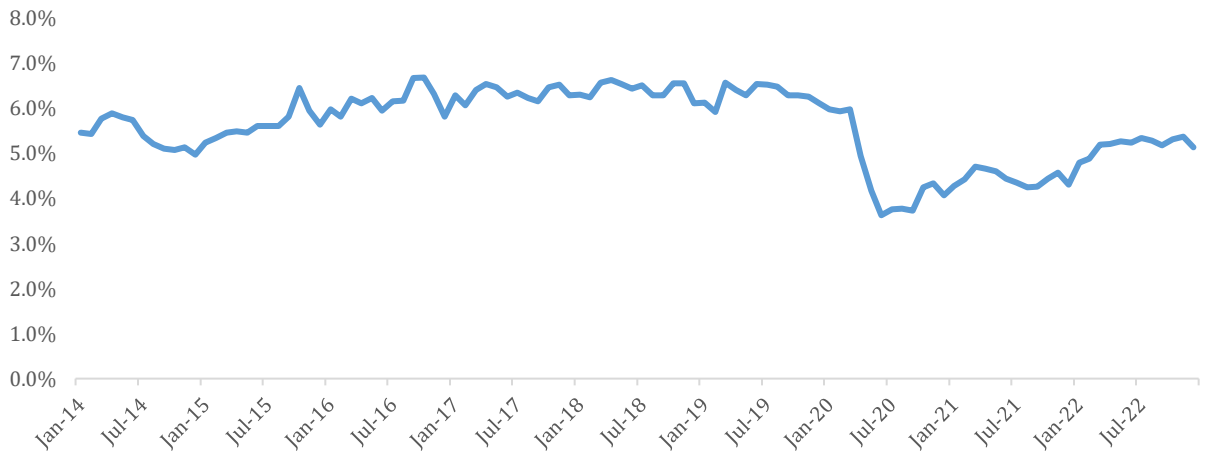
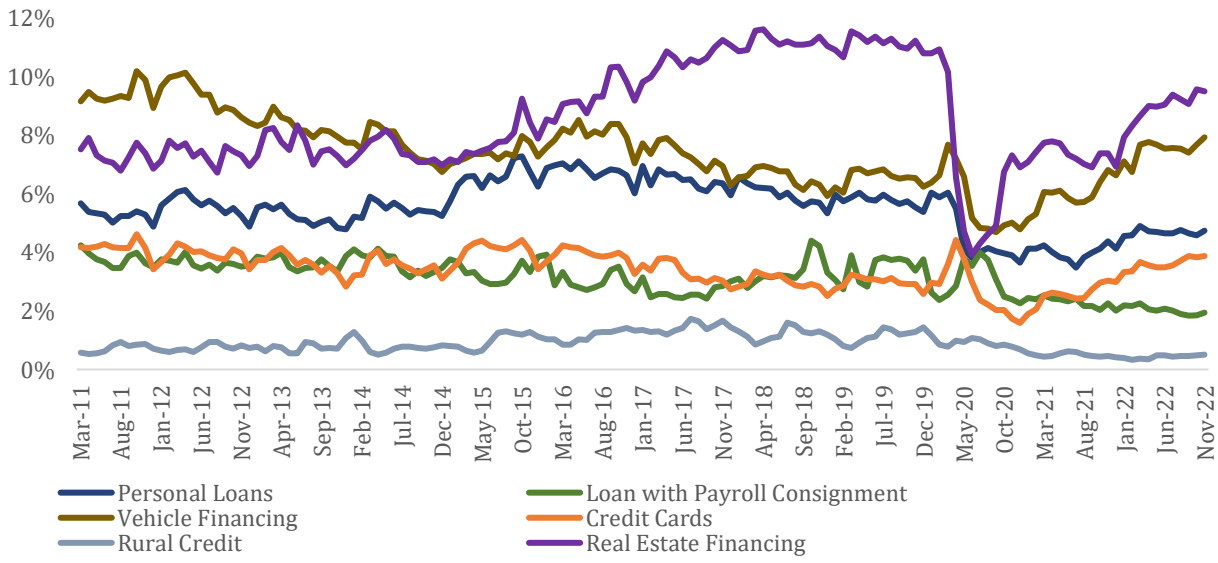


Figure VIII: 15-90DPD by credit type



Credit Refinancing and Effects on Delinquencies

Some of the delinquency relief during COVID was driven by lenders offering refinancing options to alleviate the growing debt-burden among Brazilians. **Figure IX** shows that refinancing during COVID resulted in a drop in delinquencies for personal loans. During this time-period there was also an increase in the number of refinanced personal loans (Personal Loans - Renegotiation[11]) as seen in **Figure X**. Although refinancing created a short-term drop in delinquencies, the relief did not last long, and delinquencies started to rise again for refinanced accounts.

Figure IX: 15-90 DPD Trends for Refinancing in select Credit Sectors

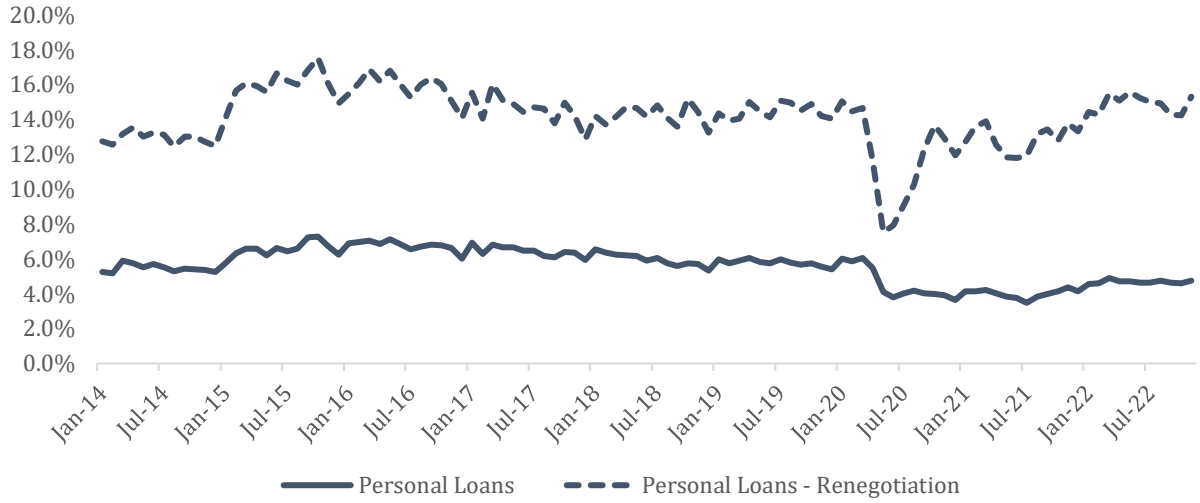
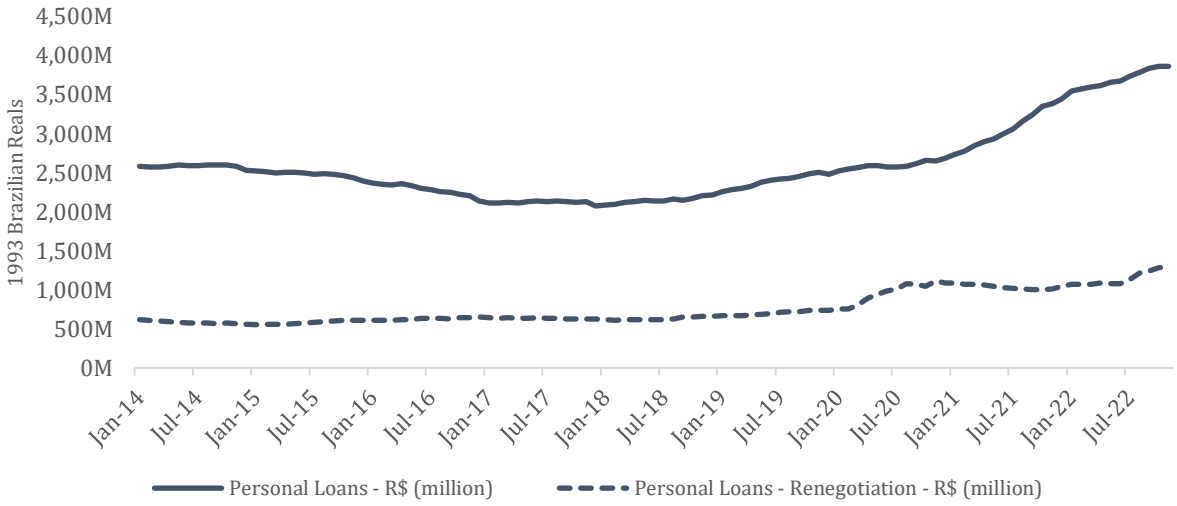


Figure X: Inflation Adjusted Outstanding Balances for Refinancing in select Credit Sectors

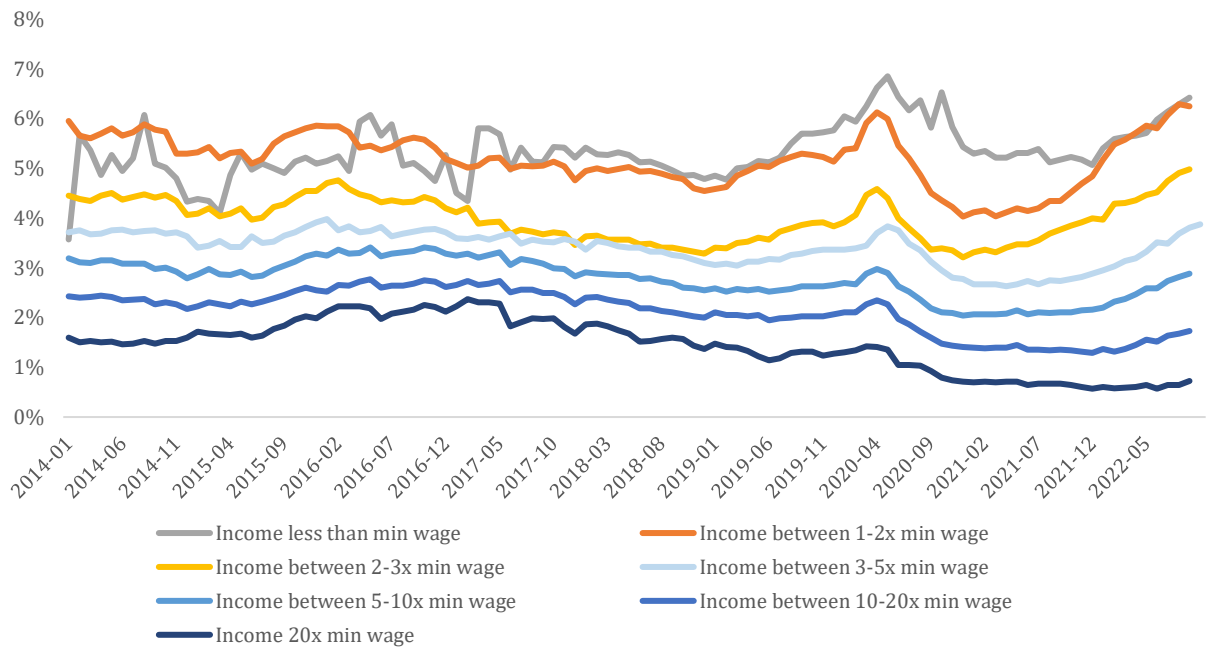


[11] Loans to individuals linked to renegotiation of two or more loans originally from different types of credit operations.

Credit Risk by Income Brackets

In this section we deep dive into the rising delinquency trends by key customer segments. Looking at delinquencies by income bands reveals that a great part of this overall increase in risk comes from the lower income brackets. **Figure XI** shows the percentage of the outstanding balance that is 90+ days-past-due, segmented by income brackets. A steeper increase in delinquencies is observed for individuals with income between 1 to 2 times minimum wage, followed by those with 2 to 3 times minimum wage. In general, as income increases the delinquency levels flatten out. There is also a large difference in delinquency rates across income bands. For instance, the average delinquency of someone with income 1 to 2 times minimum wage was 6% in September 2022, compared to 0.7% for someone earning over 20 times minimum wage.

Figure XI: 90+DPD by income: all credit sectors[12]



These delinquency trends by income brackets are comparable across credit sectors, but credit cards have the highest spread. For credit cards, the lower income groups are seeing steeper worsening since April 2021, as seen in **Figure XII**. And these income groups, especially the 1-2x minimum wage bracket, also have a high share of the outstanding balances as shown in **Figure XIII**. Most of the outstanding balance for credit cards is represented by those with income between 5-10x minimum wage (19% of total balance), closely followed by those with income between 1-2x minimum wage (17% of total balance). Furthermore, the exposure to the 1-2x minimum wage band has been increasing over time, surpassing the 3-5x minimum wage band since August 2021. However, despite

[12] Figures XI through XIII were obtained from the BCB's Credit Information System (SCR) https://www.bcb.gov.br/estabilidadefinanceira/scrdata

the significant size, the combined share of outstanding balances in lower income groups (<3x minimum wage) is not comparable to the share of these income groups within the overall Brazilian population.

Figure XII: 90+DPD by income for credit cards

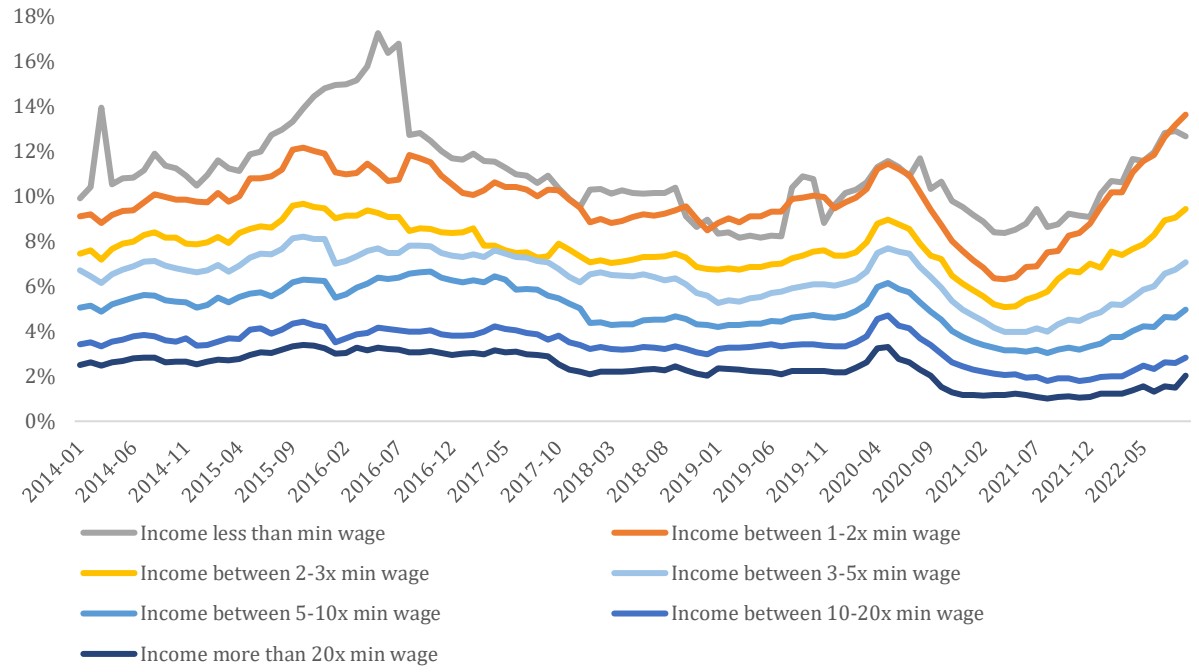


Figure XIII: Inflation-adjusted outstanding balance (in 1993 Brazilian reals) for credit cards

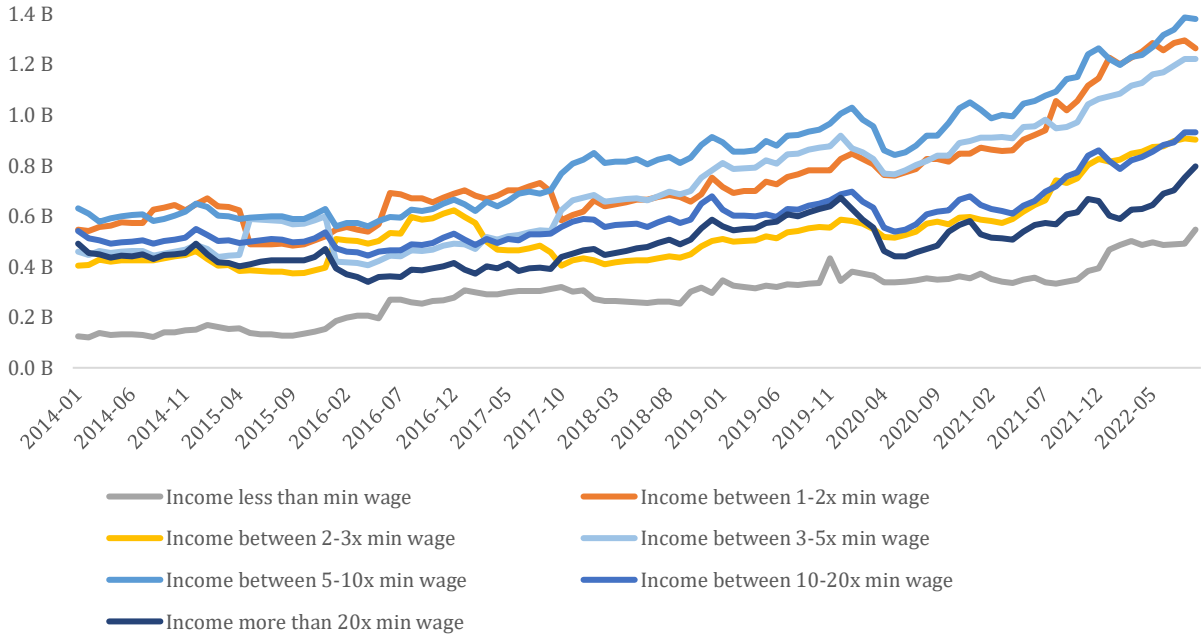
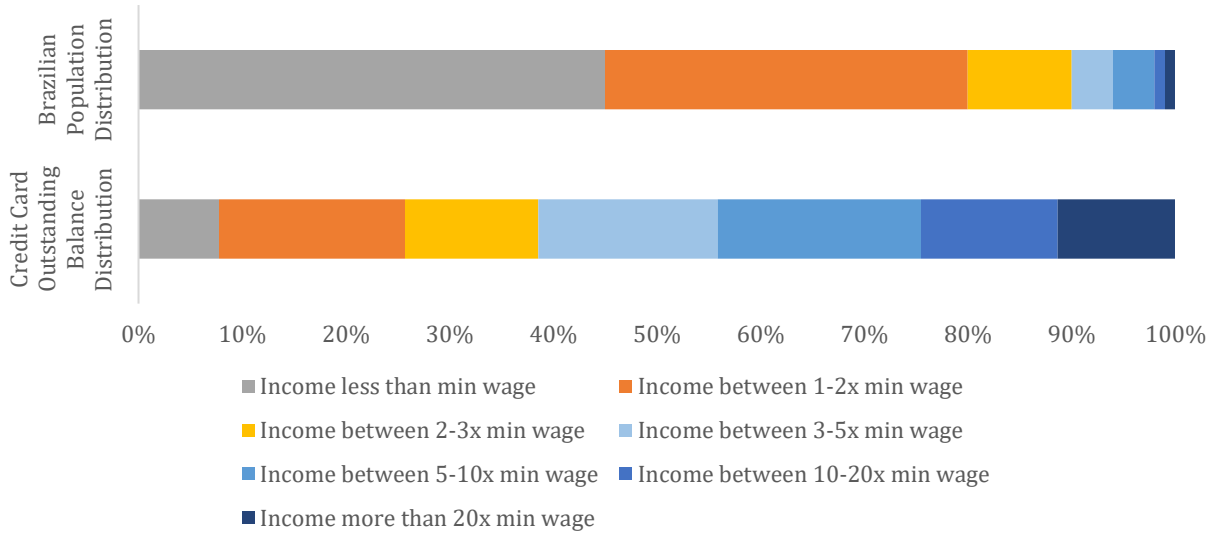


Figure XIV shows that while the credit card outstanding balance is distributed relatively evenly between 8% to 18% for each income group, the actual Brazilian population share is more skewed towards the lower income bands. Nearly 90% of Brazilians earned less than 3 times the minimum wage in 2021, while only about 39% of all credit card debt belonged to Brazilians earning less than 3x minimum wage as of September 2022. This indicates that although lower wage earners represent a significant portion of credit card outstanding balances, they represent an even larger portion of the Brazilian population overall. And while existing underwriting policies are less likely to grant credit to these lower income individuals, they are still experiencing steep delinquencies and hold a large portion of credit card debt. There is an opportunity to leverage more sophisticated underwriting to better identify lower risk pockets within each income band, as well as an opportunity to create tailored product offerings to meet the unique needs of each group. The Recommendations section describes a few of these strategies, including building more sophisticated models, leveraging alternative data sources in underwriting, and adopting a low and grow line strategy.

Figure XIV: Income distribution of Brazilian population (2021) [13] versus Income distribution of Outstanding Credit Card Balance (September 2022)[14]



Private Lenders versus Public Lenders

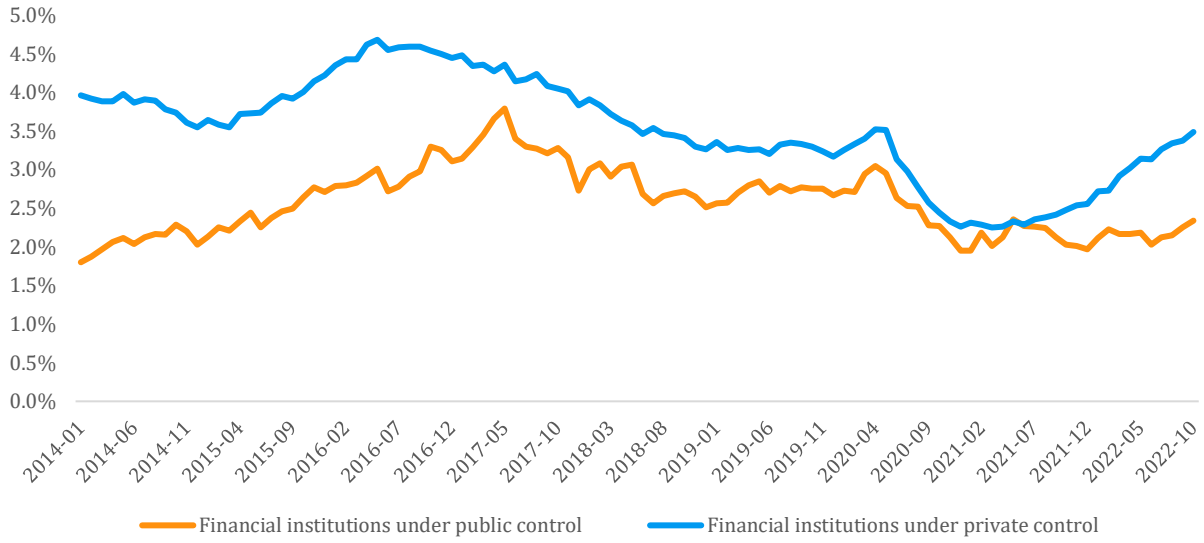
Lastly, there is an interesting distinction in the behavior of private and public banks connected to the discussion above. According to the June 2022 Brazilian financial stability report released by the BCB, private banks had a higher year-over-year growth rate of outstanding credit, having 20% growth compared to approximately 12% for public banks.

[13] Obtained from statitica.com
https://www.statista.com/statistics/1251075/average-monthly-income-percentile-brazil/
[14] Obtained from Credit Information System (SCR)
https://dadosabertos.bcb.gov.br/dataset/scr_data

Moreover, the BCB states that private banks displayed higher risk in credit lending household portfolios in June 2022.

Consequently, as it is seen in **Figure XV**, loans issued by private financial institutions are experiencing a pronounced uptick in the percentage of 90+ days-past-due loans compared to their public counterparts. Delinquency levels for private institutions are rapidly approaching their pre-pandemic levels, while the delinquencies for public institutions have remained lower, with a recent uptick starting in May 2022. This is concerning given that 57% of the credit outstanding corresponds to private banks, and it seems that their customers are having increased challenges paying their debt on time.

Figure XV: 90+DPD loans by type of issuer[15]



Recommendations

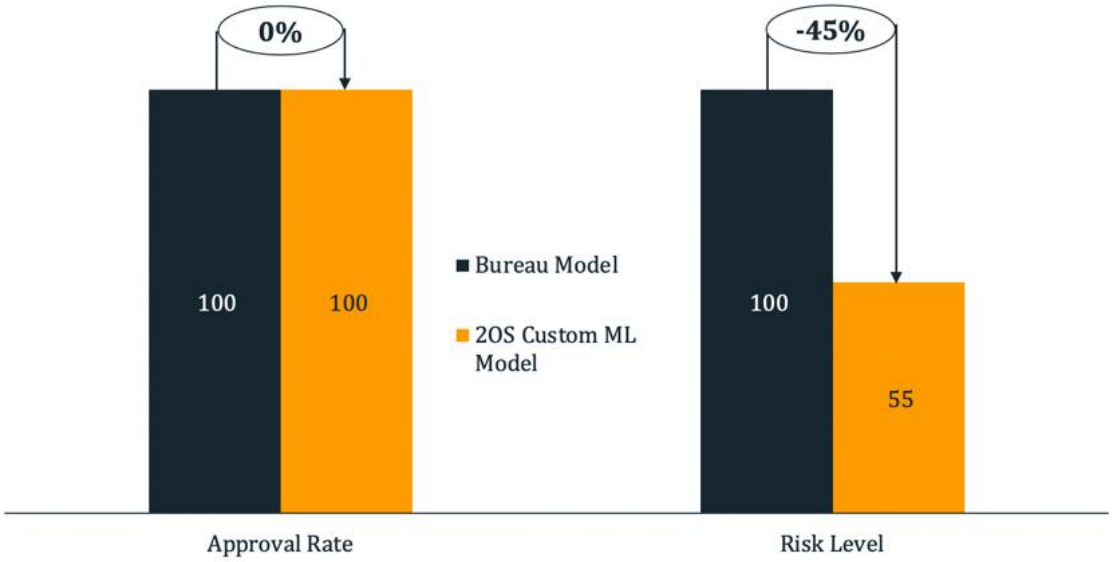
This paper identifies that the rising debt in Brazil may be negatively impacting Brazilians' ability to repay. Increased acquisitions in several credit categories with rising delinquency trends exposes potential pitfalls in lending practices in Brazil. As mentioned in the paper, credit risk is differentiated across income bands. And while that is the primary factor illustrated in the prior section, there are several inter-related components of credit risk management that are integral to developing successful low risk portfolios. 2nd Order Solutions (2OS) has addressed similar credit risk management challenges, and it recommends the following initiatives to Brazilian lenders:

More sophisticated risk modeling techniques, including advanced machine learning methods, can be deployed to improve the accuracy of a financial institution's assessment of customer risk. The incorporation of advanced modeling techniques helps lenders more

[15]Obtained from the BCB's Time Series Management System
https://www3.bcb.gov.br/sgspub/localizarseries/localizarSeries.do?method=prepararTelaLocalizarSeries

effectively disperse credit and improves portfolio risk performance. 2OS has built machine learning models for lending businesses in various sectors helping them reduce credit risk while keeping approval rates constant. For instance, 2OS built a machine learning model for an emerging LatAm fintech in the Buy-Now-Pay-Later space which reduced their 30-day delinquency risk by 45% with no change to approval rates, as shown in **Figure XVI**. The model leveraged advanced machine learning techniques and enhanced existing client data with additional data sources to significantly improve risk detection of potential customers.

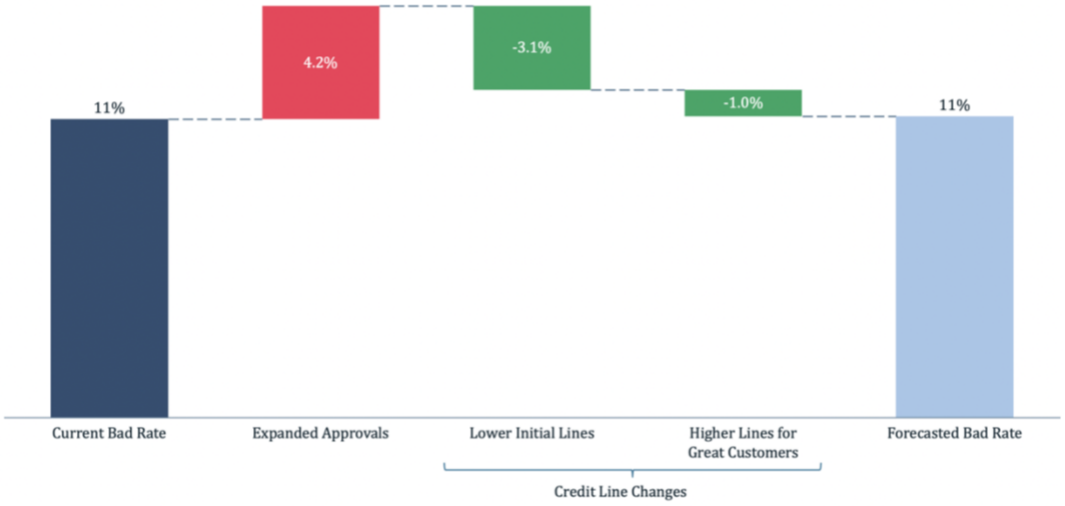
Figure XVI: Approval rate and risk level (indexed) for BNPL client[16]



Strategies to better slope credit lines based on customer risk level and ability to repay can be leveraged so that higher risk customers are given lower credit lines until they have more strongly signaled their credit worthiness. As seen in this report, the lowest income bands are experiencing the highest delinquencies. It is critical for lenders to adjust how much they lend to lower income customers, as their ability to repay the debt is lower. One such strategy is 'low and grow,' which involves extending small lines to a wider population of applicants and only growing the lines of customers with observed good payment behavior, often very quickly, to maximize profit and reduce loss rates. 2OS customized this strategy to a Latin American fintech whose goal was to expand approval rates to populations with higher risk scores and limited data. Deploying this strategy increased the client's approval rates by ~25%, while remaining loss rate neutral. As seen in **Figure XVII**, the strategy kept bad rates unaltered because the savings from low and grow compensated for the expanded approvals.

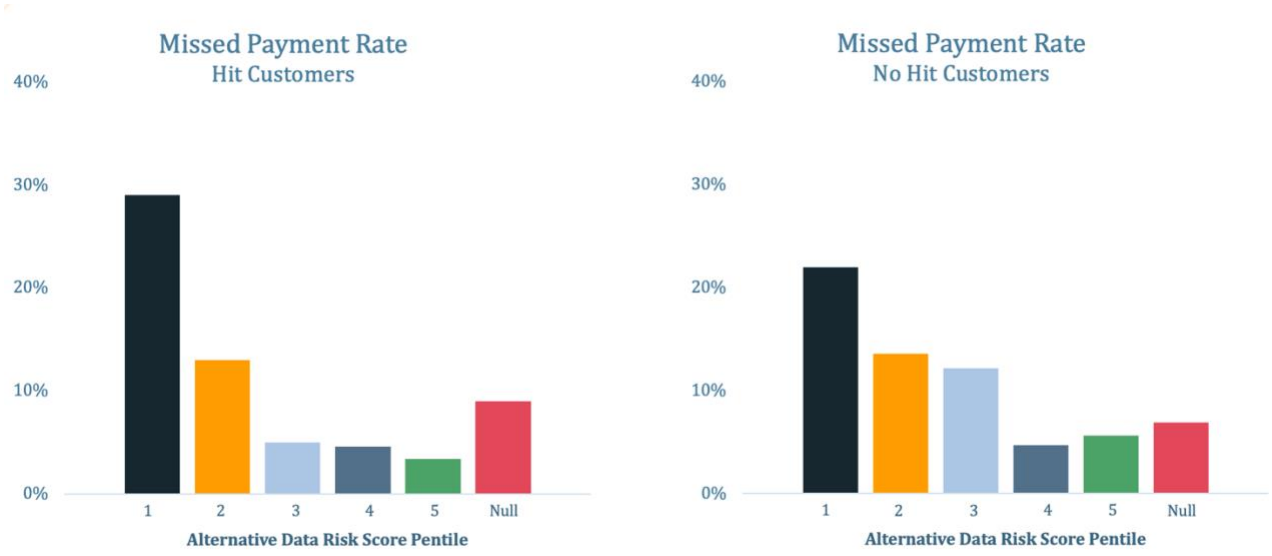
[16] The graphs in this section are anonymized actual data from 2OS client engagements. Figure XV was indexed to 100.

Figure XVII: Bad Rate Waterfall for the Proposed Strategy



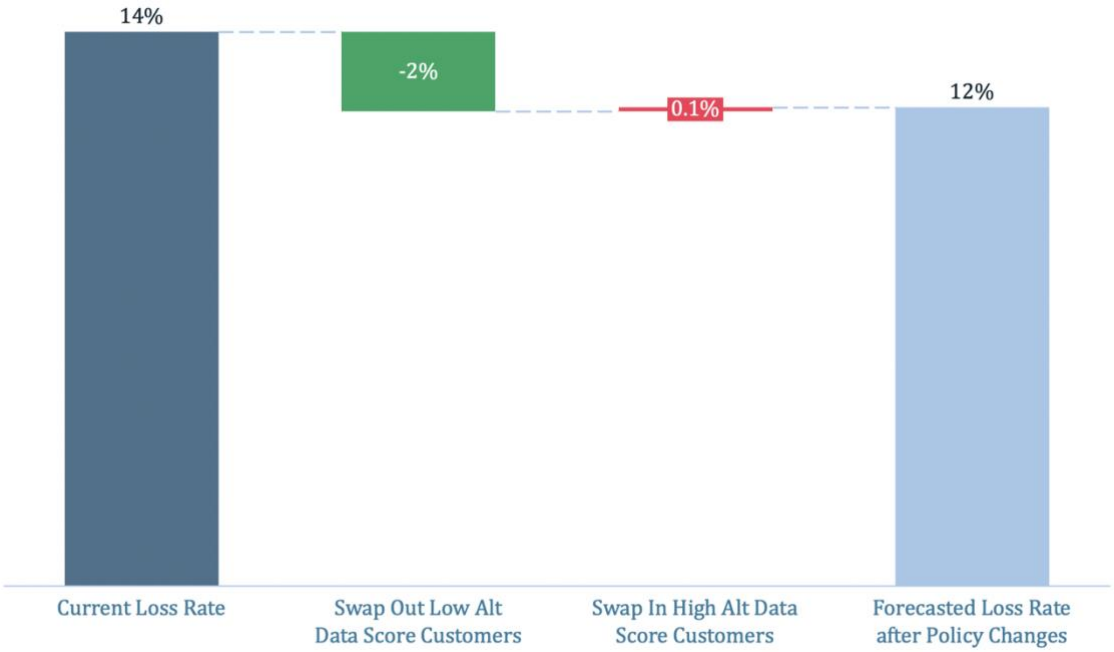
Incorporation of alternative data sources is another powerful tool to improve underwriting. 2OS has found that the use of alternative data sources, such as utility and bill pay information, digital footprint information (e.g. telco data, email data, cell phone usage), financial data (e.g. banking data), psychometrics, and public records (e.g. residential history, education level) greatly improves portfolio risk performance. For a Latin American fintech client, 2OS incorporated an alternative data source to reduce loss rates while keeping approvals neutral. As shown in **Figure XVIII**, the alternative data risk score splits risk effectively across bureau hit and no-hit customers. Moreover, swapping out low score customers reduced portfolio loss rates by 2%, as seen in **Figure XIX**.

Figure XVIII: Missed payment rate by alternative data risk score pentile[17]



[17] In this graph, the first risk score pentile represents the riskiest customers and the 5th pentile is the least risky bucket.

Figure XIX: Loss rate waterfall for incorporation of alternative risk score



Rising delinquencies post-COVID should be investigated for any signs of model degradation or unfavorable credit policy changes. Worldwide, banks responded to the pandemic by increasing the usage of deferral strategies and loan modifications. In the case of Brazil, as seen in this paper, this is reflected in personal loan refinancing. 2OS has found evidence that the vast use of these strategies among other factors has altered banking data feeds. Therefore, models that have been built using COVID-19 data do not perform as well and have exhibited model degradation. 2OS saw anywhere from 10-30% model score inflation for customers booked using their COVID-19 historical data. For example, a March 2021 acquisitions risk score of 376 for a US bank was performing the same as a March 2019 330 score would perform, as shown by **Figure XX**. This model score was used for line assignments and approvals. So, if a change was not made, approvals and initial line assignments would be inflated. For another client, 2OS analyzed trends in order to detect customers that displayed signs of financial stress during COVID. As **Figure XXI** shows, the model strongly differentiates between these two types of customers.

Figure XX: Through-the-door risk scores for model built with COVID data

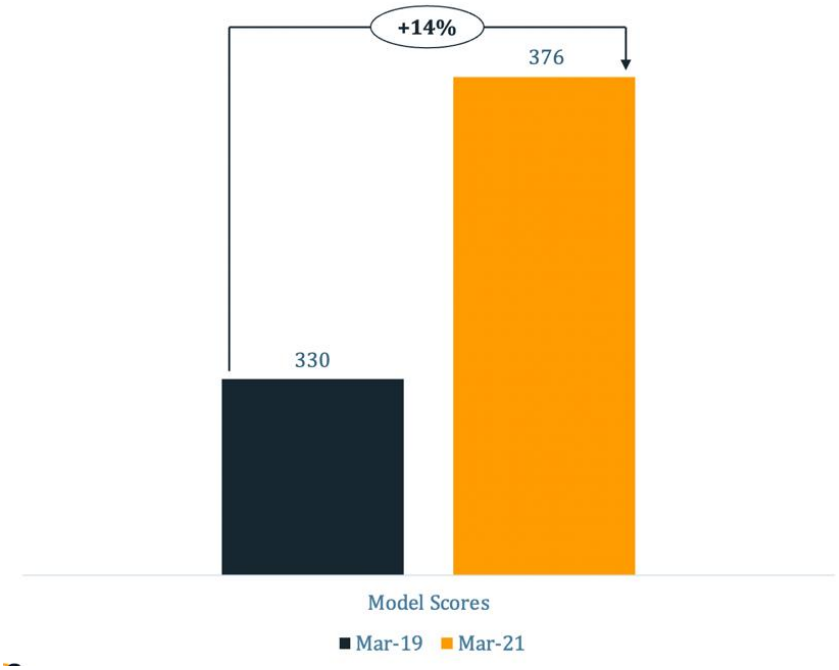
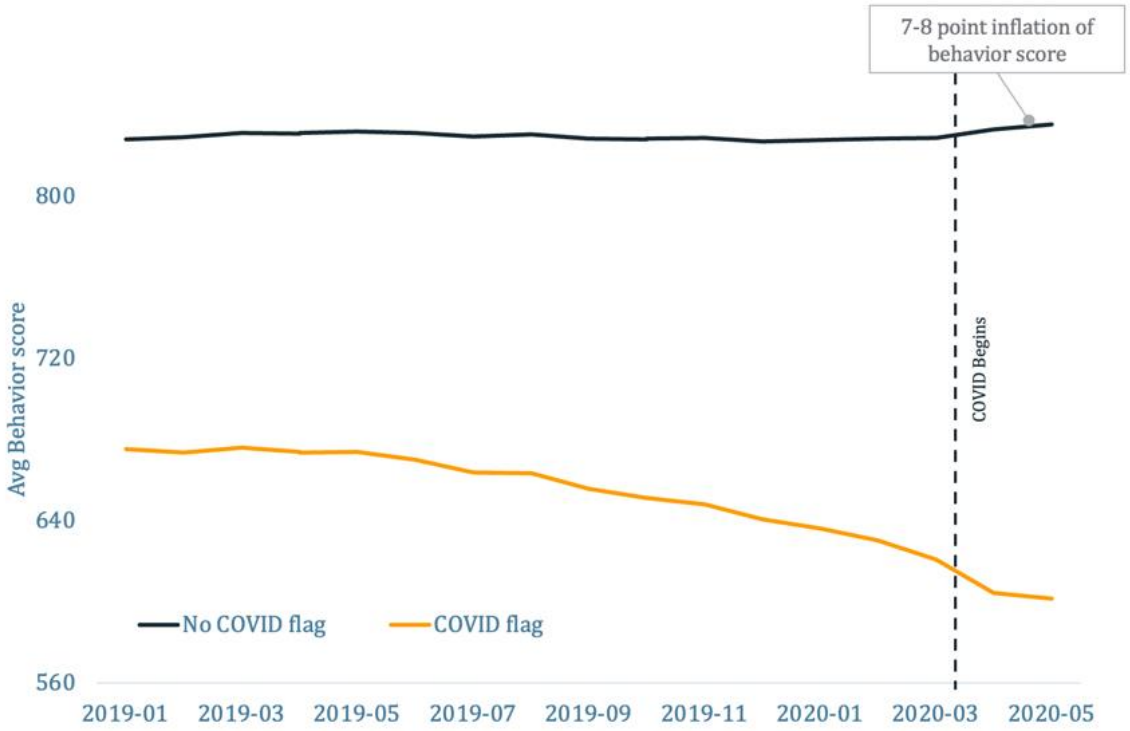
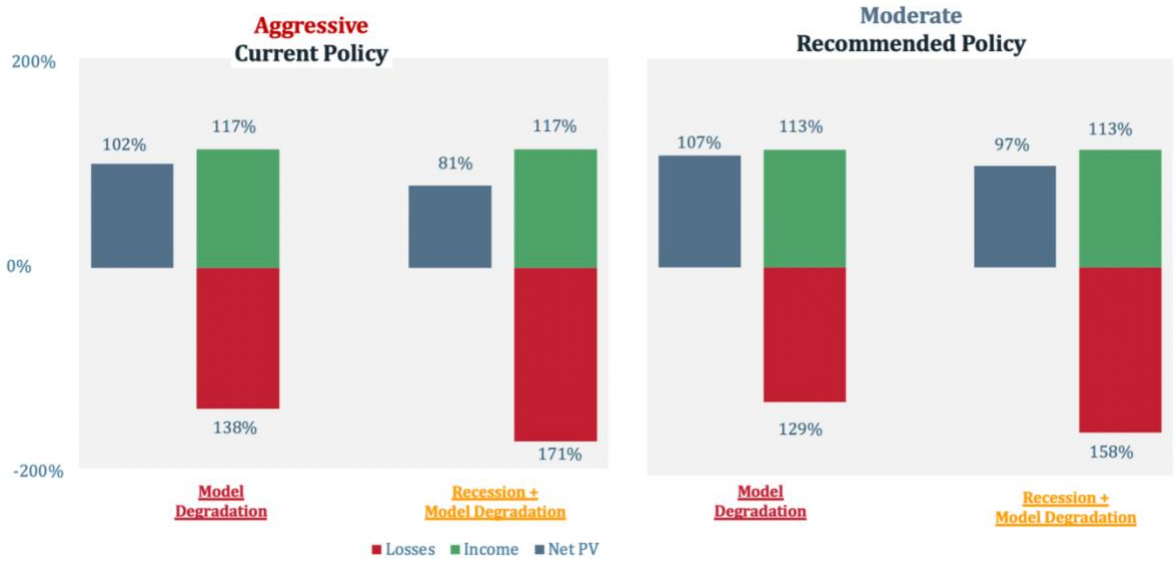


Figure XXI: Average behavior isolating COVID stress



2OS has helped combat model degradation for numerous clients. On one occasion, 2OS built an improved credit limit increase (CLI) policy to address the additional approvals and higher CLI assignment that were being driven by inflated model scores. 2OS optimized the CLIs under stress and identified the segments that were most impacted by model degradation to reoptimize the policy for those segments. **Figure XXII** shows the 5-year net present value of the current and recommended policy under two stressed scenarios compared to each corresponding no-stress scenario. Under the original policy, model degradation increases losses (38% increase) compared to the no-stress scenario but does not have a huge impact on net PV. In a recession, the losses can increase by 71%. In contrast, the recommended policy is more robust under model degradation and recession scenarios.

Figure XXII: 5-year PV compared to the corresponding no-stress scenario



Conclusions

Credit outstandings in Brazil has been growing, resulting in the highest debt-to-income ratio since the 2000s, impairing Brazilians' ability to fulfill debt. This impairment is starting to reflect in the overall delinquency levels, which had fallen during COVID but are now rising back up. The rise in delinquencies is seen across most credit sectors and proves that the refinancing options facilitated during COVID only provided temporary relief.

While credit outstanding in Brazil has grown overall, the most significant increases over time have been in credit cards. And despite credit card delinquencies decreasing dramatically during COVID, they are now reverting to their pre-COVID levels. The delinquency reversion is partly driven by the large proportion of credit outstanding granted to lower income brackets, which have seen the highest delinquency levels and steepest increase. Lastly, private institutions have been issuing riskier credit, which has led to a reversion to pre-COVID levels of delinquency compared to public institutions.

2nd Order Solutions recommends more sophisticated underwriting for most credit sectors. More specifically, the following initiatives should be considered:

- More sophisticated risk modeling techniques, including machine learning methods, which lead to more accurate assessment of a customer's risk. The incorporation of these techniques would help lenders more effectively disperse credit and improve portfolio risk performance across all sectors.

- Strategies to better slope credit lines based on customer risk level and ability to repay. As seen in this report, the lowest income bands are experiencing the highest delinquencies. It is critical for lenders to be diligent on how much to lend to lower income customers, as their ability to repay the debt is lower. By sloping line strategically across risk buckets, lenders can appropriately manage risk.

- Incorporation of alternative data sources to improve underwriting. 2OS has found that the use of alternative data sources, such as utility and bill pay information, digital footprint information, financial data, psychometrics, and public records greatly improves portfolio risk performance. Additionally, alternative data sources such as device information, biometrics, behavioral data, and consortium data help detect fraud activity, which also improves risk performance.

- Rising delinquencies post-COVID should be investigated for any signs of model degradation or unfavorable credit policy changes. Conducting tests and optimizations incorporating stress scenarios is strongly encouraged. Comprehensive model and policy monitoring frameworks should also be set up to support future investigations and preempt undesirable outcomes.

About the Authors

This report was prepared by Scott Barton, Sharon Ovadia, Deepaloke Chattopadhyay and Elizabeth Mejia-Ricart.

Scott Barton – Founder and Managing Partner for 2OS – Over his 25 years in financial services, he has developed deep expertise in lending strategy across all financial services products. He has overseen over 250 engagements for clients around the globe, including hundreds of engagements that have reduced credit risk for clients ranging from top 5 banks to fintechs in the US, Canada, Australia, Europe, and Central America, and was one of a handful of Senior Credit Officers at Capital One, where he ran several lines of business.

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About 2OS

2nd Order Solutions (2OS) is a boutique credit risk advisory firm and has deep expertise in solving some of the world's most challenging credit problems. 2OS has worked with many top 10 global banks, as well as super regionals and fintechs in the consumer and small business lending space, including many point-of-sale lenders worldwide. From building risk models, valuations models, marketing models, credit policies to collections strategies 2OS' solutions extend across all stages of the credit lifecycle. 2OS leaders have decades of experience in credit and lending, both as consultants and as operators.

Although based in the United States, several of 2OS's clients are in Latin America, including Brazil, Mexico, and Colombia. Our credit experts use groundbreaking data analysis and modeling techniques to deliver superior economic outcomes and sustainable competitive advantages for our clients.

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