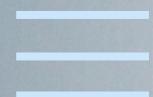


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CREDIT BEHAVIOUR ANALYSIS PROJECT

- MATH 220 - Final Project



INTRODUCTION

- U.S. credit card data (2013–2024), including utilization, minimum payments, full payments, purchase volume, and delinquency.
- Understand what separates financially healthy credit users from vulnerable ones → help consumers avoid overspending and improve long-term financial stability.
- How do credit card behaviors and credit scores relate to financial stress over time?





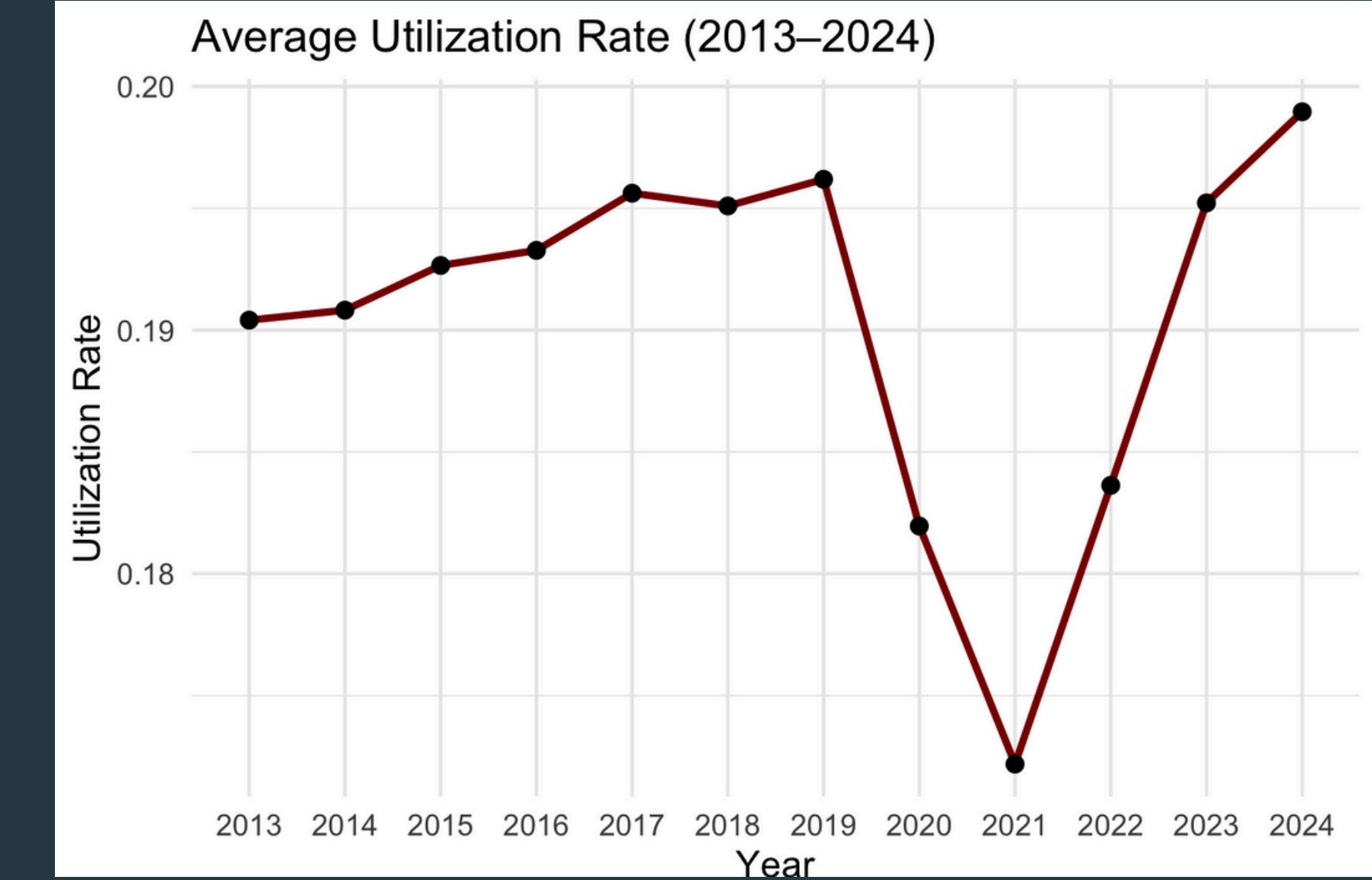
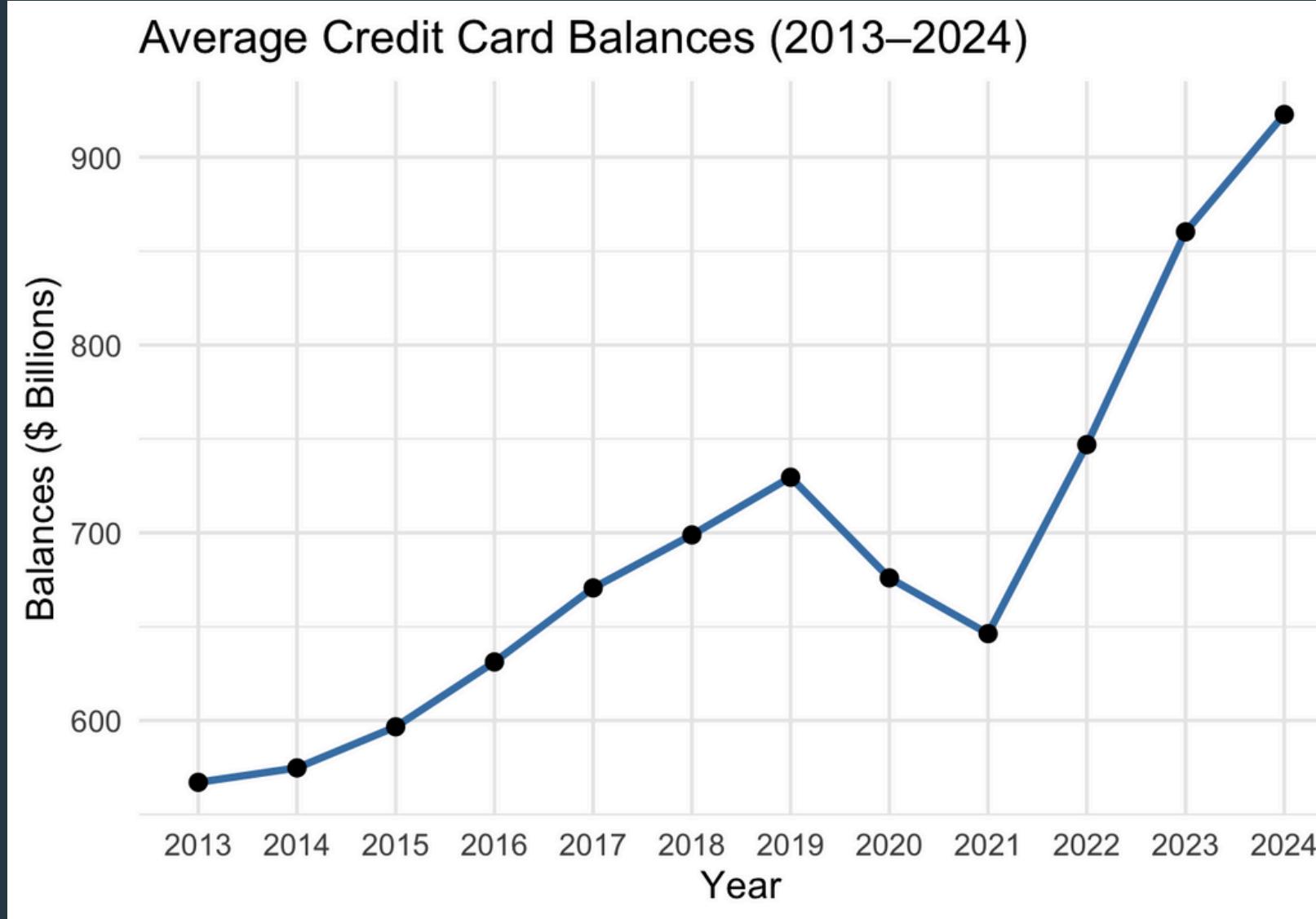
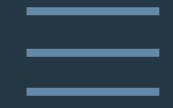
1: How have borrowing patterns and financial stress evolved over time?

CREDIT CARD BALANCES & UTILIZATION RATE

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Pre-COVID (2012–2019):

- Gradual increase in balances and utilization
- Borrowing growth remained manageable

COVID Period (2020–2021):

- Sharp decline in balances and utilization
- Reduced spending and stimulus effects
- Utilization rose to decade-high levels

Post-COVID (2022–2024):

- Balances reached historic highs
- Utilization rose to decade-high levels

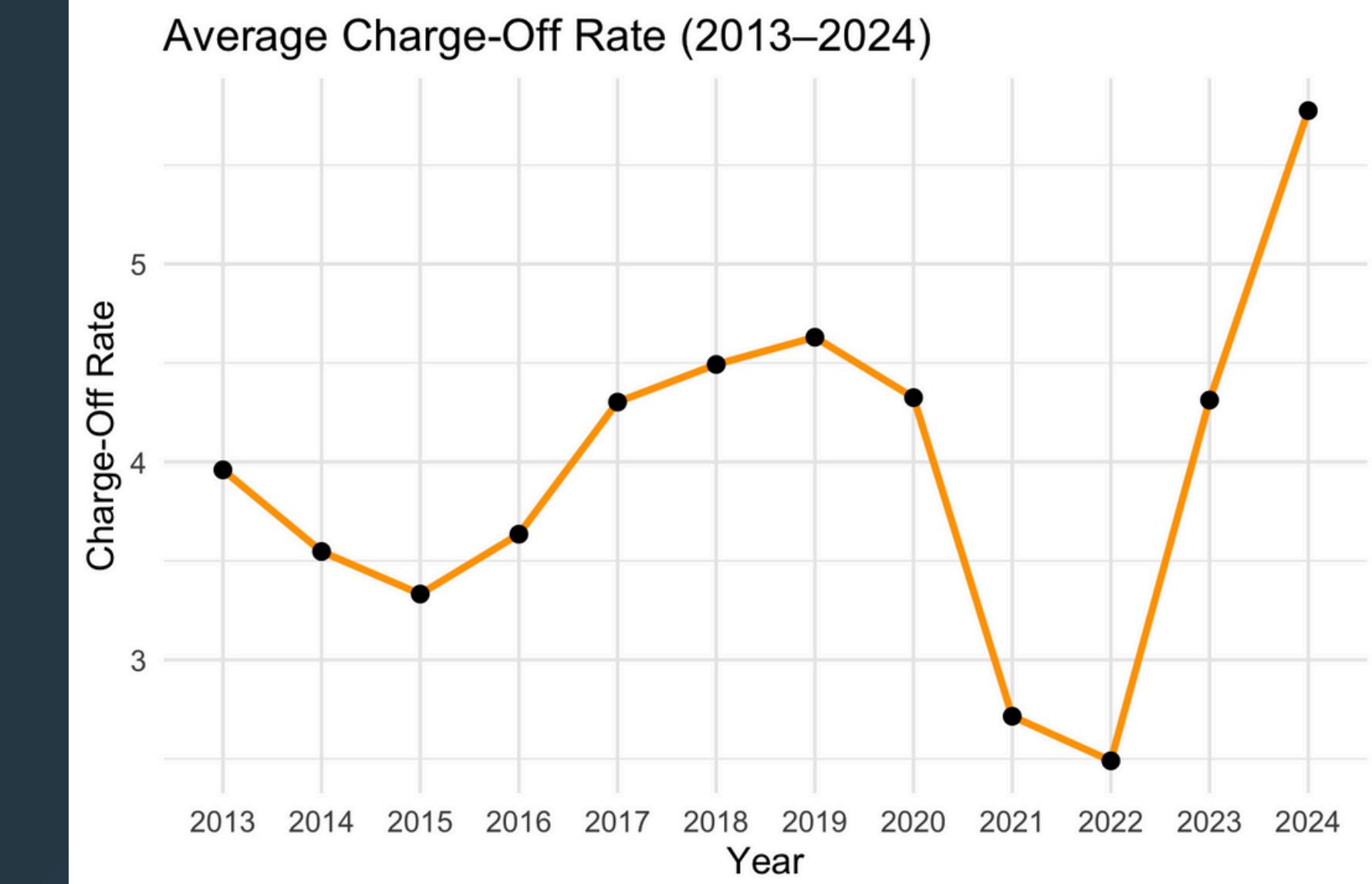
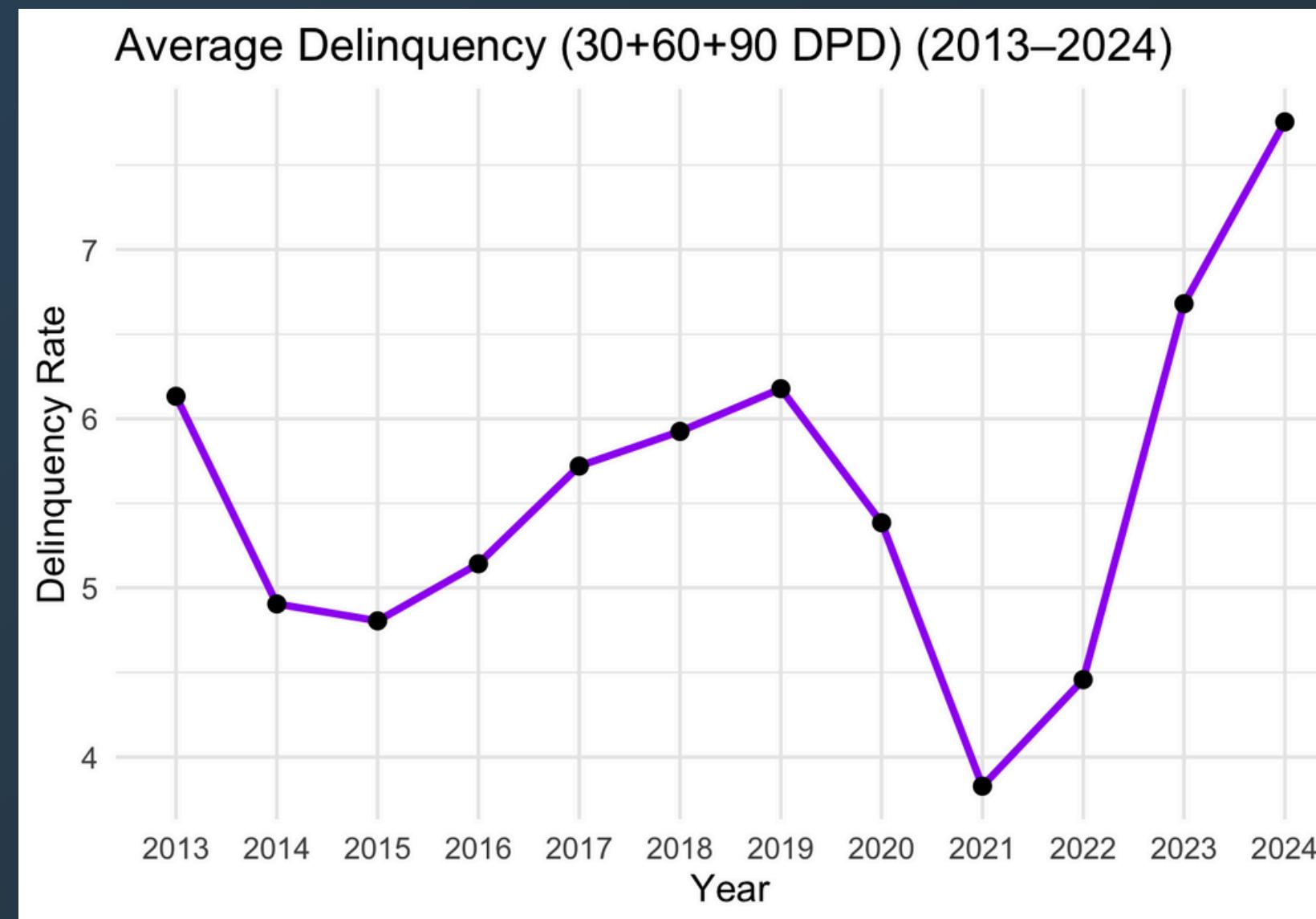
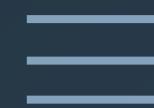
→ Higher utilization = greater financial pressure

DELINQUENCY & CHARGE-OFF RATE

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Pre-COVID (2012–2019):

- Delinquency and charge-offs remained stable
- Borrowing stress was contained

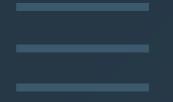
COVID Period (2020–2021):

- Delinquency fell to historic lows
- Forbearance and stimulus masked financial stress

Post-COVID (2022–2024):

- Sharp rise in delinquency and charge-offs
- 2024 exceeds pre-pandemic stress levels

→ Delayed stress emerges after policy support ends



2: How are repayment behaviors related to delinquency and financial stress?

CORRELATION

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	Avg_MinPay	Avg_FullPay	Avg_Utilization	Avg_Delinquency
Avg_MinPay	1.0	0.2	0.76	0.81
Avg_FullPay	0.2	1.0	-0.45	0.02
Avg_Utilization	0.76	-0.45	1.0	0.76
Avg_Delinquency	0.81	0.02	0.76	1.0

LINEAR REGRESSION

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	Estimate	p_value
Intercept	-25.58	0.003
Avg_Utilization	133.46	0.0006
Avg_FullPay	0.18	0.041

Adjusted R-squared: 0.6828

$$\text{Avg_Delinquency} = \beta_0 + \beta_1(\text{Avg_Utilization}) + \beta_2(\text{Avg_FullPay})$$

- Credit utilization is the strongest predictor of delinquency → higher credit use strongly increases missed payments.
- Full-balance payment behavior lowers delinquency → reflects healthier credit use.
- The model explains about 68% of the variation in delinquency.



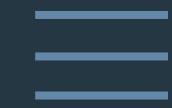
3: Do different credit score groups experience different levels of financial stress?

PURCHASE VOLUME

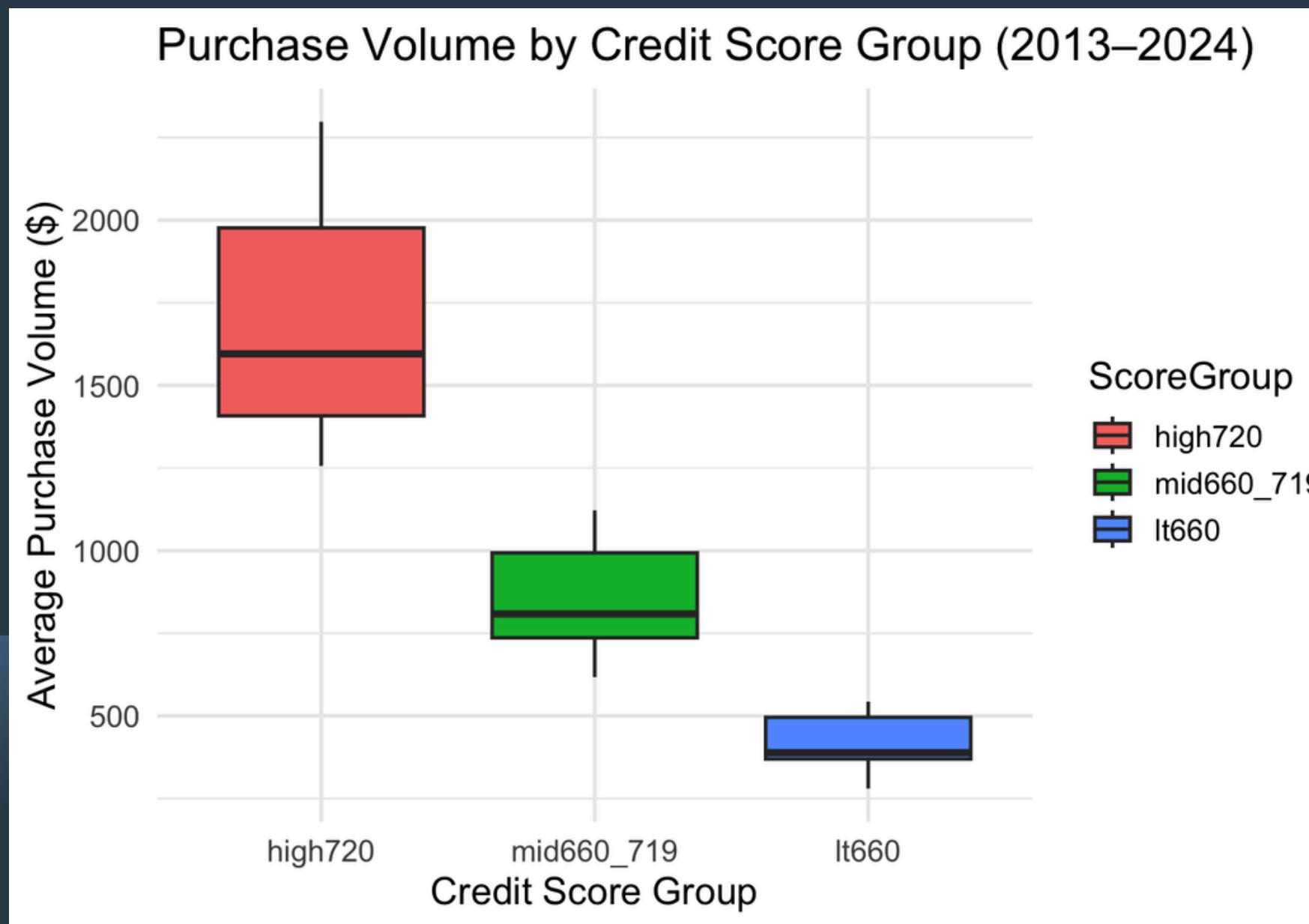
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- F-statistic: 88.77
- p-value: 5.25e-14



ANOVA TEST:

- ANOVA compares average values of a continuous variable across multiple groups.
- Chi-square is for categorical data, so ANOVA is more appropriate for spending amounts.

Results:

- High credit score (720+): Manage credit well and have higher limits → spend the most.
- Mid credit score (660 - 719): Average credit access → spend a moderate amount.
- Low credit score (<660): Limited credit → spend the least.

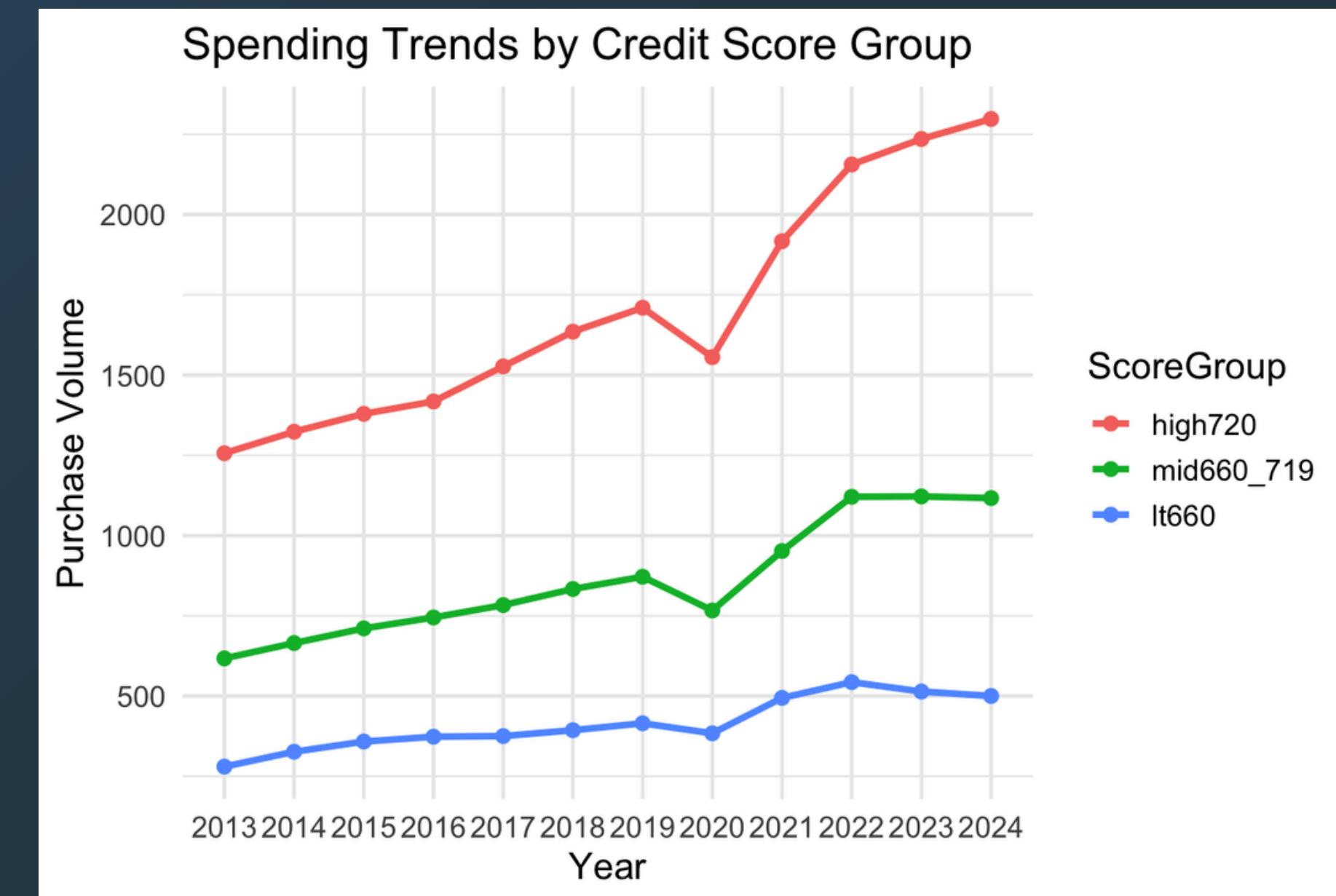
SPENDING TRENDS

- High credit score (720+): Spending sharply decreased in 2020 → rose very strongly & much higher than before COVID.
- Mid credit score (660–719): Spending dropped in 2020 → increased again afterward, but not as much as the high-score group.
- Low credit score (<660): Spending went down a little in 2020 → increased slightly after.

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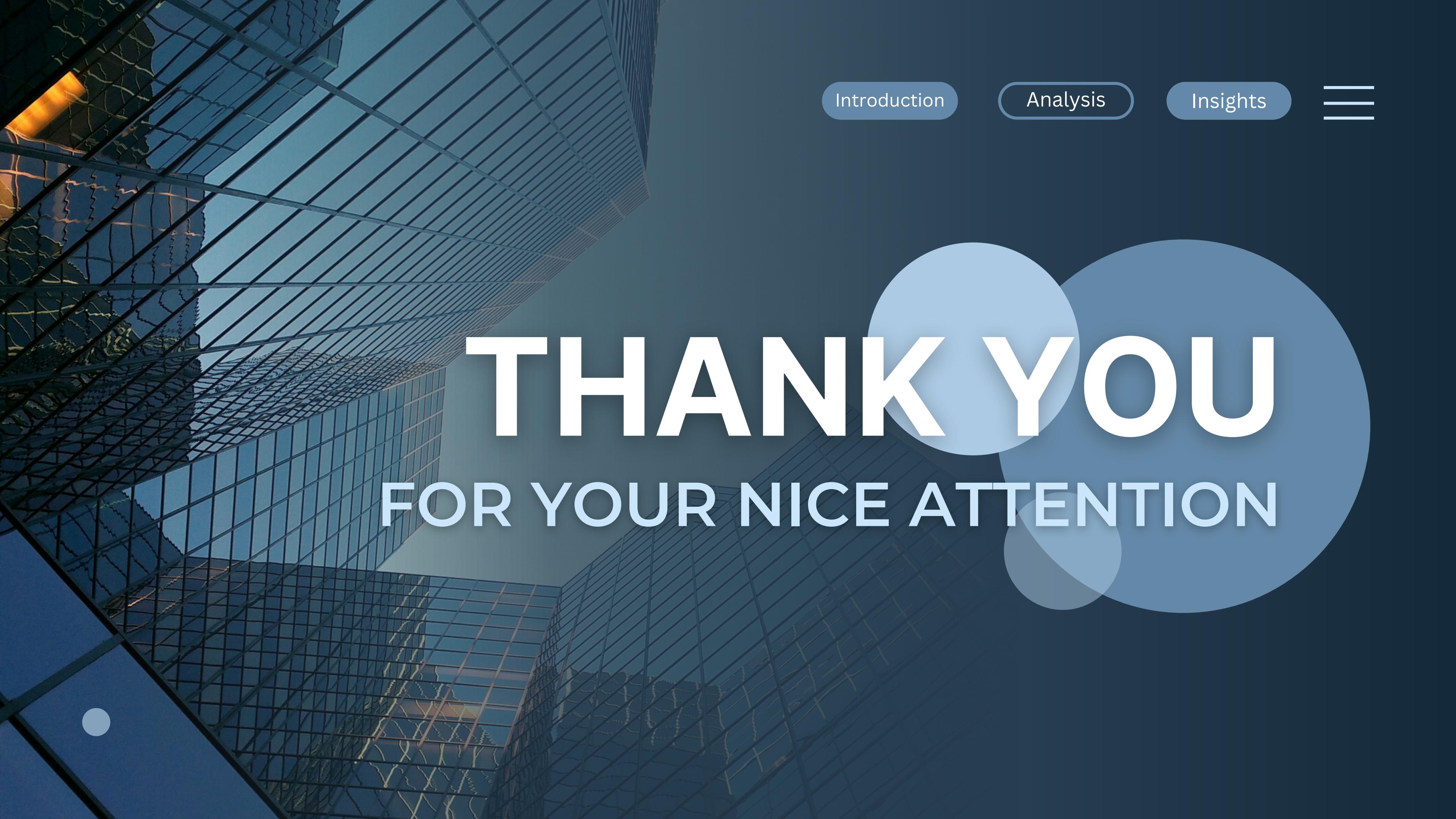
CONCLUSION & KEY INSIGHTS

- Consumer financial stress changed over time, improving during COVID but getting worse after that period
- Credit utilization is the strongest warning sign of financial stress and delinquency.
- Consumers with higher credit scores are more financially stable and able to recover more easily, while lower-score groups face higher financial stress.



LIMITATIONS & FUTURE WORK

- The data are reported quarterly, so short-term changes in behavior may be missed.
- The data are aggregated at the national level, so we cannot observe individual consumer behavior.
- Add macroeconomic variables (inflation, unemployment, interest rates) to improve predictions.
- Explore short-term prediction models to better capture sudden changes in financial stress.

The background image shows a modern skyscraper with a complex glass and steel facade, viewed from a low angle looking up. The building's surface reflects the surrounding environment, creating a grid-like pattern of light and shadow.

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THANK YOU
FOR YOUR NICE ATTENTION