CHAPTER 4

INITIAL RESULTS

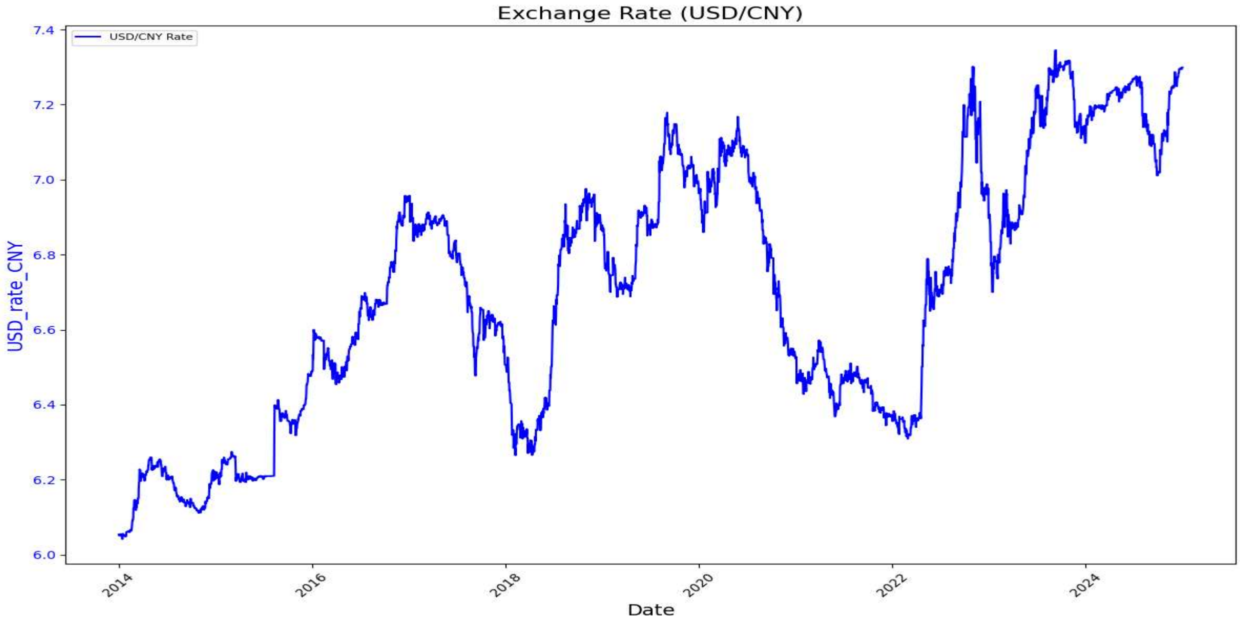
4.1 Data Visualizations

4.1.1 Interest Indicator

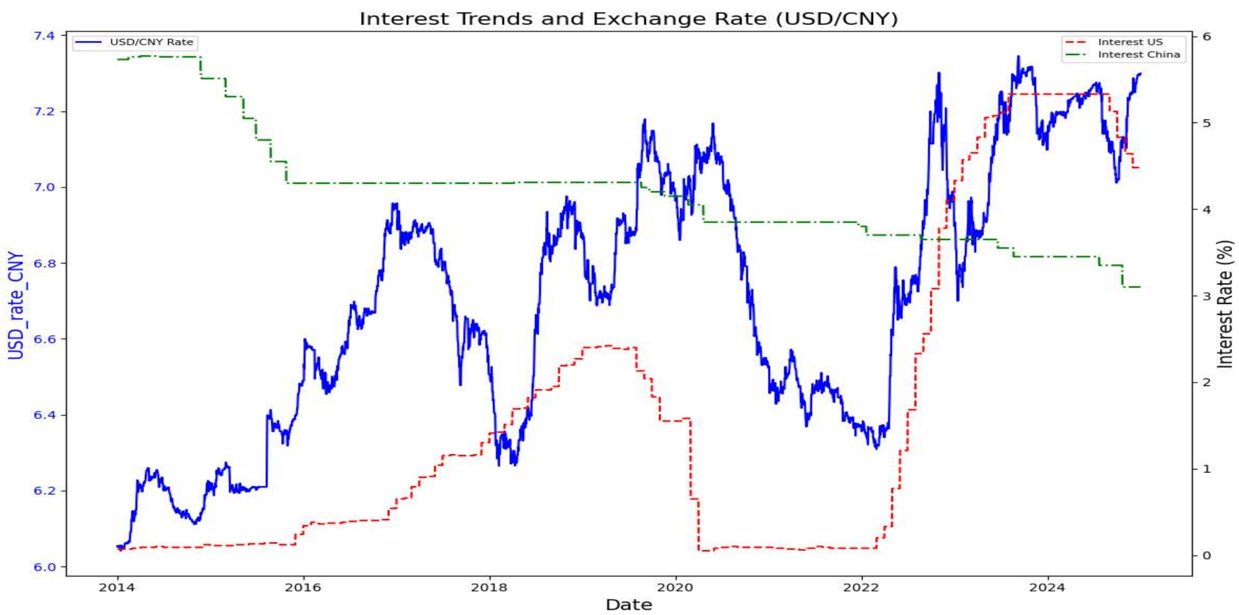
It is meaningful to overview the trending of USD/CNY through the line chart,which is Figures 4.1.It is straightward to see that the trending of line almost incline upwards.However,there are two bottomest era which are around 2018 and around 2022.Then,it is necessary to concern the major reasons which lead to this result.So ,involving with the trending of the difference between US interest and China interest,which are majorest factors to affect the trending of the FOREX ,USD/CNY paires.

When considering the interest influence,it will be able to demonstrate the the trending of pairs USD/CNY.From the Figure 4.2 to see,it is so clear to figure out the explanation from 2020 to 2022 .Because the Chinese interest was much higher than the US's which led to CNY gets strong increasing contrasting with USD , and the market expected Federal Reserve would decrease the future interest rate,the trending of USD/CNY intends to show declining over the years.

On the other hand,from 2023 to 2024,due to the continually boosting interest rate by the Federal Reserve tightening policy,the trend started to turn upward from the bottomest point.It is straightward to note the interest rate of US was higher than the Chinese one by almost 2% in a short time.Through the whole period,it illustrated interest played a significant role in the movement of the FOREX directly.



Figures 4.1the Trending of USD/CNY



Figures 4.2 the interest trending impact the exchange rate

4.1.2 CPI Indicator

CPI usually can genuinely reflect the goods price trending of a country,and is a concerning factor whether the central bank or policy maker decides to increase the interest or not.Around the global central bank ,specially for advanced economic countries,they have to control CPI fluctuation between 2% to 5%.It will urge policy makers to employ some adjustments when the CPI works out of range.

Figure 4.3 illustrates the fluctuation of CPI and exchange rate through the period of 2014 until 2024.Generally, both curves are intending to turn upward in long time because central banks need to maintain the 2% CPI goal to ensure domestic economy runs healthily.From 2020 and 2024,the CPI of US presents consistent upward movement,suggesting an increasing in value.On the other hand,Chinese one presents quite stable and slow increasing.From 2020 to 2024,it illustrates almost flat curve ,comparing with US's one.Observing the details of Chinese CPI,it may make policy maker intending to lower the interest for avoiding the risk of deflation.

To better demonstrate the relationship between CPI and FOREX ,involving interest rates which reflect the actual adjustment of central banks is quite effective .As Figure 4.4 which showcases the fluctuations in CPI ,interest rates and exchange rate between China and US,it is clear to see what happened from 2020 to 2024.There is a intensive drop of US interest around 2020 because the Federal Reserve implemented a quiet peaceful policy for due to COVID19 damage the system of economic operation.However,quick decreasing interest in short time and the global health event brow up the CPI together.Definitely,it led to the Federal Reserve employed a series of tightening policy to lower the temperature of CPI.Therefore,the result shown a sharp growth of the US interest in 2023 , and meantime the paires USD/CNY was experiencing abrupt rise.

So,CPI can not directly force the movement of the FOREX,but CPI can significantly affect the changes of interest rate.Then interest rate directly impacts on the FOREX market.

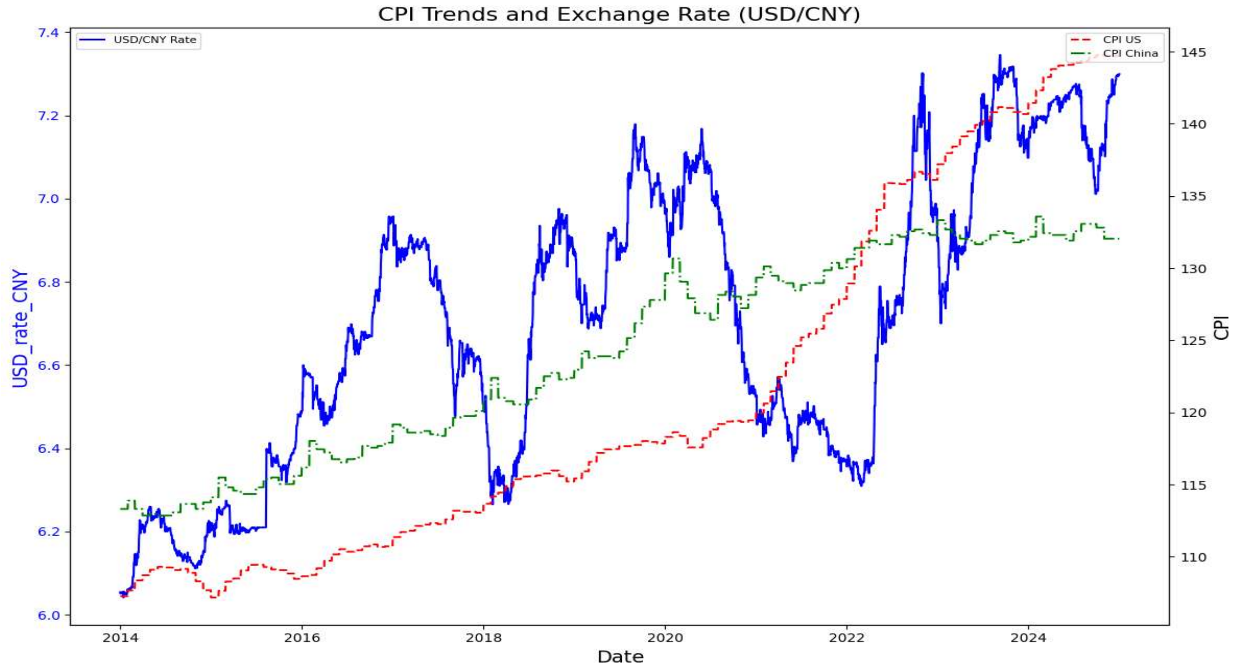


Figure 4.3 CPI and exchange rate trending

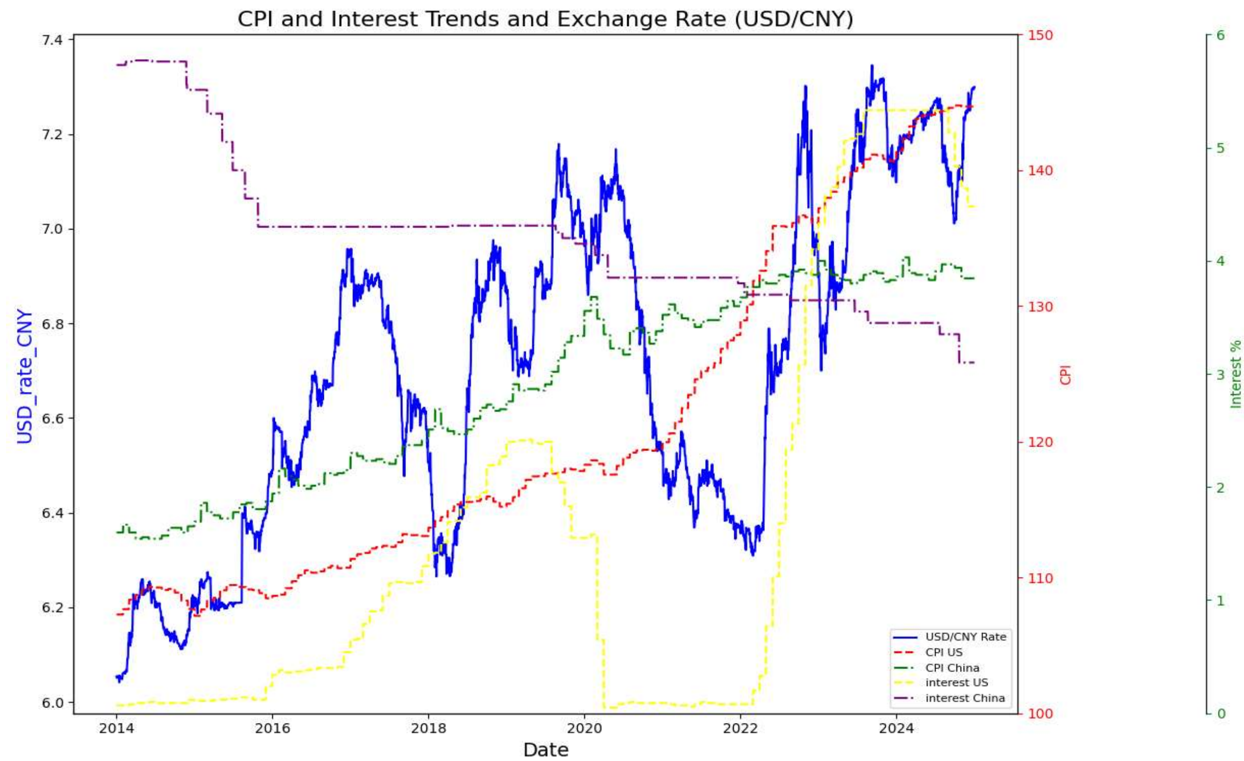


Figure 4.4 CPI, Interest and exchange rate trending

4.1.3 10 Years Bond revenue Indicator

In the financial market,government debts usually were confirmed as non-risk financial assets.Specially,10-year bond yield often is verified as the standard of concerning various interest rates such as short-term and long-term loan market .It is a effective metric to reflect the expectations of investor and stakeholders about future inflation, economic growth, and interest policies.There is a interesting market feedback mechanism,which means that it will imply higher inflation or stronger economic growth is coming when revenue of the 10-year bond is rising.

Through Figure 4.5,it presents the trending of the exchange rate under the influence of a 10-Year bond around the 10 years.From 2014 to 2024,the curve of exchange rate shares similar direction with the curve of US ten years national bond.At the China side,over the observed period,it generally illustrates the steadily decline.Specially,from 2021 to 2024,there is a noticeable and consistent downward trend.It can assume that market expects Chinese central bank will possible continually execute decline interest rate policy in the future.

When analysing the relationship between interest and 10-year bond ,the Figure 4.6 showcases that the trend of US interest rate and the trend of the US 10-year Treasury have almost the same pattern around the 10 years.From 2020 to 2024,the fluctuation of 10-year bond always leads the trend of the interest rate.It also presents the Federal Reserve often applies dramatical interest policy around the period through the quick upward and downward oscillations,contrasting to the flat and steady of Chinese one.

On the Chinese side,10-year bond steadily decline as the result that the consistent lower interest rate policy around the period.The 10 years national debts market is reflecting the trend of the Chinese central bank policies in the future.Merging the interest,10-year bond and exchange rate,it states that they play a significant role in movement of exchange rate.

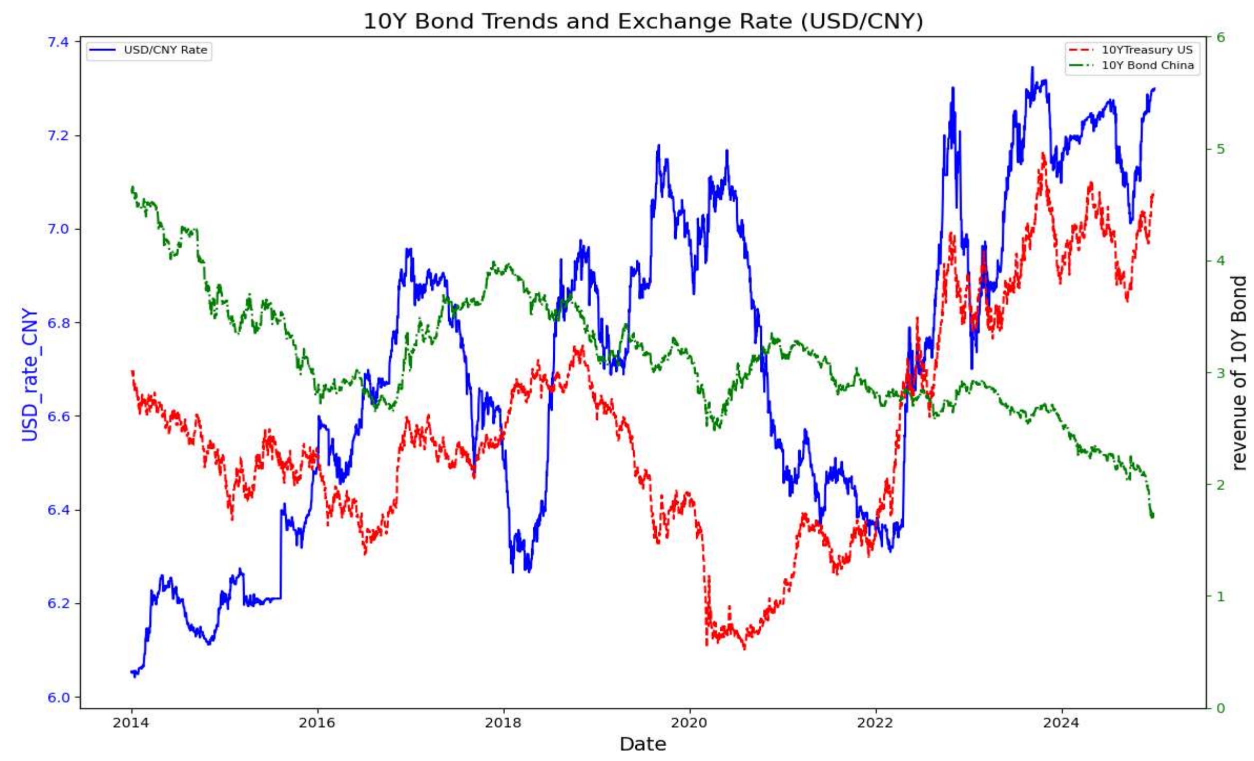


Figure 4.5 10Y Bond and USD/CNY trending

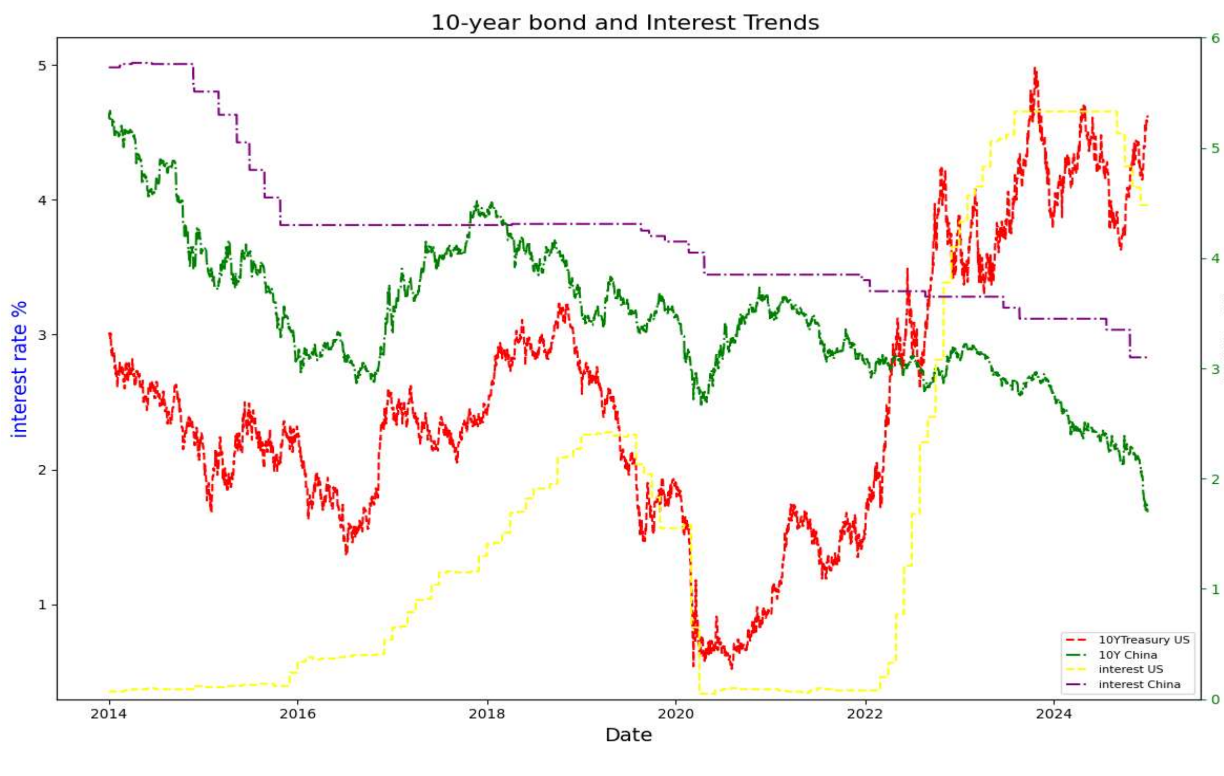


Figure 4.6 10-Year bond and interest rate

4.2 Descriptive Analysis

The below table offers a complete description of several financial factors over the 10 years,including exchange rate between US and China, CPI_China, CPI_US, Interest_US, Interest_China ,10Y_China and 10Y_US.There are 8 different statistical metrics that were presented.The 8 metrics are displayed for each distinct financial indication which are count,mean,minimum(min),25th percentile(25%),median(50%),75th percentile(75%) ,maximum(max) and standard deviation(std).

The dataset of this project consists of 4022 observations for individual financial variable,suggesting a stalwart sample size which fits for meaningful statistical analysis.The average exchange rate between China and the US is approximately 6.755, while the median is 6.7724, impling a slight skew which directs the lower end of the range.Also, the values fluctuate between 6.1775 and 7.3278, while the standard deviation is just 0.3132, offering the fairly steadiness of the exchange rate over the 10 years.

By the US CPI, it has an average of 121.17 and a median of 117.52, and it presents that value oscillates between 107.18 and 144.76.Moreover, the standard deviation shows value 12.18 confirm a middling variability, providing a significant inflationary trend.On the contrary, the average CPI of China is quite a little higher than US ,which it is 124.11.And its median is 124.23 with a narrow range from 112.85 to 133.58.However ,Chinese standard deviation is only 6.94, indicating more standfast , compared to the US CPI.

Speaking about Interest Rate, the US average one is 1.63, and its median arrives 0.85, displaying that most observations are at the lower the average. The range distributes from 0.05 to 5.33, but the standard deviation shows high value reaching 1.84, resulting in unstable fluctuations, probably because of energetic monetary policies. In contrast, the Chinese one exhibits intensive resilience and is more stable, with a mean of 4.2 and a median of 4.3. The values range from 3.1 to 5.77, and the standard deviation of 0.65 suggests minimal movement.

As for the 10-Year Bond Yield for China,its average value is 3.13, with a median of 3.09 and moves between 1.69 and 4.66. The standard deviation is 0.54, displaying limited fluctuation. Meanwhile, the 10-Year Bond Yield for the US is lower on average at 2.49, with a median of 2.36. The values change from 0.52 to 4.98, yet standard deviation is 1.00 which is higher than Chinese, providing more volatility in the US bond market.

Overall, the project data reveals crucial differences between the US and Chinese economic indicators. The US exhibits more variability in interest rates, bond yields, and inflation, presenting a dynamic and potentially active monetary environment. In contrast, China's indicators reflect more stability due to narrower ranges and lower variability in interest rates and bond yields. These patterns probably suggest the different structures and policies of economics between the two countries.

Table 4.1 Descriptive Analysis of Factors

statistic	Exchange rate	CPI_US	CPI_China	Interest_US	Interest_China	10Y_China	10Y_US
count	4022	4022	4022	4022	4022	4022	4022
mean	6.755219	121.170703	124.109282	1.628834	4.200144	3.132277	2.486363
min	6.177500	107.177760	112.853524	0.050000	3.100000	1.690000	0.520000
25%	6.473700	110.684207	117.680253	0.100000	3.700000	2.780000	1.780000
50%	6.772400	117.523291	124.230807	0.845000	4.300000	3.090000	2.360000
75%	7.016100	132.401040	131.588196	2.390000	4.310000	3.500000	2.980000
max	7.327800	144.763145	133.575159	5.330000	5.770000	4.660000	4.980000
std	0.313176	12.179279	6.942263	1.844476	0.654749	0.538024	1.004274

4.3 Initial Insights

To predict the future value of pairs USD/CNY by using an LSTM model, the LSTM analyzes the historical patterns of five key factors: CPI_US, CPI_China, Interest_US, Interest_China, and 10-year bond yields. Then integrating these variables seamlessly into a deep learning pipeline,the model transforms raw data into an effective predictive value. The below Figure 4.7 showcases trend of the USD to CNY exchange rate over the next 30 days, originating from historical data and additional features.

From the graph, it can probably be concluded that over the next 30 days, the USD displays a strong and dynamic influence in the FOREX market against the Chinese Yuan. By contrary, the Chinese currency interprets a consistent weakening trend in the financial market,because of a potential decreasing interest rate environment.Therefore,this result will may lead to Chinese policy maker hedges the risk of exchange rate by applying a series of financial tools ,ensuring the steadiness of the CNY .The upward curve provides a dominant USD position,emphasizing its resilience and muscle in the global forex market due to the Federal Reserve tightening interest policy.

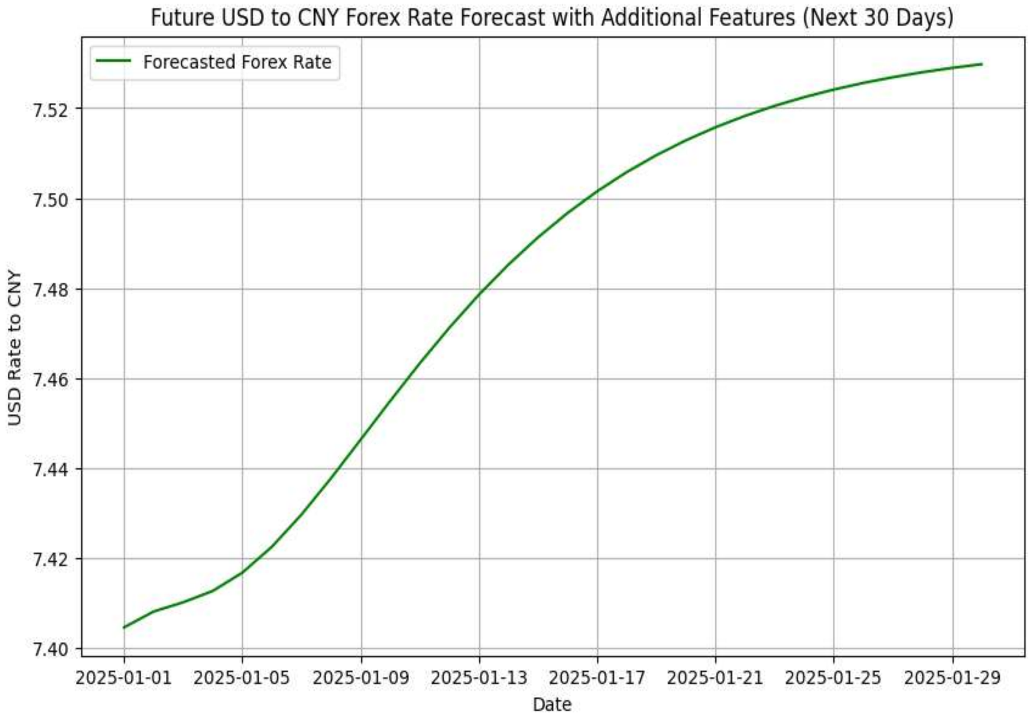


Figure 4.7 forecasting the future pairs USD/CNY rate