**E-Commerce Profitability Analysis Report**

**1. Introduction**

This report outlines the process of analyzing the profitability of an e-commerce business selling health supplement products on Amazon. The primary goal of the project was to determine the maximum Customer Acquisition Cost (CAC) that ensures overall profitability while performing various scenario analyses.

**2. Objectives**

* Calculate key financial metrics such as Gross Margin (GM), Amazon Fees, and Net Profit (NP) per unit.
* Identify the maximum CAC that allows the business to remain profitable.
* Conduct scenario analysis to understand the impact of changes in sales volume, fixed costs, and selling price.
* Provide actionable insights for optimizing profitability.

**3. Methodology**

**3.1 Data Collection & Assumptions**

A structured dataset was created with the following financial parameters:

* **Selling Price (SP):** $30 per unit
* **Cost of Goods Sold (COGS):** $15 per unit
* **Amazon Fee:** 15% of SP
* **Corporate Fixed Costs:** $10,000 per month
* **Bank Loan Interest:** $1,500 per month
* **Tax Rate:** 20%
* **Units Sold:** 5,000 (default value, subject to change for analysis)

**3.2 Calculation of Financial Metrics**

The following formulas were used for calculations:

1. **Gross Margin per Unit** = SP - COGS
2. **Amazon Fee per Unit** = SP \* 15%
3. **Net Margin per Unit** = GM - Amazon Fee - CAC
4. **Total Profit Before Tax** = (Net Margin \* Units Sold) - Fixed Costs - Interest
5. **Profit After Tax** = Profit Before Tax \* (1 - Tax Rate)
6. **Break-even CAC Calculation**: Solved for CAC where Profit After Tax = 0

**3.3 Scenario Analysis**

The following scenarios were analyzed:

* **Scenario 1:** Impact of reducing sales volume to 4,000 units.
* **Scenario 2:** Effect of increasing fixed costs by $5,000.
* **Scenario 3:** Impact of increasing selling price to $35.
* **Scenario 4:** Effect of changing the tax rate to 25%.

**4. Implementation**

The project was implemented using the following tools:

* **Google Sheets**: Created a dynamic financial model for input values and automatic calculations.
* **Python (Jupyter Notebook)**: Developed scripts using Pandas and NumPy for detailed analysis.
* **Matplotlib & Seaborn**: Used for visualizing profitability trends and scenario impacts.
* **Excel Reports**: Generated and saved key insights for future reference.

**5. Findings & Insights**

**5.1 Maximum Affordable CAC**

* The maximum CAC to maintain profitability while selling 5,000 units was calculated.
* Reducing sales volume to 4,000 units resulted in a lower allowable CAC, requiring either a price increase or cost reduction to sustain profitability.

**5.2 Impact of Cost and Price Changes**

* Increasing the fixed costs by $5,000 required selling more units to break even.
* Raising the selling price to $35 improved profitability, allowing for a higher CAC while maintaining profit margins.
* A tax rate increase from 20% to 25% reduced overall net profit, making cost control and pricing strategies even more critical.

**6. Challenges & Limitations**

* **Data Assumptions**: The analysis was based on assumed values, which might differ from real market conditions.
* **Market Dynamics**: Customer behavior, competition, and external factors like shipping costs were not included in this model.
* **Platform Fees & Advertising Costs**: Additional Amazon charges or varying ad costs might influence actual profitability.

**7. Conclusion & Recommendations**

**7.1 Key Takeaways**

* Profitability is highly sensitive to CAC, requiring careful budget allocation for ad spend.
* Increasing the selling price or optimizing ad spend can significantly improve profit margins.
* Higher fixed costs demand higher sales volume or alternative cost-cutting measures.
* Scenario-based analysis helps businesses make data-driven decisions on pricing and marketing strategies.

**7.2 Future Recommendations**

* Integrate real-world sales data for more accurate analysis.
* Expand the model to include different marketing channels and their CAC.
* Perform customer lifetime value (LTV) analysis to determine sustainable CAC.
* Use machine learning for predictive analytics on future sales and profit trends.

**8. References**

* Amazon Fee Structure: [Amazon Seller Central](https://sellercentral.amazon.com/)
* E-commerce Pricing Strategies: Industry Reports
* Google Sheets and Python Libraries for Financial Analysis