Data Analytics Project(Group 16)

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Currency Fluctuations and Trade Balance

Project Overview :

In this project, we will be analyzing how fluctuations in currency exchange rates impact a country's trade balance, which is the difference between the value of exports and imports.

Data Collection :

The historical **Exchange Rate Data** has been collected from financial database of **Yahoo Finance** (we have collected monthly data from 2019 to 2023).

Code for Exchange Rate Data Collection:

```
1
2  #pip install yfinance to install the yfinance library
3
4  import yfinance as yf
5
6  # Euro and USD has been defined as the currency pair
7  currency_pair = "EURUSD=X"
8
9  # Downloading the historical data
10 data = yf.download(currency_pair, start="2019-01-01", end="2024-01-01", interval
       ='1mo')
11
12 # Displaying the data
13 print(data.head())
14
15 # Saving data to CSV
16 data.to_csv('currency_data_monthly.csv')
```

The historical **Exchange Rate Data** has been collected from trade database of **UN Comtrade** (we have collected data from 2019 to 2023).

Reporters - Germany

Partners - USA, Puerto Rico and US Virgin Islands

Partner 2 - World

Modes Of Transport - All

Customs Codes - All

Literature Review :

Examine existing research on the connection between currency fluctuations and trade balance. Key concepts include the Marshall-Lerner condition and the J-curve effect, which explain how currency depreciation may initially lead to a deterioration in the trade balance, followed by eventual improvement.

Tools Technologies :

Data Cleaning - Python(Pandas & NumPy)

Data Visualization - Python(Matplotlib & Seaborn)

Code Implementation:

```python
# -*- coding: utf-8 -*-
"""
Created on Mon Nov  4 12:11:18 2024

@author: aksha
"""

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import statsmodels.api as sm
from datetime import datetime
#importing Datasets
trade_balance_data = pd.read_csv("C:/Users/aksha/Downloads/TradeData_DU_USA.csv")
currency_fluctuations_data = pd.read_csv("C:/Users/aksha/Downloads/
    currency_data_monthly.csv")

print(trade_balance_data.head())
print(currency_fluctuations_data.head())

#Converting refPeriodId to date time in Trade balance dataset
trade_balance_data['refPeriodId'] = pd.to_datetime(trade_balance_data['refPeriodId
    '], format='%Y%m%d')
#print(trade_balance_data['refPeriodId'])

#Converting refPeriodId to date time in Currency exchange dataset
currency_fluctuations_data['Date'] = pd.to_datetime(currency_fluctuations_data['
    Date']).dt.strftime('%Y-%m-%d')
#print(currency_fluctuations_data['Date'])

#Replacing missing values
trade_balance_data.ffill(inplace=True)
currency_fluctuations_data.ffill(inplace=True)

```

```
33  #adding new column refYear in Currency exchange dataset to join it with Trade Data
        dataset
34  currency_fluctuations_data['Date'] = pd.to_datetime(currency_fluctuations_data['
        Date'], errors='coerce')
35
36  currency_fluctuations_data['refYear'] = currency_fluctuations_data['Date'].dt.year
37  #print(currency_fluctuations_data['refYear'])
38
39  #Merging both data sets on refYear column
40  merged_data = pd.merge(trade_balance_data, currency_fluctuations_data, on='refYear
        ')
41  #print(merged_data.head())
42
43  # creating differnt Import and Export column for respective values
44  merged_data['primaryValue'] = merged_data['primaryValue'].round(4)
45  merged_data['Imports'] = merged_data.apply(lambda x: x['primaryValue'] if x['
        flowDesc'] == 'Import' else 0, axis=1)
46  merged_data['Exports'] = merged_data.apply(lambda x: x['primaryValue'] if x['
        flowDesc'] == 'Export' else 0, axis=1)
47  merged_data['Imports'] = merged_data['Imports'].round(4)
48  merged_data['Exports'] = merged_data['Exports'].round(4)
49  '''print(merged_data['Import'])
50  print(merged_data['Export'])'''
51
52  merged_data['TradeBalance'] = merged_data['Exports'] - merged_data['Imports']
53  print(merged_data['TradeBalance'])
54
55  merged_data.to_csv('merged_data.csv', index=False)
56
57
58  #visualizing the data
59
60  plt.figure(figsize=(14, 7))
61
62  #Displaying Trade Balance Over Time
63  plt.plot(merged_data['refPeriodId'], merged_data['TradeBalance'], label='Trade
        Balance', color='blue')
64  plt.title('Trade Balance Over Time')
65
66  plt.xlabel('refPeriodId')
67  plt.ylabel('Trade Balance')
68  plt.legend()
69  plt.show()
70
71  correlation_matrix = merged_data[['TradeBalance', 'Exports', 'Imports', 'Adj Close
        ']].corr()
72  sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
73  plt.title('Correlation Matrix')
74  plt.show()
75
76  X = merged_data[['Adj Close', 'Imports', 'Exports']]
77  y = merged_data['TradeBalance']
78
79  # Add a constant to the independent variables
80  X = sm.add_constant(X)
81
82  # Fit the regression model
83  model = sm.OLS(y, X).fit()
84
```

```
85  # Print the summary of the regression results
86  print(model.summary())
87
88  # Visualization of regression results
89  plt.figure(figsize=(14, 7))
90  plt.scatter(merged_data['Adj Close'], merged_data['TradeBalance'], color='blue',
        label='Data points')
91  plt.plot(merged_data['Adj Close'], model.predict(X), color='red', label='
        Regression line')
92  plt.title('Trade Balance vs. Exchange Rate')
93  plt.xlabel('Exchange Rate')
94  plt.ylabel('Trade Balance')
95  plt.legend()
96  plt.show()
97
98  # Reporting
99  # Save the analysis results to a CSV file
100 summary_df = pd.DataFrame({
101     'Date': merged_data['refPeriodId'],
102     'TradeBalance': merged_data['TradeBalance'],
103     'ExchangeRate': merged_data['Adj Close'],
104     'Exports': merged_data['Exports'],
105     'Imports': merged_data['Imports']
106 })
107
108 summary_df.to_csv('trade_analysis_summary.csv', index=False)
109 print("Analysis summary saved to 'trade_analysis_summary.csv'")
```

Conclusion :

This project can provide valuable insights into the mechanisms of international trade and currency markets, helping economists and policymakers understand how currency strategies can influence trade outcomes.