# Key Insights from Exploratory Data Analysis (EDA)

1. Customer Spending Inequality

The top 10% of customers contribute 20% of total revenue, spending 5x more than the bottom 10% (who contribute <2%). The top 30% account for nearly half of all spending, with a sharp drop between the lowest deciles. This Pareto-like distribution suggests prioritizing retention strategies for high spenders (e.g., loyalty programs) while incentivizing lower-tier customers (e.g., personalized discounts, upselling). Addressing the spending gap could stabilize revenue and reduce dependency on top spenders.


Customer Spending Distribution by Decile (Split by Central Axis)
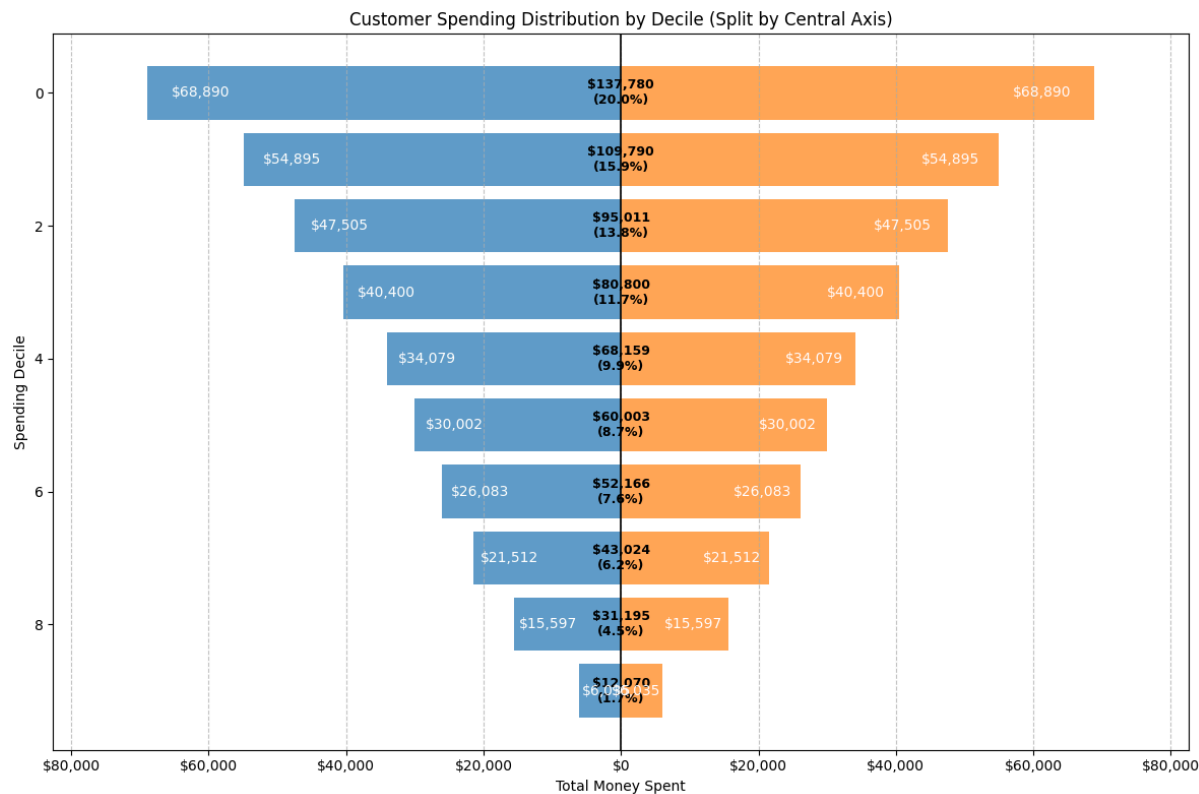
2. Weak Price-Sales Correlation

Price minimally impacts sales volume (R^2 = 0.009). High-priced items (e.g., premium products) have niche demand, while mid-priced items dominate revenue. Best-sellers (e.g., SoundWave Jeans) exceed 40 units sold, outperforming expensive items. Strategies include discounting slow-moving luxury stock, bundling high-revenue products, and replicating success factors of best-sellers (e.g., demand analysis, competitive pricing).

Bubble Chart: Price vs. Quantity Sold (Bubble Size = Revenue)
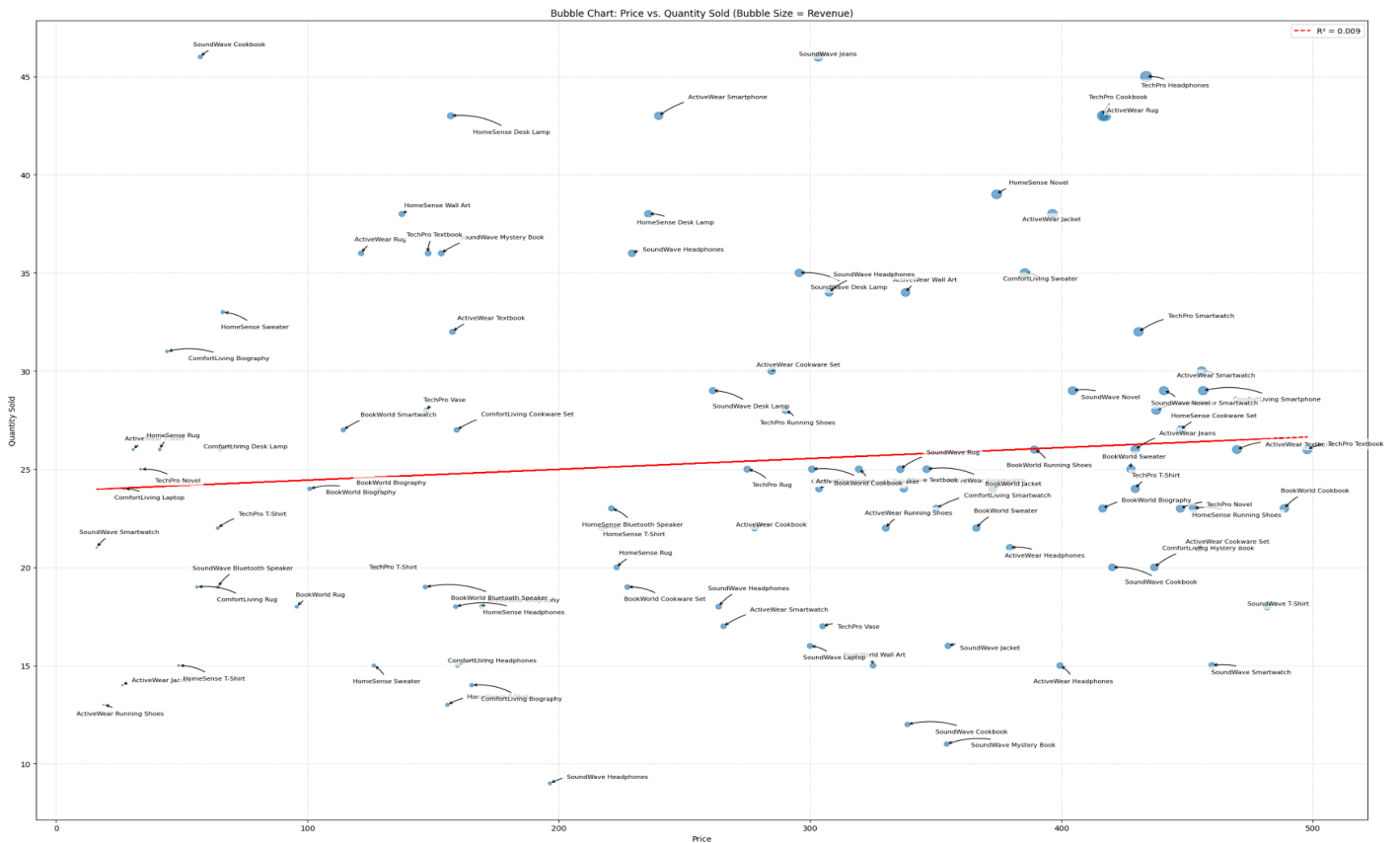
3. Seasonal Category Trends

Books peak in Feb/Sep (academic cycles), Electronics surge in Nov (holidays), and Clothing peaks in Oct/Dec (festive demand). Home Decor shows steady sales with minor festive lifts. February, September, and December are critical months for cross-category promotions. Diversifying inventory into high-growth categories (e.g., Electronics during holidays) and aligning campaigns with events (e.g., back-to-school for Books) can maximize seasonal revenue.

Monthly Variation of Category Sales
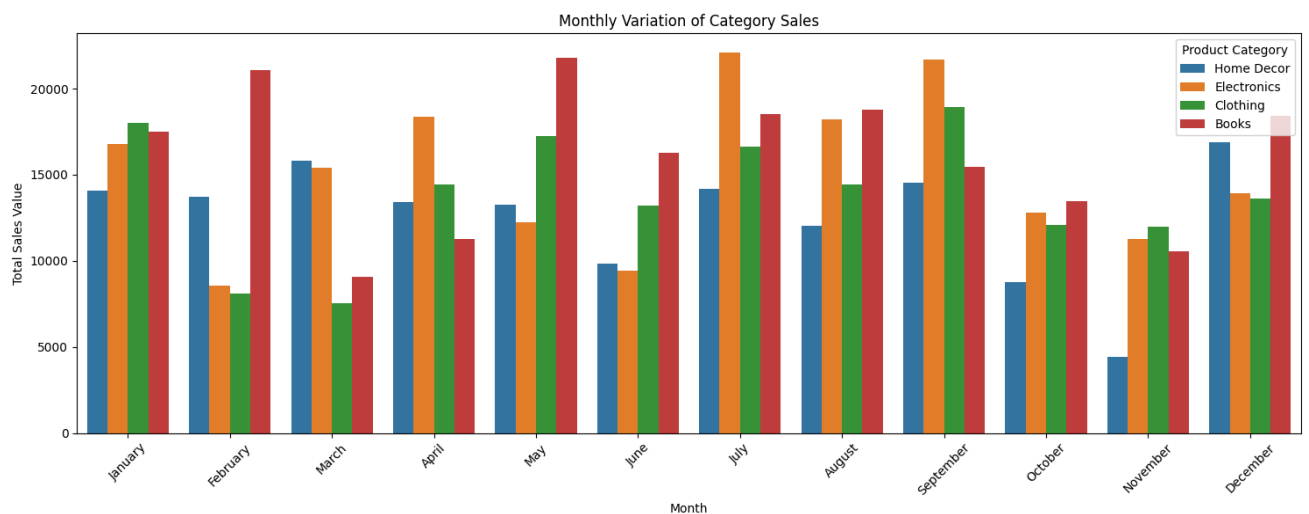
4. Transaction Timing & Regional Patterns

Weekend transactions peak globally (notably Sundays in North America), while midweek lulls occur (Mondays and Tue-Wed). Asia shows unique midweek spikes (Tue/Thu), and Europe has consistently low volumes. Recommendations:

 - Boost weekend staffing/marketing in high-activity regions (e.g., North America).
 - Target midweek lulls with region-specific promotions (e.g., flash sales in Asia on Tuesdays).
 - Align financial planning with regional transaction cycles.

Transaction Volume by Day and Region
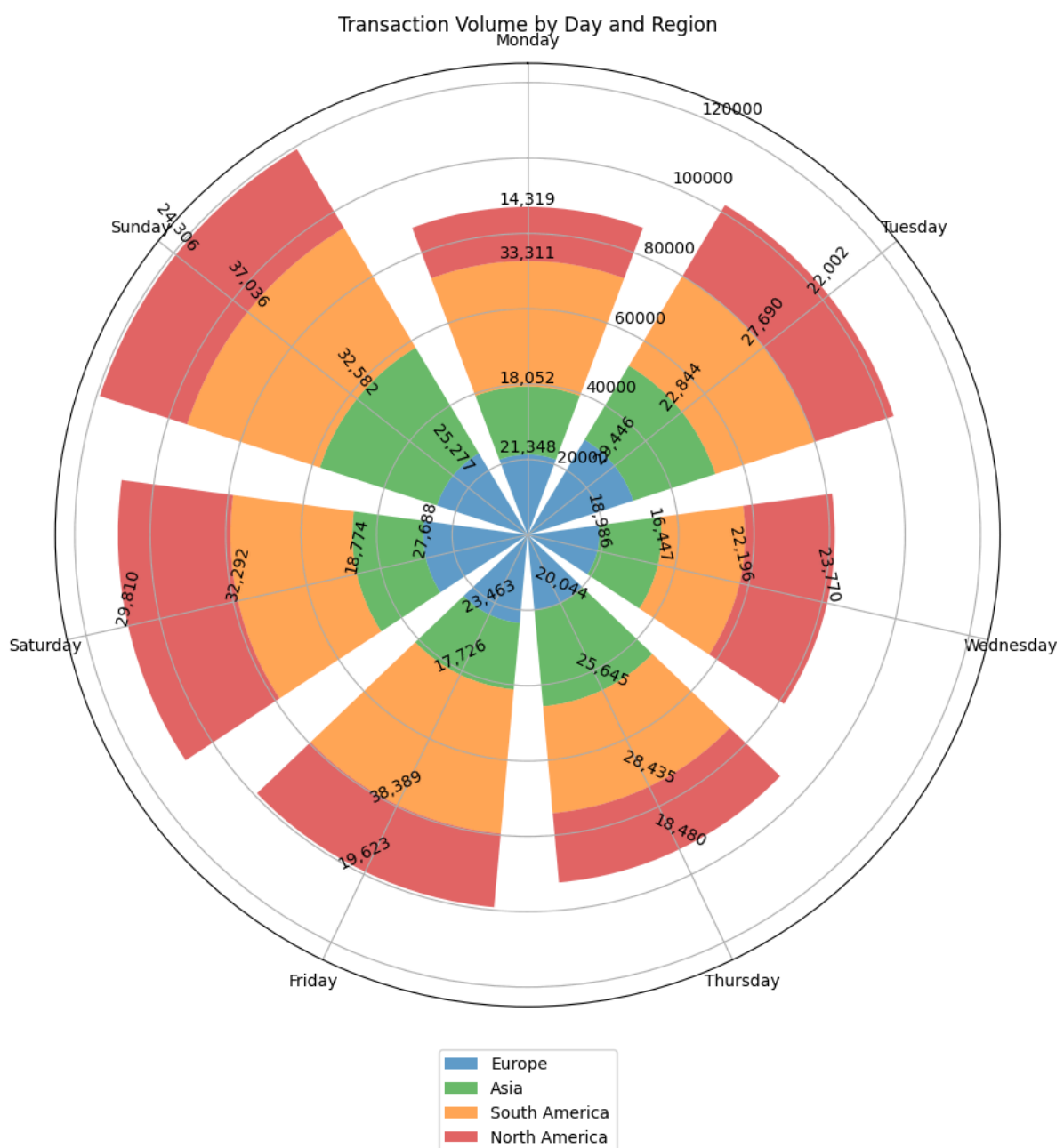
5. Regional-Category Sales Distribution

North America leads in Clothing, Books, and Electronics; Europe balances all categories evenly. Asia prioritizes Books, while South America focuses on Clothing/Electronics. The sunburst chart highlights regional preferences, guiding inventory allocation (e.g., expanding Electronics in South America) and localized marketing (e.g., promoting Home Decor in Europe). Leveraging these insights can optimize regional-category profitability.

Conclusion & Recommendations

- Retain High-Value Customers: Launch VIP rewards to stabilize revenue.
- Optimize Pricing: Balance premium (niche) and volume-driven (mid-tier) products.
- Leverage Seasonality: Align promotions with category-specific peaks.
- Regional Adaptation: Customize staffing, campaigns, and inventory by region.

Expected Impact: Improved revenue stability, higher customer engagement, and efficient resource allocation.