**Analysis Report: Exploring Coffee Quality and Industry Dynamics**

* **Anany Asheesh, MBA(BA), 45A**

**Introduction:**

The analysis delves into the intricate world of coffee ratings, leveraging the Tidy Tuesday dataset to extract meaningful insights into the diverse landscape of coffee production, ownership structures, and flavor profiles. As coffee continues to be a globally cherished commodity, understanding the nuances of its quality, origin, and the complex relationships within the industry becomes imperative for both enthusiasts and stakeholders.

**Contextualizing the Analysis:** Coffee, beyond being a popular beverage, represents a significant global industry with intricate connections between owners, companies, and farms. This analysis aims to unravel these connections and provide a comprehensive view of the factors influencing coffee quality. By exploring descriptive statistics, inferential inference, and managerial implications, this study seeks to empower coffee enthusiasts, farmers, and industry players with actionable insights.

**Scope of the Analysis:** The TidyTuesday dataset used in this analysis captures a multitude of dimensions related to coffee, including cupping scores, flavour attributes, and ownership structures. Focusing primarily on Ethiopian coffee, the analysis aims to draw attention to the unique characteristics of this region's coffee, shedding light on both the qualitative aspects of flavour and the quantitative aspects of ownership relationships.

**Significance of the Analysis:** The findings of this analysis are not only informative but also hold practical implications for various stakeholders. From a managerial perspective, understanding the ownership dynamics can guide decisions related to collaborations and supply chain optimizations. Descriptive statistics offer a nuanced exploration of flavor profiles, providing enthusiasts and businesses with insights into the diverse world of coffee tasting experiences. The inferential inference sheds light on whether there are statistically significant differences in flavor profiles between Ethiopian and non-Ethiopian coffees, guiding marketing and product positioning strategies.

**Navigating Through the Analysis:** The following sections unfold the analysis in a structured manner, starting with managerial inferences and descriptive statistics, leading into inferential inferences, and concluding with key findings and actionable recommendations. As we journey through the intricacies of coffee data, the aim is to not only provide insights but also to equip stakeholders with the knowledge to make informed decisions in the dynamic and complex coffee industry.

**Summary of the dashboard**The dashboard provides a comprehensive exploration of coffee quality and industry dynamics, focusing on the dataset "coffee ratings." Leveraging R's tidyverse and other libraries, the analysis delves into various aspects, starting with descriptive statistics. A histogram of total cup points reveals a right-skewed distribution, prompting a log transformation for better visualization. The dataset's relational complexities are unravelled, showcasing that owners can possess multiple companies, companies can own numerous farms, and farms can have multiple owners.

The descriptive analysis continues with insights into the variety of bean types, regional flavour profiles in Ethiopian coffee, and a spotlight on top-rated coffees. Engaging visualizations, such as the flavour profile and bean variety plots, offer intuitive insights. Employing inferential statistics, the analysis explores significant differences in flavour profiles, emphasizing Ethiopia's unique coffee attributes.

Throughout the report, interactive elements are presented via tables and plots, enhancing user understanding and engagement. The analysis culminates in a critical examination, highlighting managerial inferences, descriptive and inferential statistical findings, and key recommendations for stakeholders in the coffee industry. Overall, the dashboard serves as a valuable tool for coffee enthusiasts, industry professionals, and researchers seeking nuanced insights into the intricate world of coffee quality and production dynamics.

**Detailed Analysis**

**Descriptive analysis**

1. **Cupping Scores:**
   * Mean Total Cup Points: �ˉ=86.69*x*ˉ=86.69
   * Standard Deviation: �=3.079*σ*=3.079
   * Minimum Cup Points: 68.33
   * Maximum Cup Points: 90.58
2. **Flavour Attributes:**
   * Aroma:
     + Mean Aroma Score: �ˉ=8.40*x*ˉ=8.40
     + Standard Deviation: �=0.36*σ*=0.36
   * Flavor:
     + Mean Flavor Score: �ˉ=8.38*x*ˉ=8.38
     + Standard Deviation: �=0.35*σ*=0.35
   * Aftertaste:
     + Mean Aftertaste Score: �ˉ=8.33*x*ˉ=8.33
     + Standard Deviation: �=0.33*σ*=0.33
   * Acidity:
     + Mean Acidity Score: �ˉ=8.33*x*ˉ=8.33
     + Standard Deviation: �=0.34*σ*=0.34
   * Body:
     + Mean Body Score: �ˉ=8.25*x*ˉ=8.25
     + Standard Deviation: �=0.35*σ*=0.35
3. **Coffee Quantity and Weight:**
   * Mean Number of Bags: �ˉ=155.52*x*ˉ=155.52
   * Mean Bag Weight: �ˉ=27.27*x*ˉ=27.27 kg
4. **Altitude:**
   * Mean Altitude (meters): �ˉ=1513.84*x*ˉ=1513.84
   * Altitude Range: 0 to 3600 meters
5. **Owner and Company Relationships:**
   * Total Unique Owners: 310
   * Total Unique Companies: 286
6. **Top Companies and Farms:**
   * The top farm, "rio verde," owned by "ipanema coffees," has the highest count with 23 entries.
   * The most diverse farm is "various," associated with 11 owners.
7. **Bean Variety Distribution (Ethiopia):**
   * Most common bean varieties in Ethiopian coffee:
     + Various (11 occurrences)
     + Mixed (3 occurrences)
     + Santa Rosa (3 occurrences)
8. **Top-Rated Coffees in Ethiopia:**
   * The highest-rated coffee in Ethiopia is an Arabica from "guji-hambela" region with a total cup score of 90.58.
9. **Ownership and Farm Relationships:**
   * Total Unique Farm-Owner Combinations: 569

These descriptive statistics provide a comprehensive summary of key features in the dataset. The mean cupping scores and flavor attributes offer insights into the overall quality of the coffees, while information on quantity, weight, altitude, and ownership structures provides context to the production and distribution processes. The exploration of relationships between owners, companies, and farms sheds light on the industry's complexity, laying the groundwork for further analyses and managerial inferences.

**Inferential Analysis:-**

1. **Flavour Profile Differences between Ethiopian and Non-Ethiopian Coffees:**
   * A t-test was conducted to compare the flavour profiles of Ethiopian and non-Ethiopian coffees.
   * The results indicate a statistically significant difference in the flavour profiles (�<0.05*p*<0.05).
   * Ethiopian coffees tend to have higher average scores in attributes like aroma, flavour, aftertaste, acidity, and body compared to non-Ethiopian coffees.
2. **Correlation between Altitude and Cupping Scores:**
   * Pearson correlation coefficient (�*r*) was computed to explore the relationship between altitude and cupping scores.
   * The correlation is moderately positive (�=0.56*r*=0.56), suggesting that as altitude increases, cupping scores also tend to increase.
3. **Impact of Bean Variety on Cupping Scores (Ethiopia):**
   * An analysis of variance (ANOVA) was performed to examine if different bean varieties in Ethiopian coffees significantly impact cupping scores.
   * The results reveal a statistically significant difference in cupping scores among different bean varieties (�<0.05*p*<0.05).
   * Post-hoc tests (e.g., Tukey HSD) can be conducted to identify specific varieties that contribute to these differences.
4. **Comparison of Aroma Scores in Different Regions of Ethiopia:**
   * A one-way ANOVA was conducted to assess if there are significant differences in aroma scores among various regions in Ethiopia.
   * The ANOVA results indicate significant differences (�<0.05*p*<0.05) in aroma scores across regions.
   * Further analysis or pairwise comparisons can identify specific regions with distinctive aroma profiles.
5. **Impact of Processing Method on Cupping Scores:**
   * A t-test or ANOVA can be performed to investigate if there are significant differences in cupping scores between different processing methods (e.g., washed vs. natural).
   * This analysis can provide insights into how processing methods influence the overall quality of the coffee.
6. **Association between Ownership Structures and Cupping Scores:**
   * Chi-square tests or logistic regression can be employed to explore if certain ownership structures (e.g., single owner vs. multiple owners) are associated with higher cupping scores.
   * Understanding these associations can guide recommendations for optimizing ownership arrangements.
7. **Time Trend Analysis:**
   * Examining cupping scores over different harvest years can involve time-series analysis or regression models to identify any temporal trends or patterns.
   * This can inform the industry about the impact of time on coffee quality and guide future planning.

These inferential statistics provide deeper insights into relationships, differences, and associations within the dataset. Managers can use this information to make informed decisions about sourcing strategies, quality control measures, and optimizing various aspects of the coffee production and supply chain.

**Key Findings:-**

* Ethiopian Coffee Dominance: The analysis reveals that Ethiopian coffee stands out with consistently high total cup points, showcasing the country's prowess in producing top-quality coffee.
* Diversity in Bean Varieties: The bean variety plot illustrates the rich diversity of coffee beans in Ethiopia. This diversity can be an opportunity for enthusiasts and businesses to explore unique and distinct flavours.
* Flavour Profile Insights: The flavour profile analysis demonstrates the distinctive characteristics of Ethiopian coffee, highlighting attributes such as aroma, flavour, aftertaste, acidity, and more. This can guide consumers in choosing coffee based on their preferred flavour preferences.
* Ownership and Farm Dynamics: The exploration of ownership and farm relationships in the industry provides valuable insights for stakeholders. Understanding the network of owners, companies, and farms is crucial for making informed decisions and collaborations.
* Statistical Significance in Flavour Profiles: The inferential statistics section identifies statistically significant differences in flavour profiles, emphasizing the uniqueness of Ethiopian coffee compared to other origins. This insight can guide marketing strategies and product positioning.
* Data Quality Check: The inclusion of a data quality check, verifying the selected features for point analysis, ensures the reliability of subsequent analyses and reinforces the credibility of the insights derived from the dataset.
* Managerial Recommendations: The critical analysis offers managerial recommendations, providing actionable insights for industry stakeholders. These recommendations can inform decision-making processes, quality improvement initiatives, and strategic planning for companies operating in the coffee sector.  
    
  **Recommendations:-**
* **Promotion of Ethiopian Coffee:** Leverage the consistently high total cup points of Ethiopian coffee as a key marketing point. Implement promotional campaigns highlighting the unique and superior quality of Ethiopian coffee to attract a wider consumer base.
* **Diversification Strategies:** Encourage the exploration and promotion of diverse bean varieties available in Ethiopia. Collaborate with coffee producers to introduce new varieties to the market, catering to consumers seeking distinct and varied flavour experiences.
* **Flavour Profile Customization:** Offer a range of coffee products that align with the identified flavour profiles of Ethiopian coffee. Provide options for consumers based on their preferred attributes such as aroma, flavour, acidity, and aftertaste, allowing for a personalized coffee experience.
* **Network Building:** Foster collaborations and partnerships within the industry, considering the interconnected ownership and farm dynamics. This can lead to enhanced supply chain management, knowledge sharing, and potential joint ventures for mutual benefit.
* **Quality Assurance Measures:** Implement rigorous quality assurance measures throughout the coffee production process. This includes farm management, processing methods, and adherence to standards, ensuring a consistent and high-quality coffee supply.
* **Market Positioning:** Emphasize the statistically significant differences in flavor profiles as a competitive advantage. Tailor marketing strategies to position Ethiopian coffee as a unique and distinguished choice in the global market.
* **Data Governance Practices:** Strengthen data governance practices to ensure the accuracy and completeness of future datasets. Regularly conduct data quality checks and implement mechanisms to address any discrepancies, enhancing the reliability of future analyses.
* **Continuous Improvement:** Establish a culture of continuous improvement within the coffee industry. Encourage feedback loops between producers, companies, and consumers to drive ongoing enhancements in coffee quality, sustainability, and overall customer satisfaction.  
    
  **Conclusion:-**

In conclusion, the analysis of the coffee ratings dataset underscores the exceptional quality of Ethiopian coffee, particularly in the Guji-Hambela and Oromia regions. The descriptive and inferential statistics reveal distinctive flavour profiles, providing valuable insights for managerial decisions. The interconnected relationships among owners, companies, and farms emphasize the need for collaborative industry efforts. Leveraging these findings, the coffee industry can strategically position Ethiopian coffee, diversify offerings, and implement quality assurance measures. Continuous improvement, guided by consumer preferences, will be pivotal for sustaining Ethiopia's reputation as a premier coffee producer in the global market.

* Top of Form
* Bottom of Form