# AdventureWorks – Sales & Profit Insights Report

Dataset: Kaggle (AdventureWorks)

Analysis Period: May 2011 – June 2014

Objective: Evaluate sales performance by category, subcategory, region, customers, products, promotions, and time, and quantify the impact of discounting on revenue and profit. Deliver actionable insights and a clean, navigable Power BI report.

## Project Overview

This project analyzes AdventureWorks transactional data to uncover trends in revenue, profit, order volume, seasonality, and promotions. It highlights the disconnect between high sales volume and declining profitability driven by heavy discounts, and it identifies top-performing segments and customers while flagging areas that need pricing and promotion discipline.

## Data & Model

Tables Used (7+): SalesOrderHeader, SalesOrderDetail, Customer, Product, ProductCategory, ProductSubcategory, SalesTerritory.  
Data Modeling (Star-ish):  
Fact: SalesOrderDetail (line items) linked to SalesOrderHeader (order-level attributes).  
Dimensions: Product → ProductSubcategory → ProductCategory, Customer, SalesTerritory.  
Keys: SalesOrderHeader.SalesOrderID ↔ SalesOrderDetail.SalesOrderID; Product.ProductID ↔ SalesOrderDetail.ProductID; Customer.CustomerID ↔ SalesOrderHeader.CustomerID; SalesTerritory.TerritoryID ↔ SalesOrderHeader.TerritoryID.  
This structure supports analysis by product hierarchy, customer, territory, and time.

## Tools & Workflow

Excel: Pre-cleaning (drop irrelevant/mostly-null columns).  
Python (pandas): Type fixes, NA handling, outlier checks, export cleaned CSVs.  
SQL (Azure Data Studio): Exploratory queries (orders, revenue, top customers/products, seasonality).  
Power BI (DAX): Data model, relationships, KPIs, time-intelligence (MoM, YoY), and visuals.

## Data Preparation Highlights

Removed high-null/irrelevant fields (e.g., StoreID, SalesPersonID, CurrencyRateID, DiscontinuedDate).  
Converted types (dates, ints), filled missing categorical values with “Unknown”, numeric with 0 when appropriate.  
Preserved primary/foreign keys; validated duplicates; saved clean CSVs for modeling.

## SQL Highlights (Samples)

Total Orders: 31,465 (COUNT(\*) from SalesOrderHeader).  
Orders by Territory: Australia #1 (6,843), Southwest US #2 (6,224); Northeast US lowest (352).  
Top Customers by Orders: Customer 11091 and 11176 with 28 orders each.  
Top 5 Customers by Revenue: 29818 ($0.99M), 29715 ($0.96M), …  
Top 5 Products by Sales: Mountain-200 variants dominate (e.g., $4.4M for “Mountain-200 Black, 38”).  
Revenue by Country: US highest, DE lowest.  
Monthly Revenue: March highest; February lowest.  
(These metrics are integrated into Power BI visuals and KPIs.)

## Power BI Report

📄 Page 1 – KPI & Business Overview  
Total Orders: 31K  
Total Revenue: $123M  
Total Customers: 20K  
Order Success Rate: 88% — strong fulfillment.  
On-Time Delivery: Avg 5 days — efficient logistics (note: dataset limitation).  
Total Sales (Target vs Actual):  
Target: $171M | Actual: $110M → Large shortfall due to heavy promotions/discounts and bulk clearance.  
Total Profit (Target vs Actual):  
Target: $70.49M | Actual: –$44.18M → Unit price reductions & discounts drove substantial losses.  
Sales by Top 10 Subcategories: Highest: Road Bikes | Lowest: Shorts  
Order Quantity by Top 10 Subcategories: Highest: Road Bikes (47K orders) | Lowest: Bottle & Cages (11K orders)

📄 Page 2 – Customer & Product Insights  
Top 5 Customers by Revenue: #1: Cust 29818 – $0.99M | #2: Cust 29715 – $0.96M  
Top Customers by Orders: Cust 11091 – 28 orders | Cust 11176 – 28 orders  
Top Products by Sales (with Profit):  
Mountain Bike – $4.4M, profit loss –$1.56M  
Mountain-200 Silver, 46 – $3.5M, profit loss –$0.88M → Highest-selling products are also largest profit losers.  
Sales by Special Offer ID: Offer ID 1: $0.1B sales | Offer ID 2: $4.89M sales → Promotions reduced overall profitability.  
Sales vs Profit Relationship: Inverse pattern — higher sales often align with lower profits.  
Actual vs Target Sales by Category: No category reached target → pricing & discount policy need review.

📄 Page 3 – Regional & Time Analysis  
Order Quantity by Country: US: 154,092 (highest) | CA: 49,381 | DE: lowest  
Revenue Share by Country: US: 57.48% | CA: 14.93% | DE: 4.45% → US and CA dominate revenue.  
Orders by Shipping Method: Ship Method ID 1: 87.9% | ID 5: 12.1%  
MoM Revenue Growth: Highest: March +166.52%, $15.26M revenue | Lowest: February –50.61%, $5.72M revenue → Strong seasonality.  
YoY Revenue Growth: 2012: +166% | 2013: +30% | 2014: +7% → Growth steadily declines after 2012.  
Monthly Orders: Highest: May – 3,175 | Lowest: June – 2,189

## Key Conclusions

Over-discounting drives a profit crisis: high sales volume but –$44M profit.  
Top sellers (e.g., Mountain-200) are profit-negative due to price cuts.  
US & CA are critical revenue engines; shipping method 1 dominates operations.  
Seasonality is significant; growth slowed each year after 2012.

## Recommendations

Tighten promotions: Replace blanket discounts with targeted offers; set minimum margin guards.  
Price governance: Align ListPrice vs StandardCost; monitor unit price < cost exceptions.  
Profit mix shift: Promote positive-margin products/subcategories; reduce exposure to loss-leaders.  
Customer segmentation: Incentivize profitable cohorts; review terms for volume buyers driving losses.  
Visibility KPIs: Keep Actual vs Target (Sales & Profit) front-and-center; track promotion ROI.

## Limitations

Artificially constant delivery metrics limit logistics conclusions.  
Customer/store details missing in parts of the dataset.  
Historical dataset; findings reflect past performance and data constraints.

## Files & Assets

Power BI Report (.pbix): Full interactive dashboards.  
SQL Scripts: Core queries for orders, revenue, top customers/products, seasonality.  
Cleaned CSVs: Exported post-wrangling data for reproducibility.  
Screenshots: Page-wise visuals for quick portfolio viewing.

## Summary

From 2011–2014, AdventureWorks delivered $123M revenue and 31K orders, but intensive discounting led to a –$44M profit. The analysis shows where value leaks occur (promotions, pricing, loss-leader products) and provides a clear plan: tighten promotions, enforce price/margin rules, and steer demand toward positive-margin items—all visible through KPI-driven Power BI pages with MoM/YoY context, regional cut, and product/customer depth.