# World Bank Loan Analysis: Distribution, Repayment, and Economic Impact across Countries and Sectors

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## Motivation and Background

The World Bank provides financial assistance to countries worldwide, which significantly impacts their economic development. Understanding the distribution, performance, and economic effects of these loans can provide valuable insights for economists, development organizations, and policymakers. This study aims to analyze World Bank loan data to identify trends, patterns, and correlations, which can help improve loan policies and strategies.

World Bank loans to a country are carefully considered, and the total loan amount, loan projects, and related items can provide a snapshot of the country's economic situation, especially its debt status, and its focus on development projects. Additionally, tracking a country's data over multiple years can better reflect the effectiveness of its long-term development strategies. Comparisons between countries can also highlight economic differences and how these differences affect the choice of development projects. For policymakers, finding suitable development projects for a country and providing appropriate financial assistance is crucial, and this relies heavily on analyzing past loan data.

### Research Questions:

1. What is the distribution of loan amounts across different countries?
2. What types of loans are most commonly issued by the World Bank, and what is the average allocation of loan amounts to different loan types? Additionally, what is the distribution of loan amounts for the top 20 projects in South Asian countries?
3. Which countries repay their loans the slowest and the fastest?
4. What is the average amount of money borrowed for each sector, and how are loan funds distributed among different industries in different countries? What are the three major factors considered while lending a loan?
5. Do the interest rates exhibit any obvious trends based on the borrowers' geographic locations?

## Summary of Research Questions and Results

## 1. What is the distribution of loan amounts across different countries?

It provides how the World Bank allocates the financial resources globally; we can see that the highest share of loans is found in India when compared to any of the countries in the world. We can also see that Indonesia and Brazil have high shares of loans since they are the major recipients of aid, probably from their huge developmental needs and strategic importance.

## 2. What types of loans are most commonly issued by the World Bank, and what is the average allocation of loan amounts to different loan types? Additionally, what is the distribution of loan amounts for the top 20 projects in South Asian countries?

The World Bank issues various loan types, including Fixed Spread Loans and Consumer Personal Loans, each designed for specific financial needs and borrower situations. Infrastructure projects like railways, power, and highways in South Asian countries typically receive higher median loan amounts compared to other sectors. Loan amount ranges differ greatly throughout project types; certain exhibit stable financing levels, while others exhibit considerable change contingent on particular project requirements.

## 3. Which countries repay their loans the slowest and the fastest?

With a total loan amount exceeding $1 billion, the countries with the fastest average repayment times are South Africa, Hungary, Venezuela, and Uruguay. The countries with the slowest repayment times are Egypt, China, El Salvador, and Jordan. The larger the total loan amount, the longer the average repayment time.

## 4. What is the average amount of money borrowed for each sector,how are loan funds distributed among different industries in different countries and what three major factors are considered while lending a loan?

Each sector has a very different average amount of money borrowed, with significant projects like combating poverty and highways receiving substantial allocations. The allocation of loan funds among various industries is based upon the unique requirements of individual nations. Total loan amount, repaid amount, and total due amount are the three major factors taken into account when making a loan decision by the bank.

### 5. Do the interest rates exhibit any obvious trends based on the borrowers' geographic locations?

Not exactly, interest rates are influenced by monetary policy, external relationships, political risk, inflation, and economic stability. While the conditions of IBRD loans vary by region, IDA credits typically offer concessional terms to the world's poorest countries, primarily those in South Asia and Sub-Saharan Africa. We found that countries with stable political and economic environments typically receive lower loan interest rates, which raises our concerns that those facing crises like war or pandemics may struggle to obtain loans or face prohibitively high costs.

## Dataset

The dataset used for this project is the World Bank loan data, which includes information on loan amounts, types, repayment periods, sectors, and interest rates. The dataset is publicly available and can be accessed from the following URL: https://finances.worldbank.org/Loans-and-Credits/IBRD-Statement-of-Loans-Latest-Available-Snapshot/sfv5-tf7p/data_preview

### Details:

Over 9153 records, with key data columns including Country, Loan Number, Borrower, Loan Status, and financial details like Original Principal, Disbursed, and Repaid amounts.

### Additional Analysis Components:

### Data Integrity and Preprocessing:

Check for completeness, correct any errors, and prepare data for analysis.

### Analytical Tools:

Use Python libraries such as Pandas for data manipulation and Matplotlib for visualization.

### References:

World Bank, IBRD Loans and Credits. Available at World Bank - Finances

## Methodology

### Data Preprocessing

Firstly, we conducted preprocessing steps on the data, which included:

**Removing irrelevant columns:** We excluded columns not pertinent to our research questions, such as 'End of Period', 'Guarantor Country Code', 'Guarantor', and 'Currency of Commitment'.

**Handling missing values:** Rows with missing values in 'Loan Number' and 'Project ID' were removed to ensure data integrity and accuracy.

**Date column conversion:** All columns related to dates (e.g., 'First Repayment Date', 'Last Repayment Date') were converted to the datetime format. This conversion facilitates subsequent date calculations and analysis.

### Data Aggregation and Computation

During the aggregation and computation phase, our main methods involved:

**Grouping and aggregation:** We utilized the groupby function in pandas to categorize and group data. This allowed us to perform statistical operations and calculations based on different categorical variables (e.g., country, loan type).

**Numerical operations:** Using pandas and numpy libraries, we conducted various numerical operations on data columns, including summing, averaging, and calculating standard deviations. These computations helped us understand loan distribution, repayment patterns, and the distribution of loan amounts.

### Visualization Tools

To visualize and analyze the data, we employed the following visualization tools:

**Geospatial visualization:** Geopandas was used to visualize geographic data (such as loan information by country or region) on maps.

**Plots:** Using matplotlib and seaborn libraries, we created a variety of charts including bar plots, line plots, and scatter plots. These visualizations enabled us to analyze trends, correlations, and distribution characteristics within the data.

**Additional Steps in Analysis:**

Correlation Matrix:

To find significant connections between various loan parameters, a correlation matrix was created.

3D Scatter Plot:

To see the links between loan amounts, repayment rates, and due dates, 3D scatter plots were used.

## Results

## Research Question 1: What is the distribution of loan amounts across different countries?

This analysis was set up to determine which are the largest countries in terms of financial support, and if any trends would occur within these distributions.

**Data Processing and Analysis:**

**Grouping and Summation of Loan Amounts:**

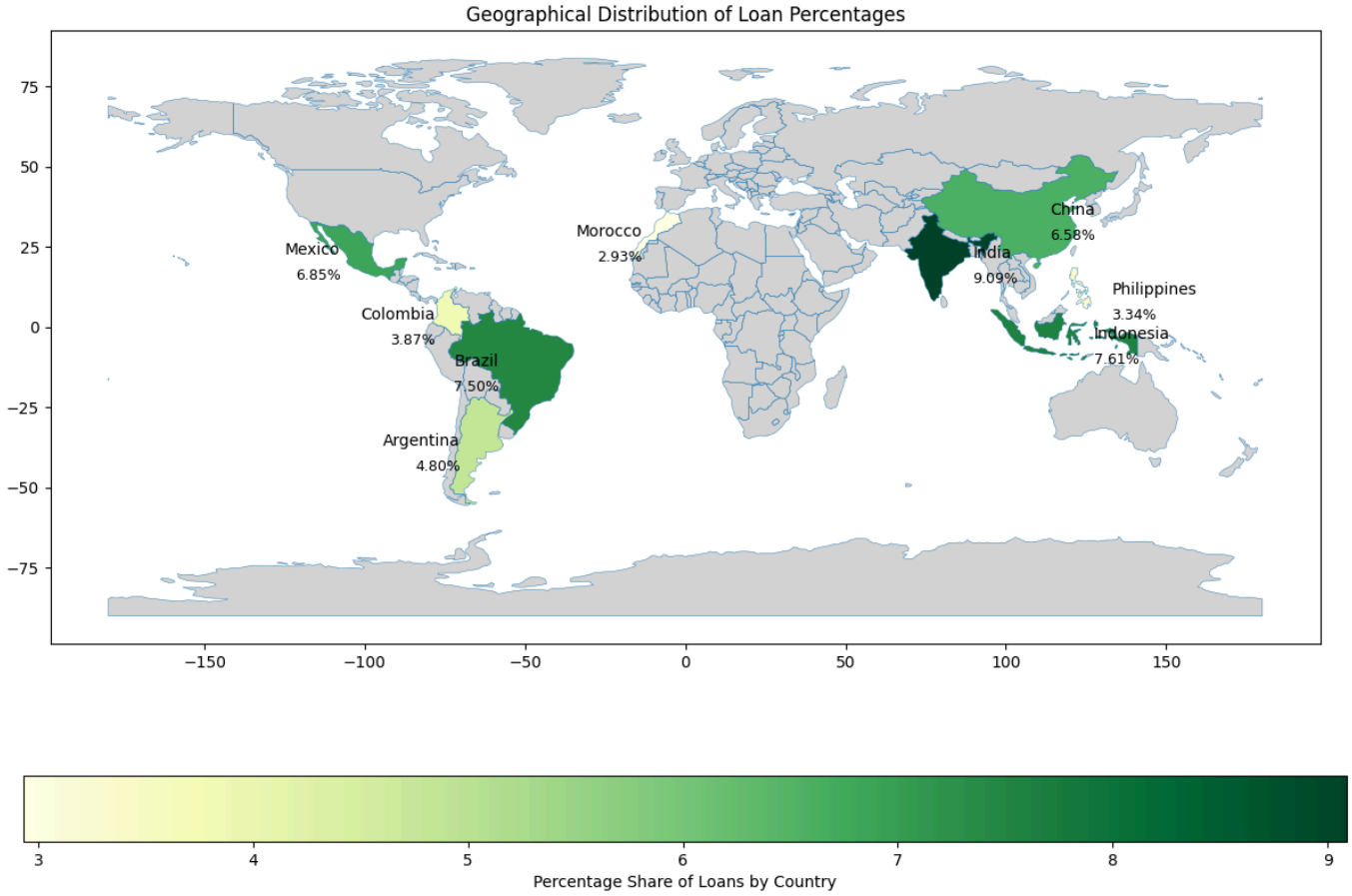
The dataset was grouped by 'Country', and then summed by 'Original Principal Amount' for each country, to outline exactly how much financial aid has been received by each.

**Calculation of Total and % Share:**

First, the overall sum of the loans granted all over the world was calculated. Then every nation's portion as a percentage of the total amount was computed. Ranking and Identification of Top Loan Recipient Countries The data has been sorted in descending order on 'Percentage' to find out the top countries which have been granted maximum percentages of the loan share. Key Findings : India, Indonesia, and Brazil emerged as the top borrowers, with India having the largest share of World Bank loans. This simply means financial resource concentration is very high in these two countries.

**Visualization and Further Analysis**: The data was visualized using a geographical map, identifying the top 10 countries by loan share and representing different percentage ranges through different colors.

**Implications:** Insights on Economic Focus: This would be a strategic distribution pattern for some countries, probably due to the fact that they have larger populations, significant development challenges, or are crucial to regional stability.




## Research Question 2. What types of loans are most commonly issued by the World Bank, and what is the average allocation of loan amounts to different loan types? Additionally, what is the distribution of loan amounts for the top 20 projects in South Asian countries?

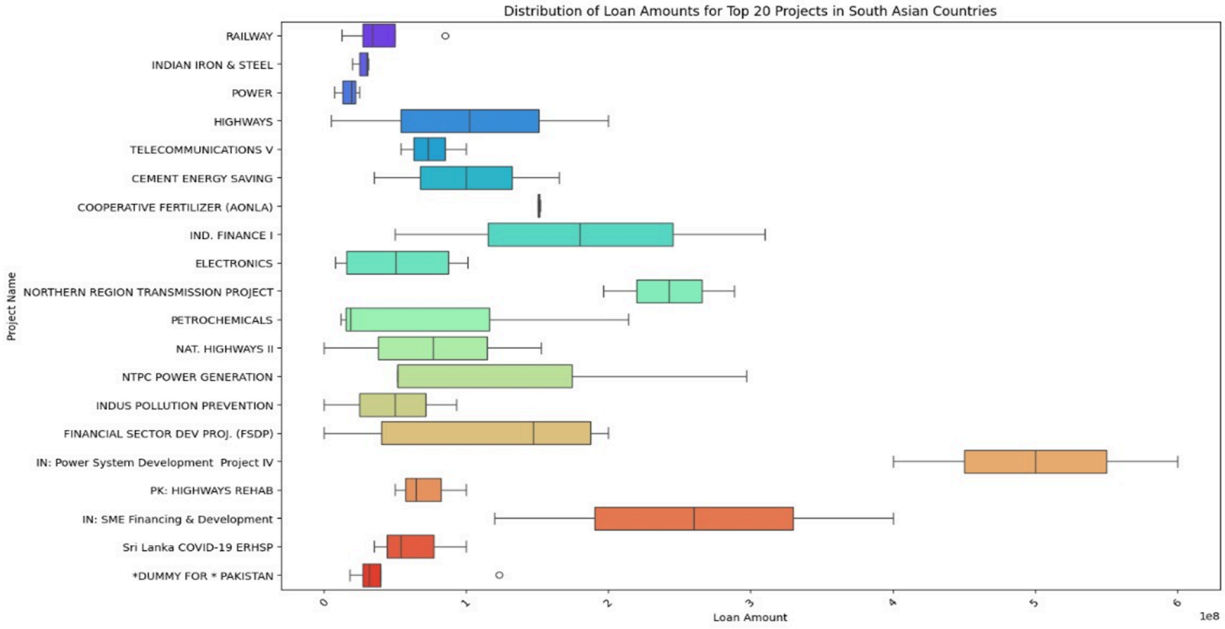
This research question is crucial as it helps in:

1. Identifying Funding Patterns: Understanding which sectors receive the most funding can highlight priority areas for the World Bank and inform future funding decisions.
2. Assessing Economic Impact: Analyzing the distribution of loan funds across industries and countries can reveal how these loans contribute to economic development and stability.
3. Enhancing Loan Strategies: By identifying the major factors considered in lending decisions, policymakers and financial institutions can refine their strategies to ensure loans are effectively utilized and repayments are managed efficiently.

**Part 1: Average Amount of Money Borrowed for Each Sector**

• Grouped the data by sector (Project Name) and calculated the mean of the original principal amount.

• Visualized the top 15 sectors by average loan amount using a horizontal bar plot.




**Common Loan Types Issued by the World Bank**

1. **Fixed Spread Loan (FSL):**
   - These loans have an interest rate composed of a fixed spread over a base rate. This type of loan provides borrowers with predictable interest payments over the life of the loan, making financial planning easier.
2. **Consumer Personal Loan (CPL):**
   - These loans are designed to support programs aimed at improving access to personal finance or consumer credit within member countries. They help enhance financial inclusion and support economic development by making credit more accessible to individuals.
3. **Non-Performing Loan (NPL):**
   - Non-performing loans are those where the borrower has not made scheduled payments for a specified period, typically 90 days or more. These loans are either canceled or repaid after being classified as non-performing. Managing NPLs is crucial for maintaining financial stability and ensuring that resources are efficiently allocated.
4. **Secured Loan (SCL):**
   - Secured loans require the borrower to provide collateral to obtain the loan. This type of loan reduces the risk for the lender and often allows the borrower to access larger amounts or more favorable terms. The collateral can be seized if the borrower defaults on the loan.
5. **Secured Payday Loan (SCPD):**
   - These loans also require collateral and are typically short-term, designed to be repaid on the borrower's next payday. They provide quick access to funds for individuals

facing immediate financial needs. The requirement for collateral helps mitigate the risk for lenders.

## Analysis of Loan Amounts for Top 20 Projects in South Asian Countries

### Box Plot Interpretation

The box plot displays the distribution of loan amounts for the top 20 projects in South Asian countries. Each box plot represents a different project and illustrates the variability in loan amounts for that project. Here are some key interpretations:

#### 1. Railway Projects

- The loan amounts for railway projects have a relatively small range, indicating consistency in the funding amount. The median loan amount is also quite high.

#### 2. Indian Iron & Steel

- These projects also have a small range in loan amounts, similar to railway projects, but with slightly lower amounts.

#### 3. Power Projects

- Power projects show a wider range of loan amounts with a higher median compared to the above projects. This indicates variability in the funding depending on the specific power project.

#### 4. Highways

- The highway projects exhibit a significant range in loan amounts with the median skewed towards the lower end.

#### 5. Telecommunications V

- The loan amounts for telecommunications projects are relatively small and show little variability.

#### 6. Cement Energy Saving

- This project shows a very narrow range in loan amounts, indicating a standard loan amount for such projects.

#### 7. Cooperative Fertilizer (AONLA)

- There is minimal data variability for this project, suggesting a consistent loan amount.

#### 8. Ind. Finance I

- The industrial finance project shows a broad range of loan amounts with a high median, indicating substantial variability in funding.

### 9. Electronics

- Electronics projects have a moderate range of loan amounts with a relatively low median compared to other projects.

### 10. Northern Region Transmission Project

- This project shows a narrow range in loan amounts, with moderate funding levels.

### 11. Petrochemicals

- Petrochemical projects have a broad range with a high median loan amount, indicating substantial funding variability.

### 12. Nat. Highways II

- These projects also show a wide range of loan amounts with a high median, similar to the power projects.

### 13. NTPC Power Generation

- The projects have significant variability in loan amounts with a high median.

### 14. Indus Pollution Prevention

- Projects have a broad range and high median loan amounts, indicating variable but substantial funding.

### 15. Financial Sector Development Project (FSDP)

- These projects exhibit a broad range of loan amounts with a high median.

### 16. IN: Power System Development Project IV

- Projects have a moderate range in loan amounts with a high median.

### 17. PK: Highways Rehab

- These projects have a substantial range in loan amounts with a high median.

### 18. IN: SME Financing & Development

- These projects show a wide range of loan amounts with a median on the higher end.

### 19. Sri Lanka COVID-19 ERHSP

- This project has a high range in loan amounts, likely due to the varied needs during the COVID-19 pandemic.

### 20. DUMMY FOR PAKISTAN

- These entries should be disregarded as they likely do not represent actual projects.

## General Observations

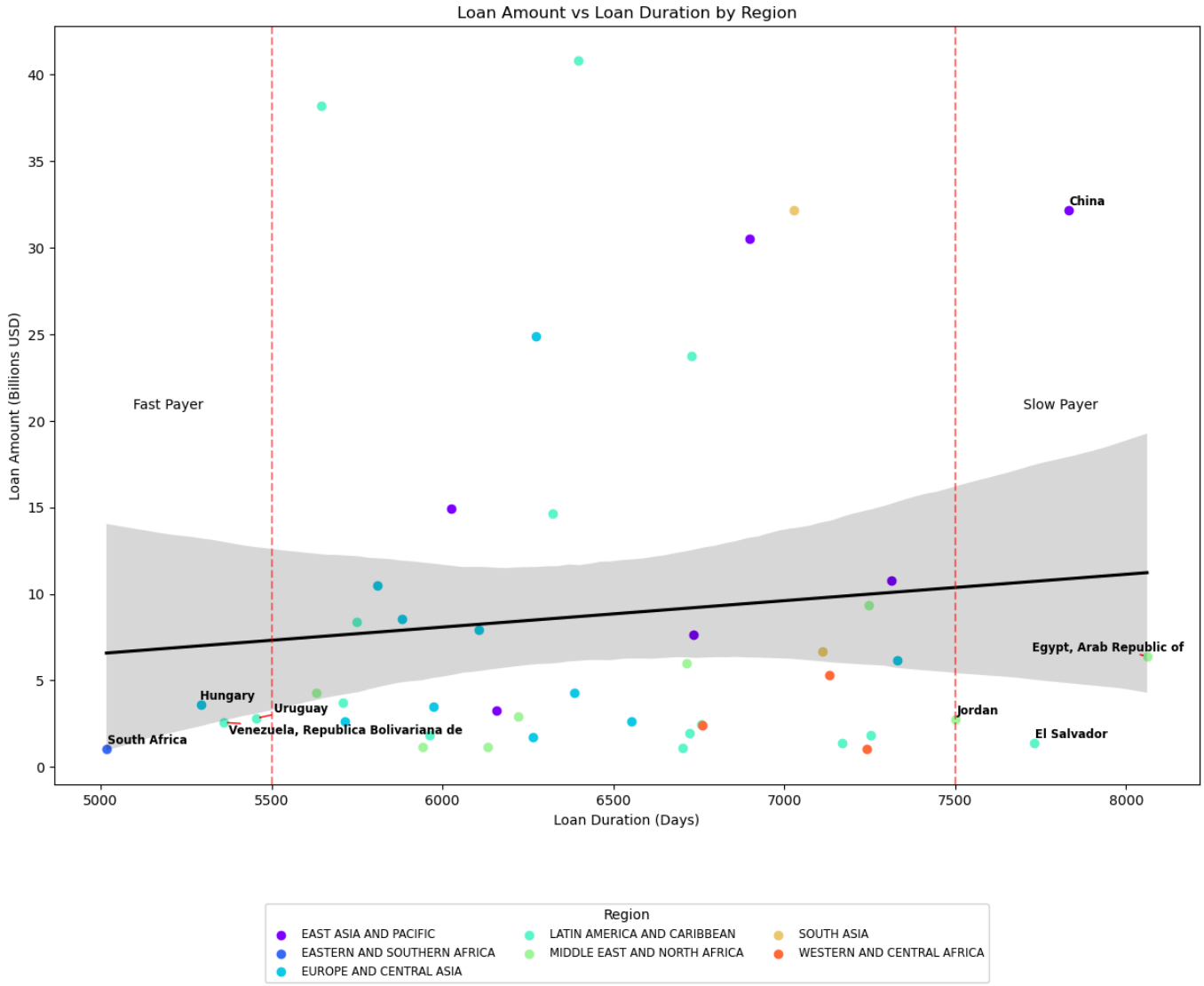
- **Median Loan Amounts:** Projects like "Railway", "Ind. Finance I", "Petrochemicals", and "Nat. Highways II" have high median loan amounts, suggesting substantial funding requirements.
- **Variability:** Projects like "Power", "Ind. Finance I", "Financial Sector Development Project (FSDP)", and "Indus Pollution Prevention" show wide ranges in loan amounts, indicating diverse funding needs within these categories.
- **Consistency:** Projects like "Telecommunications V", "Cement Energy Saving", and "Cooperative Fertilizer (AONLA)" exhibit narrow ranges in loan amounts, indicating standardized funding.

## Research Question 3: Which countries repay their loans the slowest and the fastest?

To address this question, we initially included data from 147 countries. However, we found that some countries had relatively few loans, perhaps just one or two, which may not fully represent their economic situation. Therefore, we set a bar to filter out countries: the total loan amounts should exceed $1 billion to be considered representative. Based on this criterion, we selected 45 countries and analyzed their loan amounts and loan durations.

**Loan Durations Calculation:** Loan durations were calculated from the effective date of the contract (the day countries received their first disbursement from the World Bank) until the date they paid off all loans.

**Scatter Plot and Regression Analysis:** We created a scatter plot with a simple regression line to visualize the relationship between a country's loan amount and its loan duration. The analysis showed a positive relationship between the total loan amount and the repayment duration. In other words, countries with larger loans tend to have longer repayment times.




## Fastest and Slowest Payers:

Fast Payers: The countries with the fastest average repayment times are South Africa, Hungary, Venezuela, and Uruguay. Slow Payers: The countries with the slowest repayment times are China, Egypt, El Salvador, and Jordan. Interpretation and Implications: The scatter plot and regression analysis indicate a general trend where larger loan amounts correlate with longer repayment durations. This relationship suggests that countries with substantial loans may either face more significant financial challenges or choose to prolong repayment strategically.

## Exploring Active vs. Passive Repayment Choices:

We further explored whether a country's loan repayment duration is an active or passive choice. For instance, countries like China and Egypt have longer repayment periods but enjoy low average interest rates (around 1%). This suggests that the World Bank provides preferential terms to these countries, indicating an intention to offer economic assistance rather than profit maximization. Therefore, we argue that the decision to repay quickly or delay repayment is likely an active choice, made to maximize national economic benefits.

## Geographic Distribution Analysis:

We categorized these 45 countries into seven regions and visualized their loan amounts and repayment durations. Although some regions, like Western and Central Africa, showed certain clustering with relatively small loan amounts and moderately slow repayment durations, overall, the points within the same region were still quite dispersed. This observation led us to conclude that there is no significant correlation between regions and loan durations or amounts.

### Brief Mention of Research Question 5: Do the interest rates exhibit any obvious trends based on the borrowers' geographic locations?

We briefly touched upon the relationship between interest rates and loan durations. Countries with longer repayment periods often have lower interest rates, suggesting that the World Bank offers favorable terms to support economic development. Providing favorable terms, such as low interest rates, to countries with extended repayment periods can support their economic growth and development, as evidenced by the cases of China and Jordan. This topic will be discussed in more detail in Research Question 5.

### Summary

In summary, our analysis reveals that countries with larger loans tend to have longer repayment durations. This trend is influenced by the preferential terms provided by the World Bank, suggesting that repayment duration is often an active choice by the borrowing countries.

## Research Question 4. What is the average amount of money borrowed for each sector,how are loan funds distributed among different industries in different countries and what three major factors are considered while lending a loan?

This research question is crucial as it helps in:

1. Identifying Funding Patterns: Understanding which sectors receive the most funding can highlight priority areas for the World Bank and inform future funding decisions.
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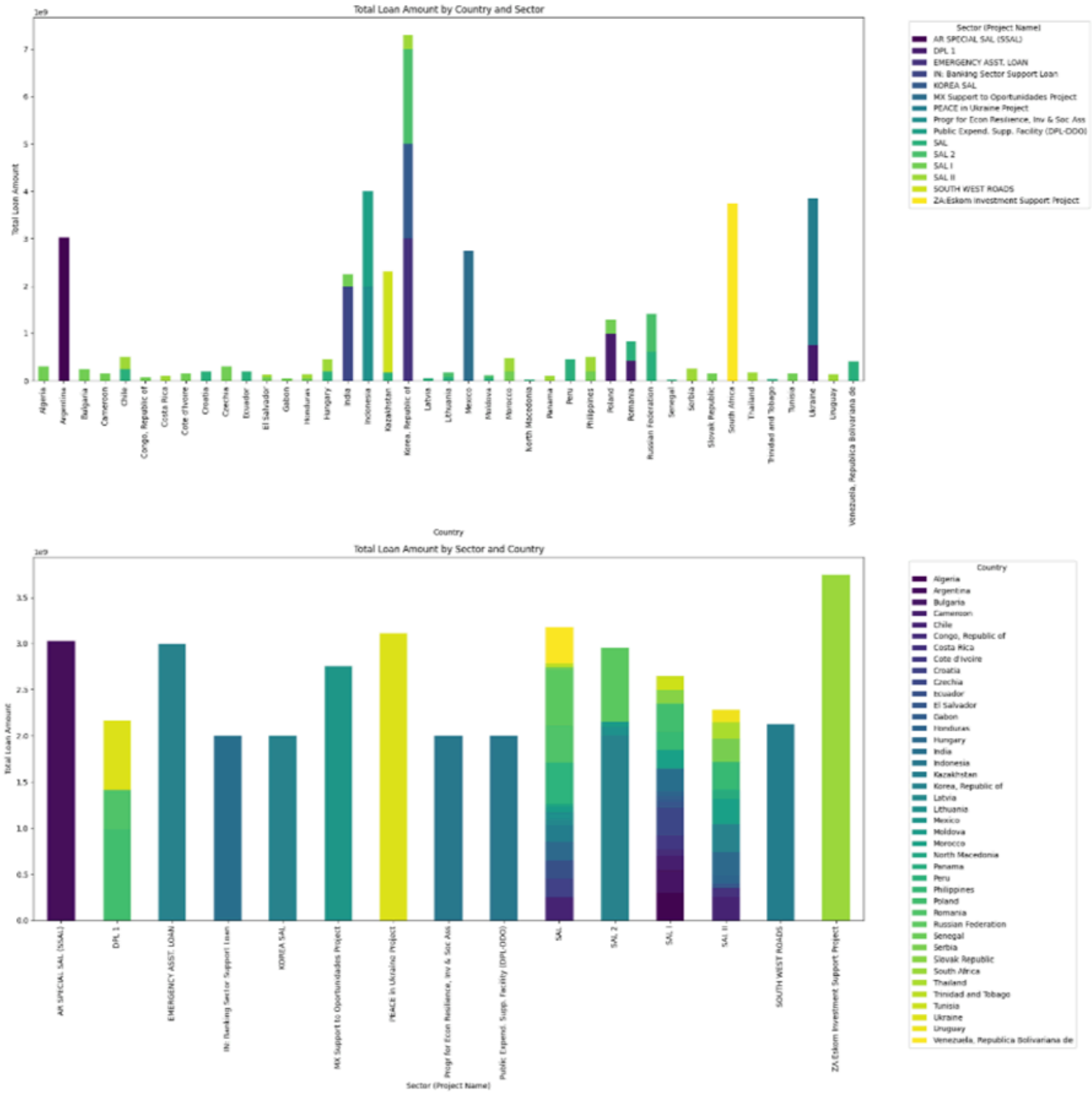



## KEY INSIGHTS FROM BAR PLOT

• The *ZA: Eskom Investment Support Project* has the highest average loan amount, indicating a strategic focus on improving energy infrastructure in South Africa.

• *Emergency Assistance Loans* receive substantial funding, reflecting the World Bank's commitment to disaster recovery and crisis management.

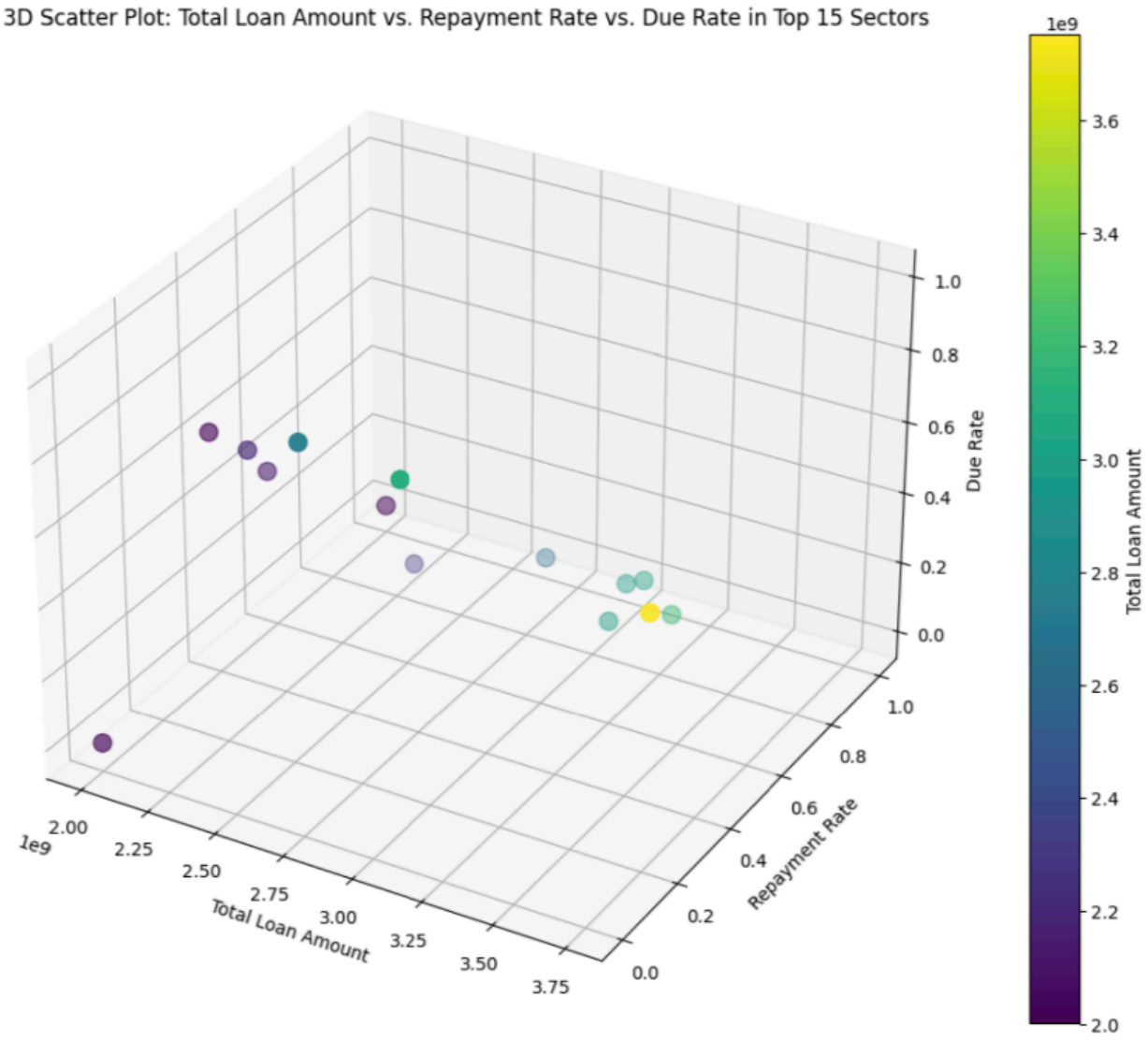
• *South West Roads projects* have significant funding, highlighting the importance of transportation infrastructure in facilitating trade, connectivity, and economic integration within regions.

• Other sectors with notable average loan amounts include *Program for Economic Resilience, Investment, and Social Assistance, Public Expenditure Support Facility (DPL-DDO), and Korea*

*SAL*. These sectors emphasize economic stability, public finance management, and sectoral adjustments, indicating a focus on sustainable economic policies and reforms.

**Part 2: What are the three major factors are considered while lending a loan?**

• Plotted a 3D scatter plot to visualize the relationship between total loan amount, repayment rate, and due rate for the top 15 sectors.




**KEY INSIGHTS FROM THE 3D SCATTER PLOT**

As we can see in the 3D scatter plot, there is a clear relationship between the total loan amount and the repayment rate. The plot demonstrates that as the total loan amount increases, the repayment rate also tends to increase. This sug- gests that sectors with higher loan amounts generally exhibit higher repayment rates, indicating a positive correlation between these two variables. Conversely, the due rate shows an inverse relationship with the total loan amount. As the total loan amount increases, the due rate decreases. This inverse proportionality implies that sectors with larger loans are more efficient in managing their dues, resulting in lower due rates. This analysis provides valuable insights into the financial dynamics of different sectors,

highlighting how larger loan amounts are associated with better repayment performance and lower due rates.

## GENERAL OBSERVATIONS:

• The World Bank prioritizes sectors such as energy infrastructure, emergency assistance, and transportation due to their critical role in economic stability and growth.

• Significant investments are directed to countries like India, South Africa, and Mexico, reflecting tailored strategies to meet regional development needs.

• Sectors with higher loan amounts, such as Eskom Investment Support and Banking Sector Support Loans, generally exhibit better repayment behaviors and lower due rates.

## Research Question 5. Do the interest rates exhibit any obvious trends based on the borrowers' geographic locations?

Interest rates can vary widely between regions and countries due to a variety of factors including economic conditions, monetary policies, inflation rates, and risk factors. Here's a detailed explanation for the observed differences in interest rates for each region:

### Regional Interest Rate Analysis

### East Asia and Pacific

#### Higher Interest Rates:

- **Inflation Control:** Countries like Indonesia and the Philippines may set higher interest rates to control inflation.
- **Economic Growth:** Rapid economic growth can lead to higher interest rates to prevent the economy from overheating.

#### Lower Interest Rates:

- **Economic Stability:** Countries like China and South Korea have more stable economies with controlled inflation, allowing for lower interest rates.
- **Export-Driven Economies:** Lower interest rates can help maintain competitive export prices.

### Eastern and Southern Africa

#### Higher Interest Rates:

- **Inflation and Currency Risks:** Higher inflation rates and currency depreciation risks can lead to higher interest rates.

- **Economic Instability:** Political instability and economic uncertainty can result in higher interest rates to attract foreign investment.

Lower Interest Rates:

- **Economic Policy:** Policies aimed at stimulating economic growth and investment might lead to lower interest rates.
- **Foreign Aid and Investment:** Countries receiving significant foreign aid or investment might be able to maintain lower interest rates.

Europe and Central Asia

Higher Interest Rates:

- **Economic Transition:** Countries transitioning from planned to market economies (e.g., Eastern Europe) might have higher rates to control inflation and stabilize the currency.
- **Political Risks:** Geopolitical tensions can lead to higher rates as a risk premium.

Lower Interest Rates:

- **Monetary Policy:** The European Central Bank and other national banks in this region often have lower interest rates to stimulate growth.
- **Economic Stability:** Countries like Germany and France have stable economies with low inflation, allowing for lower interest rates.

Latin America and Caribbean

Higher Interest Rates:

- **Inflation Control:** Many countries in this region (e.g., Argentina, Venezuela) face high inflation and use high interest rates to try to control it.
- **Political and Economic Instability:** Political instability and economic uncertainty can result in higher interest rates to mitigate risk.

Lower Interest Rates:

- **Economic Policy:** Efforts to stimulate economic growth and encourage borrowing can lead to lower interest rates.
- **External Influence:** Influence from stable economic partners (e.g., USA) can help maintain lower rates.

Middle East and North Africa

Higher Interest Rates:

- **Political Instability:** Countries facing political turmoil or conflict may have higher interest rates to compensate for higher risk.
- **Inflation and Currency Risks:** High inflation rates and volatile currency values can lead to higher interest rates.

### Lower Interest Rates:

- **Oil Revenue:** Oil-rich countries can afford lower interest rates due to revenue from oil exports.
- **Stable Economic Policies:** Countries with stable governments and policies (e.g., Gulf states) can maintain lower interest rates.

### South Asia

### Higher Interest Rates:

- **Inflation Control:** Countries like India might have higher rates to control inflation.
- **Economic Growth:** Rapid growth can necessitate higher interest rates to prevent the economy from overheating.

### Lower Interest Rates:

- **Stimulating Investment:** Lower rates can be used to stimulate investment and economic growth.
- **Economic Stability:** More stable economic conditions can allow for lower interest rates.

### Western and Central Africa

### Higher Interest Rates:

- **Economic and Political Instability:** Higher interest rates can compensate for risks associated with political instability and economic volatility.
- **Inflation and Currency Risks:** Countries with high inflation and unstable currencies may have higher interest rates.

### Lower Interest Rates:

- **Monetary Unions:** Membership in monetary unions (e.g., CFA franc zone) can lead to lower interest rates due to shared monetary policy.
- **External Aid:** Foreign aid and investment can support lower interest rates.

### Conclusion

Interest rates are influenced by a complex interplay of factors including economic stability, inflation rates, political risks, monetary policies, and external economic relationships. Each region and country adapts its interest rate policies to address its unique economic challenges and opportunities.

### Factors Influencing World Bank's Interest Rates

The World Bank's interest rates, particularly those associated with its lending operations, are influenced by a range of factors that include global economic conditions, the specific needs and economic stability of borrower regions, and the types of loans or financial instruments being

offered. The main lending arms of the World Bank are the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA).

### Factors Influencing Regional Differences

#### Economic Stability

- **East Asia:** Countries in East Asia, particularly those with rapidly growing economies, might have better access to IBRD loans at relatively lower spreads due to their stronger economic indicators.
- **Sub-Saharan Africa:** Sub-Saharan Africa, with many countries facing economic instability and higher risks, might face higher spreads on IBRD loans.

#### Creditworthiness

- **Central Asia and South Asia:** These regions might receive varied terms based on individual country creditworthiness, political stability, and economic reforms.

#### Development Needs

- **World Bank Considerations:** The World Bank considers the specific development needs and priorities of each region. This can influence not just the terms of lending but also the type and scale of financial assistance provided.

#### Global Economic Conditions

- **Impact on IBRD Loans:** Changes in global interest rates, inflation, and financial market conditions impact the cost of funds for the World Bank, subsequently affecting the interest rates for IBRD loans across all regions.

#### Summary

While the base interest rates for IBRD loans are influenced by global market conditions, the specific terms offered to different regions can vary based on economic stability, creditworthiness, and development needs. IDA credits, aimed at the poorest countries, provide consistent concessional terms across eligible countries, predominantly benefiting regions like Sub-Saharan Africa and South Asia. Regional variations exist primarily in the context of IBRD loans, reflecting the diverse economic landscapes and risk profiles of countries within each region.

## Reflection

**What did you learn from this analysis?**

The complexity of the World Bank loan program and the variety of approaches to global economic development have been made clear by this study. According to the data, there is a strong correlation between loan amounts and repayment terms, which highlights the difficulties

that borrowing nations with big debts have managing their finances. The study also suggests that the loan payback pace is a deliberate decision impacted by interest rate and other variables.

Initially, there was a focus on the geographical factors influencing loan conditions. However, the analysis showed no significant correlation between the loan conditions and the geographical region. This research highlights how crucial it is to place less emphasis on regional patterns and more on the unique features of each nation.

**Learning Insights:**

The group found and analyzed the World Bank loan data to get an insightful overview of how loans are distributed, the borrowing rates and specific sectors, where loans are directed. Skills for Data preparation and visualization methods including regression models, box plots, scatter plots and bar graphs improved.

**Difficulties :**

When dealing with extensive datasets containing multiple variables involved a lot of work for substantial data transformations as well as cleaning exercises. It proved difficult to ensure appropriate interrelationships and interpretations of data while choosing only the columns that were necessary to answer one particular research question. Challenges in the choice of geographical plotting tools that appropriately visualize the distribution of loan amounts. Because some plotting libraries are not very well supported in a Jupyter Notebook, alternatives had to be found that work within the Jupyter environment. There was a need for critical evaluation of compatible libraries that would allow proper and complete data representation. Time management was tough but necessary; likewise organizing team tasks and responsibilities.

**What would you do differently?:**

The study might also be extended to investigate the effects of other variables on repayment behavior, such as interest rates, the degree of economic development, and political stability. Providing details about how loans are used for things like infrastructure and healthcare would help to clarify the strategic goals that guide loan disbursements. Global patterns in aid should be better understood by contrasting World Bank loans with other organizational loans. Building a more thorough and perceptive analytical framework would benefit from the inclusion of extra variables like GDP growth rates and inflation rates.