

Understanding Global Financial Dynamics Through Data Analysis

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Abstract

This project delves into a comprehensive analysis of global financial trends through the lens of four distinct yet interconnected topics. Firstly, we explore remittance patterns across various countries, shedding light on the flow and impact of international money transfers. Secondly, we delve into demographics of mobile phone users across nations, examining age, income levels, and geographic distribution to discern trends in mobile technology adoption. Thirdly, we compare the demographics of digital payment users to those of mobile phone users, unveiling overlaps and disparities in technological utilization. Finally, we assess the adaptivity level of individuals towards embracing cutting-edge technologies, offering insights into the pace and extent of technological adoption worldwide. Through rigorous data analysis and interpretation, this project provides valuable insights into global financial dynamics, technological evolution, and socio-economic trends, thereby informing strategic decisions in the realms of finance, technology, and beyond.

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I. Introduction

In an increasingly interconnected world, understanding global financial dynamics is paramount for informed decision-making and strategic planning. This project embarks on a multifaceted exploration of four pivotal aspects of world finance, leveraging a rich dataset spanning 161 unique countries.

The analysis encompasses remittance patterns, demographics of mobile phone users, comparison of digital payment and mobile phone user demographics, and the adaptivity level of individuals towards embracing latest technologies.

These analyses hold significant importance for several reasons. Firstly, remittances represent a crucial source of income for many countries, impacting both individual livelihoods and national economies. Understanding the flow and determinants of remittances can inform policies aimed at maximizing their positive effects.

Secondly, with the rapid proliferation of mobile technology, examining demographics of mobile phone users provides insights into societal trends, consumer behavior, and potential opportunities for businesses.

Comparing demographics of digital payment users to mobile phone users elucidates the extent to which technological advancements translate into financial inclusion and adoption of modern payment methods.

Lastly, evaluating the adaptivity level towards latest technologies sheds light on the pace of global digital transformation and its implications for various sectors including finance, commerce, and social welfare.

The findings of this analysis are anticipated to have significant implications for global economics, influencing policies, investments, and business strategies on a regional and international scale.

List of Countries

India Argentina Bahrain Benin Brazil Cameroon	Afghanistan Armenia Bangladesh Bhutan Bulgaria Canada	Albania Australia Belarus Bolivia Burkina Faso Central African Republic Comoros	Algeria Austria Belgium and Bosnia Herzegovina Burundi Chad	Angola Azerbaijan Belize Botswana Cambodia Chile
China Costa Rica Denmark	Colombia Cote d'Ivoire Djibouti	Croatia Dominican Re- public	Congo, Dem. Rep. Cyprus Ecuador	Congo, Rep. Czechia Egypt, Arab Rep.

El Salvador France Ghana Honduras	Estonia Gabon Greece Hong Kong SAR, China Iraq Japan Kosovo Lebanon Luxembourg Mali Moldova Myanmar Nicaragua Oman Philippines Romania	Eswatini Gambia, The Guatemala Hungary	Ethiopia Georgia Guinea Iceland	Finland Germany Haiti Indonesia
Iran, Islamic Rep. Jamaica Korea, Rep. Latvia Lithuania Maldives Mexico Mozambique New Zealand Norway Peru Qatar	Serbia Somalia Sudan	Ireland Jordan Kuwait Lesotho Madagascar Malta Mongolia Namibia Niger Pakistan Poland Russian Federation Sierra Leone South Africa Sweden	Israel Kazakhstan Kyrgyz Republic Liberia Malawi Mauritania Montenegro Nepal Nigeria Panama Portugal Rwanda	Italy Kenya Lao PDR Libya Malaysia Mauritius Morocco Netherlands North Macedonia Paraguay Puerto Rico Saudi Arabia
Senegal Slovenia Sri Lanka	Tajikistan Tunisia	Tanzania Turkiye	Singapore South Sudan Switzerland	Slovak Republic Spain Syrian Arab Republic Togo Uganda Uruguay Zambia
Taiwan, China Trinidad and Tobago Ukraine	United Arab Emirates Vietnam	United Kingdom	Thailand Turkmenistan United States Yemen, Rep.	
Uzbekistan		West Bank and Gaza		
Zimbabwe				

II. Data Preprocessing

Data preprocessing involved handling missing values and separating the main dataset into three sub-datasets based on specific keywords in the 'series name' column.

Handling Missing Values

To ensure data completeness, only instances with values for consecutive years were retained:

- Initially, the dataset was examined to determine if data was available for all four years: 2014, 2017, 2021, and 2022.
- Upon discovering no entries with data for all four years, a check was conducted for three consecutive years.
- It was found that 4,000 rows had data for the years 2014, 2017, and 2021.
- Consequently, it was decided to proceed with the analysis using these 4,000 instances.

Sub-dataset Creation

Three sub-datasets were created based on keywords in the 'series name' column:

- Remittance Data:** Rows containing 'remittance' in the 'series name' column.
- Mobile Phone User Data:** Rows containing 'mobile phone' in the 'series name' column.
- Digital Payment Data:** Rows containing 'mobile phone payment' in the 'series name' column.

Unique Series Names in Sub-datasets

Remittance Data:

```
'Received domestic remittances'
'Received domestic remittances, income, poorest'
'Received domestic remittances, income, richest'
'Sent domestic remittances'
'Sent domestic remittances: delivered in person and in cash only'
'Sent domestic remittances: using an account'
```

Mobile Phone User Data:

```
'Mobile money account'
'Mobile money account, female'
'Mobile money account, male'
'Received private sector wages: through a mobile phone'
'Received public sector wages: through a mobile phone'
```

Digital Payment Data:

```
'Made a digital payment'
'Made or received a digital payment, female'
'Made or received a digital payment, male'
'Received digital payments'
'Used a credit card'
'Used a debit card'
```

III. Time Series Predictive Analysis

- The prediction process involves utilizing ARIMA (Autoregressive Integrated Moving Average) modeling.
- Historical data from 2014, 2017, and 2021 is collected for specific categories: "Sent or Received Domestic Remittance," "Utility Payments Using Mobile Phones," and "Sent or Received Digital Payments."
- ARIMA is applied to this historical data to analyze trends, seasonality, and patterns.
- The model generates forecasts for the year 2022 based on the analyzed data.
- Forecasts provide estimates of expected values for each category in 2022 across various countries.
- These predictions offer insights into the anticipated trajectory of domestic remittance, utility payments, and digital payments usage.

IV. Power BI Dashboards

Remittance Analysis

This dashboard delves into the remittance data, uncovering insights into global remittance trends across various countries. Remittances, the transfer of money by foreign workers to their home countries, play a significant role in international finance and development. Analyzing remittance patterns can inform policymakers and researchers on economic conditions, migration trends, and financial inclusion. The dashboard presents remittance data for several countries, seemingly spanning three years (2014, 2017, 2021). The data is visualized through charts offering various perspectives on remittance flows.

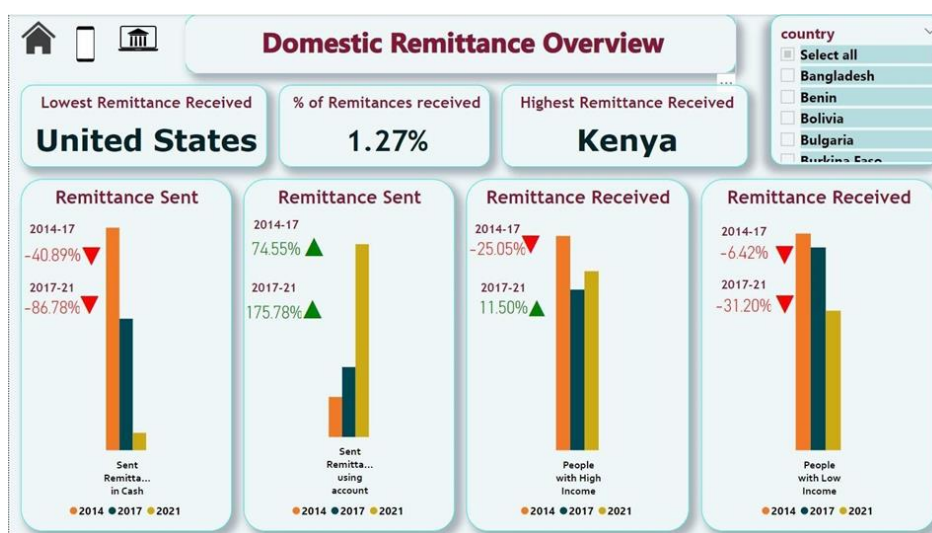


Figure 1: Domestic Remittance Overview

Highest and Lowest Remittance Countries: This prominent section serves as a key performance indicator (KPI) for the remittance dashboard. It highlights the countries with the highest and lowest remittance values, offering a quick overview of the extreme ends of remittance flows globally. Understanding these extremes can help identify both lucrative and challenging markets for remittance service providers, as well as shed light on economic conditions in various regions.

The indication that Kenya receives the highest remittance while the US receives the lowest could suggest several factors. Firstly, it might reflect the pattern of migration and economic relationships between these countries and their respective diaspora communities abroad. Kenya has a significant portion of its population living and working overseas, particularly in countries such as the United Kingdom, the United States, and the Middle East, sending money back home to support their families or invest in local businesses. Conversely, the United States, being a high-income country with a large economy, might have fewer individuals sending remittances abroad relative to the number of expatriates residing in Kenya or other countries with higher remittance outflows. Additionally, differences in economic conditions, exchange rates, and the cost of living between the two countries could also contribute to this disparity in remittance flows.

Percentage of Remittance Received: This serves as the third key performance indicator (KPI) within the dashboard. It provides insights into the proportion of total global remittance inflows that each country receives relative to all other countries. Essentially, it offers a comparative view of how much remittance each country attracts in relation to the total remittance pie. For example, if a country receives 10% of the total remittances sent globally, its corresponding percentage on this dashboard would indicate that 10%.

This metric helps to gauge the significance of remittances for each country's economy and its relative

position in the global remittance landscape. Countries with higher percentages signify a larger share of global remittance flows, reflecting factors such as the size of diaspora communities, economic conditions, and migration patterns. Conversely, lower percentages indicate smaller shares of remittances relative to other countries, highlighting potential disparities in remittance inflows and the varying degrees of reliance on remittances as a source of external income.

Remittance Sent (in Cash and in Account): The two graphs titled "Remittance Sent in Cash" and "Remittance Sent by Account" present data on the percentage of people sending money through different methods—either in cash or via bank transfer—for various years. These visualizations allow users to compare the prevalence of each remittance method over time and observe any trends or changes. The percentage increase or decrease displayed alongside each graph provides additional insights into how the usage of cash or bank transfers for remittances has evolved over the specified time period.

For example, if there is a notable increase in the percentage of remittances sent by account transfer compared to cash, it may indicate a growing preference for digital financial transactions or improvements in banking infrastructure. Conversely, a decrease in cash remittances could reflect broader shifts towards formal financial channels or changes in remittance behavior influenced by factors such as technological advancements, regulatory changes, or economic conditions. Overall, these graphs offer valuable insights into the dynamics of remittance sending methods, aiding in understanding consumer preferences and guiding policy decisions aimed at enhancing financial inclusion and efficiency in remittance channels.

Remittance received (High and Low Income): encompasses two charts: "Remittance Received (High Income)" and "Remittance Received (Low Income)." These visualizations offer a nuanced breakdown of remittance receipts among high and low-income groups across multiple years. The data allows for a comparative analysis, highlighting how remittance inflows differ between these economic strata over time. Additionally, the percentage increase or decrease displayed alongside each chart provides valuable insights into trends and fluctuations in remittance receipts for both income groups.

For instance, a significant increase in remittances received by the low-income group compared to the high-income group may indicate shifts in global economic conditions, migration patterns, or policy interventions affecting remittance flows to different income segments. Conversely, a decline in remittances received by either group could signify factors such as economic downturns, changes in government regulations, or shifts in migration trends impacting remittance behaviors. Overall, these charts offer a comprehensive view of how remittance receipts vary between high and low-income groups, allowing for a deeper understanding of economic dynamics and potential avenues for policy intervention.

Mobile User Analysis

The dashboard titled "Analyzing the Mobile User details" offers a glimpse into the usage patterns of the mobile account. Most people own mobile phone today, this dashboard analyses mobile money transactions in different setups.

Percentage of people with Mobile Money Account This metric indicates the portion of the population with access to mobile financial services. This measure reflects the extent of financial inclusion and digital adoption within a society. Higher percentages signify greater accessibility to mobile money platforms, enabling individuals, particularly in underserved areas, to manage finances conveniently and participate in the formal economy. From a macroeconomic perspective, widespread mobile money adoption fosters economic growth by facilitating efficient transactions and enhancing transparency in financial transactions, including government disbursements. Understanding this metric informs targeted efforts to promote financial inclusion and harness the potential of digital technology for economic development.

Money Account Users (Male and Female): The charts titled "Money Account Users - Male" and "Money Account Users - Female" are bar graphs depicting the number of account users for each gender across three different years. These graphs dynamically adjust based on the selected country from a dropdown menu and display the rate of increase or decrease per year. By visually representing the data for both male and female account users over time, users can observe trends and disparities in account ownership between genders within the chosen country.

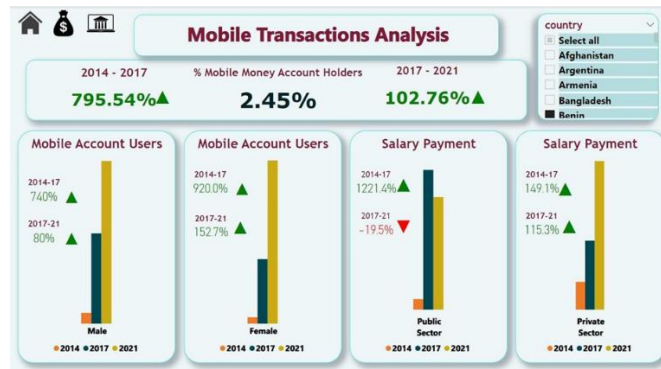


Figure 2: Mobile Transactions Analysis

The inclusion of the rate of increase or decrease per year offers additional insights into the pace of adoption or decline of financial accounts among males and females, facilitating informed analysis and decision-making regarding financial inclusion efforts and gender-specific policies.

Salary Payment (Public and Private Sector): The graph titled "Salary Payment (Public and Private Sector)" mirrors the structure of previous visualizations, presenting data on salary disbursements across public and private sectors over multiple years, with adaptability to the chosen country from a dropdown menu. This graph serves as a comparative tool, allowing users to discern shifts and patterns in salary payments between these sectors over time. Through analyzing the variations in salary disbursements for both public and private sectors across different years, users can extract insights into economic dynamics, labor market trends, and governmental policies influencing compensation practices.

Digital Payment Analysis

% of Digital Payment Users and Yearly Increment/Decrement The "% of Digital Payment Users" and "Yearly Increment/Decrement" KPIs provide valuable insights into the adoption and trends of digital payment usage over time.

Firstly, the "% of Digital Payment Users" metric quantifies the proportion of the population that utilizes digital payment methods for transactions. This measure reflects the extent of digital financial inclusion within a society and the penetration of digital payment platforms among consumers. A higher percentage indicates a larger share of the population embracing digital transactions, potentially driven by factors such as technological advancements, convenience, and accessibility of digital payment infrastructure. Monitoring changes in this percentage over time offers insights into shifts in consumer behavior, adoption of new payment technologies, and the evolution of digital payment ecosystems.

Secondly, the "Yearly Increment/Decrement" metric complements the digital payment usage percentage by providing additional context on the rate of change in digital payment adoption from one year to the next. This metric quantifies the increase or decrease in the percentage of digital payment users over consecutive years, highlighting trends and fluctuations in adoption rates. Positive increments indicate growth in digital payment adoption, suggesting increasing acceptance and integration of digital payment methods into daily financial activities. Conversely, negative decrements signify a decline in digital payment usage, potentially signaling barriers or challenges hindering adoption, changes in consumer preferences, or shifts in economic conditions.

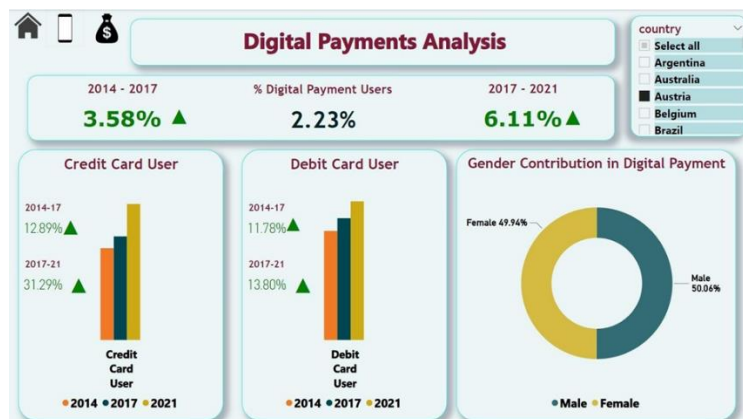


Figure 3: Digital Payment Analysis

Credit Card and Debit Card Users: The "Credit Card and Debit Card Users" bar graphs, accompanied by percentages of increase and decrease, offers a visual representation of changes in the usage of credit and debit cards over time. Each bar on the graph represents a specific time period, showcasing the proportion of individuals using credit cards, debit cards. The accompanying percentages of increase or decrease provide additional context by illustrating the rate of change in card usage from one period to the next.

Analyzing this graph allows for insights into shifting trends in payment behavior and preferences among consumers. For instance, a significant increase in credit card usage accompanied by a decrease in debit card usage may suggest a growing preference for credit-based transactions or changes in consumer spending habits. Conversely, a decline in both credit and debit card usage could indicate broader economic factors impacting consumer confidence or financial stability.

Gender Contribution in Digital Payments: The "Gender Contribution in Digital Payments" pie chart provides a visual breakdown of the participation of different genders in digital payment transactions. Each segment of the pie represents a gender category, such as male, female, or other, and displays the proportion of digital payments attributed to each group.

Predictive Analysis Charts

The Predictive Analysis Charts in Power BI feature line time-series graphs that dynamically adjust according to the selected country. These charts are constructed using datasets derived from time-series forecasting conducted in Python. Once the forecasting models generate predictions, the forecasted values for each time period are exported to a compatible format for Power BI. In Power BI, the forecasted data is imported and visualized using line time-series graphs, which are configured to change dynamically based on user selections. Users can interact with the graphs by selecting different countries, causing the line graphs to update and display the corresponding forecasted values for the chosen country. These predictive analysis charts enable users to explore future trends and patterns for the selected variables across different countries, facilitating data-driven decision-making and strategic planning.

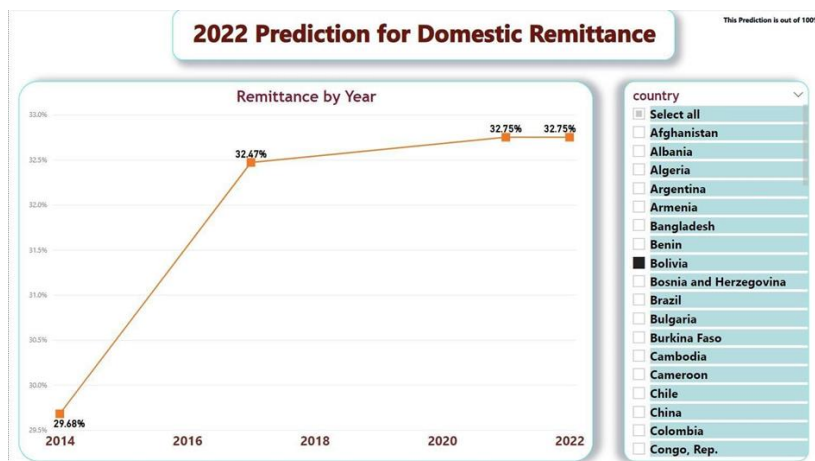


Figure 4: Remittance Prediction

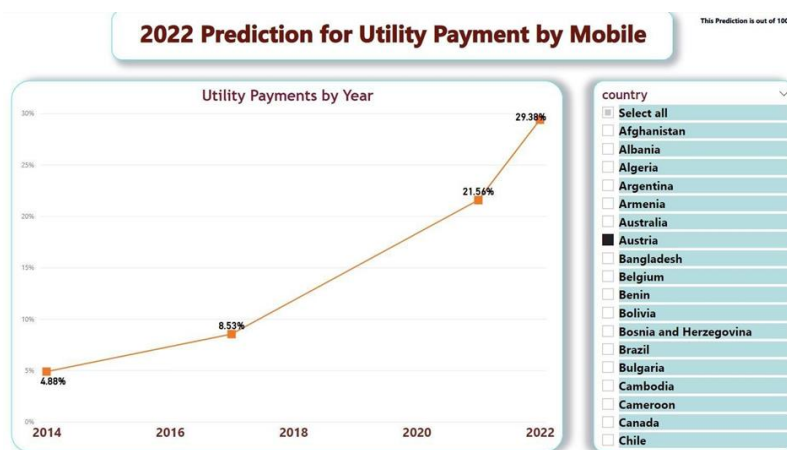


Figure 5: Utility Payments Prediction



V. Conclusion

The project analyzed global finance data, emphasizing remittances, mobile phone usage demographics, and digital payment adoption. Through data preprocessing and sub-dataset creation, it revealed insights into global financial trends. Understanding these patterns is crucial for informed decision-making by policymakers and businesses in the dynamic digital economy, setting the stage for future research and policy interventions.

Over the past decade, a profound shift has occurred globally in the realm of technology adoption, particularly evident in the exponential rise of mobile phone users, digital payment transactions, and domestic remittances across numerous countries. This transformative trend reflects a seismic evolution in consumer behavior and economic infrastructure, underpinned by the proliferation of smartphones and the advent of secure, efficient digital payment platforms. As mobile connectivity has become increasingly ubiquitous, especially in emerging economies, the convenience and accessibility of digital payment solutions have reshaped financial landscapes, facilitating greater financial inclusion and efficiency. Consequently, the last decade has witnessed a remarkable surge in both the sheer number of mobile phone users and the volume of digital transactions, indicating a profound paradigm shift towards a more interconnected and digitized global economy.

In conclusion, the comprehensive analysis of mobile phone usage, digital payment adoption, and domestic remittances over the past decade underscores the transformative power of technology in reshaping socio-economic dynamics worldwide. The unprecedented growth in mobile connectivity and digital financial services has not only facilitated greater access to information and financial resources but has also catalyzed inclusive economic development, particularly in underserved communities. As we move forward, harnessing the potential of these technological advancements will be paramount in addressing persistent challenges and unlocking new opportunities for sustainable growth and prosperity on a global scale. Thus, while reflecting on the achievements of the past decade, it is imperative to remain vigilant and innovative in navigating the ever-evolving landscape of digital transformation to ensure equitable access and meaningful progress for all.