International Debt

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Contents

International debt data collected by The World Bank was analyzed. Throughout this analysis, the amount of debt (in USD) owed by developing countries is viewed and compared.

```
# Load the required libraries
library(tidyr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(DBI)
library(RSQLite)

# Read file from The World Bank
data <- read.csv("international_debt.csv")

# Rename columns
colnames(data) <- c("Country_Name",
  "Country_Code",
  "External_Debt",
  "Debt_Value",
  "Total_Percent_Employment",
  "Annual_Population_Growth"
)

# Connect to SQLite database
connection <- dbConnect(RSQLite::SQLite(), "imdb.db")

# Write data to the database
dbWriteTable(connection, "international_data", data, overwrite = TRUE)
```

Across 217 countries, the top 10 countries with the highest external debt were extracted.

```
# View data structure
head(data)
```

```
##     Country_Name Country_Code External_Debt  Debt_Value
## 1    Afghanistan          AFG    1859403115  2139655439
## 2        Albania          ALB    4859519255  4623701701
## 3        Algeria          DZA    1055682237   671247749
## 4 American Samoa          ASM            NA          NA
## 5        Andorra          AND            NA          NA
## 6         Angola          AGO   47817457374 46548635256
##   Total_Percent_Employment Annual_Population_Growth
## 1                 18.25935                2.5344983
## 2                 47.17728               -1.2157903
## 3                 68.97835                1.6283393
## 4                       NA               -1.7064955
## 5                       NA                0.9946071
## 6                 35.20936                3.0967527
```

```
summary(data)
```

```
##  Country_Name       Country_Code       External_Debt         Debt_Value
##  Length:217         Length:217         Min.   :1.548e+08   Min.   :1.177e+08
##  Class :character   Class :character   1st Qu.:2.147e+09   1st Qu.:1.917e+09
##  Mode  :character   Mode  :character   Median :6.519e+09   Median :6.044e+09
##                                        Mean   :2.828e+10   Mean   :2.541e+10
##                                        3rd Qu.:2.413e+10   3rd Qu.:2.105e+10
##                                        Max.   :4.644e+11   Max.   :4.090e+11
##                                        NA's   :95          NA's   :95
##  Total_Percent_Employment Annual_Population_Growth
##  Min.   : 5.988           Min.   :-14.2570
##  1st Qu.:37.800           1st Qu.:  0.2324
##  Median :65.931           Median :  0.8915
##  Mean   :59.687           Mean   :  0.8821
##  3rd Qu.:83.930           3rd Qu.:  1.8942
##  Max.   :99.607           Max.   :  3.7130
##  NA's   :31               NA's   :1
```

```
# Top 10 countries with the highest debt
top_10_debt <- dbGetQuery(connection, "
    SELECT Country_Name, External_debt, Debt_Value
    FROM international_data
    ORDER BY External_Debt DESC
    LIMIT 10;
")
# Return results
print(top_10_debt)
```

```
##          Country_Name External_Debt   Debt_Value
## 1               China  464366000000 408967000000
## 2              Mexico  293095000000 286005000000
```

```
## 3           Indonesia  223805000000 215457000000
## 4               India  205239000000 186653000000
## 5              Brazil  189689000000 164448000000
## 6             Turkiye  140057000000 133882000000
## 7  Russian Federation  136086000000 135301000000
## 8    Egypt, Arab Rep.  110206000000  97499868098
## 9           Argentina  109252000000  77879855756
## 10           Colombia   97610136306  97915074181
```

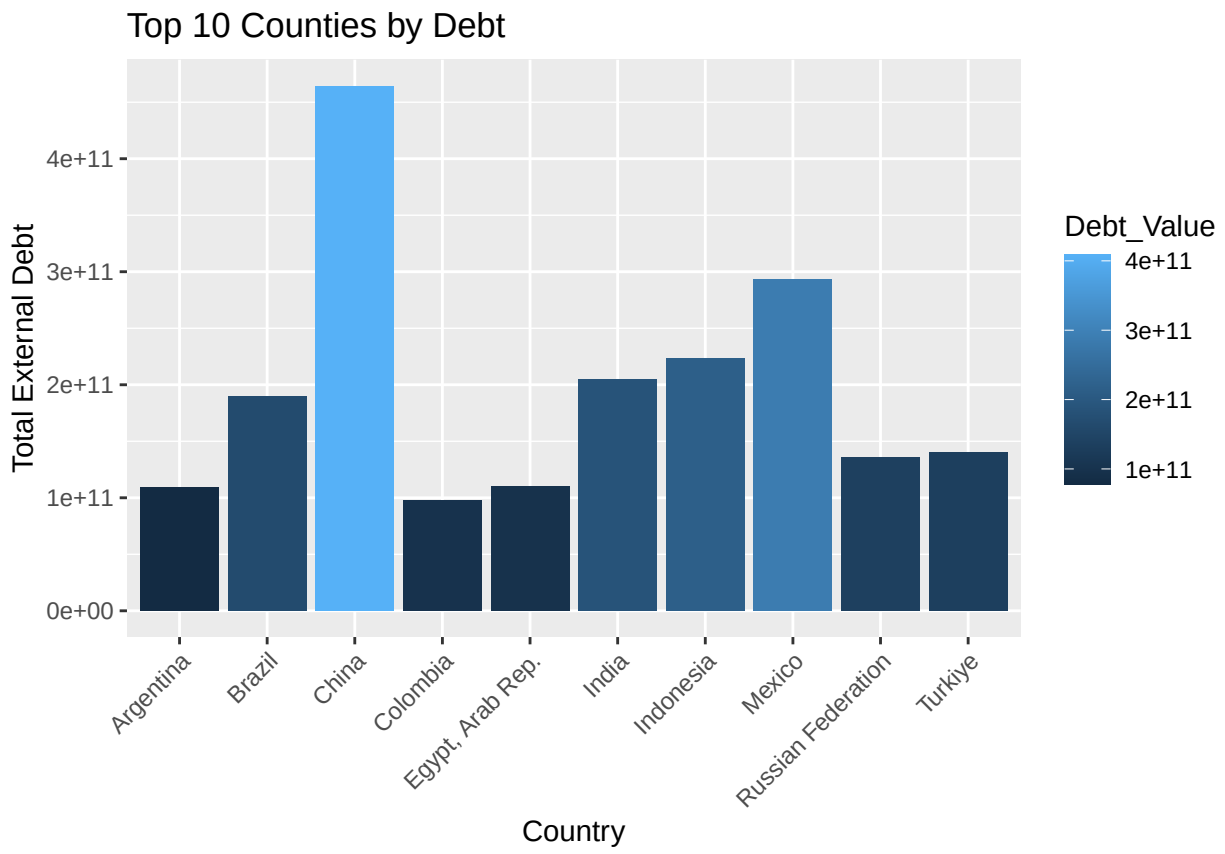
```
# Calculate average national debt
avg_debt <- dbGetQuery(connection,
  "SELECT AVG(External_Debt)
  FROM international_data;
")
# Return results
print(avg_debt)
```

```
##   AVG(External_Debt)
## 1        28280221492
```

The country with the highest debt was China with a whopping total external debt of $464,366,000,000 for the year of 2022. This is significantly higher than all the other countries. The average external debt is approximately $28,280,221,492.

```
# Load required packages
library(ggplot2)

# Bar plot; top 10 countries by debt
ggplot(top_10_debt,
       aes(x = Country_Name, y = External_Debt, fill = Debt_Value)) +
  # Bar plot
  geom_bar(stat = "identity") +
  # Add labels
  labs(title = "Top 10 Counties by Debt", x = "Country", y = "Total External Debt") +
  # Additional plot structures/features
  theme(axis.text.x = element_text(angle = 45, vjust = 1, hjust=1))
```



Now we will look at the employment rates accross the countries and see if there is a correlation between these two factors.

```
# Top 10 countries with the highest percent of employment
top_10_employed <- dbGetQuery(connection, "
    SELECT Country_Name, ROUND(Total_Percent_Employment, 2) AS  Total_Percent_Employment
    FROM international_data
    ORDER BY Total_Percent_Employment DESC
    LIMIT 10
")
# Return results
print(top_10_employed)
```

```
##            Country_Name Total_Percent_Employment
## 1                 Qatar                     99.61
## 2                Kuwait                     97.91
## 3               Bahrain                     97.32
## 4                  Oman                     95.60
## 5  United Arab Emirates                     95.53
## 6                Norway                     95.41
## 7               Belarus                     95.29
## 8         United States                     93.72
## 9          Saudi Arabia                     93.55
## 10     Macao SAR, China                     93.44
```

```r
# Average percent employment
avg_employment <- dbGetQuery(connection,
  "SELECT ROUND(AVG(Total_Percent_Employment), 2) AS Total_Percent_Employment
  FROM international_data;
")
# Return results
print(avg_employment)
```

```
##   Total_Percent_Employment
## 1                    59.69
```

```r
# Chinas employment percentage
china_employment <- dbGetQuery(connection,
  "SELECT Country_Name, ROUND(Total_Percent_Employment, 2) AS Total_Percent_Employment
  FROM international_data
  WHERE Country_Name = 'China';
")
# Return Results
print(china_employment)
```

```
##   Country_Name Total_Percent_Employment
## 1        China                    54.24
```

The top 10 countries with the highest employment percentages are:

- Qatar
- Kuwait
- Bahrain
- Oman
- United Arab Emirates

- Norway
- Belarus
- United States
- Saudi Arabia

- Macao SAR, China

Given that China's external debt surpasses all countries, I was curious about their employment rate and how it compared to the average employment rate. China's employment rate was China, 54.24 which isn't far from the overall average of 59.69. This made me wonder if there is any correlation between the total employment rate of countries and the total external debt they have.

```r
# Load required libraries
library(dplyr)

# Debt/Employment variable
empl_debt <- dbGetQuery(connection, "
    SELECT External_Debt, Total_Percent_Employment
    FROM international_data;
")
```

```r
# Remove NA values
empl_debt <- na.omit(empl_debt)

# Correlation test
empl_debt_corr <- cor(empl_debt$External_Debt, empl_debt$Total_Percent_Employment)

# Return results
print(empl_debt_corr)
```

```
## [1] 0.155674
```

The correlation coefficient of 0.16 suggests a very weak positive correlation between the total external debt and the percent of employment within each country, indicating no meaningful connection between these two variables.

The annual population growth was then compared to the country's debt and another correlation test was performed between these two variables.

```r
# Top 10 countries with highest population growth
top_10_popul <- dbGetQuery(connection, "
    SELECT Country_Name, External_Debt, ROUND(Annual_Population_Growth, 2) AS  Annual_Population_Growth
    FROM international_data
    ORDER BY Annual_Population_Growth DESC
    LIMIT 10
")
# Return results
print(top_10_popul)
```

```
##            Country_Name External_Debt Annual_Population_Growth
## 1                 Niger    4636264262                     3.71
## 2  Syrian Arab Republic    3497976517                     3.69
## 3             Singapore            NA                     3.31
## 4            Kazakhstan   25571805936                     3.22
## 5      Congo, Dem. Rep.    5351434063                     3.20
## 6                  Chad    2440613626                     3.12
## 7                Angola   47817457374                     3.10
## 8                  Mali    5410613720                     3.10
## 9               Somalia    2339432364                     3.07
## 10               Uganda   13108560256                     3.00
```

```r
# Debt/Population variable
debt_popul <- dbGetQuery(connection, "
    SELECT External_Debt, Annual_Population_Growth
    FROM international_data;
")

# Remove NA values
debt_popul <- na.omit(debt_popul)

# Correlation test
debt_popul_corr <- cor(debt_popul$External_Debt, debt_popul$Annual_Population_Growth)
# return results
print(debt_popul_corr)
```

```
## [1] -0.1411703
```

The top 10 countries with the highest population growth annually are:

- Niger
- Syrian Arab Republic

- Singapore
- Kazakhstan
- Congo, Dem. Rep.

- Chad
- Angola
- Mali
- Somalia
- Uganda

Given the correlation of -0.14, there is no correlation between population growth and the debt accumulated by country.

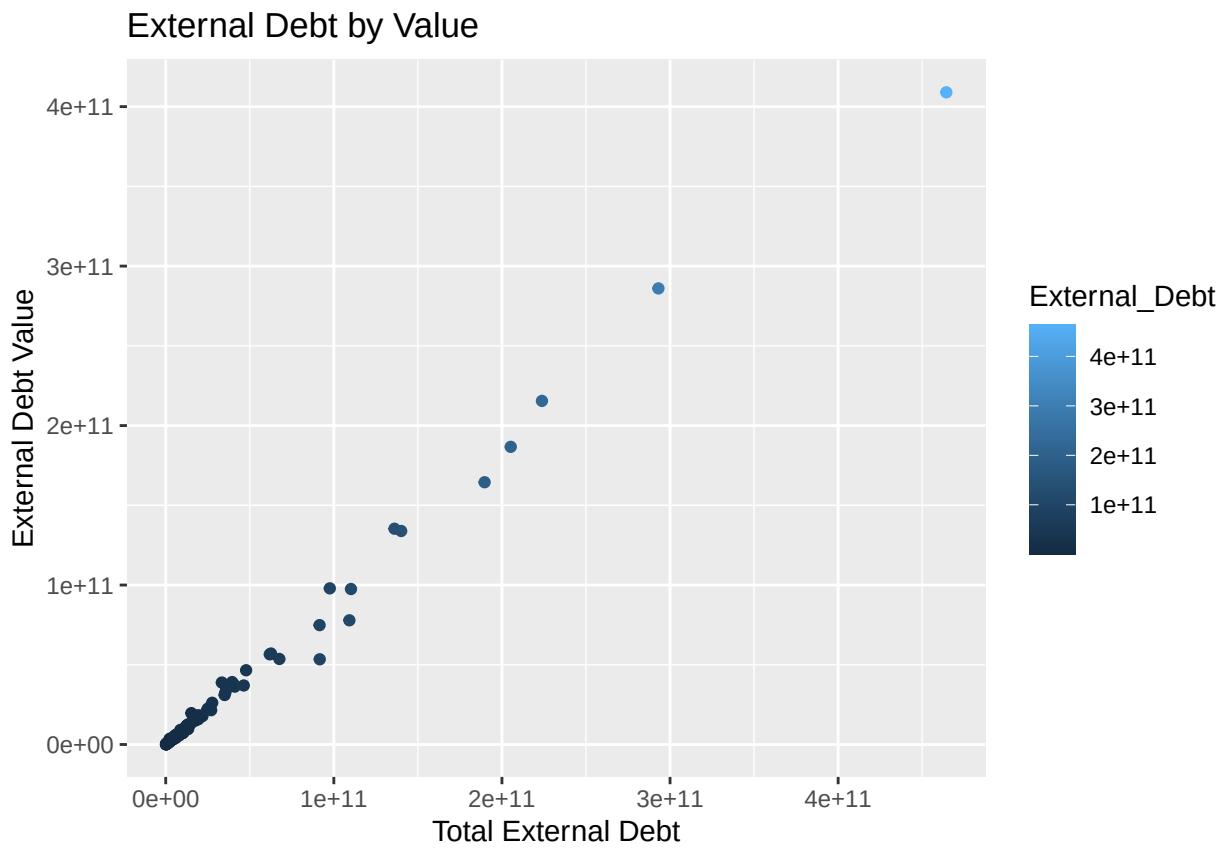
```
# Debt/Population variable
debt_val <- dbGetQuery(connection, "
    SELECT External_Debt, Debt_Value
    FROM international_data;
")

# Remove NA values
debt_val <- na.omit(debt_val)

# Correlation test
debt_val_corr <- cor(debt_val$External_Debt, debt_val$Debt_Value)
# return results
print(debt_val_corr)
```

```
## [1] 0.9964028
```

```
# scatter plot; external debt by value
ggplot(debt_val,
       aes(x = External_Debt, y = Debt_Value, color = External_Debt)) +
  # scatter plot
  geom_point() +
  # Add labels
  labs(title = "External Debt by Value", x = "Total External Debt", y = "External Debt Value")
```




```
# disconnect from database
dbDisconnect(connection)
```

Here we can see a strong positive correlation between debt and debt value.