

E-Commerce Sales Analysis

1 Project Overview / Introduction

Dataset Source: Kaggle, “Online Retail” dataset from UCI Machine Learning Repository (2010–2011).

About the Dataset:

- UK-based online retail company selling unique all-occasion gifts.
- Transactions from 01/12/2010 – 09/12/2011.
- Columns: InvoiceNo, StockCode, Description, Quantity, InvoiceDate, UnitPrice, CustomerID, Country.

Objective:

- Explore sales trends, top products, customer behavior, returns/cancellations, and regional performance.
-

2 Data Cleaning Summary

Key Steps:

- Converted InvoiceDate to datetime.
 - Filled missing Description with stock code or “Unknown”.
 - Dropped duplicate transactions.
 - Flagged returns ($\text{Quantity} < 0$) and cancelled orders (InvoiceNo starting with 'C').
 - Exported cleaned dataset for analysis.
-

3 Feature Engineering

Created Features:

- net_sales = Quantity * UnitPrice
- Flags: is_return, is_cancelled
- Time-based: invoice_month, invoice_year, invoice_day, invoice_hour

Purpose: Simplify analysis, enable aggregation by product, customer, time, and country.

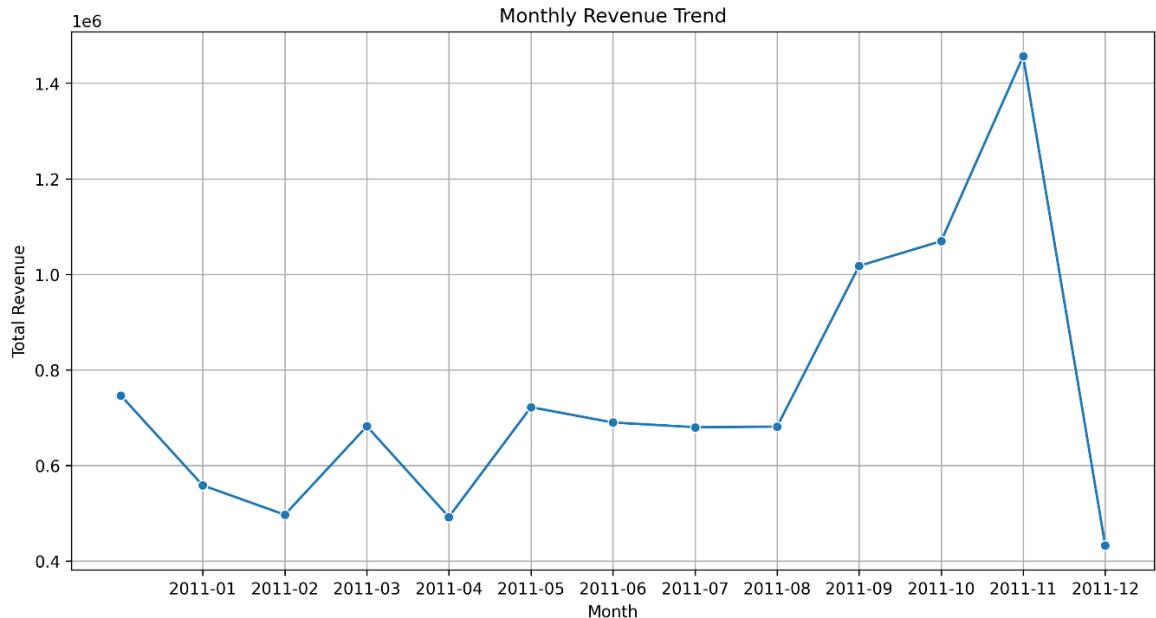


Analysis & Key Findings

4.1 Revenue & Sales Trends

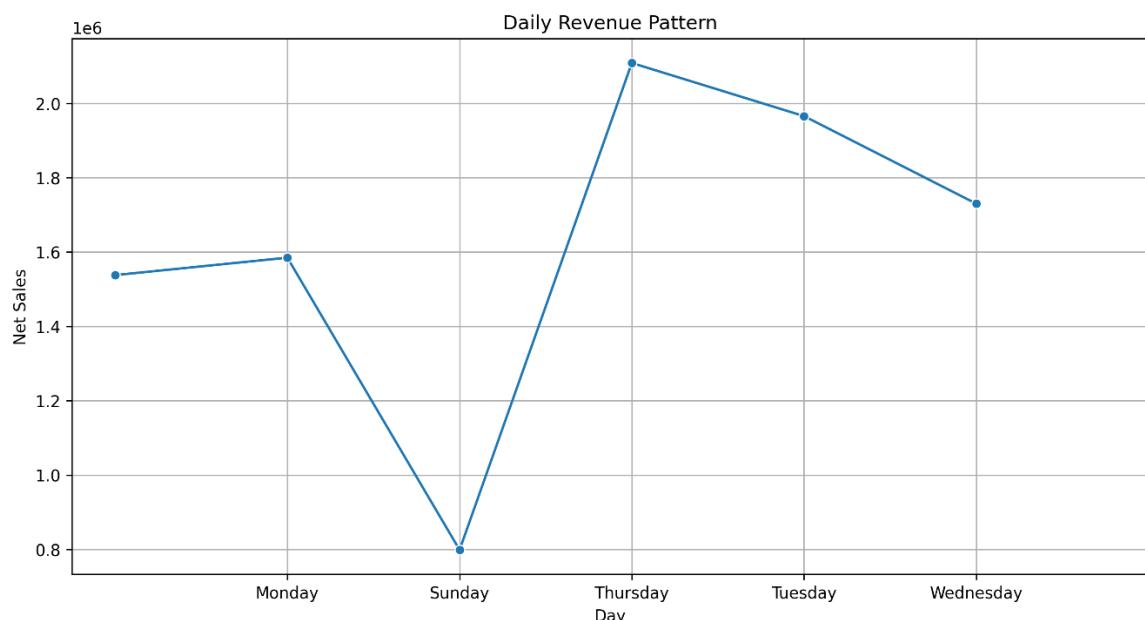
Monthly Revenue:

- Sudden spike in Nov 2011, sharp drop the following month.



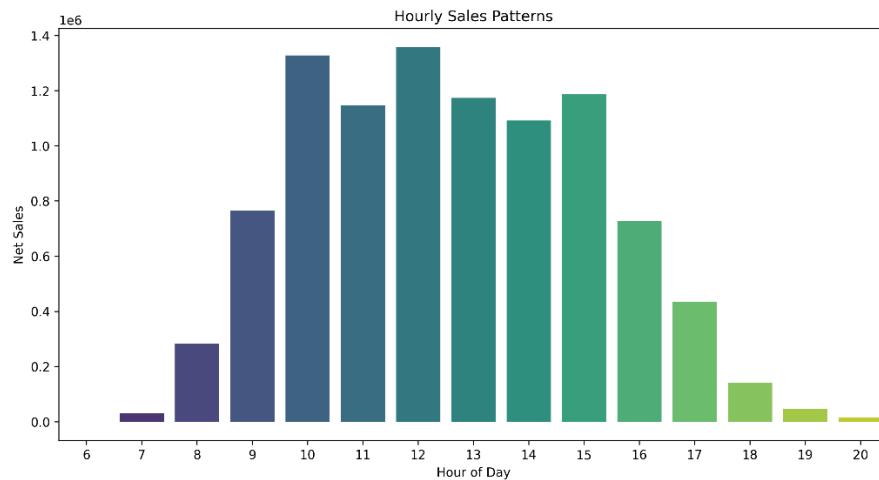
Daily Patterns:

- Thursday highest sales, Sunday lowest.



Hourly Patterns:

- 12 PM peak, 8 PM lowest.



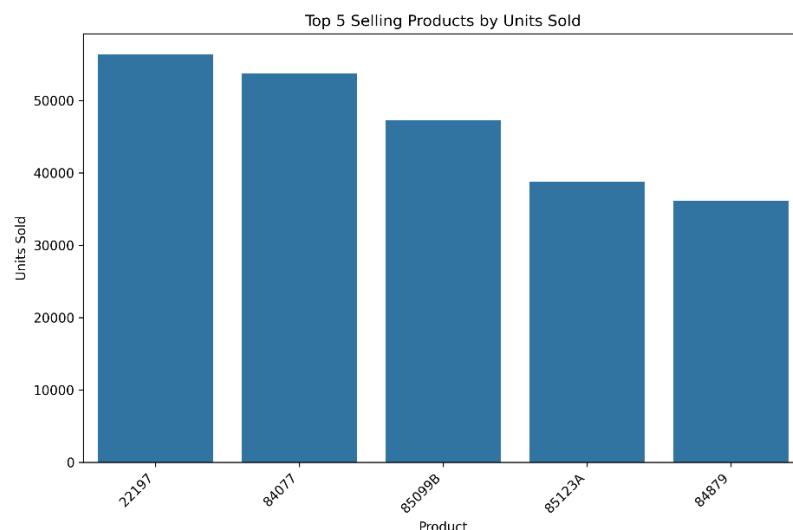
4.2 Product & Category Analysis

Top Products by Units Sold:

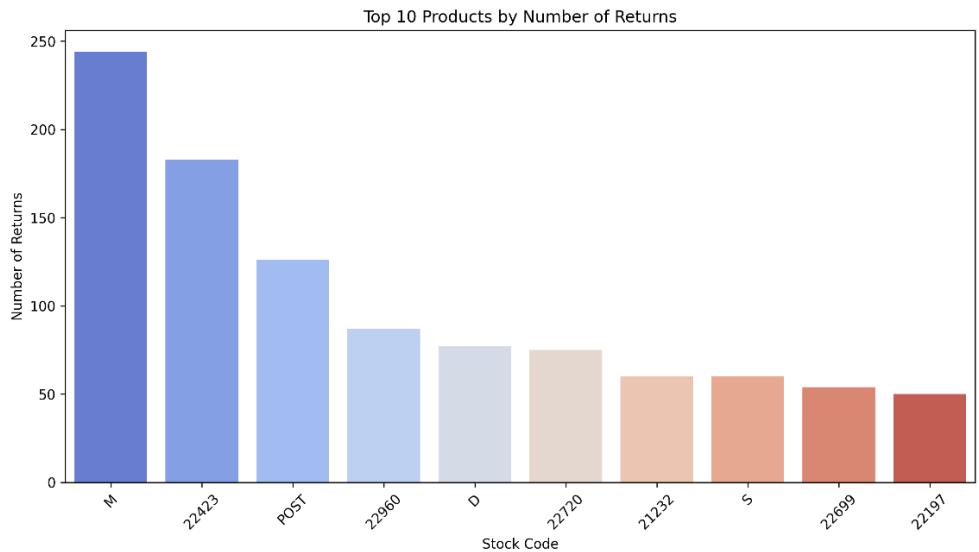
StockCode Quantity

22197	56427
84077	53751
85099B	47260
85123A	38811
84879	36122

Top Products by Revenue:



Products with Most Returns:

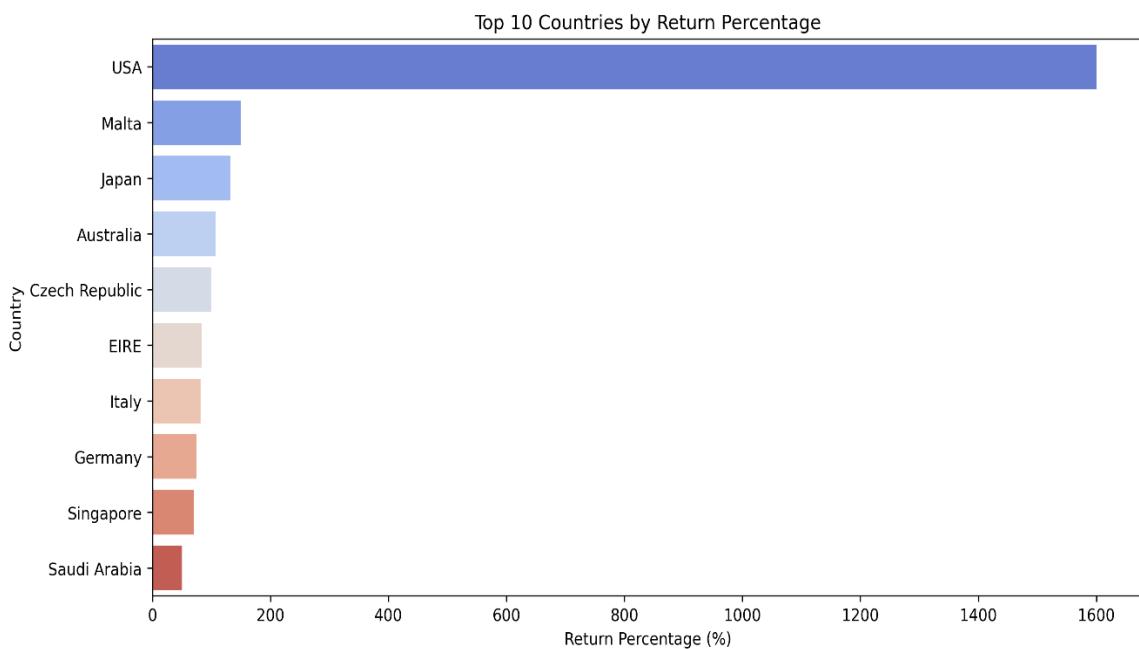


4.3 Returns & Cancellations

- Total orders: 25,900
- Returns: 10,587 → 40.88%
- Cancellations: 9,251 → 35.72%

Countries with Highest Return Percentage:

- USA > Malta > Japan ...



4.4 Customer Analysis

Top Customers by Revenue:

CustomerID Net Sales

12415.0	123,725.45
15749.0	21,535.90
12357.0	6,207.67
12688.0	4,873.81
12752.0	4,366.78

Average Order Value per Customer:

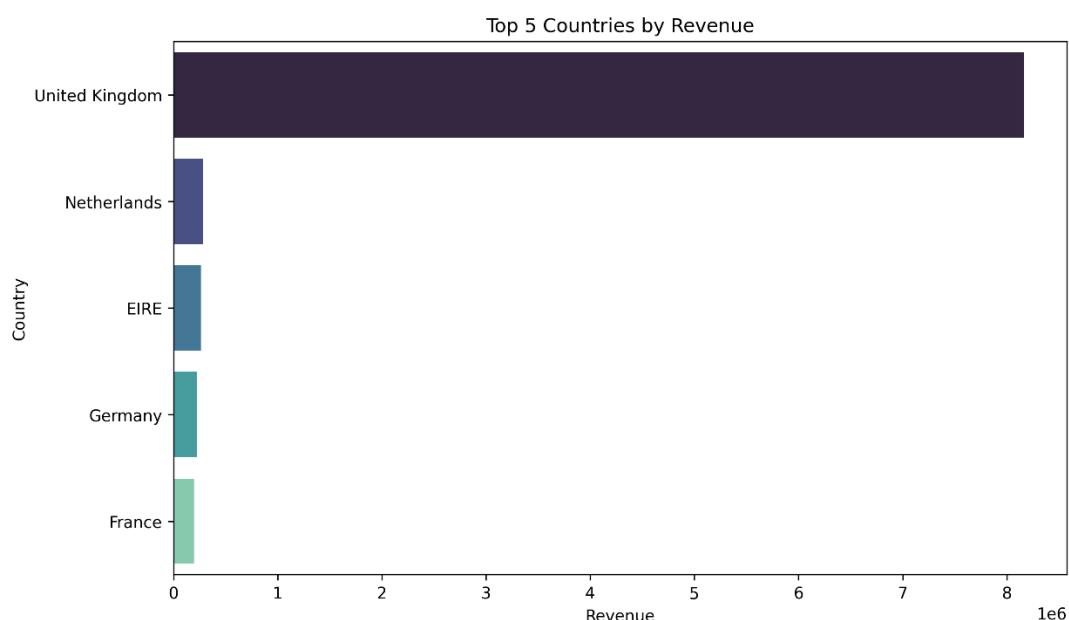
CustomerID Avg Order Value

12357.0	6207.67
15749.0	5383.98
12688.0	4873.81
12415.0	4758.67
12752.0	4366.78

Top Countries by Revenue:

Country Net Sales

United Kingdom	8,167,128.18
Netherlands	284,661.54
EIRE	262,993.38
Germany	221,509.47
France	197,317.11



5 Recommendations / Insights

- Focus on **high-return products** to improve quality control.
- Leverage **peak sales times** (Thursdays, 12 PM) for promotions.
- Target marketing to **top revenue-generating countries and customers**.
- Monitor **Nov 2011 spike** to understand abnormal sales events.