

# Loan Portfolio & Credit Risk Analysis Dashboard

## Project Overview

I built this Power BI dashboard to better understand how credit risk is distributed across a large loan portfolio with approximately \$32.5 billion in total exposure. Rather than focusing only on high-level metrics, the goal of this project was to dig into why certain borrowers default more than others and whether current pricing and underwriting policies adequately reflect that risk.

By converting raw loan and borrower data into an interactive dashboard, this analysis helps identify high-risk borrower segments, evaluate whether interest rates are aligned with credit quality, and track default behavior across income levels, employment history, and loan purposes.

## Key Features & Insights

### 1. Executive KPI Header

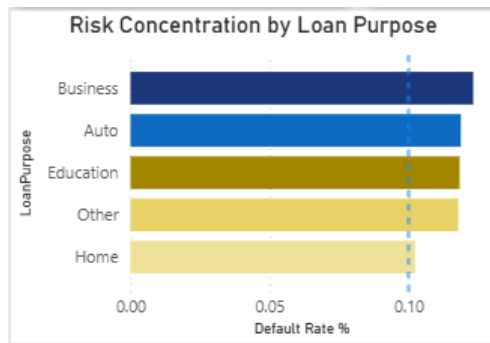
The KPI section at the top of the dashboard is designed for quick decision-making and gives an immediate snapshot of portfolio health:

- **Total Loan Exposure:** Shows the total capital at risk, which currently stands at \$32,576.9M.
- **Defaulted Loans:** Highlights the scale of non-performing loans, totaling approximately 29.6K.
- **Average Credit Score:** Acts as a high-level indicator of borrower quality, with an average score of 574 across the portfolio.
- **Avg Interest Rate:** Displays the average cost of borrowing across the portfolio, currently 13.5%, which serves as a benchmark for risk-based pricing analysis.
- **Total Loans:** Highlights the total volume of unique loan accounts being managed, totaling 255,347.

These KPIs allow stakeholders to quickly assess whether the portfolio is generally healthy before exploring deeper risk drivers.

### 2. Risk Concentration by Loan Purpose

To understand where risk is most concentrated, I analyzed default rates by loan purpose.

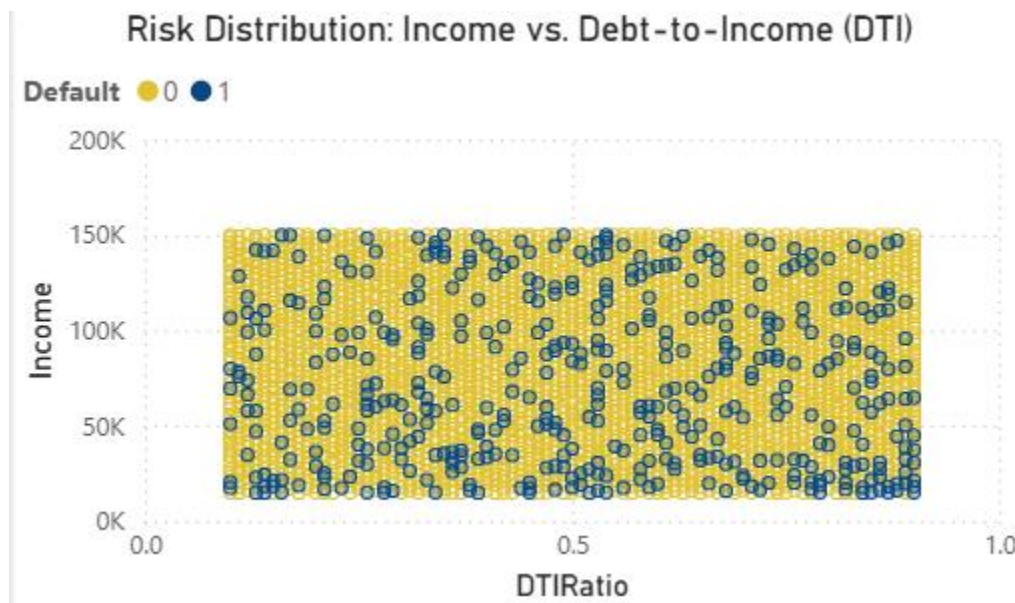


- **Metric Used:** Default Rate (%) was chosen instead of loan count to focus on *risk*, not volume.
- **Benchmark:** A constant reference line at 10% was added to reflect a practical policy threshold.
- **Insight:** Business, Auto, Education and Other loans significantly exceed the 10% benchmark, while Home loans represent the safest segment, sitting exactly at the 10% risk threshold

This view helps prioritize which loan categories require closer monitoring or tighter underwriting standards.

### 3. Risk Distribution (Income vs. DTI)

This scatter plot visualizes the financial profile of 255,347 borrowers by comparing income with debt burden.



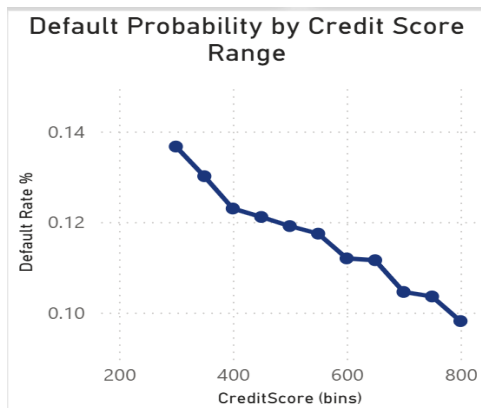
- **Axes:** Income is plotted against the Debt-to-Income (DTI) ratio.
- **Design Choice:** High transparency was used to manage the density of data points without losing overall patterns across the massive dataset.

- **Insight:** Defaults are not limited to low-income borrowers; they cluster strongly around higher DTI values across all income levels.

This suggests that debt burden is a stronger driver of default risk than income by itself.

#### 4. Default Probability by Credit Score Range

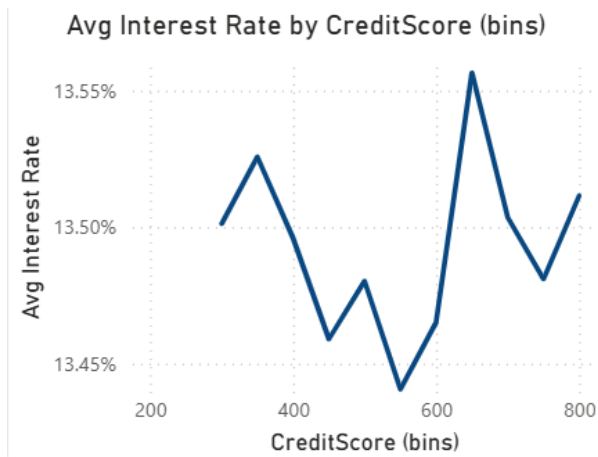
This line chart analyzes the direct correlation between a borrower's creditworthiness and their likelihood of default.



- **The X-Axis Binning:** CreditScore is grouped into bins of 50 points (e.g., 400, 450, 500) to transform individual scores into broad, readable credit tiers.
- **The Y-Axis Logic:** It utilizes the Default Rate % measure, showing the probability of a loan failing within each specific credit bucket.
- **The Insight:** The chart shows a strong, linear relationship where the default rate drops significantly as the credit score increases, moving from roughly 14% at the 300-score mark to below 10% at the 800-score mark.
- **Business Value:** This proves the predictive power of the credit scoring model; it allows the bank to set "cutoff" scores (e.g., 700+) where the risk of default is statistically acceptable.

#### 5. Risk-Based Pricing (Interest Rate vs. Credit Score)

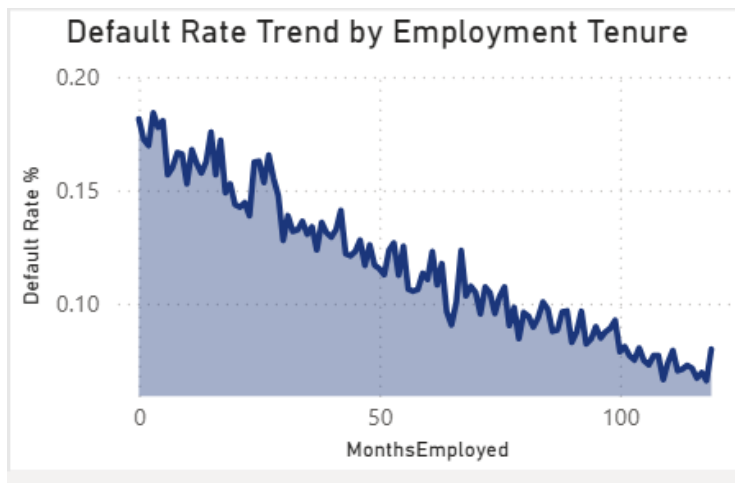
This line chart analyzes the direct correlation between a borrower's creditworthiness and their likelihood of default.



- **The Data:** While credit scores range from 300 to 800, the average interest rate stays within a very narrow band of 13.44% to 13.56%.
- **The Insight:** Unlike the Default Probability chart (which shows a clear 4% risk drop), the interest rate does not show a strong downward trend as credit scores improve.
- **Business Recommendation:** This reveals a pricing misalignment. High-risk borrowers (300 score) are being charged nearly the same rate as low-risk borrowers (800 score), despite being significantly more likely to default. The institution should consider more aggressive risk-based pricing to protect profit margins on lower credit tiers.

## 6. Default Rate Trend by Employment Tenure

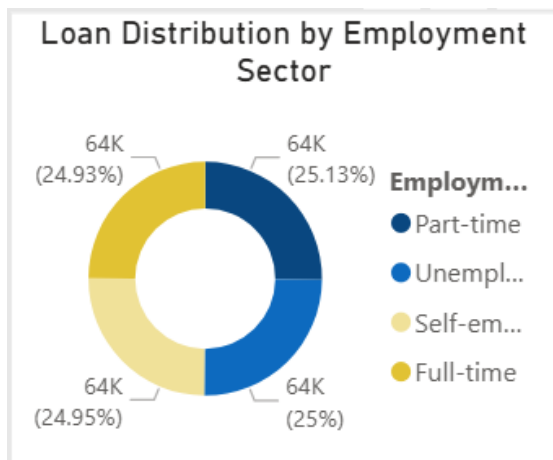
To assess borrower stability, I analyzed default rates based on employment tenure.



- **X-Axis:** Represents the length of employment in months, ranging from 0 to over 120 months.
- **Y-Axis:** Displays the Default Rate %, scaled from 0.05 (5%) to 0.20 (20%).
- **Key Insight:** There is a significant risk peak for borrowers with the shortest tenure, where the default rate starts near 18%. As employment tenure increases, the default risk shows a steady "decay" or downward trend.
- **Stability Threshold:** By the time a borrower reaches approximately 50 months of employment, the default rate drops toward the 10% benchmark.
- **Business Action:** This visual supports a policy of "Tenure-Based Underwriting," where borrowers with less than 2 years (24 months) of job history might be flagged for higher interest rates or additional collateral requirements due to their higher statistical risk.

## 7. Loan Distribution by Employment Sector

This donut chart provides a high-level breakdown of the portfolio's distribution across different employment categories.

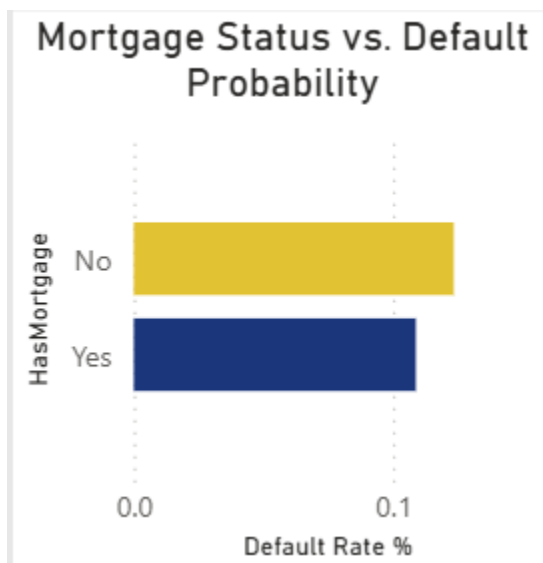


- **Portfolio Balance:** The loan portfolio is remarkably evenly distributed among four key employment sectors, with each sector representing approximately 25% of the total volume.
- **Sector Breakdown:**
  - Part-time: 64K loans (25.13%).
  - Unemployed: 64K loans (25.00%).
  - Self-employed: 64K loans (24.95%).
  - Full-time: 64K loans (24.93%).

- **Business Insight:** The near-perfect uniformity across these sectors suggests a diversified lending strategy that does not over-rely on a single employment type.
- **Risk Context:** While the volume is balanced, this chart sets the stage for cross-analyzing default rates; for instance, determining if the 25% of loans held by unemployed borrowers carries a disproportionately higher default risk compared to the 24.93% held by full-time employees.

## 8. Mortgage Status vs. Default Probability

This bar chart evaluates the impact of property ownership on a borrower's likelihood of loan repayment.



- **Categories:** The chart compares borrowers who currently have a mortgage (Yes) against those who do not (No).
- **The Insight:** Borrowers without a mortgage exhibit a noticeably higher Default Rate % compared to those who are currently homeowners with a mortgage.
- **Data Analysis:** While both groups hover near the 0.1 (10%) threshold, those with a mortgage (represented by the dark blue bar) show lower default probability.
- **Business Interpretation:** This finding suggests that borrowers with an existing mortgage may be more financially disciplined or have higher "skin in the game," making them statistically more reliable than non-homeowners in this portfolio.

## Technical Skills & Execution

**1. Data Modeling:** Created binned categories for CreditScore and LoanAmount to convert granular data into actionable insights.

## 2. DAX Measures

Here is the technical breakdown of the custom measures developed to drive the dashboard's analytics and KPI cards.

### 1. Avg Credit Score

- **Code:** *dax Avg Credit Score = AVERAGE('Loan\_default'[CreditScore])*
- **Description:** Calculates the mean creditworthiness of the borrower pool. It serves as a primary KPI to monitor overall portfolio quality and provides a baseline for evaluating risk-based pricing.

### 2. Avg Interest Rate

- **Code:** *dax Avg Interest Rate = AVERAGE('Loan\_default'[InterestRate])*
- **Description:** Calculates the mean interest rate across the portfolio. This allows for a quick assessment of whether the institution's pricing is appropriately aligned with the level of risk identified in borrower segments.

### 3. Defaulted Loans

- **Code:** *dax Defaulted Loans = CALCULATE(COUNTROWS('Loan\_default'), 'Loan\_default'[Default] = 1)*
- **Description:** Filters the dataset to provide a direct count of all non-performing loans. This measure serves as the volume foundation for all risk probability calculations.

### 4. Default Rate %

- **Code:** *dax Default Rate % = DIVIDE([Defaulted Loans], [Total Loan], 0)*
- **Description:** A core Risk Indicator showing the percentage of total loans that have failed. It is used to identify high-risk pockets across dimensions like loan purpose and employment tenure.

### 5. Total Loan Amount

- **Code:** *dax Total Loan Amount = SUM('Loan\_default'[LoanAmount])*
- **Description:** Aggregates the principal value of all loans to determine total financial exposure. This figure represents the total capital currently at risk within the lending portfolio.

### 6. Total Loan

- **Code:** *dax Total Loan = COUNTROWS('Loan\_default')*

- **Description:** Provides the total count of loan records in the dataset. It acts as the denominator for percentage-based metrics and tracks the overall scale of the lending operation.

**3.Analytical Enhancements:** Implemented constant benchmark lines at 10% to support policy-level decision-making.

**4.Interactivity:** Education and marital status slicers enable rapid segmentation and persona-based risk analysis.

**5.UI/UX Design:** Applied a clean, modern layout with rounded containers (10px), consistent navy/teal colors, and aligned visual spacing for readability.

## Data Structure

The dashboard is built on a structured dataset that includes:

- **Borrower Demographics:** Education, marital status, and employment type.
- **Financial Attributes:** Income, debt-to-income ratio, and credit score.
- **Loan Details:** Loan amount, interest rate, loan purpose, and mortgage status.

## Conclusion

Overall, the portfolio appears relatively stable, but the analysis highlights clear pockets of elevated risk. In particular, Business loans and borrowers with short employment tenure consistently exceed the institution's 10% default threshold. These segments would benefit from tighter underwriting standards or adjusted pricing to better reflect their risk profile.