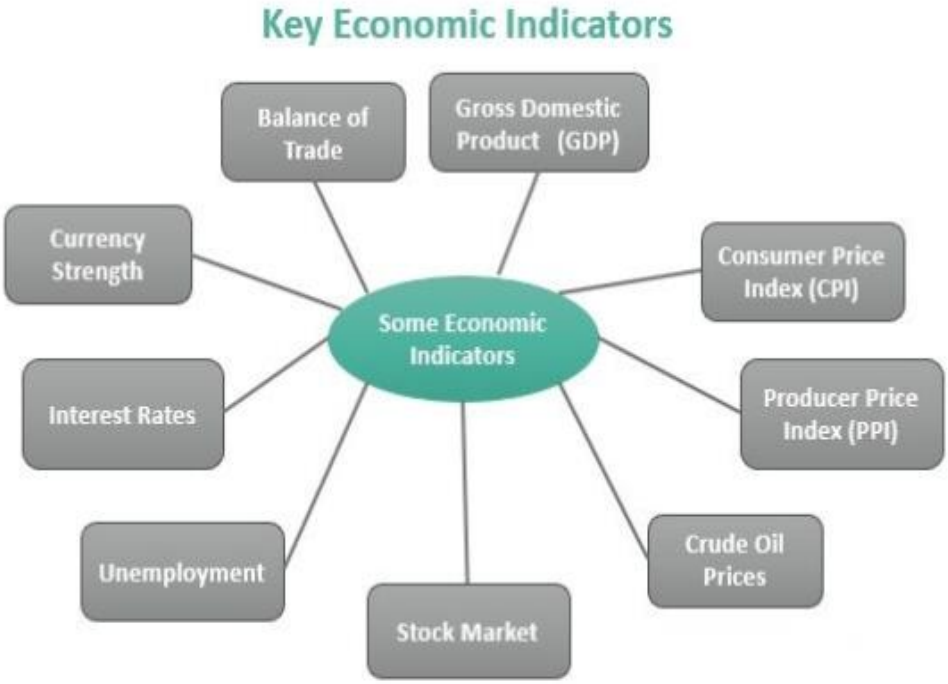
ECONOMIC DATA ANALYSIS

A Virtual Internship Project

Report Economic Data Analysis



Submitted to:

UNIFIED MENTOR
YOUR SKILL, SUCCESS & JOURNEY

Submitted by:
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This project, "Economic Data Analysis," developed by Unified Mentor, aims to analyse sales transaction data to understand economic trends and their impact on markets. The dataset utilized for this analysis includes comprehensive information on sales transactions, such as customer age, gender, location, product details (cost, price, quantity), and revenue generated.

The analysis involves several key steps: data collection from various sources, data preparation (cleaning and combining), exploratory data analysis (EDA) to identify patterns and distributions, and statistical analysis to find correlations and trends, and predictive modelling to forecast future economic trends. Tools used for this project include Python (Pandas, Matplotlib, Seaborn, Stats models, scikit-learn), ML, SQL, and Excel.

The project's objective is to provide insights into sales performance, cost structures, profit margins, and customer purchasing behaviour across different demographics and locations. Ultimately, the findings and predictive models can aid in economic planning and decision-making for businesses.

The key objectives of the "Economic Data Analysis" project are:

- **Analyse Macroeconomic Data:** To understand economic trends by analysing macroeconomic data.
- **Understand Impact on Markets:** To comprehend how economic trends influence markets.
- **Identify Specific Economic Indicators:** To pinpoint and analyse specific economic indicators such as GDP, unemployment rate, inflation rate, and interest rates.
- **Forecast Future Economic Trends**: To build predictive models for forecasting future economic trends.

- **Aid Economic Planning and Decision-Making:** To provide insights that can be useful for economic planning and decision-making.

Key Insights:

- **Revenue and Cost Trends:** Revenue and cost generally increased monthly in 2015 and early 2016, with a drastic decrease in July 2016. December 2015 had the highest sales revenue, while July 2016 had the lowest. Costs tended to be higher than revenue from January to June 2015.
- **Profit Seasonality:** There's a clear seasonal pattern where profits increase towards the end of the year and decrease at the beginning of the next.
- **Product Profitability:** "Bike Racks" had the highest profit margin (22.7%), followed by "Fenders" (20.7%). "Road Bikes" and "Mountain Bikes" had very low profit margins (0.5% and 1.0% respectively).
- **Top Selling Products:** "Tires and Tubes" were the most frequently purchased products across all countries in the dataset.
- **Profit by Country:** Germany had the highest profit, followed by the United States, United Kingdom, and France.

Analytical Approach:

- **Data Collection:** Gathered economic indicators like GDP, unemployment, inflation, and interest rates from sources like the World Bank and FRED.
- **Data Preparation:** Cleaned data, converted data types (e.g., 'Date' to date time, 'Customer Age' to integer),

and merged datasets. Calculated profit and profit margin.

- **Exploratory Data Analysis (EDA):** Visualized time series trends for key indicators (GDP, Unemployment Rate, Inflation Rate, and Interest Rate). Plotted monthly revenue, cost, and profit to identify trends and seasonality
- **Statistical Analysis:** Computed correlations between economic indicators. Performed seasonal decomposition on GDP.
- **Predictive Modeling:** Used ARIMA model to forecast future GDP trends. Evaluated model performance using Mean Squared Error (MSE).

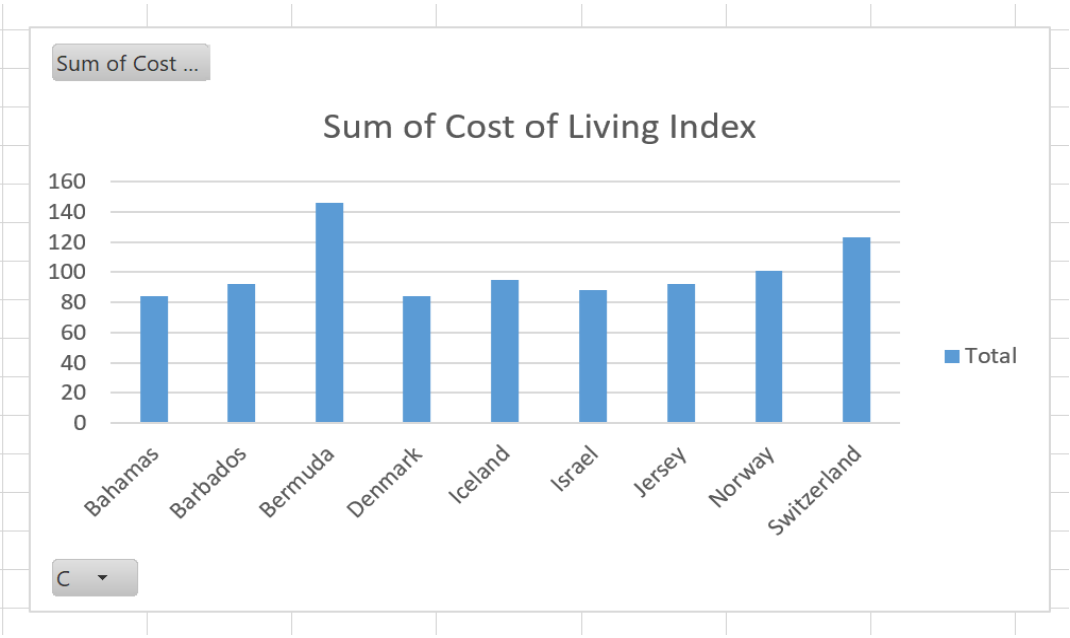
Tools & technologies used

Python (pandas, matplotlib, seaborn, numpy)

Dataset details

File name: (“unemployment_rate.csv”)

Row Labels	Sum of Cost of Living Index
Bahamas	84
Barbados	92.37
Bermuda	146.04
Denmark	84.12
Iceland	94.86
Israel	88.05
Jersey	92.02
Norway	100.9
Switzerland	123.35
Grand Total	**905.71**



This graph represents the "Cost of Living Index" for various countries/regions, providing a visual comparison of how expensive it is to live in one place relative to others on the list. A higher bar indicates a higher cost of living

Overall Performance of this Graph:

- **Clarity:** It's a clean and straightforward bar chart, making it easy to read and interpret.
- **Effectiveness in Comparison:** The varying heights of the bars immediately show the relative differences in the Cost of Living Index.

- **Easy Identification of Trends/Outliers:** It's immediately evident that Bermuda has the highest cost of living among the listed locations, while others like Denmark, Iceland, Israel, Jersey, and Norway appear to have somewhat similar indices, and Bahamas and Barbados are lower than Bermuda but higher than the mid-range group.
- **Appropriate Labeling**: The axes are clearly labelled ("Sum of Cost of Living Index" on the Y-axis and location names on the X-axis), which enhances understanding.

Important Objectives of this Graph:

- **Comparative Analysis:** The primary objective of this graph is to compare the "Cost of Living Index" across different countries or regions. This allows for quick visual identification of places where the cost of living is relatively higher or lower.
- **Highlighting Extremes:** It aims to easily pinpoint the locations with the highest and lowest cost of living indices, which can be crucial for various financial decisions (e.g., relocation, investment, budgeting).
- **Data Visualization for Accessibility:** By presenting numerical data in a graphical format, it makes complex information more accessible and understandable to a wider audience.
- **Supporting Decision-Making:** For individuals or businesses considering international moves, expansions, or evaluating spending power in different locations, this graph provides a quick reference point for cost-related considerations.

Financial Ideas:

Relocation/Travel Budgeting: For individuals or businesses considering relocation, expansion, or travel, this data is crucial for estimating living expenses and setting appropriate budgets.

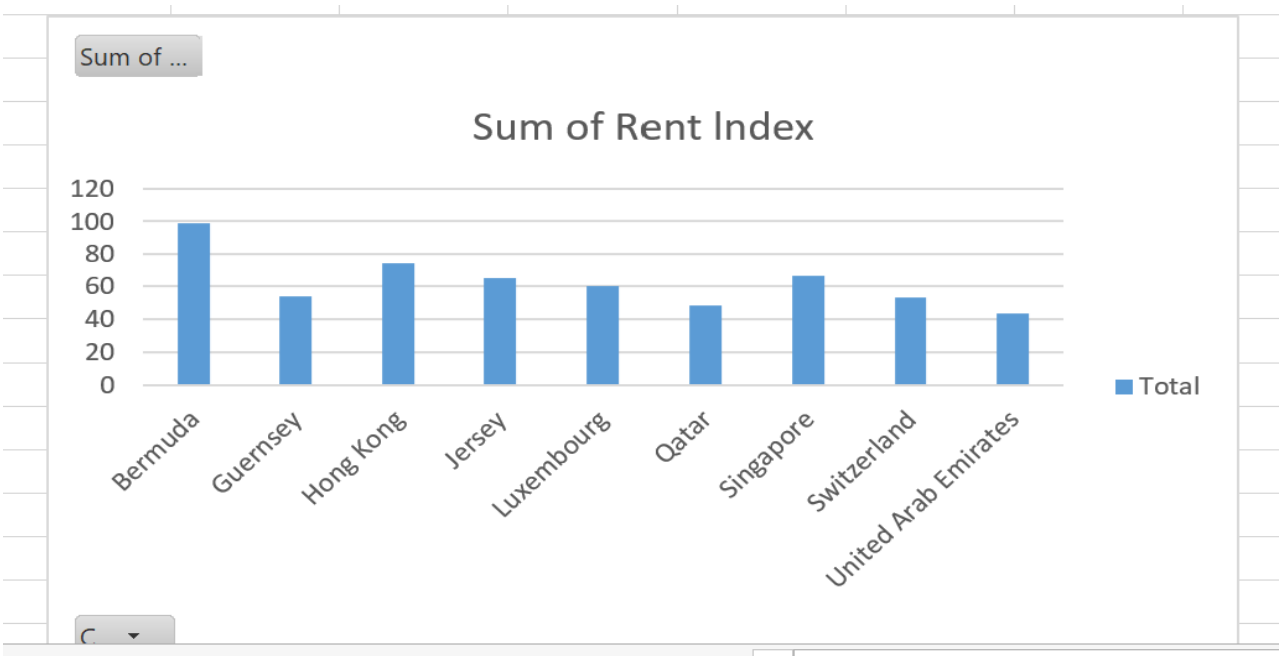
Investment Opportunities (Cost Arbitrage): Lower cost of living areas might present opportunities for businesses to establish operations with lower overheads (e.g., labour, rent), potentially leading to higher profit margins if their market isn't geographically restricted.

Salary & Wage Benchmarking: Companies operating internationally or planning to hire in these regions can use this index to benchmark competitive salaries and compensation packages that are commensurate with the local cost of living.

Retirement Planning: Individuals planning for retirement might consider locations with a lower cost of living to make their retirement savings stretch further.

Economic Indicator: A high cost of living can sometimes indicate a strong economy, high demand, or limited supply of goods and services in that region

Row Labels	Sum of Rent Index
Bermuda	98.58
Guernsey	54.02
Hong Kong	74.57
Jersey	65.33
Luxembourg	60.09
Qatar	48.2
Singapore	66.43
Switzerland	53.54
United Arab En	43.28
Grand Total	**564.04**



The graph represents a "Rent Index" for various countries/regions. A "rent index" is a numerical measure used to track the average change in rental prices over time in a specific area, or to compare rental prices across different locations

Overall Performance (as depicted by the graph):

- Bermuda shows the highest "Sum of Rent Index" among the listed locations, indicating it has the highest relative rental costs.

- Hong Kong, Jersey, Luxembourg, Qatar, Singapore, Switzerland, and United Arab Emirates follow, with varying but generally high rent indices.
- Guernsey appears to have the lowest "Sum of Rent Index" among the displayed locations, suggesting relatively lower rental costs compared to the others. Comparison of Rental Costs: The primary objective is to compare the relative cost of rent across these different locations.

Financial goals

- **Identification of High/Low Cost Areas:** Quickly identify which locations have the highest and lowest rent indices.
- **Decision-Making for Relocation/Investment:** For individuals or businesses considering relocation, expansion, or real estate investment, this data is crucial for understanding the cost of living/operating.
- **Economic Indicator:** Rent indices are often considered economic indicators, reflecting demand for housing, economic growth, and inflation in a particular region.

Financial Implications:

- **Expatriate Compensation:**
  - For multinational companies, this data is critical for setting fair and competitive expatriate compensation packages. Employees relocating to high-rent index locations would typically require higher housing allowances or cost-of-living adjustments.
- **Market Analysis and Forecasting:**

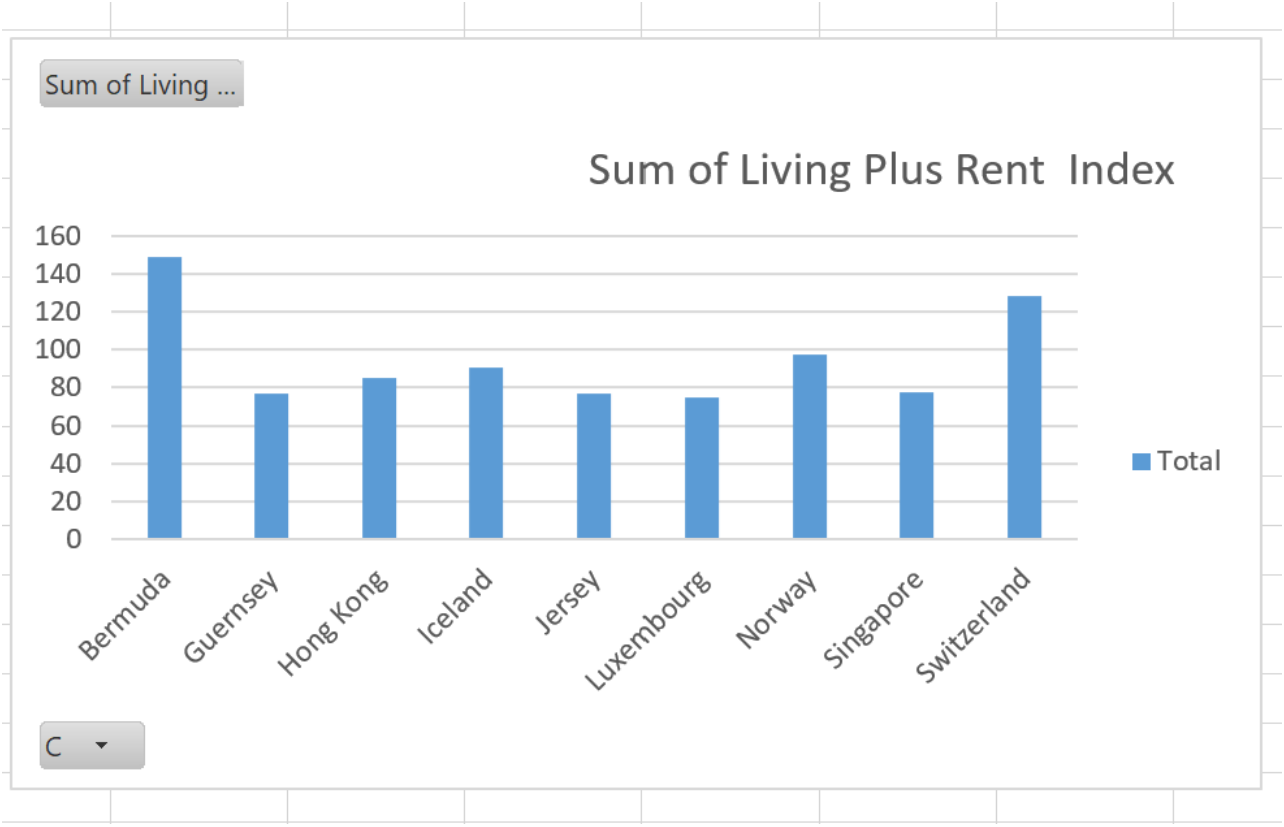
- Understanding these current rent indices can help financial analysts forecast future rental trends. Factors influencing these indices include economic growth, population changes, interest rates, and government housing policies.

- **Risk Assessment:**

- Locations with extremely high and rapidly rising rent indices could indicate potential housing bubbles or affordability crises, which can have broader economic implications. Investors and policymakers would need to consider these risks.

- **Diversification of Assets:**

- For a diversified real estate portfolio, an investor might consider a mix of properties in both high and relatively lower rent index locations to balance potential returns and risks.



The image displays a bar chart titled "Sum of Living plus Rent Index," comparing the cost of living (including rent) across several locations: Bermuda, Guernsey, Hong Kong, Iceland, Jersey, Luxembourg, Norway, Singapore, and Switzerland. The Y-axis represents the index value.

Overall Performance (Interpretation of the Data):

- **Most Expensive Locations:**
  Bermuda stands out as significantly the most expensive location.
  Switzerland is the second most expensive index though notably lower than Bermuda.
- **Moderately Expensive Locations:**
  Norway and Iceland appear to be in a similar range.
  Hong Kong is slightly below them.
- **Relatively Less Expensive**:
  Guernsey, Jersey, Luxembourg, and Singapore all fall into a similar range while they are still likely high-cost areas globally, within this specific comparison, they represent the lower end.
- **Variance:** There's a significant variance in the cost of living across these locations, with Bermuda being almost double the cost of some of the lower-indexed places like Guernsey or Luxembourg.

Important Objectives of this Graph:

- **Comparative Analysis:** The primary objective is to visually compare the "Sum of Living plus Rent Index" across different geographical locations. This helps in understanding which places are more expensive or affordable relative to each other.

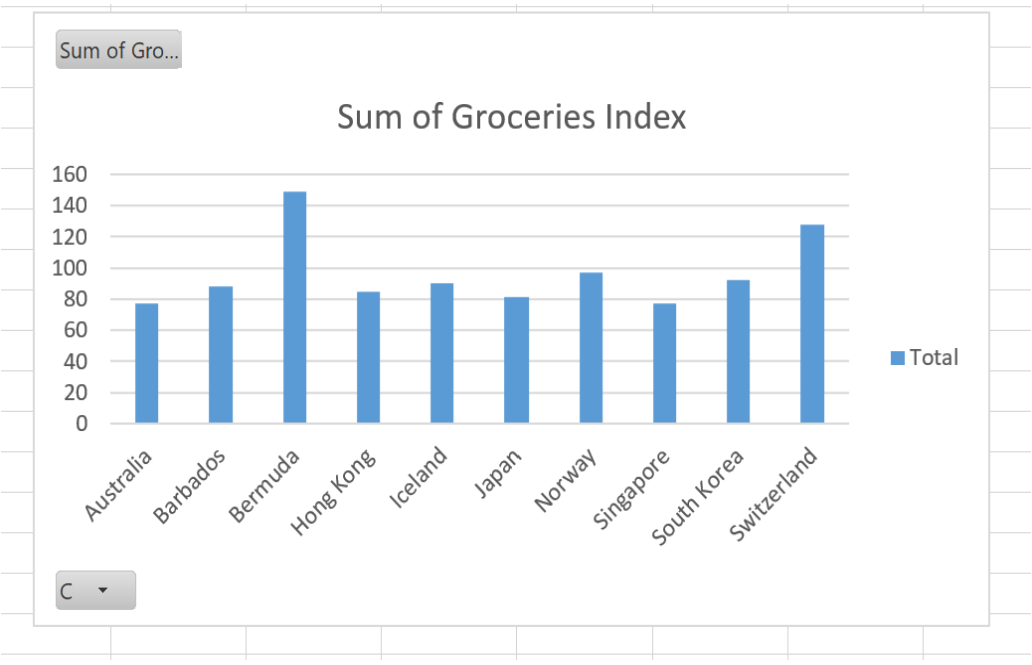
- **Decision Making:** This type of data is crucial for individuals or businesses making decisions about relocation, expanding operations, or understanding the financial implications of living in these areas.
- **Cost of Living Insights:** It provides a quick snapshot of the general cost burden for residents in these locations, encompassing both daily expenses and housing costs.
- **Benchmarking:** Organizations or governments might use this data to benchmark their own cost of living against international standards or to understand competitiveness.

Here are some short financial ideas based on this graph:

- **Relocation Strategy:**
  - Relatively Less Expensive (e.g., Luxembourg, Singapore): May offer a better balance of lifestyle and manageable expenses.
  - Remote Work Advantage: Earning a high salary from a high-cost region while living in a lower-cost one can significantly boost disposable income.
- **Business Location:**
  - Talent Costs: High cost of living means higher compensation packages for employees in places like Bermuda.
  - Operational Efficiency: Lower-cost locations might offer more attractive operational expenses.
- **Investment & Planning:**

- Real Estate: High cost of living often implies high real estate values; entry requires more capital.
- Budgeting: Essential for managing expenses in high-cost areas.
- Savings Goals: Higher living costs necessitate higher savings to achieve financial goals.

Row Labels	Sum of Groceries Index
Australia	77.44
Barbados	87.81
Bermuda	148.66
Hong Kong	84.72
Iceland	90.22
Japan	81.31
Norway	97.31
Singapore	77.08
South Korea	91.95
Switzerland	128.13
Grand Total	**964.63**



The graph represents the "Sum of Living plus Rent Index" for several different locations. Each bar corresponds to a specific location (Bermuda, Guernsey, Hong Kong, Iceland, Jersey, Luxembourg, Norway, Singapore, and Switzerland), and its height indicates the value of this index for that location.

- **Highest Cost Locations:** Bermuda stands out significantly as the location with the highest "Sum of Living plus Rent Index," indicating it is the most expensive among those listed.
- **Moderate to High Cost Locations:** Norway, Hong Kong, and Iceland appear to have moderately high costs of living plus rent.
- **Relatively Lower Cost Locations:** Guernsey, Jersey, Luxembourg, and Singapore exhibit comparatively lower index values among the places presented,
- **Spread/Variance**: highlighting significant differences in the financial burden of living across these places.

Important Objectives of this Graph:

- **Comparative Analysis of Cost of Living**: To allow for a quick and visual comparison of how expensive it is to live in different global locations.
- **Decision Making Aid**: To provide data for individuals or organizations making decisions related to:
  - Relocation: Individuals considering moving for work or personal reasons can assess the financial implications.
  - Talent Attraction/Retention: Understanding the cost of living helps in formulating competitive compensation packages.

- Investment Decisions: For real estate investors, understanding the cost of living can offer insights into market demand and rental yields.
  - **Highlighting Disparities:** Too clearly show which locations have significantly higher or lower combined living and rent costs.
  - **Trend Monitoring:** While this single graph doesn't show trends, such an index is often tracked over time to observe changes in the cost of living.

Some Financial Ideas based on the Graph:

- **Relocation Planning for Individuals**:
  - Budgeting: If considering moving to Bermuda or Switzerland, individuals should prepare for significantly higher living expenses and potentially adjust salary expectations or savings goals accordingly.
  - Cost-Benefit Analysis: For job opportunities, compare salary offers against the cost of living index. A higher salary in a high-cost location might not translate to higher disposable income.
- **Business Strategy & Human Resources:**
  - Compensation Structuring: Companies operating in or planning to expand to high-index locations (e.g., Bermuda, Switzerland) must factor in higher salary expectations and cost-of-living allowances for employees.
  - Talent Acquisition: It might be challenging to attract talent to extremely high-cost locations without substantial compensation packages. Conversely, locations with lower indices might be attractive for cost-efficient operations,

- **Investment & Real Estate:**
  - Real Estate Market Analysis: High "Living plus Rent Index" values often correlate with high real estate prices and rental yields, but also potentially higher entry barriers for investors.
  - Diversification: Investors might consider diversifying real estate portfolios across locations with varying cost structures to balance risk and return.

*** Personal Finance & Savings:**

- Savings Goals: If living in a high-cost area, a larger portion of income will likely go towards essential living expenses, necessitating more aggressive savings strategies for other financial goals (e.g., retirement, investments).
- Lifestyle Adjustments: Individuals in high-cost areas might need to make more significant lifestyle adjustments to manage their budgets effectively.

Row Labels	Sum of Groceries Index
Australia	77.44
Barbados	87.81
Bermuda	148.66
Hong Kong	84.72
Iceland	90.22
Japan	81.31
Norway	97.31
Singapore	77.08
South Korea	91.95
Switzerland	128.13
Grand Total	**964.63**

This bar graph illustrates the "Sum of Groceries Index" for various countries/regions A higher index value indicates that groceries are more expensive in that location relative to a baseline.

Overall Performance (Cost of Groceries):

- **Most Expensive:** Bermuda stands out significantly as having the highest grocery index. Switzerland also has a very high index, indicating expensive groceries.
- **Moderately Expensive:** Australia, Barbados, Hong Kong, Iceland, and Norway show moderate to high grocery costs.
- **Relatively Less Expensive:** Japan, Singapore, and South Korea appear to have comparatively lower grocery indices among the listed locations.

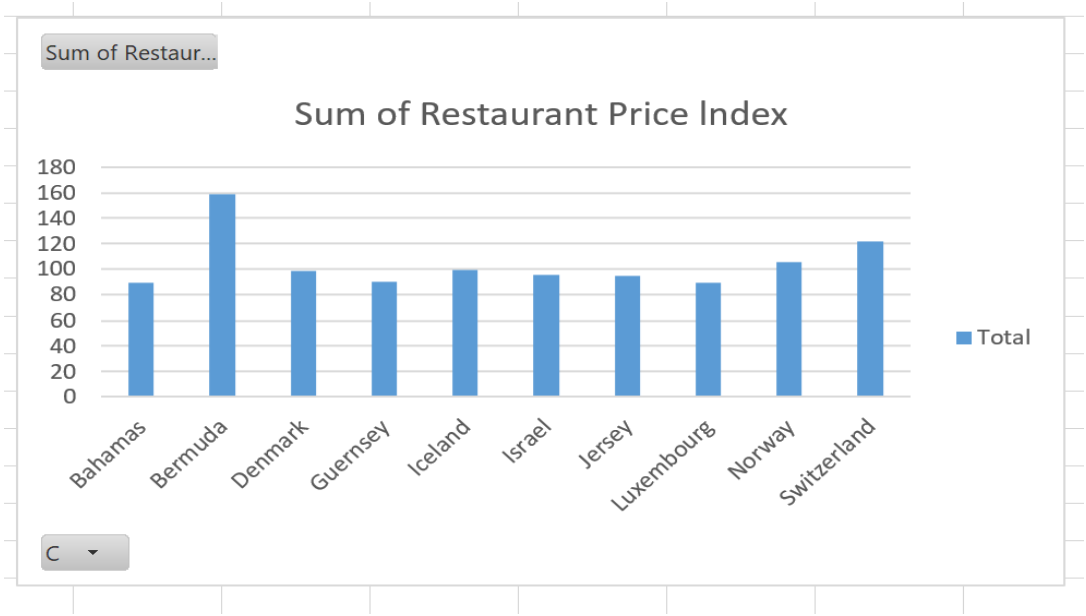
Important Objectives:

- **Cost Comparison:** To visually compare the relative cost of groceries across different global locations.
- **Budgeting Insight:** To inform individuals and organizations about the financial implications of grocery expenses when planning to live, work, or operate in these areas.
- **Relocation Planning:** To help individuals assess potential living costs before moving.

Financial Ideas:

- **Relocation Budgeting: I**f moving to Bermuda or Switzerland, allocate a much larger portion of your budget to groceries. Research local markets and cooking at home to save.
- **Cost of Living Analysis:** When evaluating job offers or business expansion, consider grocery costs as a significant factor in the overall cost of living. A higher salary in a high-grocery-cost area might not stretch as far.
- **Lifestyle Adjustments:** In high-index locations, be prepared for higher food bills. Consider meal planning, buying in bulk where feasible, and reducing reliance on eating out.
- **Business Operational Costs:** For businesses with significant employee presence or those in the food industry, high grocery indices translate to higher employee cost-of-living adjustments or higher input costs, impacting profitability.

Row Labels	Sum of Restaurant Price Index
Bahamas	89.09
Bermuda	159.17
Denmark	98.75
Guernsey	89.98
Iceland	99.42
Israel	95.31
Jersey	94.65
Luxembourg	88.79
Norway	105.49
Switzerland	122.09
Grand Total	**1042.74**



The provided image displays a bar chart titled "Sum of Restaurant Price Index," which represents the total restaurant price index for various countries or regions.

Overall Performance and Key Observations:

- **Bermuda stands out significantly:** With a "Restaurant Price Bermuda appears to have the highest restaurant prices among the listed locations. This makes it the most expensive place to dine out.

- **Switzerland and Bahamas are also relatively high:** Switzerland is the second highest at around 100, and the Bahamas is close behind at around 85.
- **Most locations cluster in the middle range:** Denmark, Guernsey, Iceland, Israel, Jersey, Luxembourg, and Norway show restaurant price indices they are more moderately priced compared to Bermuda.
- **Lowest Index:** Luxembourg seems to have the lowest restaurant price index among the listed countries, suggesting it might be the most affordable for dining out.

Important Objectives

- **Cost of Living Comparison:** This graph is crucial for understanding the relative cost of living across different regions, specifically concerning dining expenses.
- **Travel and Tourism Planning:** For individuals or businesses planning travel, this data helps in budgeting for food expenses
- **Business Location Strategy:** For restaurant chains or hospitality businesses, this data can inform decisions about market entry. High price indices might indicate higher potential revenue per customer.
- **Economic Indicator:** Restaurant price indices can serve as a micro-economic indicator of inflation or deflation within the hospitality sector of a region.
- **Investment Decisions:** Investors looking into the hospitality sector might use this data to identify

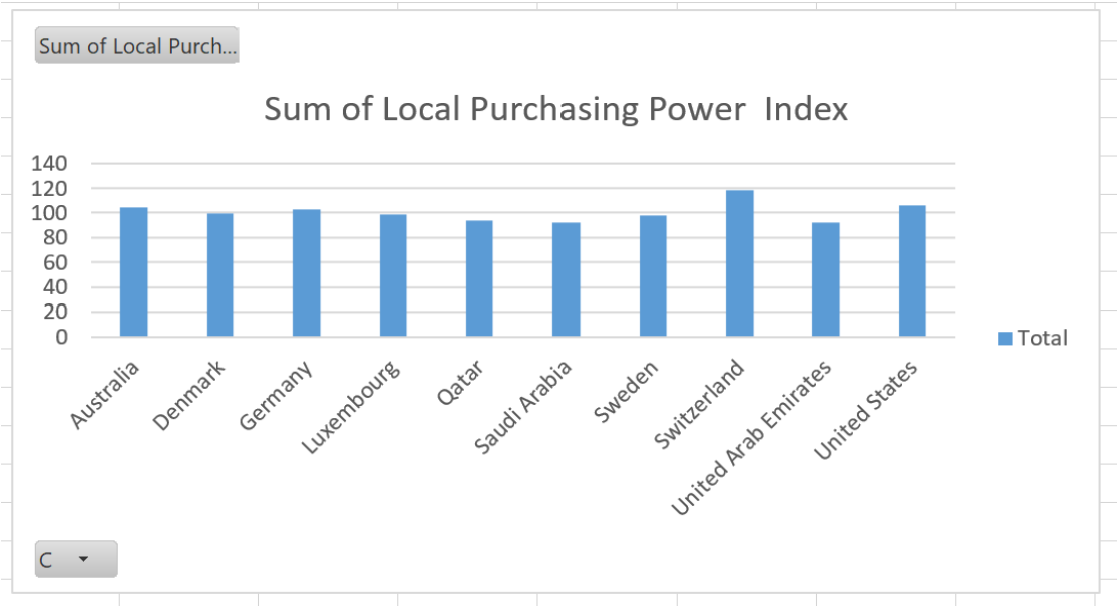
markets with higher profitability potential or areas where consumer spending on dining is robust.

Financial Ideas

- **For Consumers:** Consider destinations like Luxembourg or other locations in the 70-90 range for more affordable dining experiences when planning vacations or business trips.
- **For Investors in Hospitality:**
    - High-Cost Markets (e.g., Bermuda): While potentially high-revenue, these markets require premium offerings, strong brand equity, and efficient cost management to thrive.
    - Mid-Range Markets (e.g., Denmark, Iceland): These offer a balance of reasonable prices and potentially stable demand. Opportunities exist for diverse restaurant concepts.
    - Lower-Cost Markets (e.g., Luxembourg): Focus on volume and value-for-money propositions. May be attractive for casual dining or quick-service restaurants.
- **Currency Exchange Impact:** When comparing these indices, it's also important to consider the local currency and its exchange rate against a common currency (e.g., USD, EUR) to get a true picture of affordability for international visitors or investors.
- **Local Income Levels:** A high restaurant price index in a country with high average income might still be affordable for locals, whereas the same index in a

country with lower average income would be considered very expensive.

Row Labels	Sum of Local Purchasing Power Index
Australia	104.63
Denmark	99.45
Germany	103.08
Luxembourg	98.84
Qatar	93.67
Saudi Arabia	91.85
Sweden	98.14
Switzerland	118.44
United Arab En	92.17
United States	106.34
Grand Total	**1006.61**



The image displays a bar chart titled "Sum of Local Purchasing Power Index." A higher bar indicates a higher local purchasing power index in that country.

Overall Performance of this Graph (in terms of presentation):

- **Clarity:** The graph is generally clear and easy to understand. The bars are well-defined, and the labels are legible.
- **Simplicity:** It's a simple bar chart, which is effective for comparing discrete categories.
- **Informative:** It quickly conveys relative purchasing power among the listed nations.
- **Area for Improvement:** The Y-axis labels could be slightly more precise Also, ensuring the country names are fully visible without tilting the head would improve readability.

Important Objectives of this Graph:

- **Comparative Analysis:** The primary objective is to compare the local purchasing power across different countries. This allows for quick identification of countries where local purchasing power is relatively high or low.
- **Economic Indicator:** The purchasing power index is a key economic indicator. This graph aims to visually present this indicator for various economies.
- **Decision Making Support:** For businesses, investors, or individuals considering relocation, this data can inform decisions related to market entry, investment, or living costs.
- **Trend Spotting** : While this is a static snapshot, such graphs are often used in a series to observe changes or trends in purchasing power over time.

Financial Ideas based on the graph:

High Purchasing Power Countries (e.g., Australia, Switzerland, United States): These countries generally indicate that residents can buy more goods and services with their local currency.

- **For Businesses:** May represent attractive markets for consumer goods and services due to higher disposable income/purchasing ability
- **For Individuals:** Suggests a potentially higher standard of living in terms of what one's income can buy locally.
- **Investment:** Could indicate strong consumer demand, potentially benefiting retail, consumer discretionary, or e-commerce sectors in these regions.

Mid-Range Purchasing Power Countries (e.g., Denmark, Germany, Luxembourg, Qatar, Saudi Arabia, Sweden, and UAE): These countries show a good level of purchasing power, perhaps slightly lower than the top tier but still robust.

- **For Businesses:** May offer a balance between market size/purchasing ability and potentially more moderate operating costs compared to the very high-index countries. Opportunities for growth might exist as these economies mature or diversify.

General Implication for Investment:

- **Consumer-focused Investments:** Countries with higher purchasing power often correlate with stronger consumer spending, making investments in consumer goods, retail, and services potentially attractive.

- **Currency Strength:** While not directly shown, a higher purchasing power index can sometimes correlate with a stronger local currency.
- **Economic Stability**: Generally, countries with robust purchasing power indices tend to have more stable economies, which can be appealing for long-term investments.