US DOLLAR EXCHANGE RATES: ASIAN COUNTRIES

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Group 10

Introduction:

The purpose of this project is to evaluate the performance of three popular Asian currencies, namely the Japanese Yen, Chinese Yuan, and Indian Rupee, in relation to the United States Dollar (USD). By conducting exploratory data analysis, we aim to gain insights into the trends and fluctuations in the exchange rates between these currencies and the USD over a specific time period.

Understanding the performance of these Asian currencies against the USD holds significant importance in the global economic landscape. The USD has long been regarded as a key international reserve currency, and fluctuations in its value can have profound implications for international trade, investments, and economic stability. Analyzing the performance of the Yen, Yuan, and Rupee against the USD allows us to assess the strength or weakness of these currencies and their impact on their respective economies.

To accomplish this analysis, we will utilize historical exchange rate data and statistical techniques to identify patterns, trends, and factors influencing the performance of these currencies. This exploratory approach will provide valuable insights into the exchange rate dynamics, enabling policymakers, economists, and investors to make informed decisions and devise appropriate strategies in the context of global currency markets.

Data description:

For this project, data was sourced from Kaggle Kaggle and contained the exchange rates of 38 Asian countries from January 2004 till December 2022. The data was obtained from a reliable source, and it includes daily exchange rates, enabling researchers and analysts to examine the trends and patterns in the currency markets of these countries.

The dataset consists of several variables, including the date, the exchange rate of each country, the country name, the ISO code, and the currency name. We selected the relevant columns for my analysis, including the date and exchange rate of each country.
As the date column was in string format, we converted it into a date column using appropriate functions to enable visualization on a line plot accurately. Additionally, there were some missing values in the dataset, and we filled them using forward fill since the exchange rates of neighboring dates were likely to be similar.

Data exploratory Analysis:

For exploratory data analysis, line plots were used to visualize the exchange rate trends of Japan, China, and India over the years. This ensured that it was easy to identify any significant changes in the exchange rates and identify trends in the currency markets of these countries.
Furthermore, the year-over-year percentage change in exchange rates of each country was calculated and plotted them on a line chart. This ensured that it could be easy to assess which currency had the highest variability over the years. The plot showed that the Indian Rupee had the highest variability, while the Chinese Yuan showed the least variability over the years, indicating greater stability.
Finally, a bar graph of the average percentage was plotted of the change of the exchange rates of these currencies over the last decade to get an insight into which currency was the most stable. The graph showed that the Chinese Yuan had the highest stability, followed by the Japanese Yen, and then the Indian Rupee.
Through EDA, several observations and insights into the exchange rate trends and patterns of these Asian currencies were clear. The analysis showed that the Chinese Yuan has been the most stable currency over the years, while the Indian Rupee had the highest variability in exchange rates. This could be due to various factors such as political instability or economic conditions.

Data Visualization Design:

The line charts were chosen to visualize the exchange rate trends of Japan, China, and India over the years. Line charts are an appropriate choice when working with time series data as they

effectively display trends and changes over time. To make the lines for each currency easily distinguishable, different markers and colors were used. This helped to prevent confusion and made it easier for the audience to identify the trends in each currency's exchange rates.

A bar graph was used to compare the variability of the currencies over the last decade. The choice of using a bar graph was based on the fact that it is an effective visualization for comparing values across categories. The bars clearly showed which currency had the highest variability and helped to emphasize this finding.

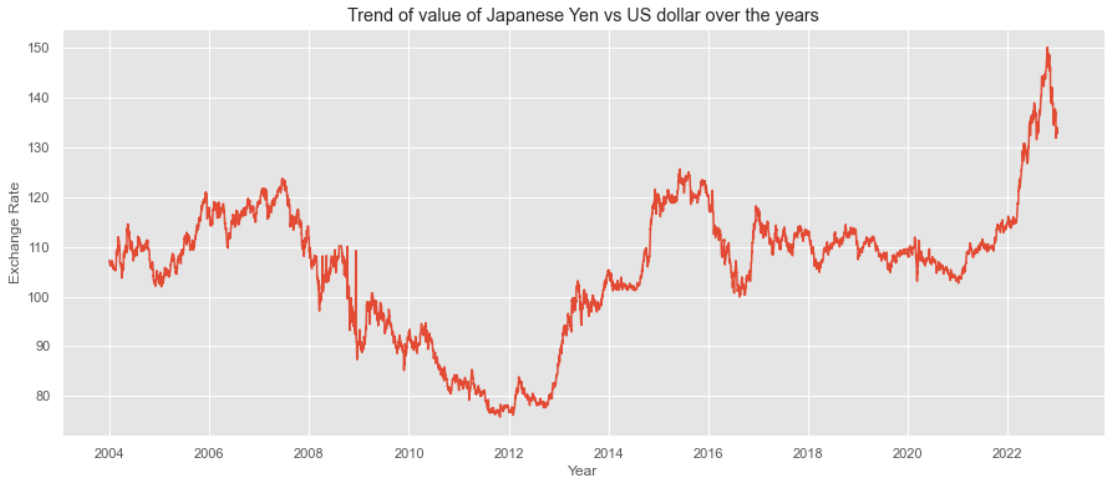
The color schemes used were chosen to be easily distinguishable from one another and followed a consistent color scheme throughout the visualizations. Each axis was labeled clearly, and units of measurement were included where applicable.

Visualizations were designed to effectively communicate insights to the audience. The line charts displayed the trends in exchange rates over time, while the bar graph provided a clear comparison of the variability of the currencies. By following best practices such as using appropriate chart types, using distinguishable colors, and emphasizing key findings, the visualizations were created in a way that was easy to understand and interpret.

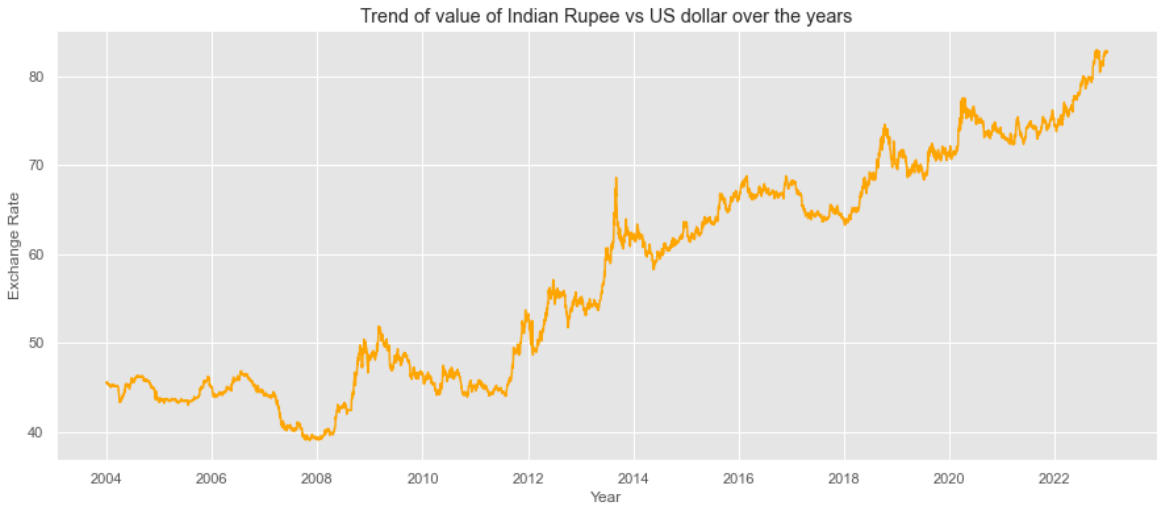
Results:

The following graphs show the trends of the exchange rates of each for the currencies over the years.

Trends of well-known International traded Asian currencies against the US dollar:



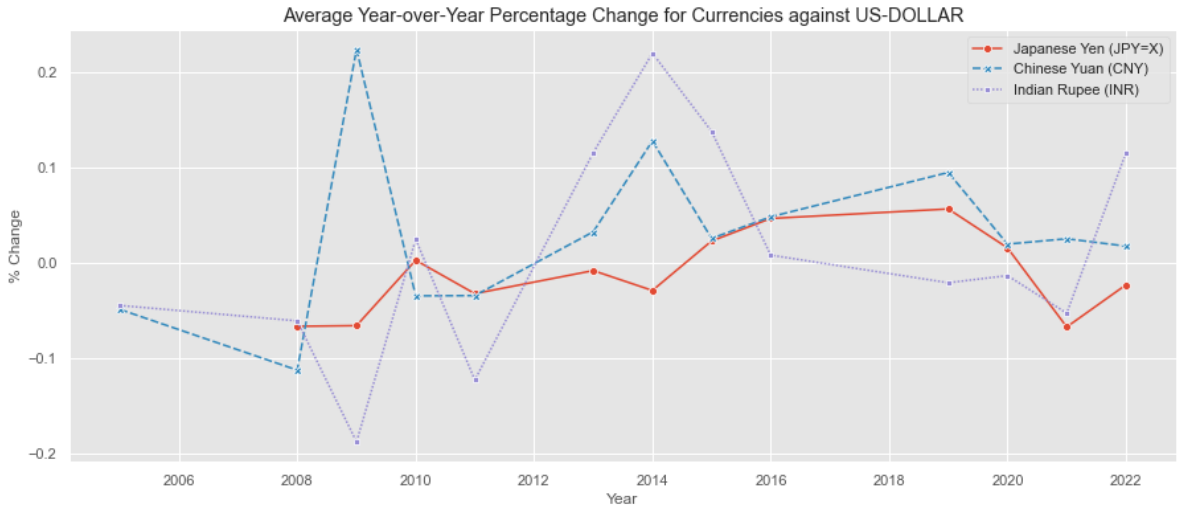
The above plots depict the historical exchange rate trends between the different currencies and the US dollar, indicating the relative strength of one currency against the other. As per the graphs, it is evident that the Japanese Yen has had a fluctuating performance over time. Between 2008 and 2012, the Yen exhibited a continuous upward trend against the US dollar, indicating that it became stronger in value. However, the Yen faced a significant drop in strength between 2013 and 2017, suggesting a decline in its value relative to the US dollar during this period. Furthermore, the graphs reveal that the Yen encountered another noteworthy drop in early 2022, indicating a further weakening of its value relative to the US dollar.



As for the Indian Rupee, there is a discernible and persistent trend that illustrates its ongoing struggle to sustain its value over the years when compared to the US dollar. The Indian Rupee has experienced a consistent and evident pattern of depreciation against the US dollar, displaying a conspicuous upward trajectory. This gradual erosion in value can be attributed to various factors such as economic imbalances, inflationary pressures, trade deficits, global market dynamics, and geopolitical influences. Consequently, this consistent upward trend signifies the ongoing challenges faced by the Indian Rupee in maintaining its value vis-à-vis the US dollar, presenting a noteworthy concern for the Indian economy and its stakeholders.

On the other hand, the Chinese Yuan grew in strength against the US dollar between the year 2004 to 2014 before starting to lose its strength from 2014 to 2016. However, from the beginning of the year 2017, the Yuan showed steady signs of recovery up to 2018. The promising trend was put off by another trend of losing strength until it steadily appreciated from the start of 2020 to 2022.

Average year over year Percentage change for currencies against US dollar:

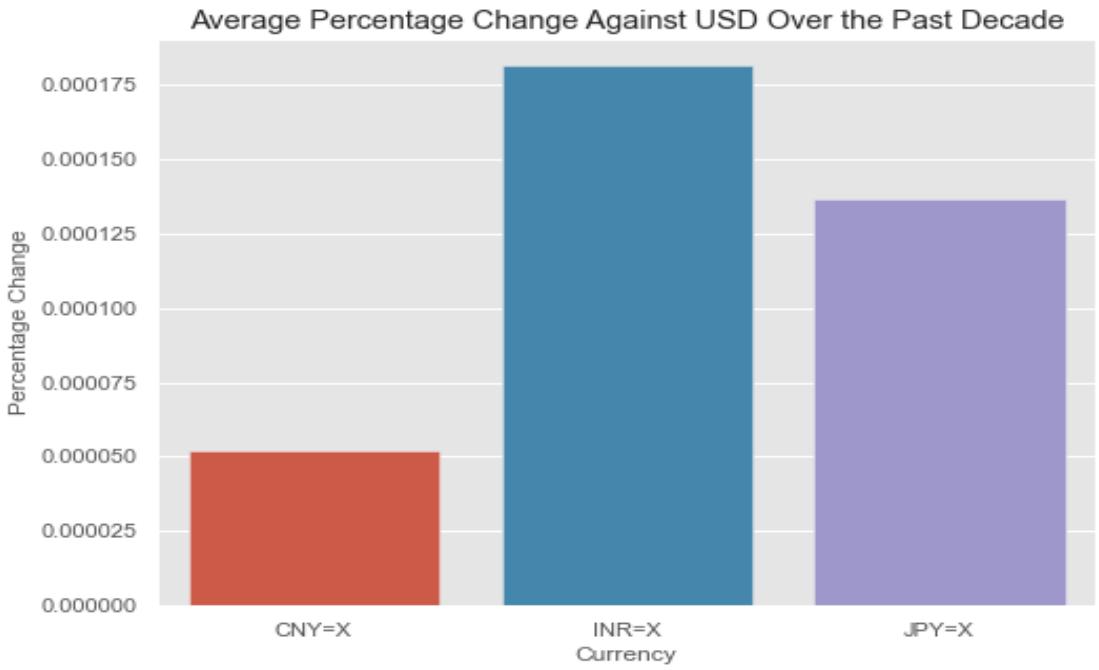


According to the plot above, it is evident that the Indian Rupee and Japanese Yen have significantly greater fluctuations of percentage change in their value against the US dollar as compared to the Chinese Yuan which seems to have less fluctuations.

The reason for this difference in volatility can be attributed to several factors. Firstly, India and Japan have relatively open economies as compared to China. This makes them more susceptible to external economic shocks and market volatility. Secondly, the monetary policies of India and Japan are more flexible than that of China. This allows their currencies to react more quickly to changes in the market. On the other hand, the Chinese government has implemented strict capital controls to limit the flow of money in and out of the country, which has resulted in a relatively stable currency.

Another reason for the difference in volatility can be attributed to the level of economic development of each country. China has become the world's second-largest economy and a major player in international trade. Therefore, the stability of its currency is crucial to maintain its economic growth and international standing. In contrast, India and Japan are still developing economies, and their currencies are not as important in the global market, which allows them to fluctuate more.

Performance of Dollar against currencies over the past decade



After comparing the average performance of the three currencies over the last decade, again the Chinese Yuan showed the least variation an indication of more stability compared to other currencies. For example, the Indian Rupee had the greatest variation of the three currencies closely followed by the Japanese Yen. According to the plot, there seems to have a significant difference between Chinese currency and the others as they show significant variation over the decade.

Discussion and conclusion:

The value of a currency in the foreign exchange market is determined by various factors such as macroeconomic indicators, government policies, global market trends, and geopolitical events. Different currencies can gain or lose value against the US dollar based on these factors. In recent years, the Chinese Yuan has gained value against the US dollar, while the Indian Rupee has depreciated.

One of the primary reasons for the appreciation of the Chinese Yuan is the growth of the Chinese economy. China has become the world's second-largest economy and a major player in international trade. This has resulted in increased demand for the Yuan in the global market, which has led to its appreciation. In addition, the Chinese government has implemented policies to make the Yuan more attractive to foreign investors. For instance, it has opened up its financial markets to foreign investors and allowed the Yuan to be used in international trade settlements, which has boosted its demand and value.

On the other hand, the Indian Rupee has depreciated against the US dollar due to a number of reasons. One of the main reasons is the high current account deficit (CAD) of the Indian economy. The CAD occurs when a country's imports exceed its exports, resulting in a net outflow of foreign exchange. The high CAD has put pressure on the Rupee, leading to its depreciation. In addition, India has been grappling with high inflation and weak economic growth, which has further weakened the Rupee.

Another factor contributing to the depreciation of the Indian Rupee is the geopolitical situation in the region. The rising tensions between India and Pakistan, and India and China, have increased uncertainty in the market, which has led to a decrease in the demand for the Rupee.

In conclusion, majority of the Asian currencies have shown improvement against the US dollar over the past decade, but only a few of the major currencies still maintain a positive trend with consistency, for example

Chinese yuan (CNY) - Which has grown positively against the US dollar, this is mainly due to China’s efforts to internationalize its currency, which kept the CNY in an upward trend. China has become the world's second-largest economy and a major player in international trade. This has resulted in increased demand for the Yuan in the global market, which has led to its appreciation. In addition, the Chinese government has implemented policies to make the Yuan more attractive to foreign investors. Japanese yen has a depreciating trend against the USD in the past decade, this is mainly due to the Bank of Japan's monetary policies, which have led to a weaker yen. Indian rupee has also shown a depreciating trend against the USD, this is majorly due to India's high inflation rates and current account deficit, which have led to a weaker rupee.

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Appendix

1. **Importing libraries to use**

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
plt.style.use('ggplot')
```

2. **Reading the dataset into python**

```
data = pd.read_csv("dataset.csv")
data.head()
```

3. **Convert the date column to date index column for the data preparation**

```
data['Date'] = pd.to_datetime(data['Date'], format='%m/%d/%Y')
data.set_index("Date"
```

4. **Selecting the most important currencies**

```
df = data[['Date','CNY=X','INR=X','JPY=X']].set_index('Date')
# Forward fill missing values
df = df.fillna(method='ffill')
# Calculate the percentage change year over year for each currency
pct_change_df = df.pct_change(freq='Y')
```

5. **Data visualization**

   a) **Chinese Yuan vs USD**

```
plt.figure(figsize=(15,6))
sns.lineplot(data=df['CNY=X'], color="red")
plt.xlabel('Year')
plt.ylabel('Exchange Rate')
plt.title('Trend of value of Chinese Yuan vs US dollar over the years')
plt.savefig("ChineseYuan.png")
```

   b) **Indian rupee vs USD**

```
plt.figure(figsize=(15,6))
sns.lineplot(data=df['INR=X'],color="orange")
plt.xlabel('Year')
plt.ylabel('Exchange Rate')
plt.title('Trend of value of Indian Rupee vs US dollar over the years')
plt.savefig("IndianRupee.png")
```

   c) **Japanese Yen vs USD**

```
plt.figure(figsize=(15,6))
sns.lineplot(data=df['JPY=X'])
plt.xlabel('Year')
plt.ylabel('Exchange Rate')
plt.title('Trend of value of Japanese Yen vs US dollar over the years')
plt.savefig("JapaneseYen.png")
```

6. **Calculate percentage changes over the past decade**

```
start_date = pd.to_datetime('2013-05-03')
end_date = pd.to_datetime('2023-05-03')
past_decade = (df.index >= start_date) & (df.index <= end_date)
percentage_changes = df.loc[past_decade].pct_change().mean()
```

7. **Create bar plot using seaborn**

```
plt.figure(figsize=(8, 6))
sns.barplot(x=percentage_changes.index, y=percentage_changes.values)
plt.title("Average Percentage Change Against USD Over the Past Decade")
plt.ylabel("Percentage Change")
plt.xlabel("Currency")
plt.savefig("AveragePercentage.png")
```

8. **Year-over-year percentage change in Asian currencies against USD**

```
plt.figure(figsize=(15,6))
sns.lineplot(data=pct_change_df, markers=True, marker='o')
plt.title('Average Year-over-Year Percentage Change for Currencies against US-DOLLAR')
plt.xlabel('Year')
plt.ylabel('% Change')

# Creating a legend for each line
plt.legend(['Japanese Yen (JPY=X)', 'Chinese Yuan (CNY)', 'Indian Rupee (INR)'])
plt.savefig("yearoveryear.png")
```