Small Business Loan Applications Analysis

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1. INTRODUCTION

1.1 Motivation

In the landscape of small business financing, the quest for a suitable loan is akin to navigating a complex maze filled with myriad options and varying terms. Among the various loan types available, the 7(a) loan program, administered by the U.S. Small Business Administration (SBA), stands out as a beacon of hope for many small business owners. This program offers a lifeline to businesses seeking financial support, with its promise of lower interest rates and favorable terms. However, the challenge for many entrepreneurs lies in identifying the right lending institution that not only offers 7(a) loans but also aligns with their specific needs and circumstances.

The motivation behind this project stems from a fundamental need to simplify this search and make the process more transparent and accessible. Small business owners, often strapped for time and resources, require a streamlined approach to finding a bank that can provide a 7(a) loan tailored to their unique situation. Key factors such as location, interest rates, loan approval rates, and historical performance of lenders play a critical role in this decision-making process.

Given the vast array of banks and financial institutions participating in the 7(a) program, each with its own set of policies and rates, the task of choosing the right lender can be daunting. This project aims to demystify this selection process. By leveraging data analysis and visualization, we seek to uncover patterns, trends, and insights that will guide small business owners in making informed decisions.

The project's goal is to analyze various aspects of 7(a) loans, including geographical distribution of loans, average interest rates offered by different banks, loan approval times, and other relevant factors. This analysis is not just about presenting numbers and statistics; it's about transforming data into actionable intelligence that can directly impact the success and growth of small businesses.

Ultimately, this project is driven by a commitment to empower small business owners with the knowledge and tools they need to secure the best possible funding options. By shedding light on the intricacies of the 7(a) loan landscape, we aim to pave a smoother path for these entrepreneurs, contributing to the overall health and vitality of the small business sector.

1.2 Existing Work

The existing work within this project has produced pivotal visualizations that contribute to our understanding of the small business loan landscape.
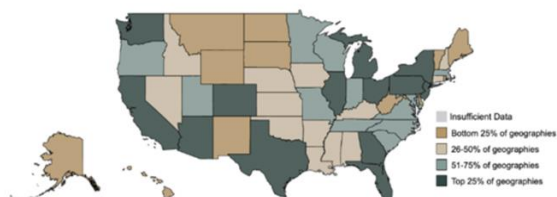

Figure 1.geographic plot

Figure 2.small business applications 7(a) and 504 loan amount over time

showcases a choropleth map that illustrates the distribution and concentration of SBA 7(a) loans across the United States. The visualization categorizes states into quintiles based on loan volume or another related metric, providing an immediate geographical perspective on loan distribution. The darker shades represent areas with higher concentrations of loans or loan values, while lighter shades represent areas with less activity. Regions marked as 'Insufficient Data' indicate a lack of comprehensive information, suggesting areas for future data collection efforts.

presents a bar chart reflecting the loan amounts over time for the SBA 504 and 7(a) loan programs. The chart depicts a trend of increasing loan amounts over the years, indicating either a growing need for larger loans among small businesses or an increased willingness by lenders to offer higher amounts. The trend could also be influenced by economic inflation or a shift in focus to support more capital-intensive business projects.

Together, these visualizations form the backbone of the existing analytical work, providing a clear and informative snapshot of the SBA 7(a) and 504 loan programs' historical trends and geographical loan distribution. These insights lay the groundwork for further analysis and underscore the importance of geographic and temporal factors in the small business lending domain.

1.3 Contribution

The contribution of this project to the field of small business finance and data analytics is multifaceted, addressing several key areas:

1. Enhanced Decision-Making for Small Business Owners

The primary contribution of this project lies in its potential to aid small business owners in making more informed decisions when seeking 7(a) loans. By analyzing data related to bank locations, interest rates, approval rates, and other pertinent factors, the project provides a comprehensive overview that can guide entrepreneurs towards the most suitable lenders for their specific needs. This targeted approach can save time, reduce complexity, and increase the chances of securing favorable loan terms.

2. In-depth Analysis of 7(a) Loan Landscape

The project delves deep into the intricacies of the 7(a) loan program, offering insights that go beyond surface-level information. It examines not just the basic terms of the loans but also looks at trends in lending practices, regional variations in loan distribution, and the performance of different lenders within the program. This level of analysis contributes to a richer understanding of the program's dynamics and its impact on the small business sector.

3. Bridging the Gap Between Borrowers and Lenders

By highlighting the key factors that influence the suitability of a lender for a specific business, the project acts as a bridge between borrowers and financial institutions. It provides a clearer picture of the lending landscape, which can be beneficial for banks and other lending entities in understanding the needs of small businesses and tailoring their services accordingly.

4. Contribution to Policy Analysis and Development

The findings of this project can be instrumental for policymakers and stakeholders in evaluating the effectiveness of the 7(a) loan program and identifying areas for improvement. The insights gained can inform policy decisions and initiatives aimed at enhancing access to finance for small businesses, ultimately contributing to economic growth and job creation.

5. Advancement in the Use of Data Analytics in Finance

This project showcases the application of advanced data analytics and visualization techniques in the realm of finance. By transforming complex datasets into comprehensible and actionable information, it demonstrates how data-driven approaches can lead to more effective solutions in financial services and policy planning.

6. Educational and Training Resource

The methodologies and findings of this project can serve as valuable educational resources for students, researchers, and practitioners in the fields of finance, economics, and data science. The project's approach to problem-solving and data analysis can inspire similar research and

contribute to the training of future professionals in these fields.

In summary, this project's contribution is significant in enhancing the decision-making process for small business owners, enriching the understanding of the 7(a) loan program, bridging the gap between borrowers and lenders, aiding in policy development, advancing data analytics in finance, and serving as an educational resource.

2. DATA & METHODS

2.1 Ideas, sketches, prototypes

The core idea of this project revolves around creating a data-driven framework to assist small business owners in navigating the complexities of securing 7(a) loans. The project's essence is encapsulated in a series of visualizations that transform raw data into clear, actionable insights. Each visualization is carefully designed to highlight specific aspects of the 7(a) loan landscape, ensuring that small business owners can easily understand and utilize the information.

1. Interactive Map of Lenders:

-   Prototype: An interactive map displaying the geographical distribution of banks offering 7(a) loans. Users can zoom in/out and click on specific regions for detailed information.
-   Design Rationale:The map provides an immediate visual representation of the availability of lenders across different regions, helping business owners locate nearby lending options.

2. Loan Interest Rate Comparison Chart:

-   Prototype:A bar or line chart comparing the average interest rates offered by various lenders over time.
-   Design Rationale:This chart allows borrowers to assess and compare the cost of borrowing from different lenders, factoring in historical interest rate trends.

3. Loan Approval Time Analysis:

-   Prototype: A histogram or boxplot representing the distribution of loan approval times across different lenders.
-   Design Rationale: Quick access to funds can be crucial for small businesses. This visualization helps in identifying lenders with faster approval processes.

4. Trends in Loan Amounts and Approvals:

-   Prototype: A time series line graph showing trends in loan amounts and the number of loans approved over the years.
-   Design Rationale:Helps in understanding how market conditions and policy changes over time affect loan availability and size.

Each visualization is designed with a focus on clarity and ease of interpretation. The interactive map uses geographical cues and color coding to denote the density of lenders, providing a quick overview of local options. The comparison charts employ intuitive bar and line formats with clear legends and

annotations to ensure straightforward comparison between lenders. Histograms and boxplots for approval times are chosen for their ability to depict distribution ranges effectively.

The lender performance dashboard combines several key metrics in one view, using gauges, bars, and numeric indicators to facilitate a multi-faceted evaluation of each lender. Correlation plots and time series graphs are equipped with trend lines and markers to highlight significant patterns and changes over time.

In essence, each part of the visualization design is carefully crafted to not only present data but to tell a story and guide decision-making, aligning closely with the project's core contribution goals.

2.2 visualization methods selection

Interactive Maps

Interactive maps are highly intuitive for representing geographical data, offering immediate visual impact and the ability to zoom in for detailed regional information. However, they can become cluttered with too many data points and their interactivity might be limited in static formats. They are best suited for showing the geographical distribution of lenders but are less effective for detailed numerical analysis, such as exact loan amounts or interest rates.

Bar and Line Charts

Bar and line charts are clear and effective for showing trends and comparisons over time or across different categories. They are easily interpretable and ideal for a wide audience.

However, they may not adequately represent complex, multi-dimensional data. These charts are ideal for comparing interest rates, loan amounts, and other financial metrics over time but are less suited for multidimensional or complex datasets that require more nuanced visualization methods.

Histograms and Boxplots

Histograms and boxplots are excellent for displaying the distribution of data, such as loan approval times. Boxplots, in particular, provide insights into medians, quartiles, and outliers, offering a compact representation of data variability. However, these methods can be less intuitive for general audiences and may potentially mislead if bins or scales are not chosen carefully. They are effective for loan approval time analysis but require clear and thoughtful presentation to ensure understanding.

Dashboards

Dashboards are potent tools for combining multiple data visualizations into a comprehensive overview. They allow for an in-depth representation of data and, when interactive, enable a deeper exploration of datasets. The main challenge lies in avoiding information overload and ensuring clarity in presentation, especially in static or printed formats. Dashboards are excellent for presenting a holistic view of lender performance, combining various data points into a single, coherent narrative.

Time Series Graphs

Time series graphs are invaluable for illustrating data trends over time, allowing for the observation of patterns, cyclical behaviors, and anomalies. They can effectively highlight changes and developments in data across different time periods. The main drawback is their potential complexity with overlapping lines or numerous data points. These graphs are very suitable for visualizing trends in loan amounts, approval rates, and other time-sensitive data, making them a key tool for temporal analysis in financial contexts.
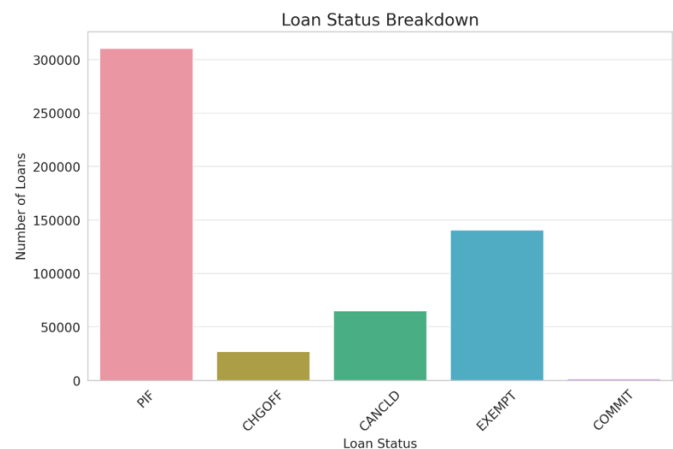
Figure 4: Loan Status Breakdown

3. VISUALIZATION AND INSIGHTS
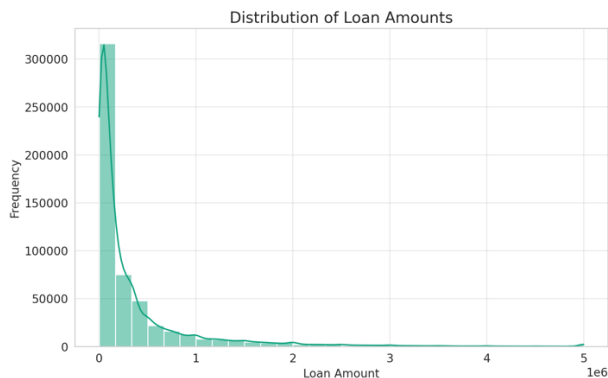
Figure 3: Distribution of Loan Amounts

The bar chart provides a breakdown of the loan status categories. The most common status is 'PIF' (Paid In Full), followed by 'EXEMPT', with 'CHGOFF' (Charged Off) and other statuses being less frequent. This indicates that a large proportion of loans are being repaid successfully, which is a positive sign for the health of the loan program and its participants.

This histogram depicts the frequency distribution of loan amounts. The data is highly right-skewed, indicating that a vast majority of the loans are small in amount, with progressively fewer loans of higher amounts. This skewness could suggest that the 7(a) loan program is more accessible or more frequently utilized by smaller businesses seeking lower loan amounts, which may reflect the program's effectiveness in targeting this business segment.
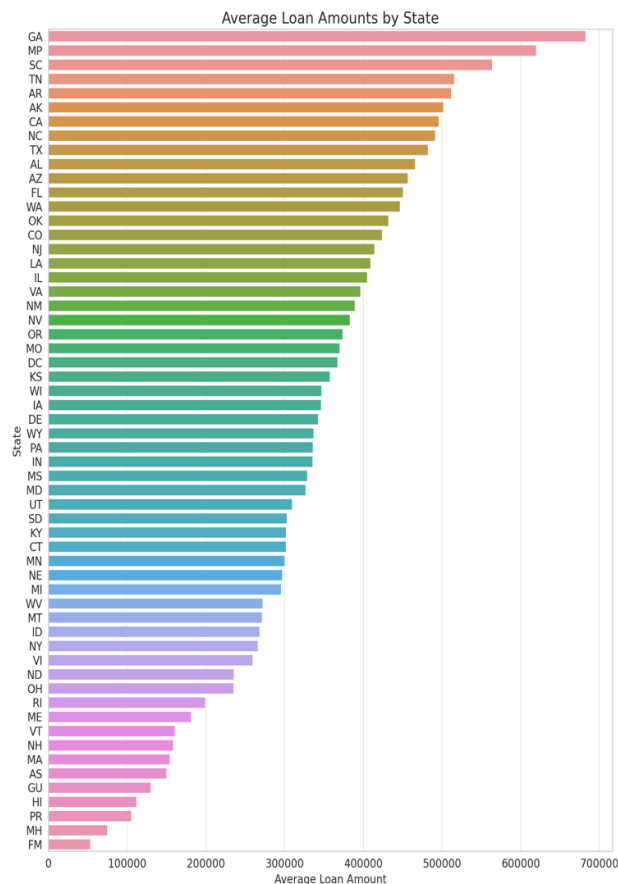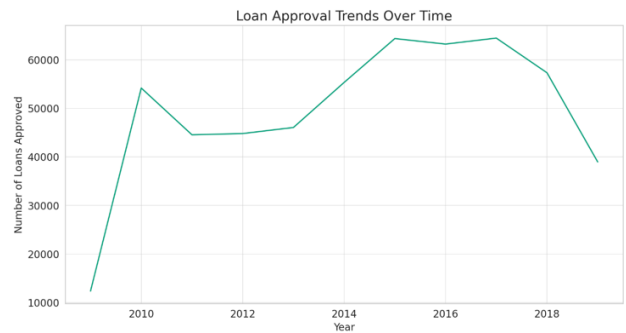
Figure 5: Average Loan Amounts by State

Figure 6: Loan Approval Trends Over Time

The line graph shows the trend of loan approvals over time. There's a noticeable increase in approvals up to a peak, followed by a decline. This trend could correlate with economic cycles, policy changes, or shifts in market conditions affecting small business confidence and lending practices.
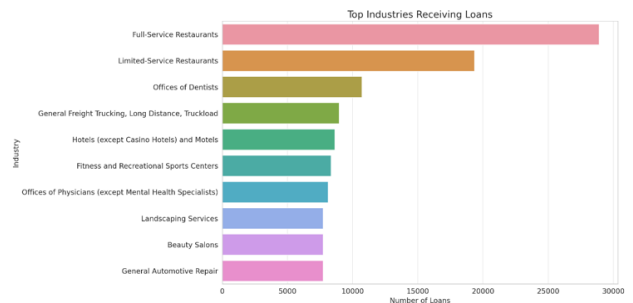

Figure 7: Top Industries Receiving Loans

The bar chart compares average loan amounts across different states. States at the top of the chart, like GA (Georgia) and MP (Northern Mariana Islands), have higher average loan amounts, which might point to larger-scale businesses or more significant funding needs in those regions. Conversely, states at the bottom have lower averages, possibly due to smaller-sized businesses or less capital requirement.

This bar chart highlights the top industries receiving loans, with "Full-Service Restaurants" and "Limited-Service Restaurants" being the most common. This suggests that the food service sector is a significant recipient of 7(a) loans, which may be due to the high startup and operational costs associated with this industry.
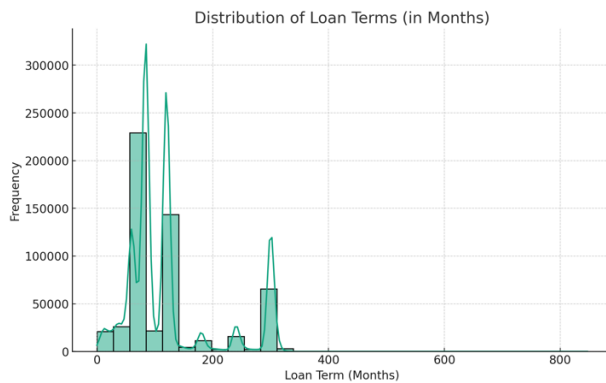
Figure 8: Distribution of Loan Terms (in Months)

The histogram for loan terms reveals a concentration of loans with shorter terms, with fewer loans extending to longer terms. This pattern may reflect the preference or ability of small businesses to take on shorter-term financial commitments.
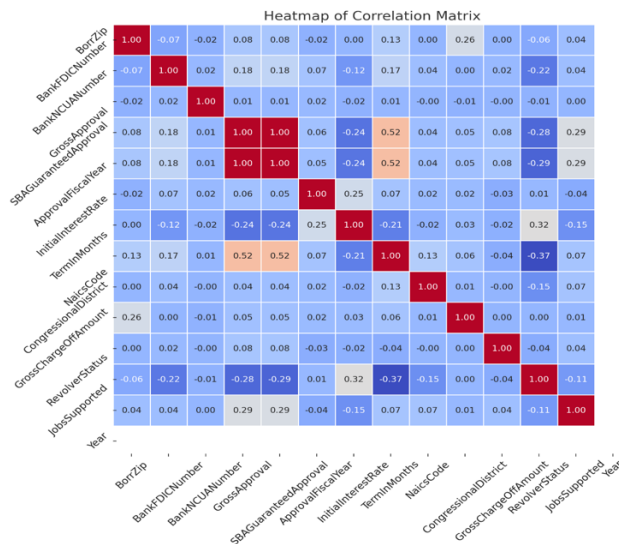

Figure 9: Heatmap of Correlation Matrix

The heatmap shows the correlation between various loan attributes. Darker colors represent stronger correlations, either positive (red) or negative (blue). This visual highlights relationships such as a positive correlation between loan amount and term length, which could indicate that larger loans typically come with longer repayment schedules.
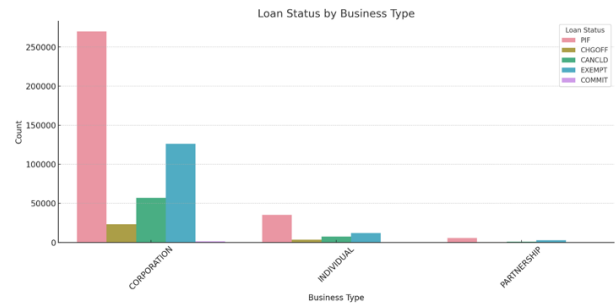

Figure 10: Loan Status by Business Type

This bar chart breaks down loan status by business type. Corporations seem to have a higher rate of loans paid in full, while individual-owned businesses and partnerships have fewer loans. This might imply that corporations are more successful in repaying loans or more likely to secure loans with terms they can fulfill.
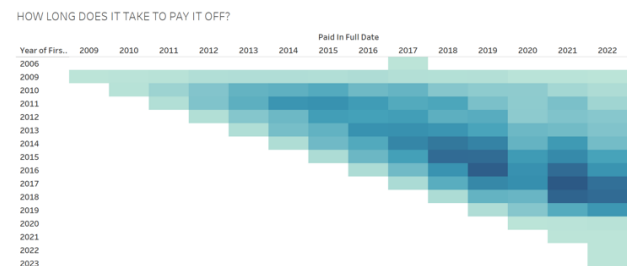

Figure 11: How Long Does It Take to Pay Off?

This chart depicts the time taken to pay off loans relative to the year of the first disbursement. It provides a visual
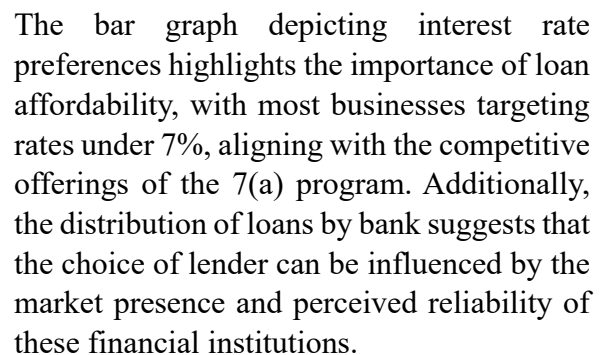
understanding of loan lifecycles, showing that many loans are paid off within a predictable time frame after disbursement.

Figure 12.Average Loan Amounts Over Time

This line graph illustrates the trend in average loan amounts over a set period. The upward trajectory indicates that the average loan amount has increased over the years. This could suggest either an increase in the scale of small businesses seeking loans, inflationary effects on capital needs, or a shift in the lending program's focus towards larger loans. It also might reflect broader economic trends, such as expansion in the average size of small businesses or increased confidence in the market, prompting businesses to seek more substantial funding for growth and expansion. This trend analysis is vital for lenders to adjust their loan offerings and for policymakers to understand the evolving needs of small businesses.

4. Discussion

The dashboard presented offers an invaluable resource for small business owners seeking SBA 7(a) loans. The interactive map is a key feature, indicating the widespread availability of financial institutions across the United States, which is crucial for businesses pinpointing potential lenders nearby. The histogram detailing the desired length of loans in years shows a marked preference for shorter loan terms, with a steep decline in interest for durations beyond 5 years. This preference suggests that businesses prioritize minimizing long-term financial burdens or the accumulation of interest.

The bar graph depicting interest rate preferences highlights the importance of loan affordability, with most businesses targeting rates under 7%, aligning with the competitive offerings of the 7(a) program. Additionally, the distribution of loans by bank suggests that the choice of lender can be influenced by the market presence and perceived reliability of these financial institutions.

5. Conclusion

The insights gained from this project emphasize the critical considerations that small business owners weigh when choosing a loan product and lender. The dashboard's visualizations shine a light on the borrowing preferences and patterns of small business operators, providing a narrative that is both clear and actionable regarding their financing needs. This dashboard not only empowers entrepreneurs to make informed decisions backed by data but also equips lenders with market insights that can inform the development of products that are more attuned to the needs of small businesses.

Ultimately, the project's findings lead to two main conclusions: Firstly, they confirm the necessity for financial solutions tailored to the unique geographic, economic, and temporal preferences of small businesses. Secondly, they highlight the transformative potential of data-driven dashboards in the decision-making processes within the small business finance sector. This project has the potential to inspire further advancements in the provision of financial services, offering both business owners and financial institutions valuable insights to foster a robust and responsive small business environment.

6. References

- *U.S. Small Business Administration. (2023). Small Business Loan Data.*
- *Federal Reserve Bank. (2021). Small Business Credit Survey.*
- *Center for Public Integrity. (2020). Small business loan data includes little about race.*