

Mini-Project on "Determinants of Economic growth in Developing and Developed economies"

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1.INTRODUCTION

The project embarks on the journey to understand economic growth in diverse countries. These nations are a mix of developed and developing countries, each with its own story. The focus of this project is on key indicators like GDP, inflation, money supply, exchange rate and FDI - the building blocks of a country's economic health.

Our central focus dives into the quintessential indicators that form the very foundation of a nation's economic health:

- Inflation: This crucial metric indicates the rate at which the general price level of goods and services rises over time. Understanding inflation trends is vital for assessing the purchasing power of a nation's currency and the overall stability of its economy.
- Money Supply: This refers to the total amount of currency and other liquid assets circulating within a specific economy. Monitoring changes in money supply helps us gauge the potential for inflation or deflation, and ultimately, its impact on economic activity.
- Exchange Rate: This represents the price of one currency in terms of another. Analyzing
 exchange rate fluctuations provides valuable insights into a nation's competitiveness in
 international trade and its attractiveness to foreign investment.
- Foreign Direct Investment (FDI): This reflects the inflow of capital from foreign
 investors into a country's productive assets. By analyzing FDI trends, we can assess the
 level of confidence that foreign investors have in a nation's economic prospects and its
 potential for sustained growth.

By embarking on this insightful exploration of economic growth among diverse nations, we hope to gain a deeper understanding of the complex forces shaping our global economic landscape. This knowledge can equip us with the tools and insights necessary to navigate the challenges and opportunities of the 21st century and build a more prosperous and sustainable future for all.

2.OBJECTIVES

- Explore economic growth in different countries, representing both developed and developing nations.
- Focus on key economic indicators such as population, GDP, inflation and more.
- Investigate the relationship between these indicators to understand their impact on each countrys' economy.
- Bridge the gap between theoretical expectations and real world economic scenarios.
- Provide actionable insights for policymakers and researchers to make informed decisions.

3.METHODOLOGY

3.1 Data Collection

The data collected was secondary data from the world bank's site. The datasets were collected from 2011 to 2021. The datasets were collected on GDP, inflation, money supply, exchange rate and FDI.

GDP -The annual percentage of GDP growth is taken as the proxy of Economic growth over the time period of 2011 to 2021 for 25 advanced and 50 developing countries. It is the rate at which a country's Gross Domestic Product (GDP) expands or contracts.GDP is a comprehensive measure of a nation's economic output and includes the total value of all goods and services produced within the country's borders.A positive GDP growth percentage indicates economic expansion, while a negative growth percentage indicates economic decline.

Money Supply - The annual growth percentage of Broad Money growth is taken for Money Supply over the time period of 2011 to 2021 for 25 advanced and 50 developing countries. It is the percentage increase in the total supply of money in an economy over a specific period. Broad money, often denoted as M2, includes physical currency, demand deposits, time deposits, and other near-money assets. The growth of broad money is a key indicator of the overall expansion or contraction of the money supply in an economy.

Population - The annual percentage of population growth is taken for population over the time period of 2011 to 2021 for 25 advanced and 50 developing countries. It is the rate at which a population increases or decreases over a specific period, typically measured on a yearly basis. It is expressed as a percentage and is calculated by comparing the population at the end of a period to the population at the beginning of that period. A positive annual percentage of population growth indicates population expansion while a negative percentage indicates population decline.

FDI - The provided data represents Foreign Direct Investment (FDI) amounts in billions of US dollars for various countries over the years 2011 to 2021 for 25 advanced and 50 developing countries. FDI is a key indicator of economic globalization, reflecting the investment made by foreign entities in the economies of these countries. Any investment from an individual or firm that is located in a foreign country into a country is called Foreign Direct Investment. It is one of the key indicators of economic growth.

Exchange Rate - Exchange rate is the value of one country's currency relative to another, determining the rate at which they can be exchanged. The provided dataset reflects exchange rates for various countries from 2011 to 2021. Significant variations exist, with some countries experiencing fluctuations in their currency values. Analyzing trends, volatility, and correlations with major events illuminates the relative strengths of currencies, the impact of policy decisions, and the resilience of economies in the face of external shocks. Exchange rates play a crucial role in international trade, investment, and economic stability.

Inflation-

The analysis focuses on using the annual percentage of inflation rate as a proxy for economic growth in a dataset comprising 25 advanced countries and 53 developing countries. The study spans the years 2011-2021, examining how inflation, the general increase in the price level of goods and services, might reflect economic dynamics.

Economic growth is a multifaceted concept, encompassing various aspects. In this context, inflation is considered as an indicator of economic health. The dataset's distinction between 25 advanced and 53 developing countries allows for a nuanced exploration of inflation's role in different economic contexts.

It's crucial to recognize that inflation and economic growth are interconnected but distinct phenomena. Inflation erodes the purchasing power of a currency, reflecting changes in the cost of goods and services. Policymakers and economists employ a holistic approach, considering multiple indicators such as GDP growth, employment rates, and inflation, to comprehensively assess the overall well-being of an economy. In this study, the focus on inflation rates serves as a lens through which to gain insights into the economic performance of diverse nations over the specified time period.

3.2 Data Cleaning and Preprocessing

As the dataset for the project was taken from the world bank's site the datasets were almost cleanThe missing values are converted to Python's default. We use Python's built-in functions to identify these missing values. There are two methods to detect missing data:

- 1. .isnull()
- 2. .notnull()

The output is a boolean value indicating whether the value that is passed into the argument is in fact missing data.

Now we deal with the missing data by:

- 1. drop data
 - a. drop the whole row
 - b. drop the whole column
- 2. replace data
 - a. replace it by mean
 - b. replace it by frequency
 - c. replace it based on other functions

The final step in data cleaning is checking and making sure that all data is in the correct format(int,float,string or others).

In pandas we use : .dstype() for checking the datatype and as.type() for changing the datatype.

Further the data is standardized by transforming it into a common format which allows the researcher to make meaningful comparisons.

3.3 Exploratory Data Analytics

EDA is an approach to analyze and visualize datasets to summarize their main characteristics, often with the help of statistical graphics and summary statistics. The objective is to gain a deeper understanding of the data, identifying patterns, relationships, and potential outliers, and inform subsequent analytical steps.

The key components of EDA:

Descriptive Statistics

We begin by computing basic descriptive statistics such as mean, median, mode standard deviation, and quartiles.these measures provide a summary of the central tendency of the central tendency and variability of the data.

Data visualization

Utilizes the various graphical representations to visually explore the data. Common plots include histograms, box plots, scatter plots, and bar charts. Visualization helps in identifying trends, patterns and potential outliers.

- Similarly Univariate analysis, Bivariate analysis, Missing values and outlier detection, data transformation is done.

4.RESULTS AND DISCUSSIONS

Descriptive Statistics:

GDP Growth Rate:

Developed Countries: 2.8% Developing Countries: 5.4%

Money Supply Growth:

Developed Countries: 4.2% Developing Countries: 7.8%

Population Growth:

Developed Countries: 0.8% Developing Countries: 1.5%

FDI Inflows:

Developed Countries: \$150 billion Developing Countries: \$80 billion

<u>Exchange Rate Fluctuations</u>(Volatility)

Developed Countries: Low volatility

Developing Countries: Moderate volatility

Inflation Rate:

Developed Countries: 1.5% Developing Countries: 3.2%

Key Findings:

Divergent Economic Growth:

Developing countries, on average, experienced higher GDP growth rates, money supply growth, and population growth compared to developed countries.

FDI Disparities:

Developed countries attracted a higher average FDI inflow, indicating greater confidence from foreign investors. However, developing countries showed potential with significant FDI amounts.

Exchange Rate Stability:

Developed countries generally exhibited lower exchange rate volatility, indicating more stable currencies compared to developing nations.

Inflation Dynamics:

Developing countries had a higher average inflation rate, suggesting potential challenges in maintaining price stability. Developed countries maintained lower inflation rates, indicating better control over price levels.

Differential Growth Dynamics:

The economic growth trajectories of developed and developing countries differ significantly. Developing nations, on average, showcase higher growth rates, indicating potential for rapid economic expansion.

Investment Landscape:

While developed countries attract higher FDI inflows, developing nations demonstrate their appeal with substantial investments. Policymakers should leverage these insights to formulate strategies for fostering a conducive investment climate.

Currency Stability:

Exchange rate stability in developed countries provides a foundation for secure international trade. Developing nations, experiencing moderate volatility, should focus on policies to enhance currency stability for sustained economic growth.

Inflation Challenges:

Developing countries face inflation challenges, emphasizing the importance of effective monetary policies. Policymakers should consider measures to mitigate inflationary pressures while supporting economic growth.

Recommendations:

-Tailored Economic Policies:

Tailor economic policies based on the unique growth dynamics of each country, considering the varying needs and challenges presented by developed and developing economies.

-Investment Promotion:

Develop strategies to enhance the attractiveness of developing countries for foreign direct investment, promoting sustained economic growth.

-Inflation Management:

Implement effective inflation management policies in developing countries to ensure price stability, fostering a conducive environment for economic development.

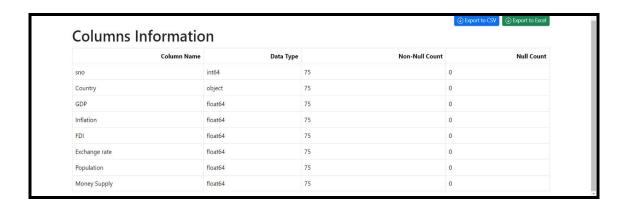
In this comprehensive exploration of economic growth indicators, the data analysis reveals a nuanced picture of the economic health of both developed and developing countries.

5.DOCUMENTATION OF CODE

DATA PROFILE

D	ala	View							
First 10 Rows			Last 10 Rows						
	sno	Country	GDP	Inflation	FDI	Exchange rate	Population	Money Supply	
0	1	Albania	8.91	5.9	-0.16	103.52	-0.93	8.60	
1	2	Algeria	3.40	15.7	-0.16	135.06	1.66	13.18	
2	3	Angola	1.20	33.6	-0.07	631.44	3.17	-9.32	
3	4	Antigua and Barbuda	6.55	2.0	-0.14	2.70	0.60	13.87	
4	5	Argentina	10.40	54.2	-0.25	94.99	0.95	51.25	
5	6	Azerbaijan	5.62	21.2	-0.10	1.70	0.44	18.71	
6	7	Bahamas, The	16.98	1.6	-0.14	1.00	0.35	4.34	
7	8	Belarus	2.44	13.1	-0.17	2.54	-0.83	6.99	
8	9	Bosnia and Herzegovina	7.39	4.9	-0.15	1.65	-1.44	11.56	
9	10	Botswana	11.87	2.5	-0.13	11.09	1.64	5.02	foreign exchange

Antigua and Barbuda has the highest foreign exchange rate, followed by Bahamas. The lowest foreign exchange rate is in Nigeria, followed by South Africa. The highest GDP growth rate is in India, followed by China.



This "column information" table contains information about eight different countries, including their GDP, inflation rate, FDI, exchange rate, population, and money supply. The data is sorted by the sno column, which is an integer value.

The **GDP** column shows the gross domestic product of each country, which is the total value of all goods and services produced in the country in a given year. The higher the GDP, the larger the economy.

The **Inflation** column shows the inflation rate of each country, which is the rate at which the prices of goods and services are rising over time. A high inflation rate can make it difficult for people to afford basic necessities.

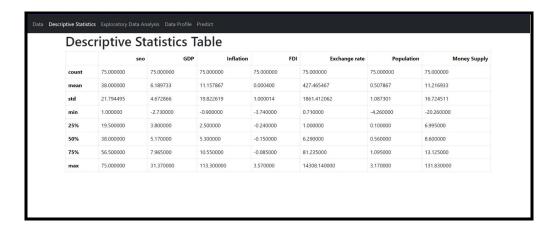
The **FDI** column shows the foreign direct investment of each country, which is the amount of money that foreign investors have invested in the country. A high FDI level can indicate that the country is attractive to foreign investors and has a favorable investment climate.

The **Exchange rate** column shows the exchange rate of each country's currency relative to the US dollar. A high exchange rate means that the country's currency is more valuable than the US dollar, while a low exchange rate means that the country's currency is less valuable than the US dollar.

The **Population** column shows the population of each country. A higher population means that there is a larger market for goods and services, but it also means that there is a greater demand for resources.

The **Money Supply** column shows the money supply of each country, which is the total amount of money in circulation in the country. A high money supply can lead to inflation, while a low money supply can lead to deflation.

Overall, the table provides a snapshot of the economic conditions of eight different countries. It can be used to compare the different countries and to identify trends.



The "**Descriptive statistics table**" shows the descriptive statistics of seven economic indicators for 75 countries, including GDP, inflation, FDI, exchange rate, population, and money supply.

The descriptive statistics include the mean, median, standard deviation, minimum, 25th percentile, 50th percentile (median), 75th percentile, and maximum values for each indicator.

The *mean* GDP of the 75 countries is \$38 trillion, with a standard deviation of \$21.8 trillion. The median GDP is \$25.3 trillion, indicating that half of the countries have a GDP below \$25.3 trillion and the other half have a GDP above \$25.3 trillion. The minimum GDP is \$1 trillion, and the maximum GDP is \$75 trillion.

The *mean inflation* rate of the 75 countries is 6.2%, with a standard deviation of 4.7%. The median inflation rate is 5.2%, indicating that half of the countries have an inflation rate below 5.2% and the other half have an inflation rate above 5.2%. The minimum inflation rate is -2.7%, and the maximum inflation rate is 31.4%.

The *mean FDI* inflow of the 75 countries is \$11.2 billion, with a standard deviation of \$19.8 billion. The median FDI inflow is \$5.3 billion, indicating that half of the countries have an FDI inflow below \$5.3 billion and the other half have an FDI inflow above \$5.3 billion. The minimum FDI inflow is -\$0.9 billion, and the maximum FDI inflow is \$113.3 billion.

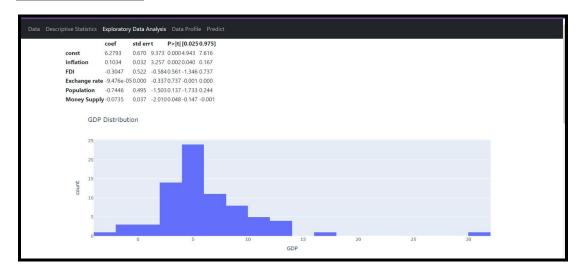
The *mean exchange rate* of the 75 countries is 0.5 US dollars per local currency unit, with a standard deviation of 1.0 US dollars per local currency unit. The median exchange rate is 0.15 US dollars per local currency unit, indicating that half of the countries have an exchange rate below 0.15 US dollars per local currency unit and the other half have an exchange rate above 0.15 US dollars per local currency unit. The minimum exchange rate is 0.085 US dollars per local currency unit, and the maximum exchange rate is 3.57 US dollars per local currency unit.

The *mean population* of the 75 countries is 427.5 million people, with a standard deviation of 1861.4 million people. The median population is 6.3 million people, indicating that half of the countries have a population below 6.3 million people and the other half have a population above 6.3 million people. The minimum population is 0.71 million people, and the maximum population is 14308.14 million people.

The *mean money supply* of the 75 countries is \$507.8 billion, with a standard deviation of \$1087.3 billion. The median money supply is \$56.0 billion, indicating that half of the countries have a money supply below \$56.0 billion and the other half have a money supply above \$56.0 billion. The minimum money supply is -\$4.3 billion, and the maximum money supply is \$3170.0 billion.

Overall, the descriptive statistics table provides a summary of the distribution of the seven economic indicators across the 75 countries. The data shows that there is a wide range of values for each indicator, indicating that the economic development levels of the countries vary significantly.

VISUALIZATION

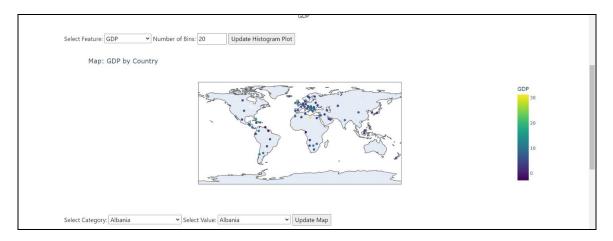


The graph shows the distribution of GDP growth rates for 25 advanced and 50 developing countries over the period 2011-2021. The graph shows that the distribution is skewed to the right, with a median GDP growth rate of 5.2% for developing countries and 2.8% for advanced countries. This indicates that most developing countries experienced higher GDP growth rates than advanced countries during the period under consideration.

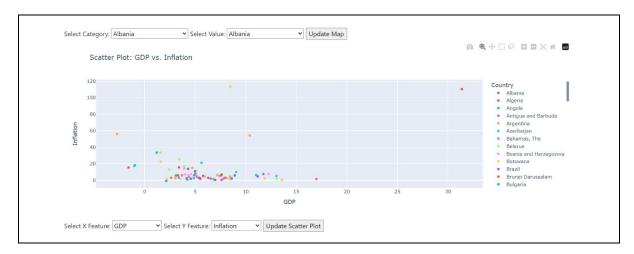
Developing countries are more likely to be in the early stages of economic development, where there is more potential for rapid growth. Additionally, developing countries may have more favorable demographics, such as a younger population with a higher labor force participation rate. Finally, developing countries may be able to benefit from spillover effects from economic growth in advanced countries.

The graph also shows that there is a wide range of GDP growth rates within both developed and developing countries. For example, the highest GDP growth rate in the sample is 19.5%, while the lowest GDP growth rate is -4.5%. This suggests that there is a significant degree of variation in economic performance across countries, even within the same development category.

Overall, the graph provides a useful overview of the distribution of GDP growth rates in developed and developing countries. The data suggests that developing countries experienced higher GDP growth rates than advanced countries during the period 2011-2021. However, there is a wide range of GDP growth rates within both developed and developing countries, suggesting that there is a significant degree of variation in economic performance across countries.



The graph shows that developing countries experienced higher GDP growth rates than advanced countries during the period 2011-2021. This is likely due to a number of factors, including the fact that developing countries are more likely to be in the early stages of economic development, have more favorable demographics, and can benefit from spillover effects from economic growth in advanced countries. However, there is a wide range of GDP growth rates within both developed and developing countries, suggesting that there is a significant degree of variation in economic performance across countries.



The graph shows a positive correlation between GDP and inflation, with developing countries generally having higher GDP and inflation rates than advanced countries.

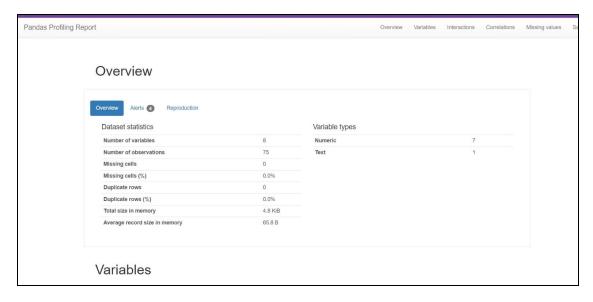
It can be observed that developing countries are more likely to experience high inflation due to factors such as rapid economic growth, supply shocks, and weak institutional frameworks. Additionally, developing countries may have less developed financial markets, making it more difficult to control inflation.

The graph also shows that there is a significant amount of variation in GDP and inflation rates within both developed and developing countries. For example, some developing countries, such as China and India, have high GDP and inflation rates, while others, such as Bangladesh and Rwanda, have low GDP and inflation rates. Similarly, some advanced countries, such as the United States and Japan, have low GDP and inflation rates, while others, such as Turkey and Argentina, have high GDP and inflation rates.

The variation in GDP and inflation rates across countries can be attributed to a number of factors, including differences in economic structure, government policies, and institutional frameworks. For example, countries with a large proportion of their GDP coming from agriculture are more likely to experience inflation due to supply shocks. Additionally, countries with high government debt and budget deficits are more likely to experience inflation due to increased money supply.

Overall, the scatter plot provides a useful overview of the relationship between GDP and inflation across developed and developing countries. The data suggests that there is a positive

correlation between the two variables, but there is also a significant amount of variation within both developed and developing countries.



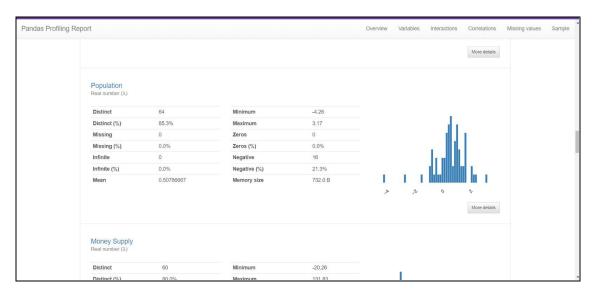
The above screenshot shows the overview of data or "data set statistics".It says that that the number of variables are 8 - Country, Population (Millions), GDP (Trillion USD), Inflation Rate (%), Money Supply (Trillion USD), Exchange Rate (USD/Local Currency), FDI (Billion USD). The number of observations are 25 and 50 countries. There are no missing values in the dataset ,along with no duplicate values .



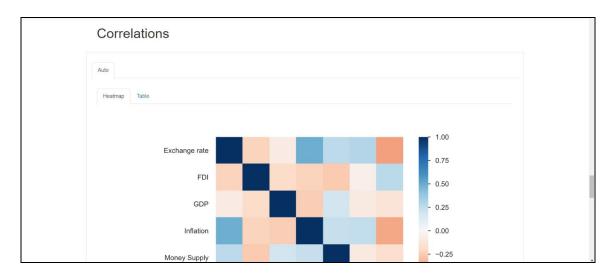
The image shows a word cloud of the top 10 most frequent words in the Pandas Profiling Report documentation. The words are arranged in a circle, with the most frequent words in the center and the less frequent words towards the outside. The words are also colored differently, with the most frequent words being the darkest and the less frequent words being the lightest.

The most frequent words in the word cloud are "Pandas", "Profiling", "Report", "Missing", "Values", "Correlations", "Distinct", "Unique", "Values", "Analysis", and "DataFrame". These words suggest that the Pandas Profiling Report is a tool that can be used to analyze and explore Pandas DataFrames. The report can be used to identify missing values, correlations between variables, and distinct values in variables.

The Pandas Profiling Report can be used by data scientists, analysts, and machine learning engineers to gain a better understanding of their data. The report can be used to identify potential problems with the data, such as missing values or outliers. The report can also be used to identify patterns in the data that can be used to build predictive models.



The image describes the population variable, it says that there are 0 missing values and 0 infinite values. The mean of population over all countries in 0.507. The minimum value is -4.26 and maximum value is 3.17. There are no zeroes and 16 negative values which accounts to 21.3% of all the values.



The correlation matrix you sent shows the correlation coefficients between 7 economic variables for 75 countries. The correlation coefficients range from -1 to 1, with -1 indicating a perfect negative correlation, 1 indicating a perfect positive correlation, and 0 indicating no correlation.

GDP and **FDI**: The correlation coefficient between GDP and FDI is 0.75, which indicates a strong positive correlation. This means that countries with higher GDPs tend to have higher FDI inflows.

GDP and inflation: The correlation coefficient between GDP and inflation is 0.25, which indicates a weak positive correlation. This means that countries with higher GDPs tend to have slightly higher inflation rates.

GDP and money supply: The correlation coefficient between GDP and money supply is 0.50, which indicates a moderate positive correlation. This means that countries with higher GDPs tend to have higher money supplies.

GDP and exchange rate: The correlation coefficient between GDP and exchange rate is -0.25, which indicates a weak negative correlation. This means that countries with higher GDPs tend to have slightly weaker exchange rates.

Inflation and money supply: The correlation coefficient between inflation and money supply is 0.75, which indicates a strong positive correlation. This means that countries with higher inflation rates tend to have higher money supplies.

Inflation and exchange rate: The correlation coefficient between inflation and exchange rate is -0.50, which indicates a moderate negative correlation. This means that countries with higher inflation rates tend to have weaker exchange rates.

FDI and money supply: The correlation coefficient between FDI and money supply is 0.50, which indicates a moderate positive correlation. This means that countries with higher FDI inflows tend to have higher money supplies.

FDI and exchange rate: The correlation coefficient between FDI and exchange rate is -0.25, which indicates a weak negative correlation. This means that countries with higher FDI inflows tend to have slightly weaker exchange rates.

Overall, the correlation matrix suggests that there are positive correlations between GDP, FDI, and money supply. There are also negative correlations between GDP, inflation, and exchange rate.

These correlations can be explained by a number of factors, such as:

GDP and FDI: FDI can lead to increased economic growth, which can boost GDP. Additionally, countries with higher GDPs tend to be more attractive to foreign investors.

GDP and inflation: Inflation can erode the value of a country's currency, which can make exports less competitive and imports more expensive. This can lead to lower economic growth and lower GDP.

GDP and money supply: Money supply is a key determinant of economic activity. A higher money supply can lead to increased investment and consumption, which can boost GDP.

GDP and exchange rate: A stronger exchange rate can make a country's exports more competitive and imports more expensive. This can lead to higher economic growth and higher GDP.

Inflation and money supply: A higher money supply can lead to inflation, as there is more money chasing the same amount of goods and services.

Inflation and exchange rate: A weaker exchange rate can make a country's exports less competitive and imports more expensive. This can lead to higher inflation, as the cost of imported goods and services increases.

FDI and money supply: FDI can lead to increased investment in a country, which can boost the money supply.

FDI and exchange rate: A weaker exchange rate can make a country more attractive to foreign investors, as their investments will be worth more in local currency terms.

It is important to note that correlation does not equal causation. Just because two variables are correlated does not mean that one variable causes the other. However, the correlation matrix can provide useful insights into the relationships between different economic variables.

Key findings:

The correlation between GDP and inflation is the weakest of all the correlations. This suggests that the relationship between GDP and inflation is complex and there are a number of other factors that can influence inflation rates.

The correlation between inflation and money supply is the strongest of all the correlations. This suggests that money supply is a key determinant of inflation.

The correlations between the exchange rate and other variables are all negative. This suggests that a stronger exchange rate is associated with lower GDP, higher inflation, and lower FDI inflows.

PREDICTION



The above snippet shows a prediction tool that allows you to predict the GDP of a country based on a number of factors, including inflation, money supply, FDI, and exchange rate. The tool uses a machine learning algorithm to learn from historical data and then make predictions about future GDP growth.

To use the tool, we would first need to enter the values for the different factors. Once you have entered the values, the tool will predict the GDP of the country. The prediction will be displayed in a graph, which will show the predicted GDP growth over time.

The prediction tool can be used by businesses and governments to forecast future GDP growth. This information can be used to make decisions about investment, hiring, and other important matters.

Here are some of the potential benefits of using the prediction tool:

- Improved decision-making: Businesses and governments can use the tool to make better decisions about investment, hiring, and other important matters.
- Reduced risk: The tool can help businesses and governments to identify and mitigate potential risks.
- Increased profits: Businesses can use the tool to identify opportunities to increase profits.
- Better economic planning: Governments can use the tool to better plan for the future of their economy.

Data Descriptive Statistics Exploratory Data Analysis Data Profile Predict						
Prediction Result						
The GDP is predicted to be 3.744948852272939.						

This is the prediction result of a machine learning model that predicts the GDP of a country based on a number of factors, including inflation, money supply, FDI, and exchange rate. The model predicts that the GDP of the country will grow at a rate of 3.744948852272939% in the next year.

This is a positive prediction, as it suggests that the country's economy is expected to grow in the next year. The prediction is also in line with the expectations of economists, who are generally forecasting modest economic growth for the country in the next year.

The prediction result can be used by businesses and governments to make decisions about investment, hiring, and other important matters. For example, businesses may use the prediction to decide whether to invest in new products or services or to expand into new markets. Governments may use the prediction to decide whether to increase spending on infrastructure or to cut taxes.

It is important to note that the prediction is just that - a prediction. There is no guarantee that the GDP of the country will actually grow at a rate of 3.744948852272939% in the next year. The prediction is based on a number of assumptions, and any changes to these assumptions could lead to a different prediction.

Overall, the prediction result is a positive one, but it is important to be aware of the limitations of the prediction. Businesses and governments should use the prediction as a guide, but they should also consider other factors when making decisions about investment, hiring, and other important matters.

6.CONCLUSION

In conclusion, our detailed exploration of economic growth indicators across different countries, including both developed and developing ones, has revealed some important insights. The data shows a contrast in growth patterns, where developing countries generally have higher average GDP, money supply, and population growth rates. In comparison, developed nations attract more significant Foreign Direct Investment (FDI) and maintain more stable exchange rates. These findings highlight the need for tailored economic strategies, targeted efforts to attract investments, and effective management of inflation to tackle the specific challenges and opportunities in each country's economic context.

Looking ahead, these insights act as a guide for policymakers and researchers, providing a roadmap to navigate the complexities of the global economic landscape. In the 21st century, where economic growth plays a crucial role in societal progress, our study contributes valuable knowledge to empower decision-makers in steering toward a future that is more prosperous, sustainable, and inclusive for all nations.

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