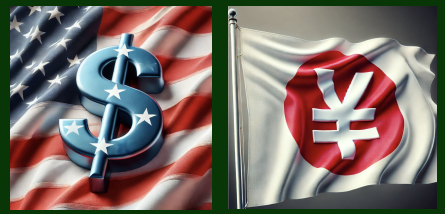
Group 2

Foreign Exchange Analysis Project

USD/EUR

USD/JPY



USD/CNY

AI Bootcamp Class with Binoy Das

February 2025

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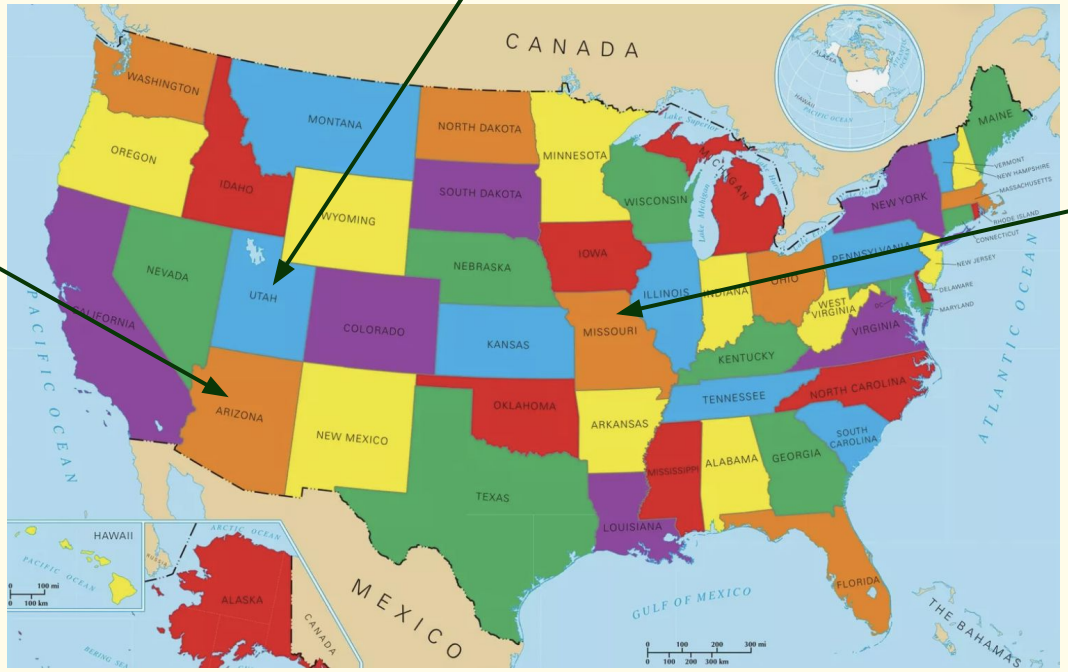


Project Overview

Do US Presidential elections impact the exchange rates?

This exploratory analysis examines Federal Reserve exchange rate data (2000-2024) to check the volatility of CNY, EUR, and JPY surrounding the US Presidential elections to identify any predictable patterns.

CNY (trade relations) EUR (value to USD) JPY (stability)

Goals

Determine impact of US Presidential elections on exchange rates

Identify potential trends

Predict future rates

Approach

Compare currency volatility overtime surrounding a recurring major economic or political event (US Presidential elections) to identify any predictable patterns

Volatility refers to the extent of currency fluctuations over time

Tools

Pandas
Datetime
Numpy
Matplotlib
Calendar
Prophet

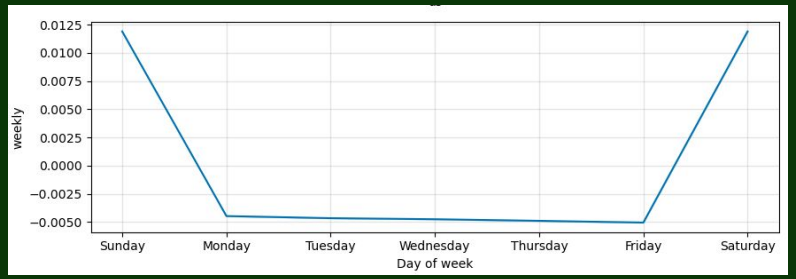
Data Preparation

Collect	daily exchange rate data for CNY, EUR, and JPY from the Federal Reserve website saved locally as individual HTML files and read into DataFrames using pd.read_html( )
Categorize	currency data into seven 30-day election windows accounting for 15 days before the election and 15 days after the election
Convert	all empty cells (US Holidays) from ‘ND’ to ‘NaN’ and all rate data to the ‘float’ data type
Combine	all three DataFrames into a single DataFrame indexed by DateTime
Clean	using ffill to backfill missing dates (weekends, holidays) preserving 30% of total data

Data Cleanup: Achieving 100% Data Integrity

Issue: Missing weekends rate (Sat/Sun) + US major holidays:

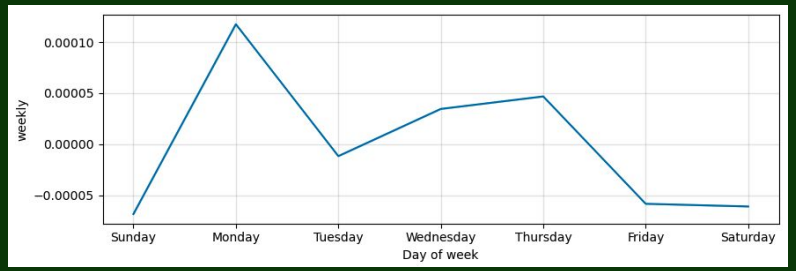
1. Approx 265 ‘ND’ rates for US major holidays from the html file
2. Approx 2600 weekend days were not included



Use fillna(method=‘ffill’) approach (Forward Fill)

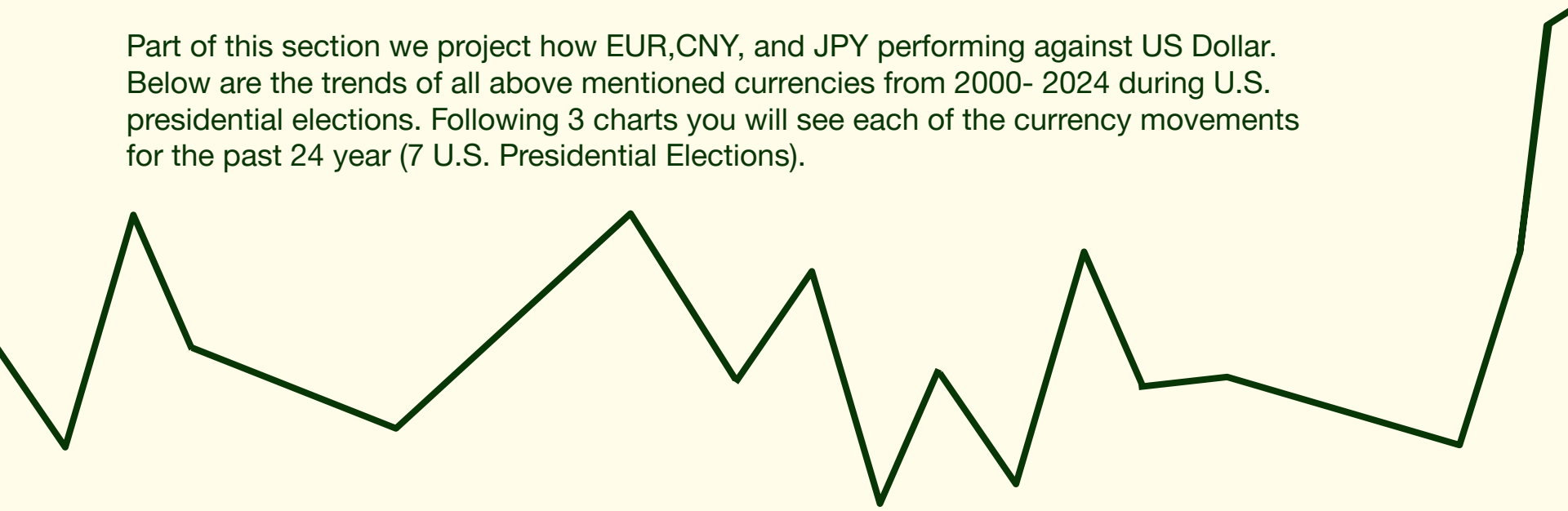
Solution:

1. Applied most recent previous day’s rate for US Holiday
2. Implemented Friday’s rate for missing Saturdays/Sundays data
3. Preserved 2865 rows (30%) of missing data, ensuring continuous rate across all calendar days. Increasing good data from 6535 to 9147.



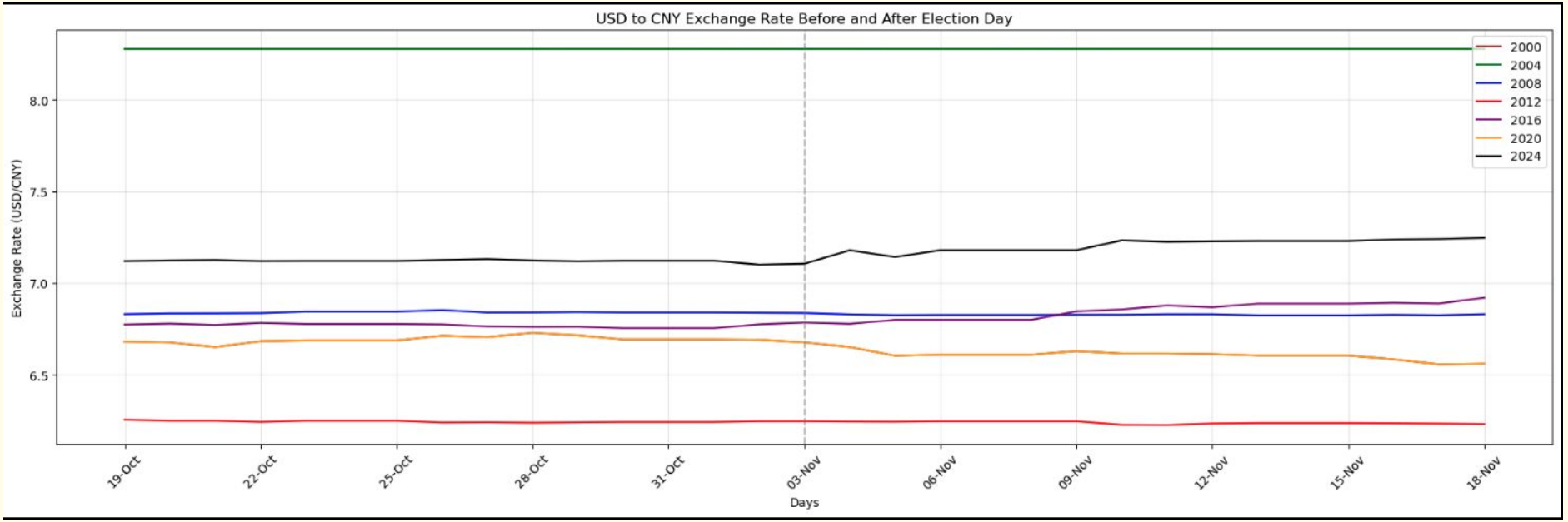
Data Visualization

Part of this section we project how EUR,CNY, and JPY performing against US Dollar. Below are the trends of all above mentioned currencies from 2000- 2024 during U.S. presidential elections. Following 3 charts you will see each of the currency movements for the past 24 year (7 U.S. Presidential Elections).



$ to CNY -

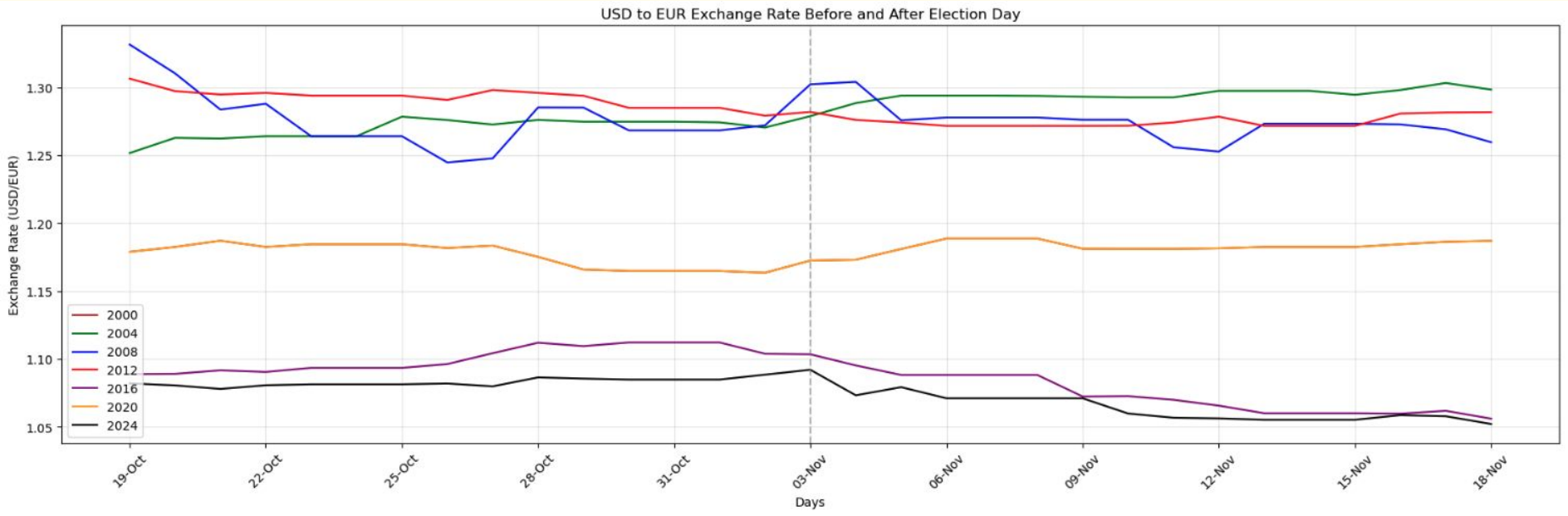
1. Low -In 2000, the USD/CNY exchange rate was approximately 6.3784
2. High -In 2024, the USD/CNY exchange rate reached approximately 7.3420
3. Current Rate - The USD/CNY exchange rate was approximately 7.2824



The middle dotted line is to show the Election Day for an easy reference.

$ to Euro

1. Low -2024 USD/EUR exchange rate reached a low 1.06 euro
2. High - 2008, the USD/EUR exchange rate was higher 1.36 Euro
3. Current exchange -USD/EUR exchange rate was 0.96 euros per dollar



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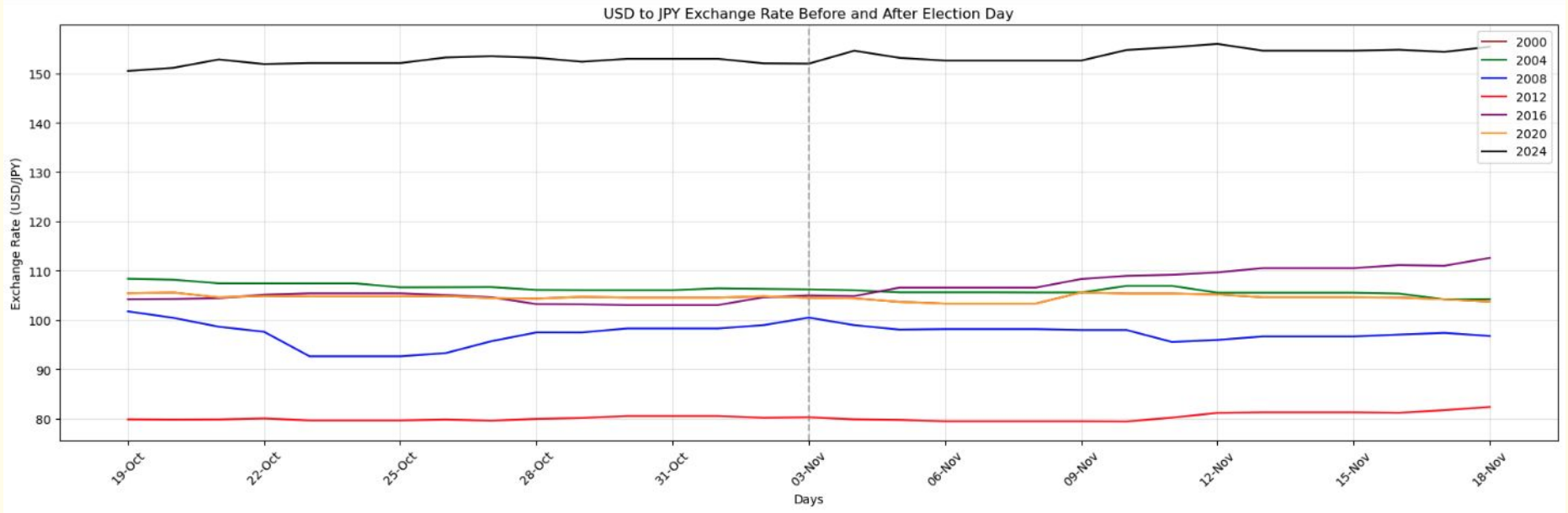
$ to JPY

1. Low - 2012, the USD/JPY exchange rate reached a low of approximately 80.25 yen per dollar
2. High - 2024, the USD/JPY exchange rate reached approximately 154.10 yen per dollar
3. Current -USD/JPY exchange rate was approximately 154.10 yen per dollar



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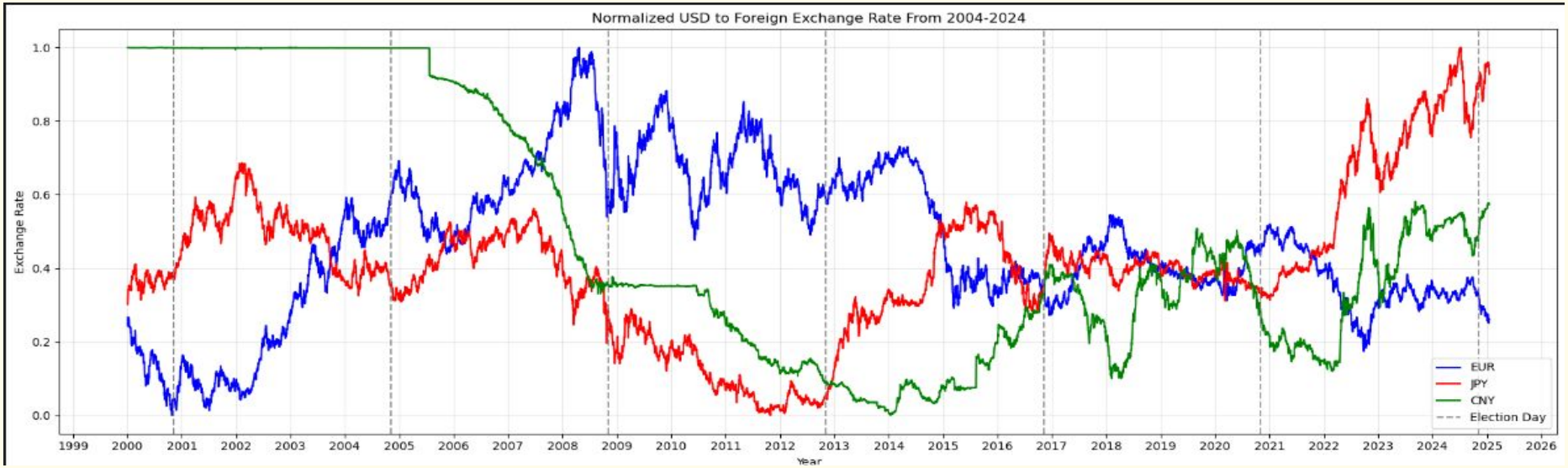
Normalization:

In order to identify the performance of all 3 currencies against dollar from 2000-2024 we normalized data in below format and projected data below.

Normalization is an approach to **scale** the y chart between 0 and 1.

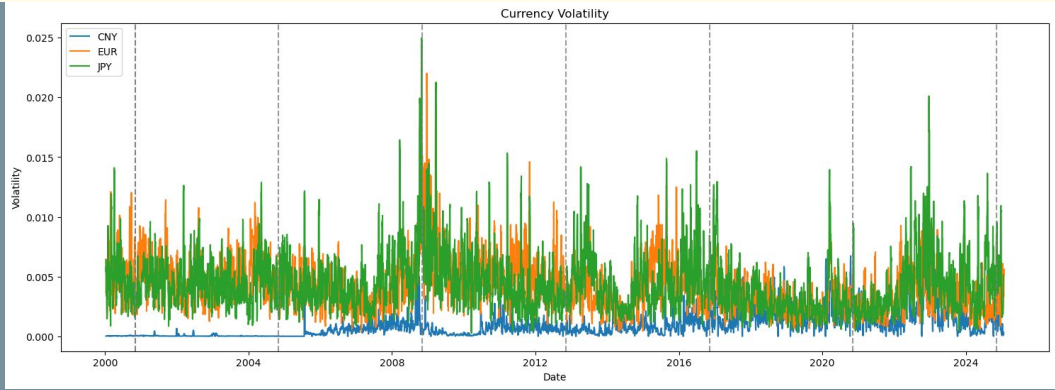


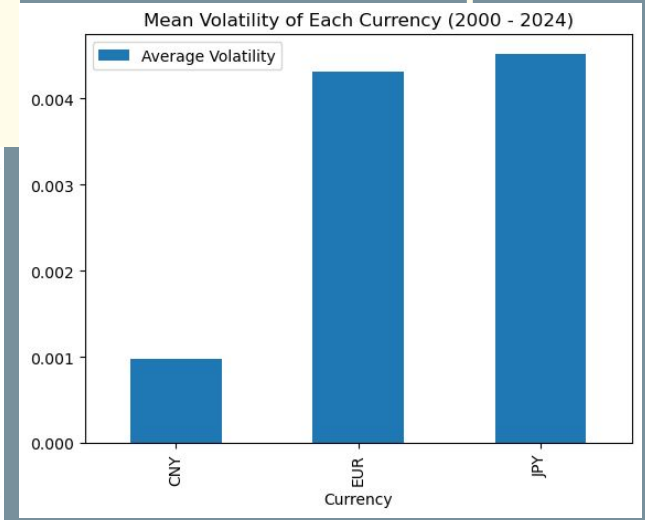
Volatility in Election Year vs Non

Context and Analysis: Investigates volatility around the 2024 election year by comparing it with the non-election year of 2022.
2022 serves as a control period, representing post-pandemic recovery conditions.
Identifies how political cycles impact currency stability.

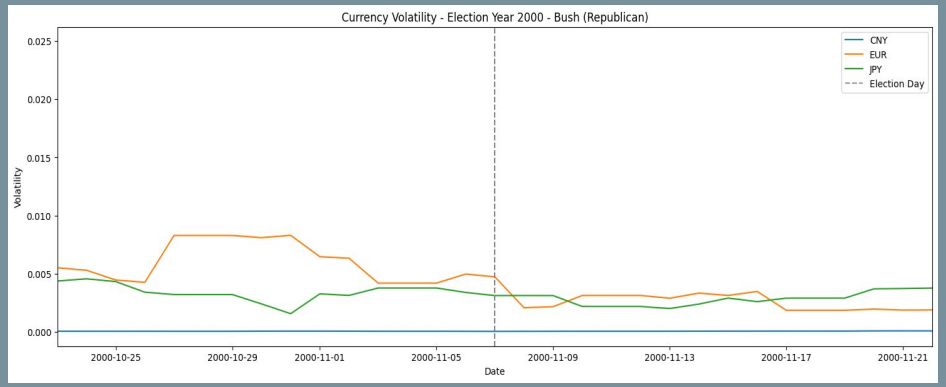
Strategic Overview : This section focuses on analyzing exchange rate trends and volatility, particularly in response to elections.

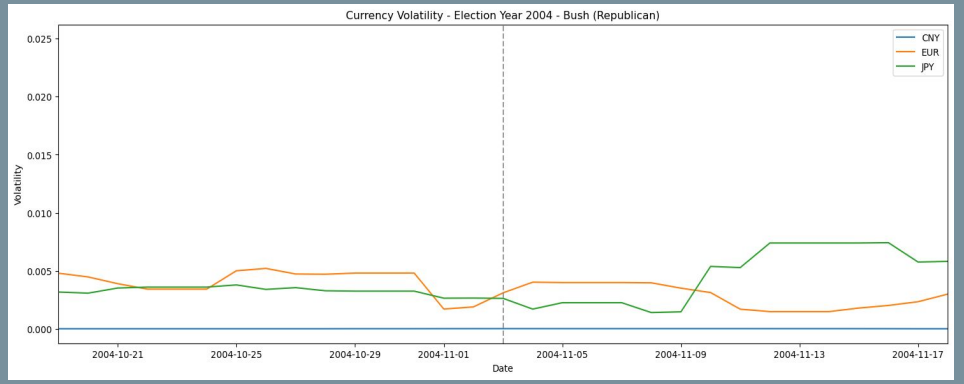
We'll calculate the volatility for each currency by calculating the percent change and then the standard deviation. Our focus to is to see how the volatility of each currency changes from 2000 to 2024 with a focus of looking at the election periods.

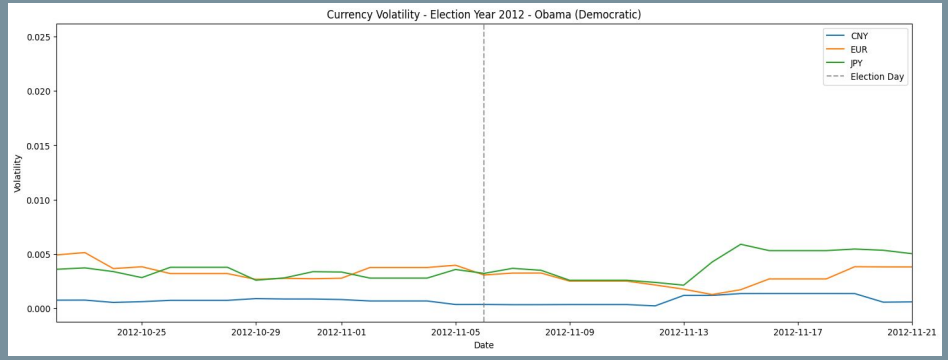


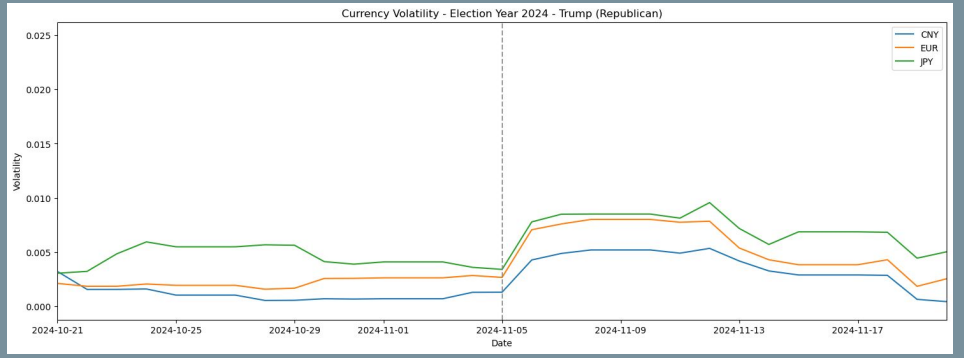


Volatility in Election Windows





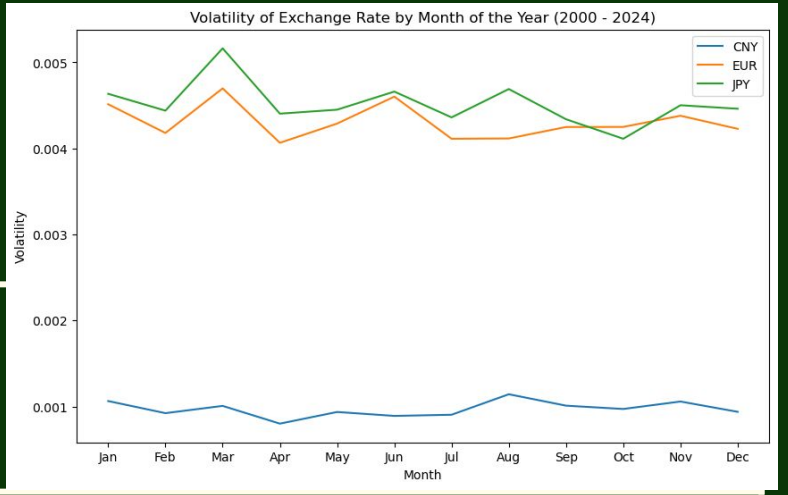


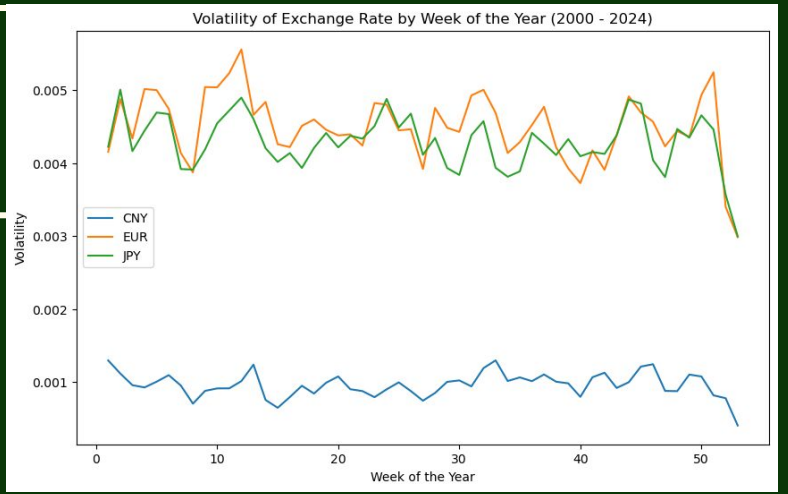


While analyzing each election window, we found that 2024 was the only year with a clear response to the election results, leading to a spike in currency volatility.

Mining Exchange Rate for Trends

Question:	Answer:
Does the currency exchange rate monthly volatility from 2000-2024 fluctuate based off of election cycles?	Election cycles do not appear to be a dominant factor in driving currency volatility.
Does the currency exchange rate weekly volatility from 2000-2024 fluctuate based off of election cycles?	Election cycles may contribute to short-term fluctuations, but they do not appear to be the primary driver of volatility cycles.





Correlation Matrix - Political Party with Exchange Rate and Volatility

- **CNY** - Political Party seems to have a medium negative correlation with exchange rate but not volatility.
- **EUR** - Political Party seems to have a weak or no correlation neither exchange rate and volatility.
- **JPY** - Political Party seems to have a weak negative correlation with exchange rate but a weak to no correlation to its Volatility.
- It can't be said whether exactly a Democratic or Republican affects exchange rates or volatility.

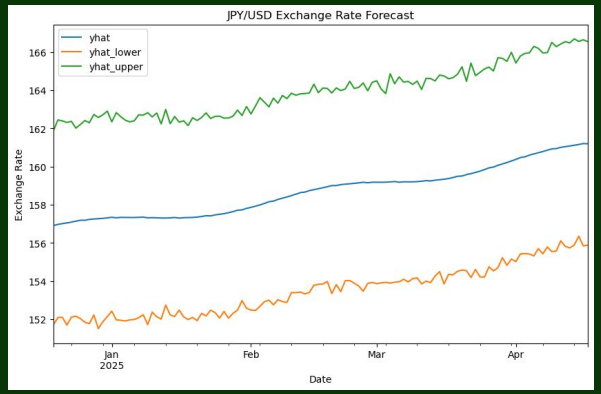
Republican vs Democratic

	Currency Volatility	CNY	Party
Currency Volatility	1.000000	-0.372127	0.079584
CNY	-0.372127	1.000000	-0.571908
Party	0.079584	-0.571908	1.000000

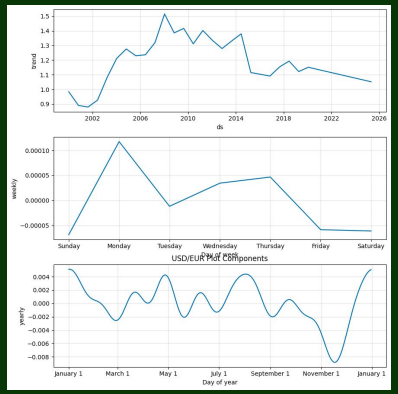
	Currency Volatility	EUR	Party
Currency Volatility	1.000000	0.005757	0.072470
EUR	0.005757	1.000000	0.071122
Party	0.072470	0.071122	1.000000

	Currency Volatility	JPY	Party
Currency Volatility	1.000000	0.010595	0.082356
JPY	0.010595	1.000000	-0.124464
Party	0.082356	-0.124464	1.000000

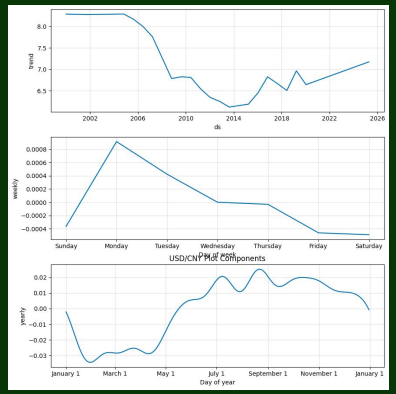
Prophet Time Series Model - Observations



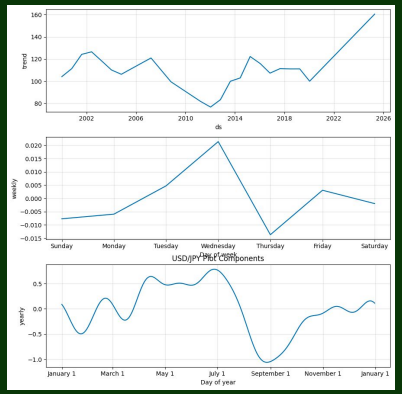
EUR



CNY



JPY



- EUR and CNY showed a stable rate around 1.06 and 7.15 respectively while JPY shows upward increase to 161 (3% increase) in the 90-day prediction window.

- EUR and CNY in the beginning of the week shows having more extreme movements vs the end of the week while JPY ramps up midweek and then falls towards the end of the week.
- ‘Day of the Year’ shows JPY and EUR having the most negative change around Sept. - Nov. while CNY having the most negative change in Feb.
- We can’t actually infer the elections are the reason so further investigation is needed.

Conclusions

- There seems to be some evidence that exchanges rates do change around an election season, although this could be coincidental with many other influencing factors like market trends, global events, etc.
- Current political party doesn’t seem to be a factor in affecting currency rate or volatility, except with CNY being the outlier with a negative correlation to party.
- Since 2000, JPY and EUR have been the most volatile while CNY is the least volatile.

Future Work

- Volatility Analysis
  - Choose a more related key indicator data set like GDP or Trade Imbalance
- Use the Prophet model to do a retro prediction of an existing election with other key indicator variables
- Broaden the dataset with additional global currencies like Canada and Mexico

Thank You

Questions?