

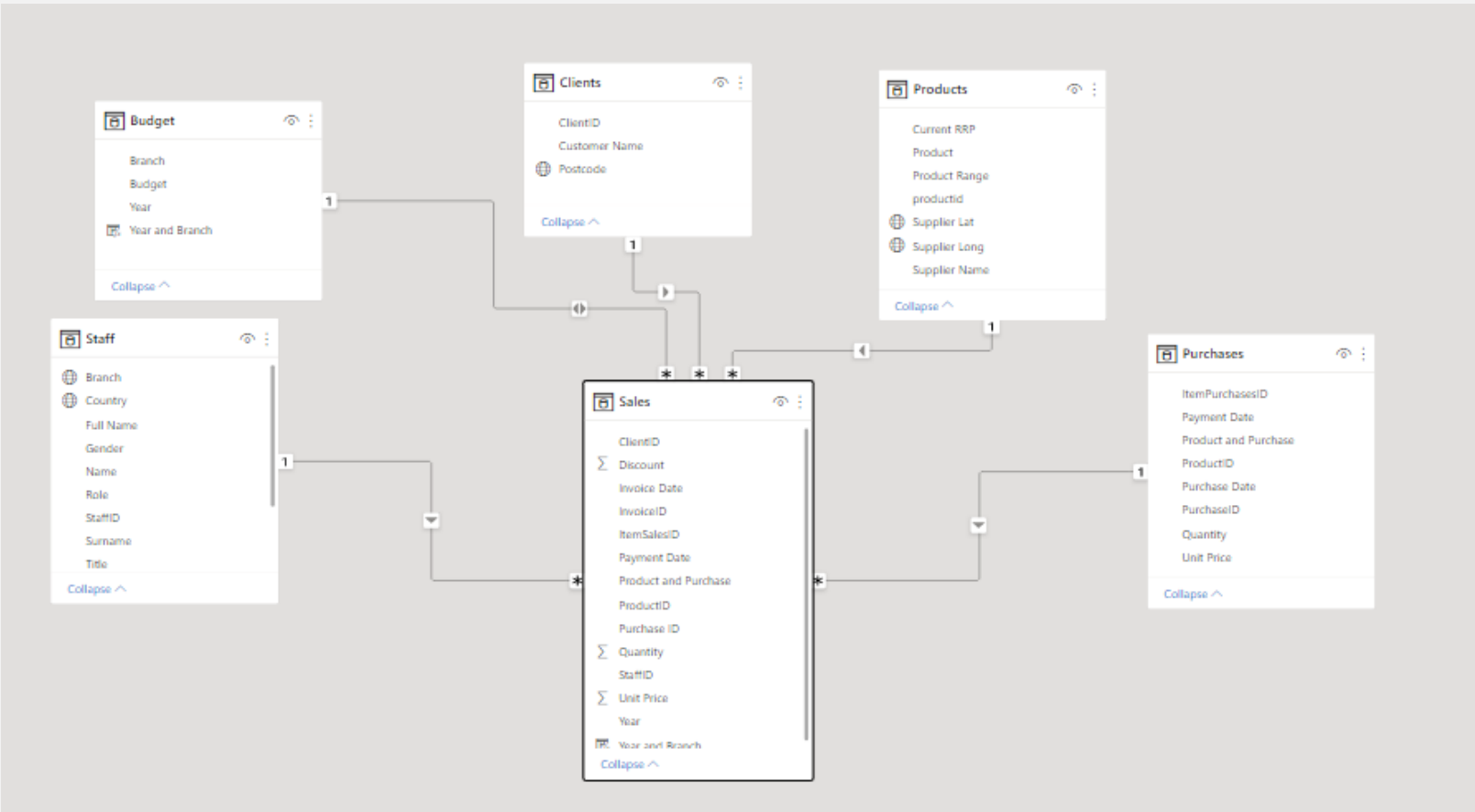
SEDISMART Supply Chain Data Analytics

Problem Statement:

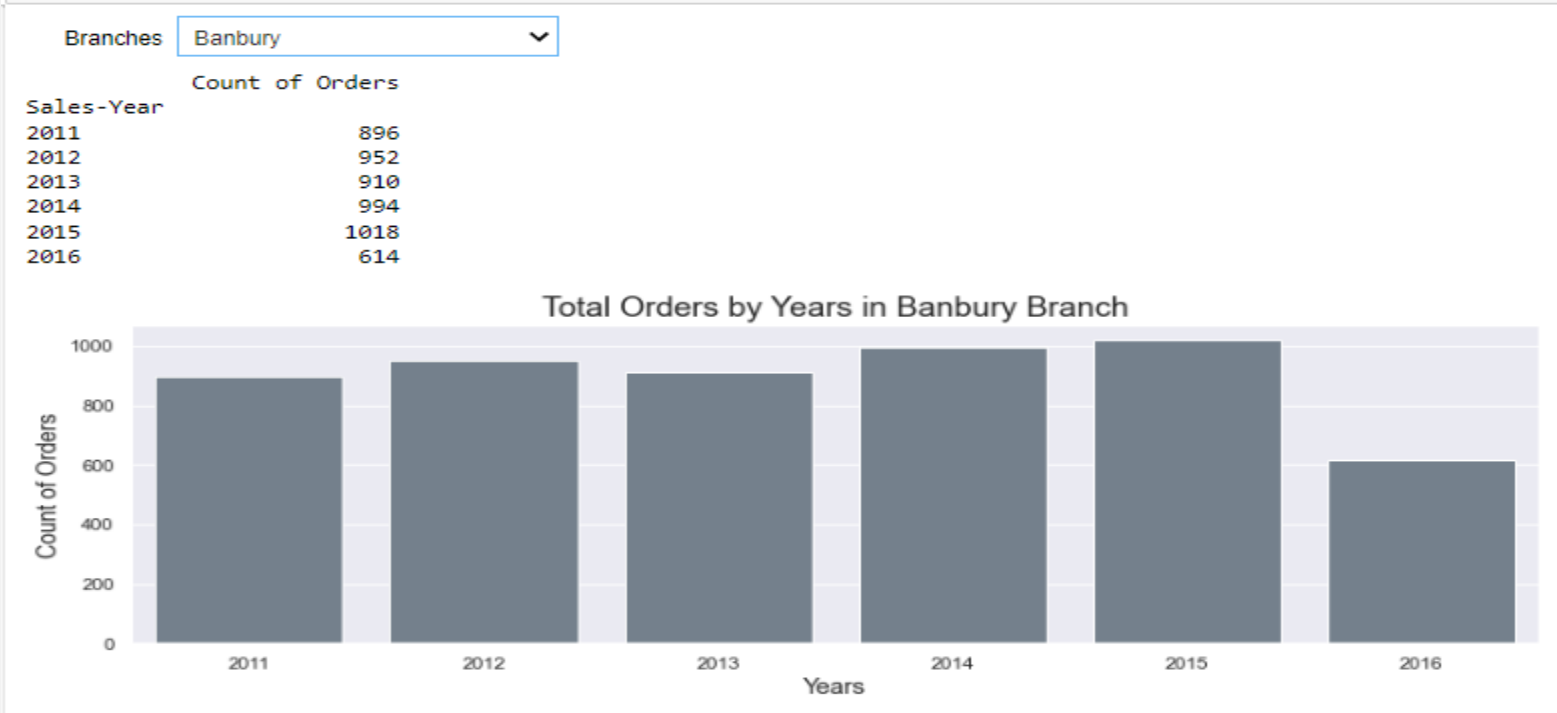
SEDISMART is an imaginary office furniture & equipment company based in UK, and its management executives have a meeting soon in which they discuss the business status. The executives would like to see:

- The general KPIs and business metrics of the business (CEO board).
- The performance of the sales-people (HR team).
- The performance of their customers (marketing team).
- The performance of their products (sales team).
- The performance of their suppliers (logistic team).
- The forecast of the revenue for the first quarter of the year - 2017 (finance team).

Data Model



KPIs Analysis



Years

Count of Orders

Staff-Branch	
London	7422
Leeds	6160
Reading	5791
Southampton	5600
Liverpool	5583
Glasgow	5572
Cardiff	5510
Banbury	5384
Manchester	5375
Aberdeen	5299
Lisburn	5255
Belfast	5178
Wrexham	5074

Total Orders by Branches in All Years

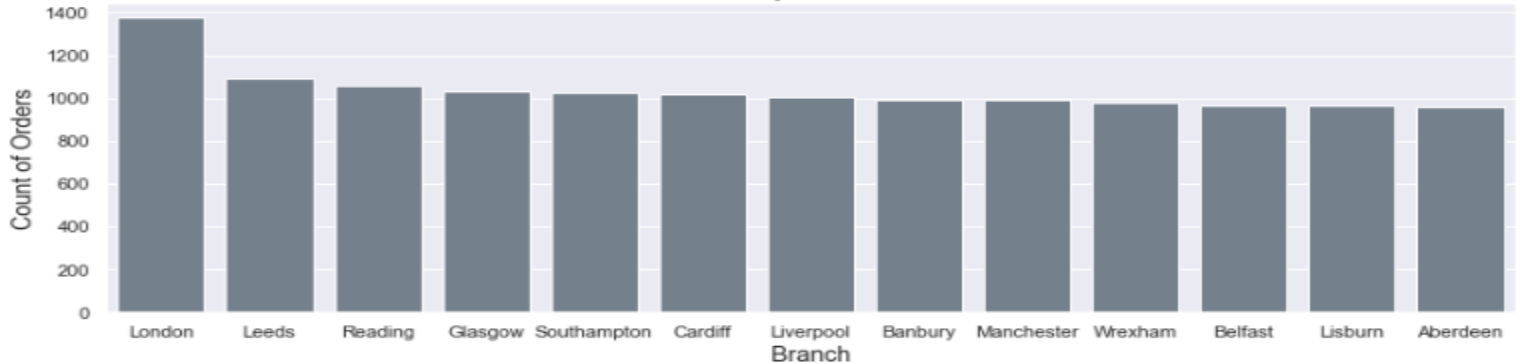


Years

Count of Orders

Staff-Branch	
London	1375
Leeds	1089
Reading	1060
Glasgow	1029
Southampton	1026
Cardiff	1015
Liverpool	1002
Banbury	994
Manchester	989
Wrexham	981
Belfast	967
Lisburn	966
Aberdeen	960

Total Orders by Branches in 2014



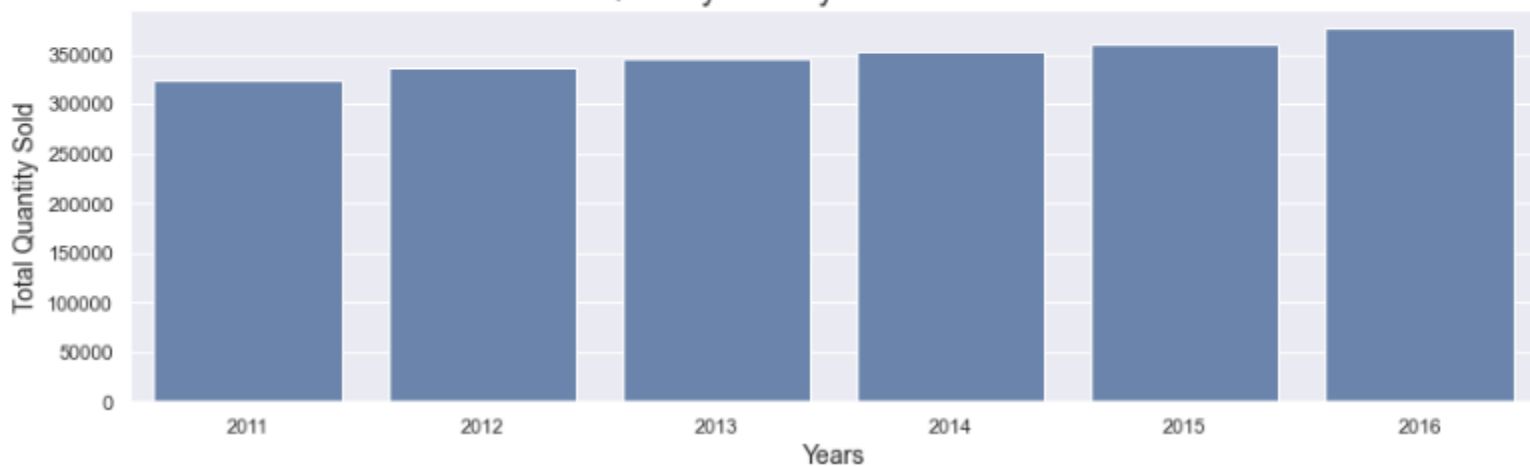
Branches

Total Quantity Sold

Sales-Year

2011	323311
2012	335947
2013	345281
2014	352216
2015	360961
2016	376046

Total Quantity Sold by Years in All Branches



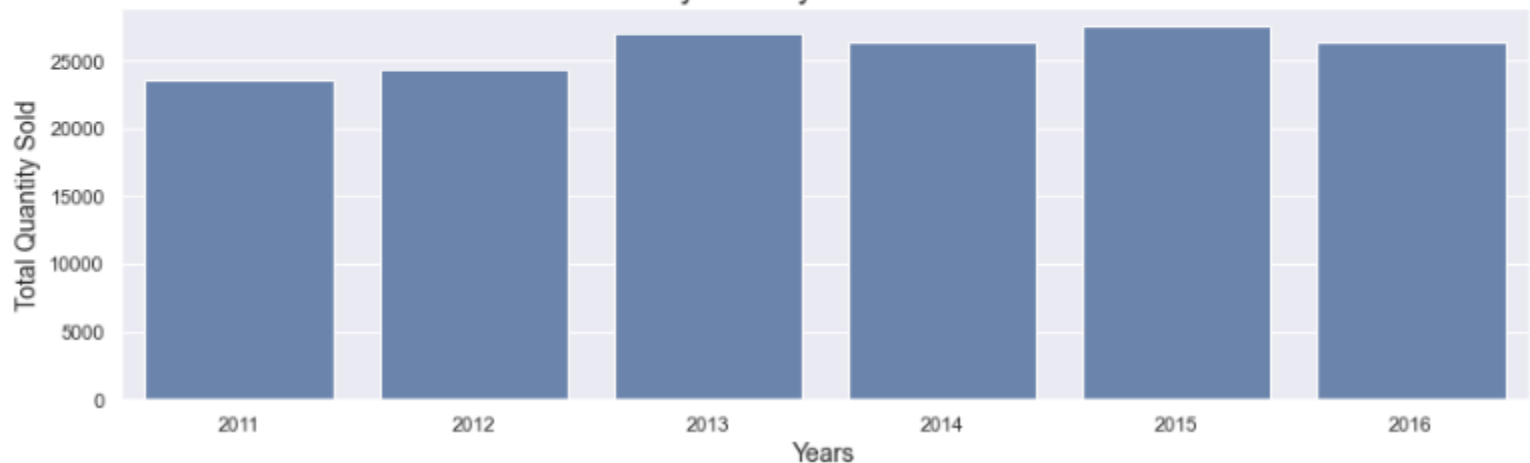
Branches

Total Quantity Sold

Sales-Year

2011	23547
2012	24315
2013	26984
2014	26427
2015	27535
2016	26414

Total Quantity Sold by Years in Cardiff Branch



Years

Total Quantity Sold

Staff-Branch	
London	213030
Leeds	179105
Reading	167027
Southampton	158908
Liverpool	158541
Glasgow	157763
Cardiff	155222
Manchester	154217
Banbury	153950
Aberdeen	151553
Belfast	148618
Lisburn	148456
Wrexham	147372

Total Quantity Sold by Branches in All Years

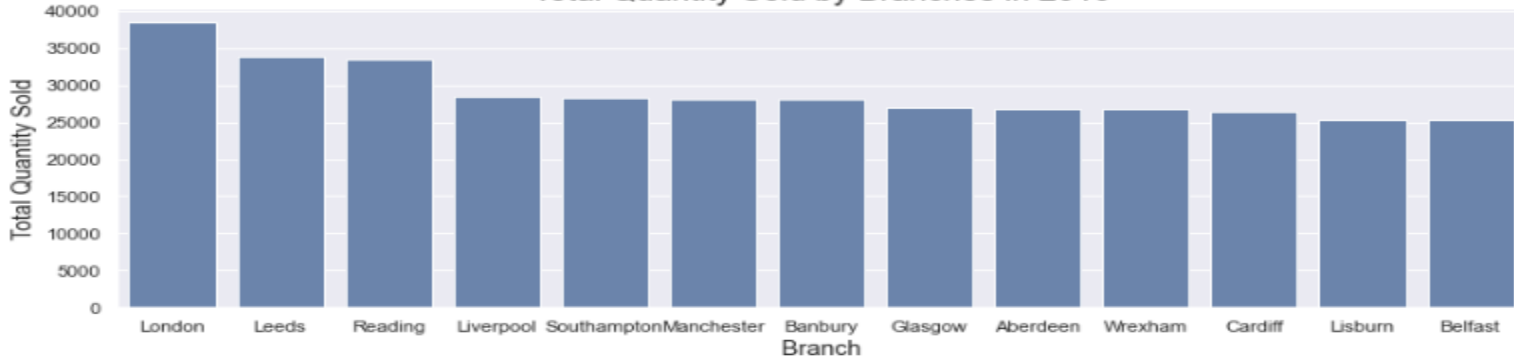


Years

Total Quantity Sold

Staff-Branch	
London	38438
Leeds	33889
Reading	33367
Liverpool	28380
Southampton	28237
Manchester	28122
Banbury	28047
Glasgow	27043
Aberdeen	26819
Wrexham	26768
Cardiff	26414
Lisburn	25294
Belfast	25228

Total Quantity Sold by Branches in 2016

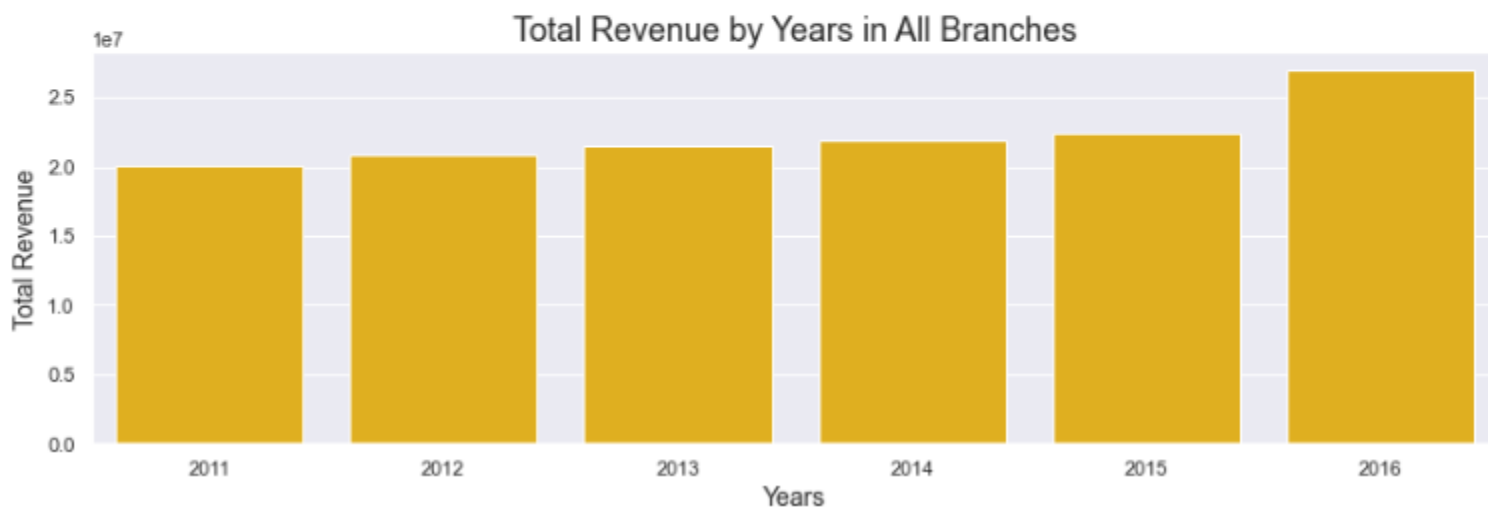


Branches

Total Revenue

Sales-Year

2011	20,119,650.00
2012	20,908,434.00
2013	21,501,936.00
2014	21,898,533.00
2015	22,457,708.00
2016	26,930,195.00

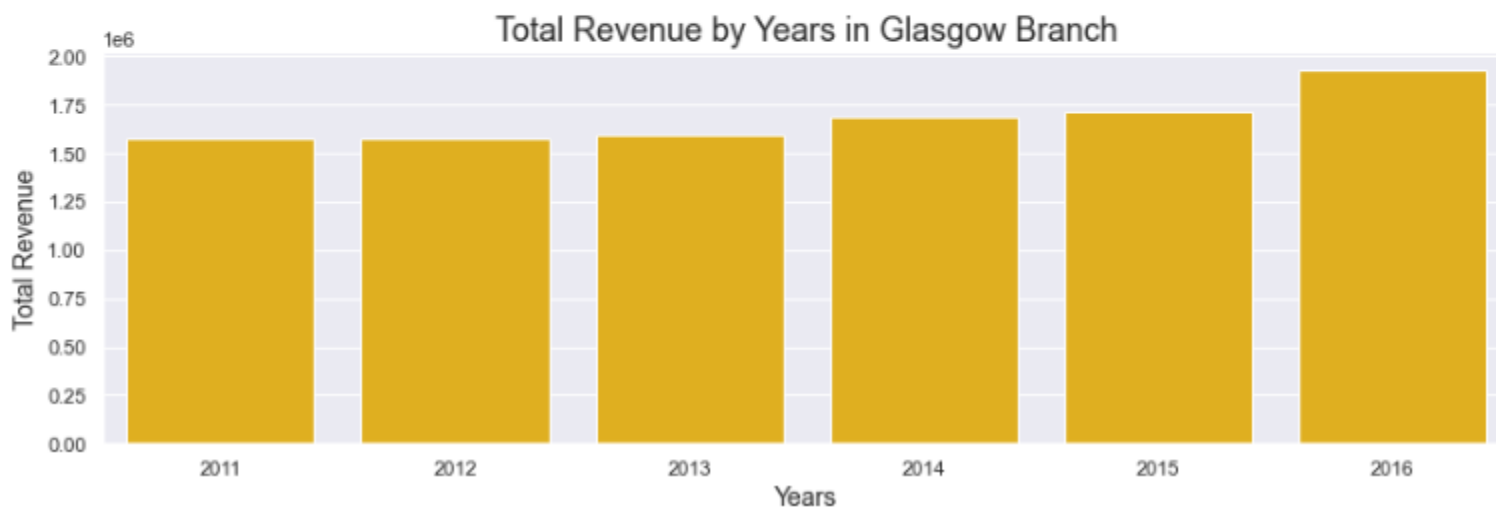


Branches

Total Revenue

Sales-Year

2011	1,573,291.00
2012	1,578,803.00
2013	1,591,446.00
2014	1,687,400.00
2015	1,720,470.00
2016	1,927,981.00



Years All

Total Revenue

Staff-Branch	
London	1.357107e+07
Leeds	1.145190e+07
Reading	1.072893e+07
Liverpool	1.014968e+07
Southampton	1.014301e+07
Glasgow	1.007939e+07
Cardiff	9.916720e+06
Banbury	9.860388e+06
Manchester	9.859955e+06
Aberdeen	9.683499e+06
Lisburn	9.479553e+06
Belfast	9.450684e+06
Wrexham	9.441682e+06

Total Revenue by Branches in All Years



Years 2011

Total Revenue

Staff-Branch	
London	2,038,821.18
Leeds	1,641,681.38
Southampton	1,586,608.79
Glasgow	1,573,291.09
Reading	1,558,955.95
Lisburn	1,518,728.47
Aberdeen	1,513,504.85
Liverpool	1,479,560.62
Belfast	1,472,646.92
Cardiff	1,457,872.74
Manchester	1,442,647.34
Banbury	1,441,787.83
Wrexham	1,393,542.44

Total Revenue by Branches in 2011



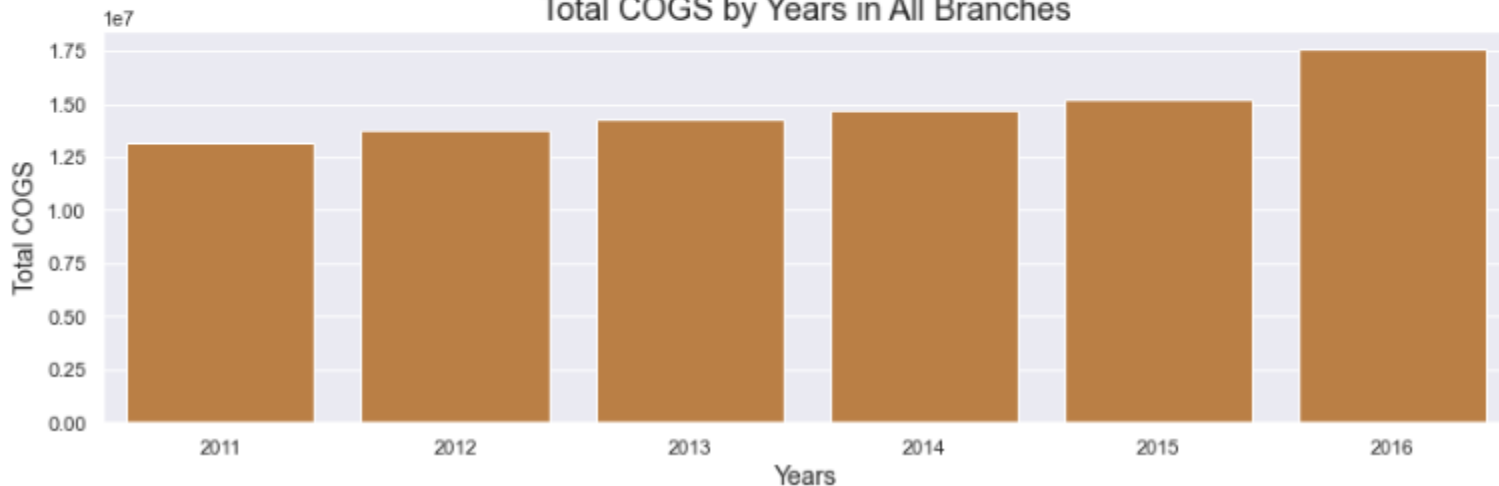
Branches

Total COGS

Sales-Year

2011	13167235.28
2012	13800918.03
2013	14324575.96
2014	14722928.23
2015	15208278.96
2016	17575292.61

Total COGS by Years in All Branches



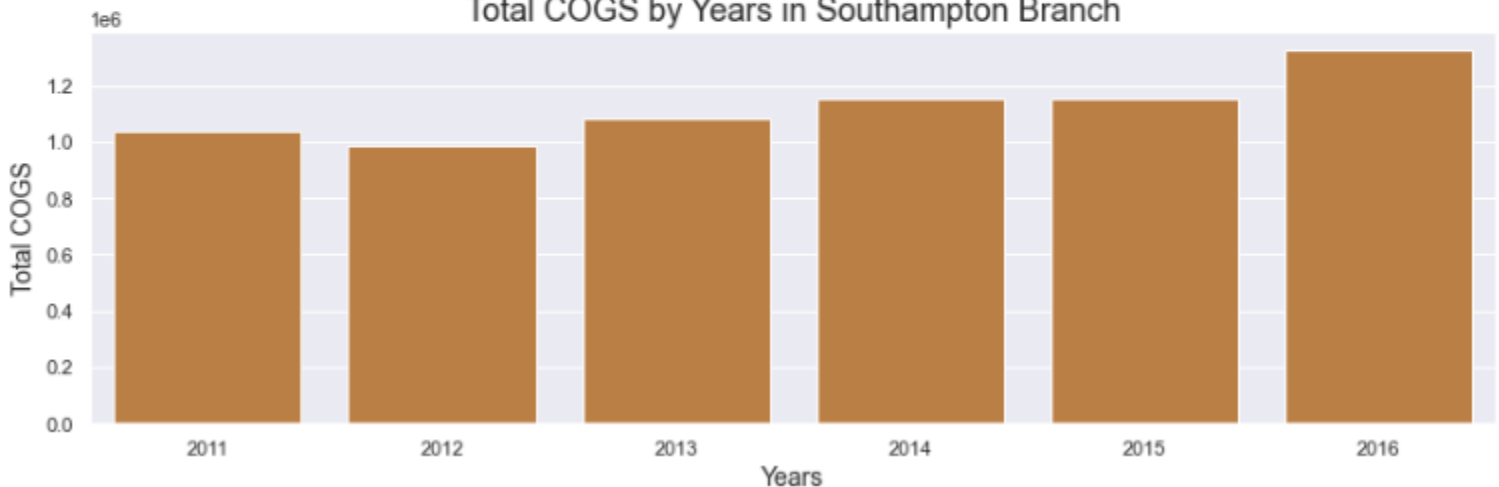
Branches

Total COGS

Sales-Year

2011	1,038,490.57
2012	987,829.19
2013	1,079,463.81
2014	1,155,807.45
2015	1,152,407.33
2016	1,324,047.58

Total COGS by Years in Southampton Branch

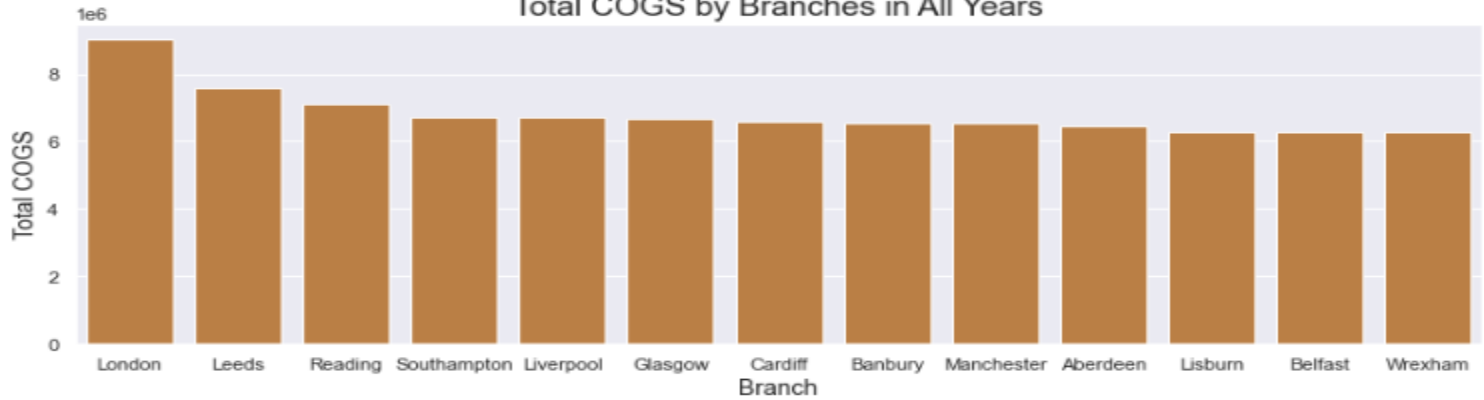


Years All

Total COGS

Staff-Branch	
London	9016640.74
Leeds	7589467.32
Reading	7113384.44
Southampton	6738045.93
Liverpool	6716716.94
Glasgow	6693870.34
Cardiff	6576499.54
Banbury	6542034.15
Manchester	6538424.04
Aberdeen	6442288.23
Lisburn	6294805.34
Belfast	6272572.99
Wrexham	6264479.07

Total COGS by Branches in All Years

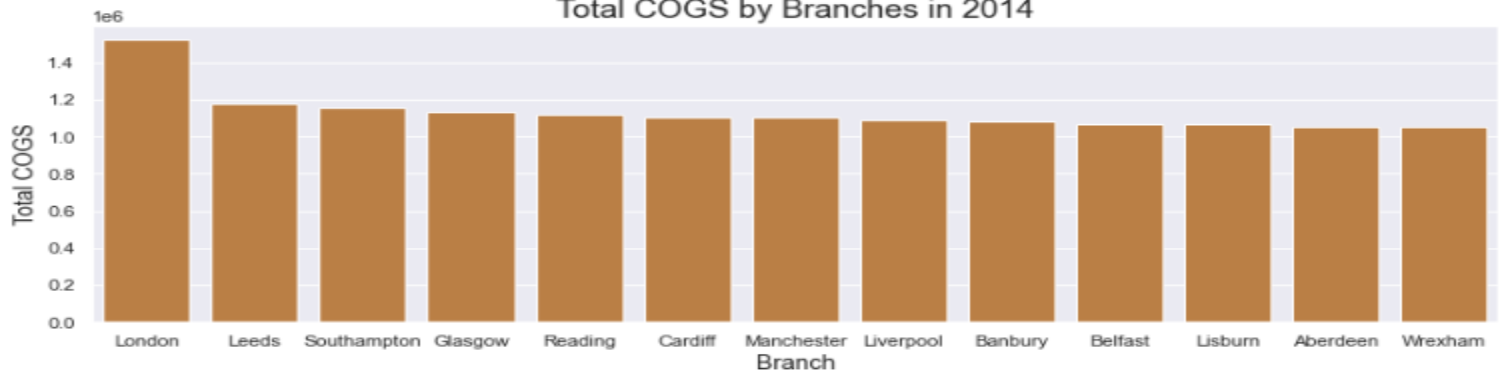


Years 2014

Total COGS

Staff-Branch	
London	1,521,279.03
Leeds	1,174,800.20
Southampton	1,155,807.45
Glasgow	1,133,284.40
Reading	1,121,035.87
Cardiff	1,100,700.10
Manchester	1,100,346.52
Liverpool	1,092,424.49
Banbury	1,083,603.32
Belfast	1,068,433.05
Lisburn	1,067,997.02
Aberdeen	1,052,608.89
Wrexham	1,050,607.89

Total COGS by Branches in 2014

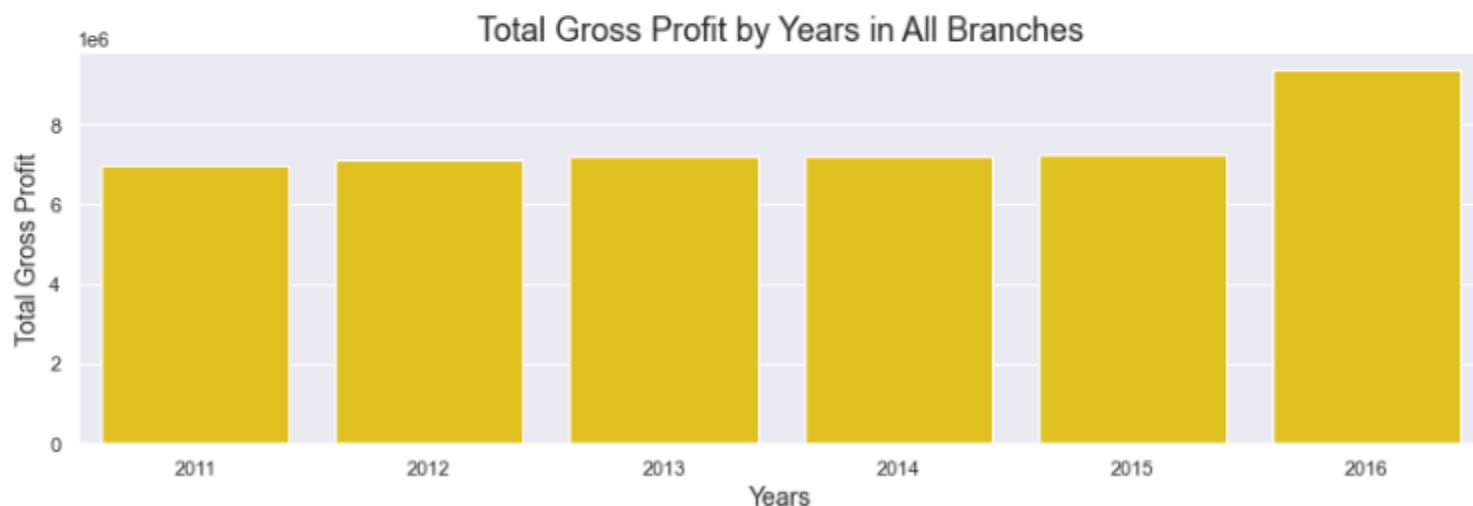


Branches

Total Gross Profit

Sales-Year

2011	6,952,414.33
2012	7,107,515.58
2013	7,177,360.01
2014	7,175,605.20
2015	7,249,429.12
2016	9,354,902.84



Branches

Total Gross Profit

Sales-Year

2011	566,578.11
2012	599,276.27
2013	629,848.89
2014	571,226.79
2015	644,034.84
2016	851,470.79



Years

Total Gross Profit

Staff-Branch	
London	4.554427e+06
Leeds	3.862436e+06
Reading	3.615541e+06
Liverpool	3.432960e+06
Southampton	3.404966e+06
Glasgow	3.385521e+06
Cardiff	3.340220e+06
Manchester	3.321531e+06
Banbury	3.318353e+06
Aberdeen	3.241211e+06
Lisburn	3.184748e+06
Belfast	3.178111e+06
Wrexham	3.177203e+06

Total Gross Profit by Branches in All Years

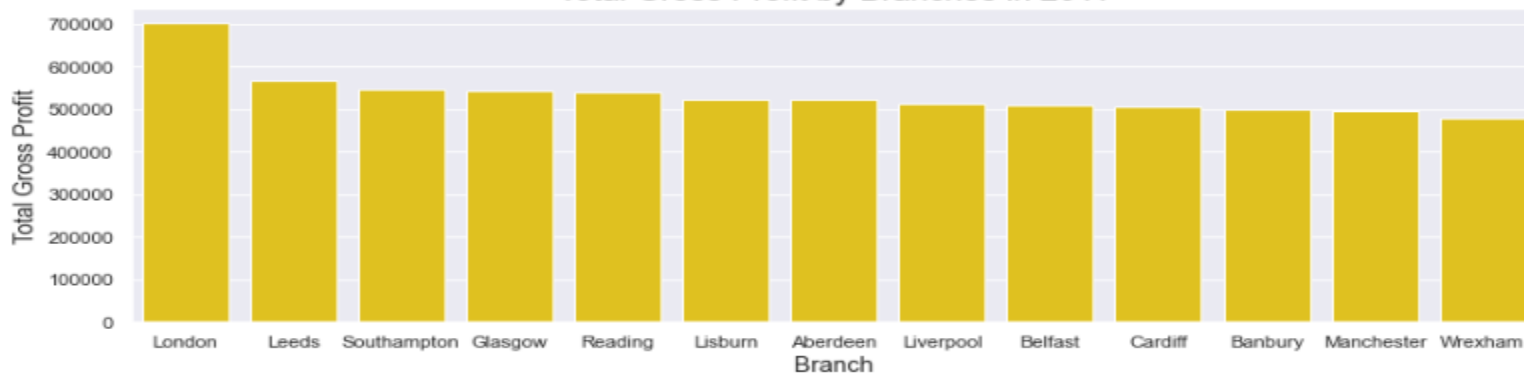


Years

Total Gross Profit

Staff-Branch	
London	702,670.60
Leeds	566,578.11
Southampton	548,118.22
Glasgow	544,684.02
Reading	540,974.19
Lisburn	524,259.14
Aberdeen	523,333.49
Liverpool	511,567.88
Belfast	509,321.92
Cardiff	505,373.17
Banbury	498,035.90
Manchester	497,104.90
Wrexham	480,392.79

Total Gross Profit by Branches in 2011



Branches

Total Monthly Revenue by Years Years in All Branches



Branches

Total Monthly Revenue by Years in Reading



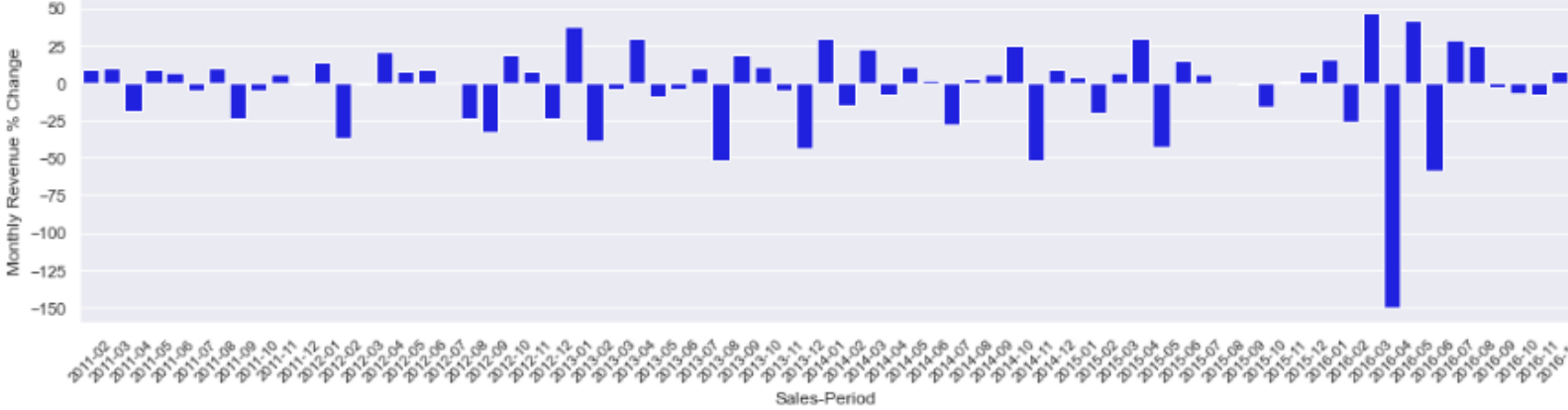
Branches All 

Monthly Revenue % Change

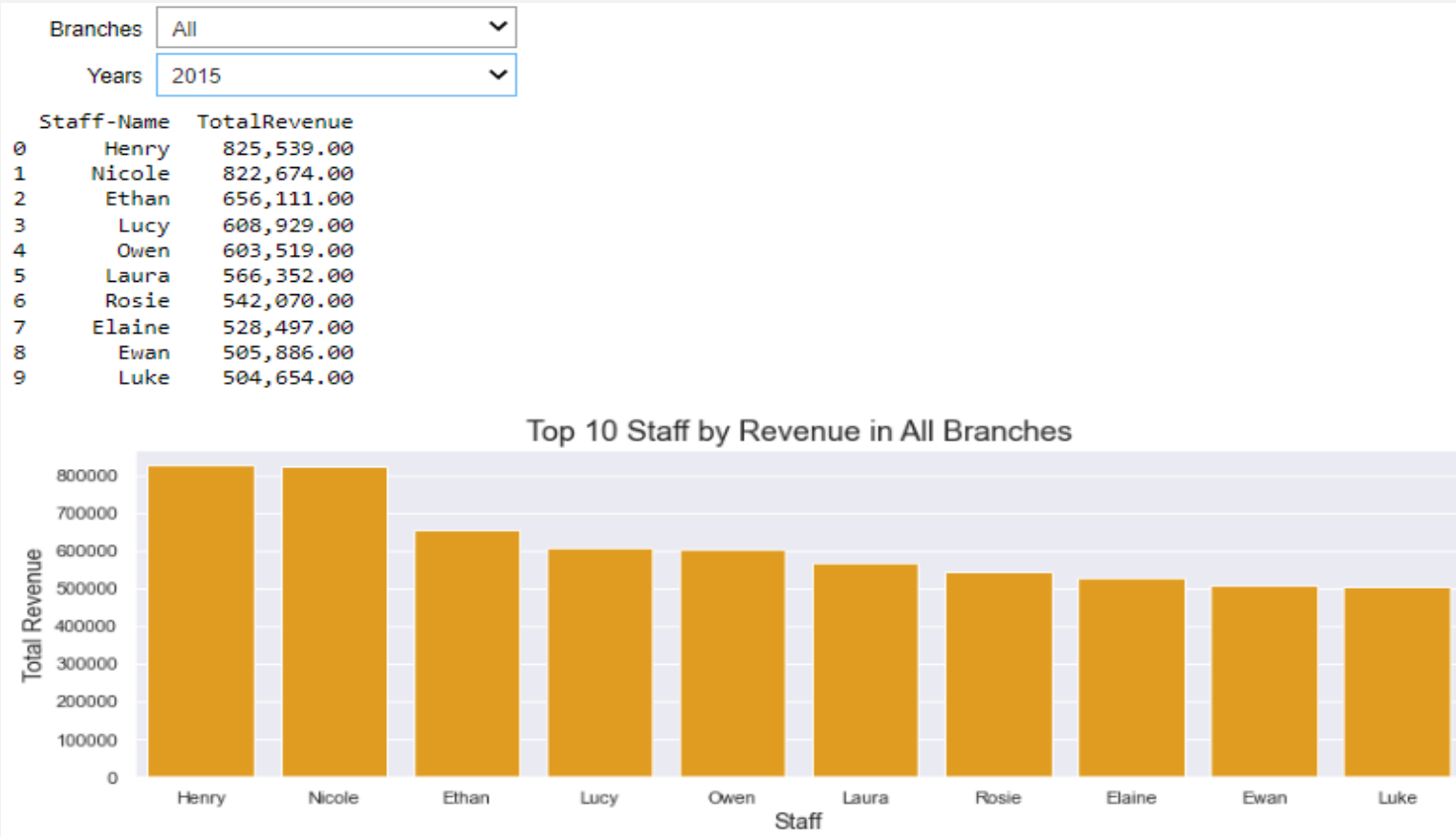
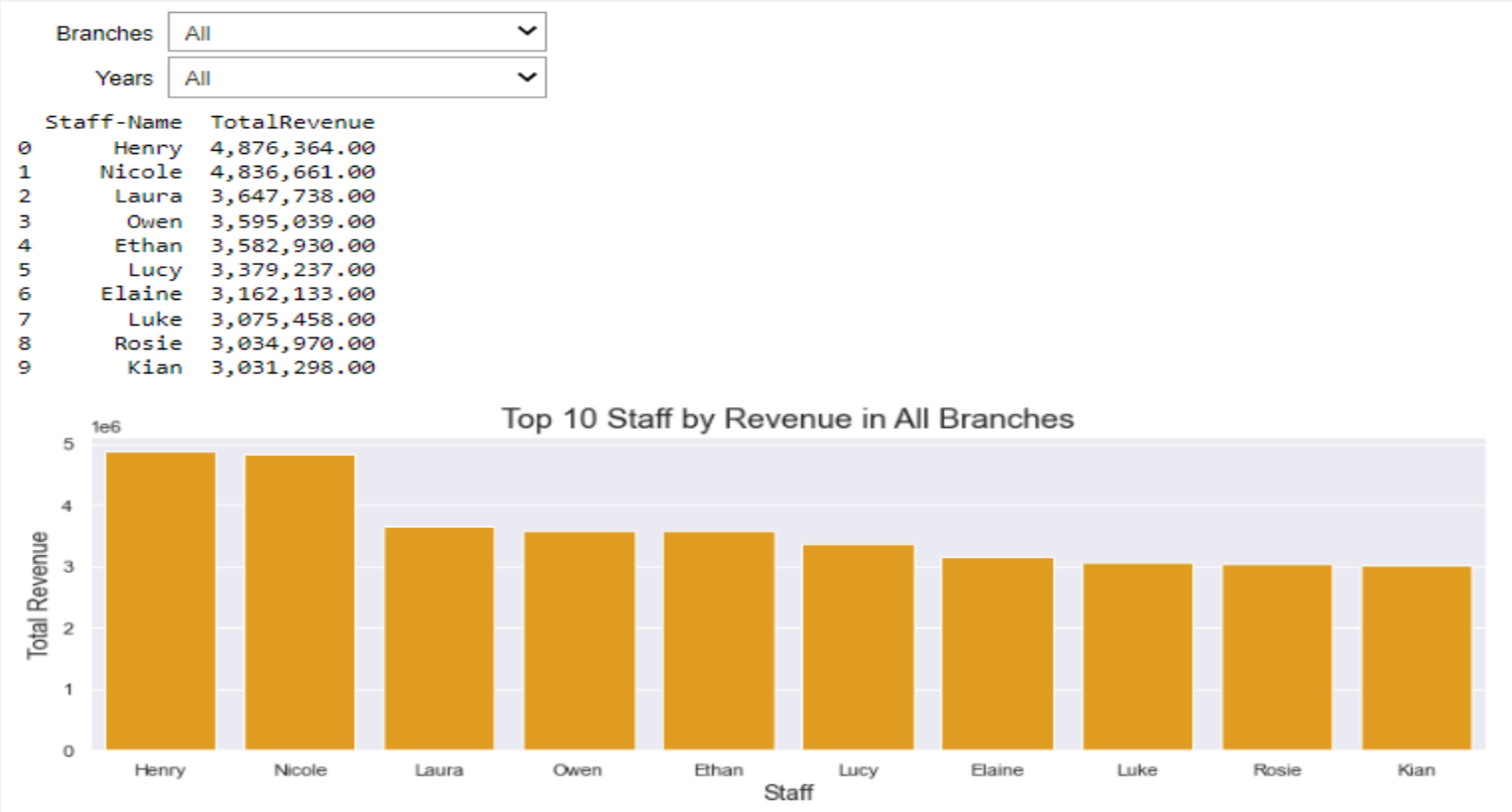


Branches Southampton 

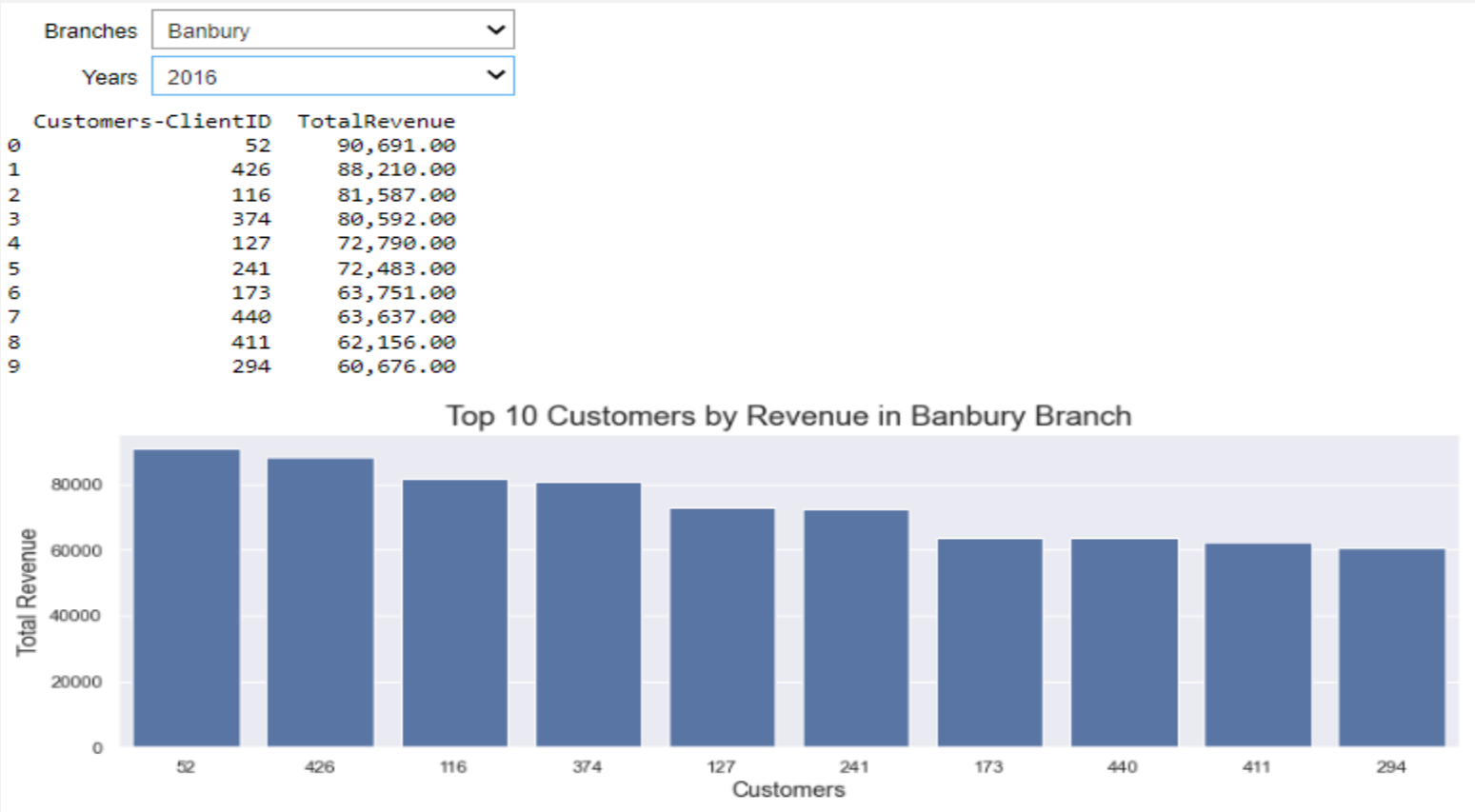
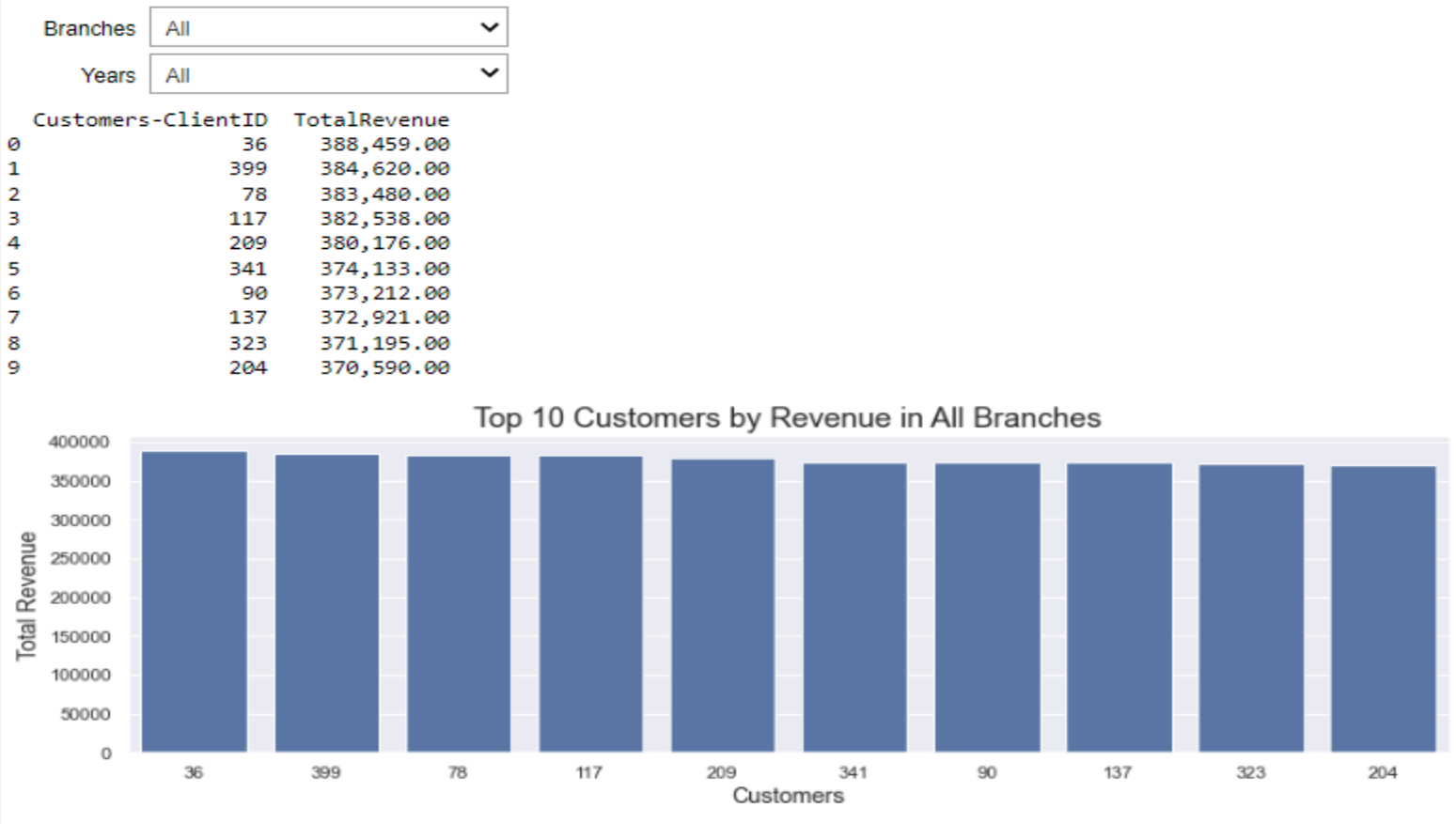
Monthly Revenue % Change in Southampton

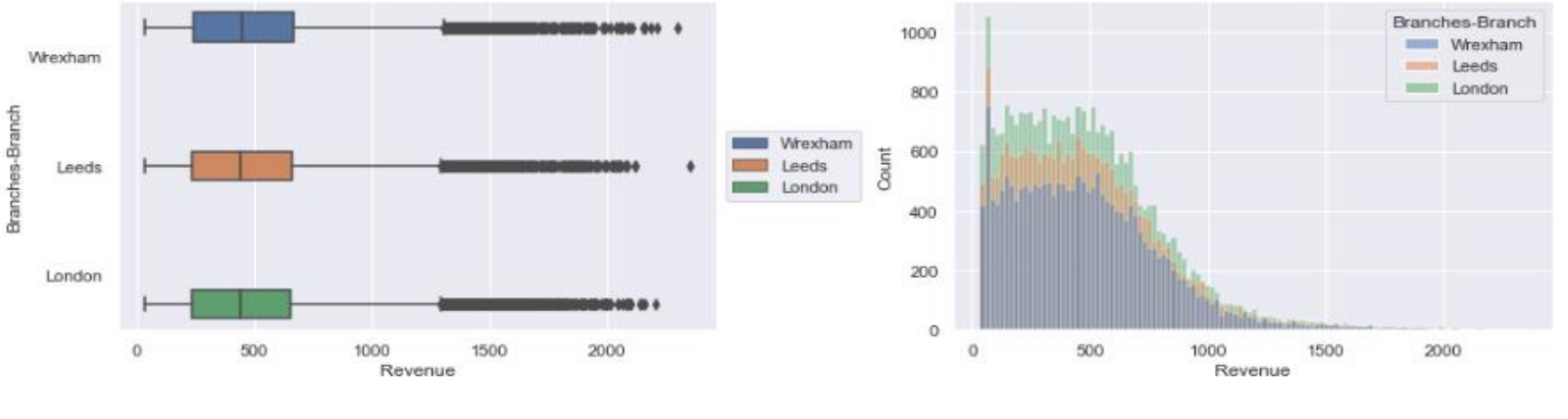
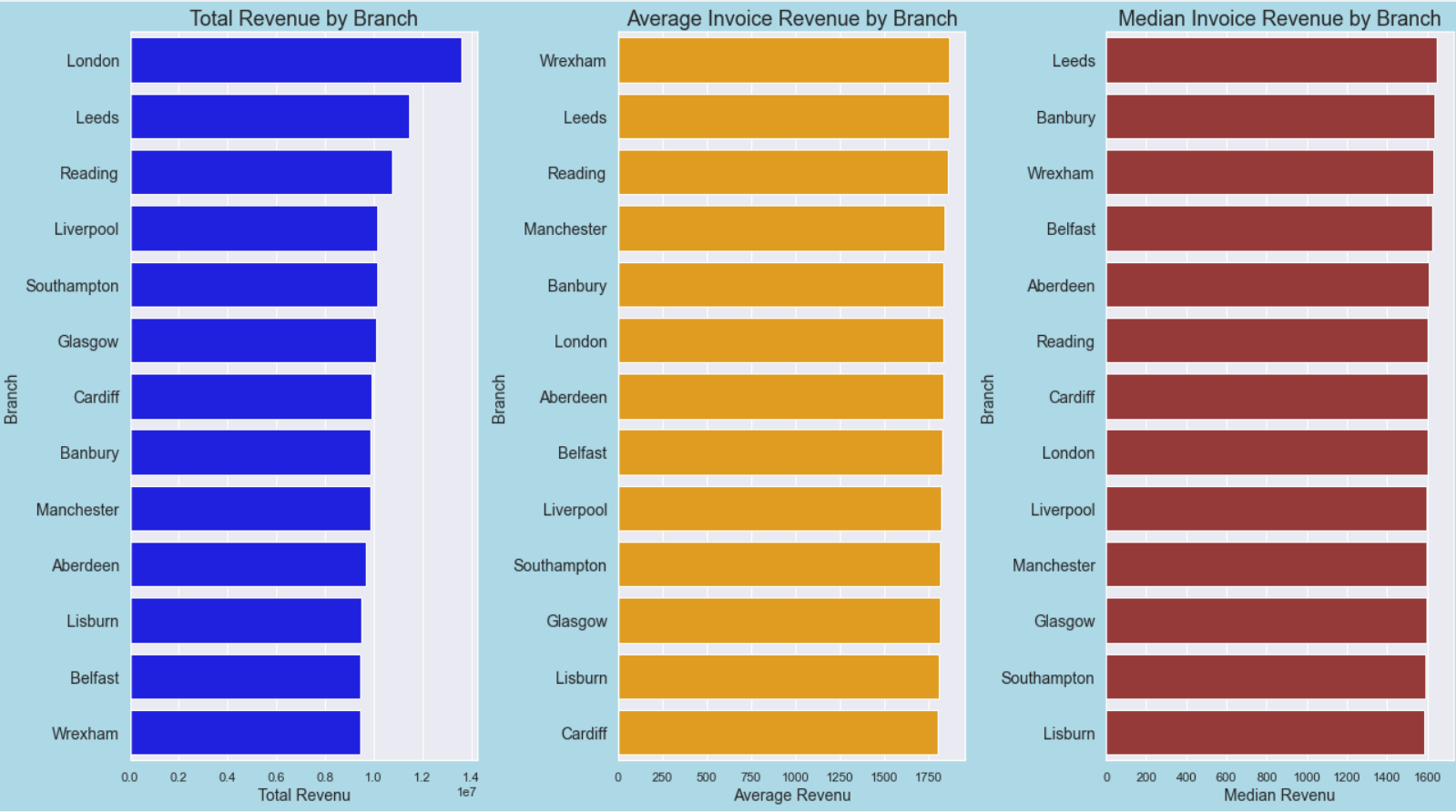


Staff Analysis

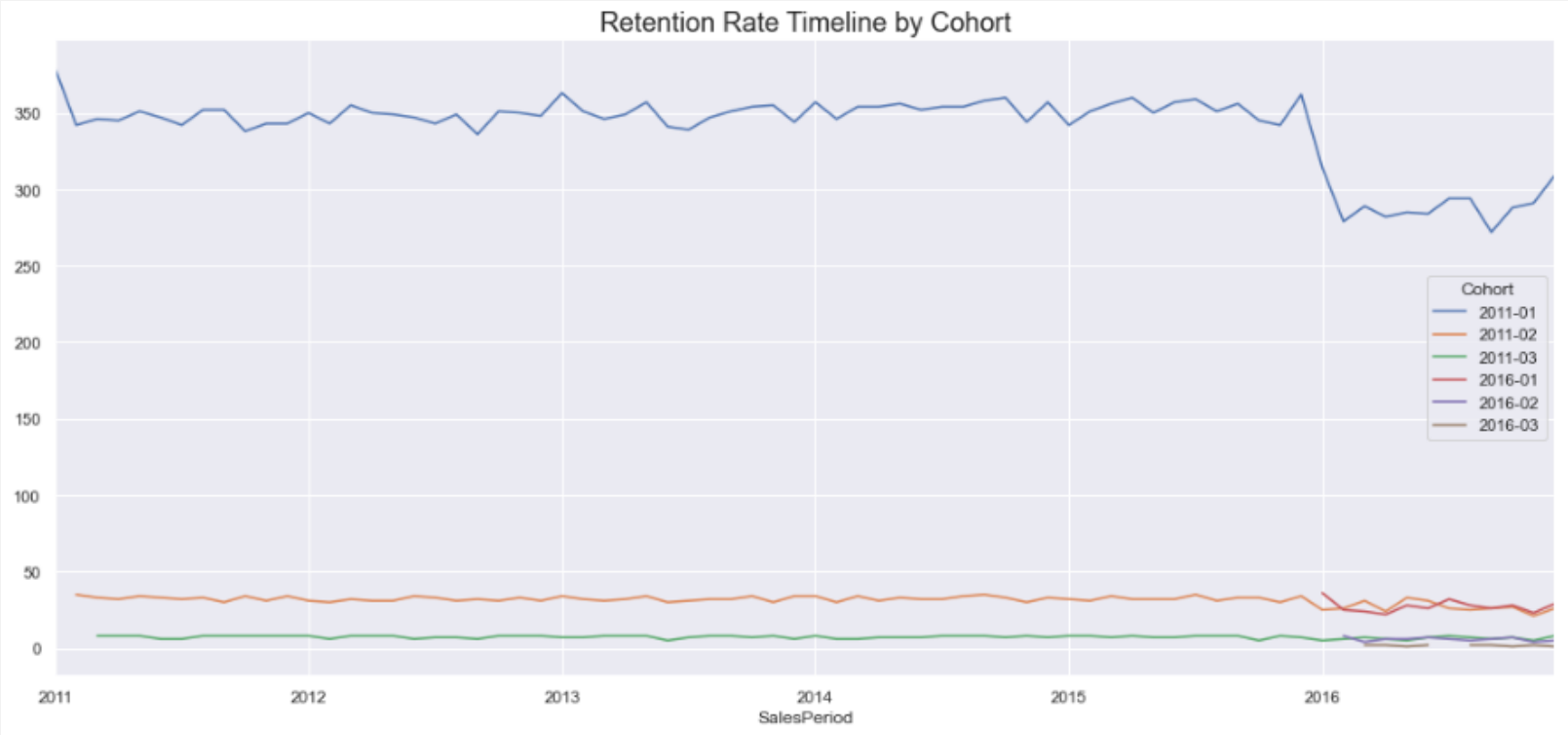


Customer Analysis





Customer Cohort Analysis

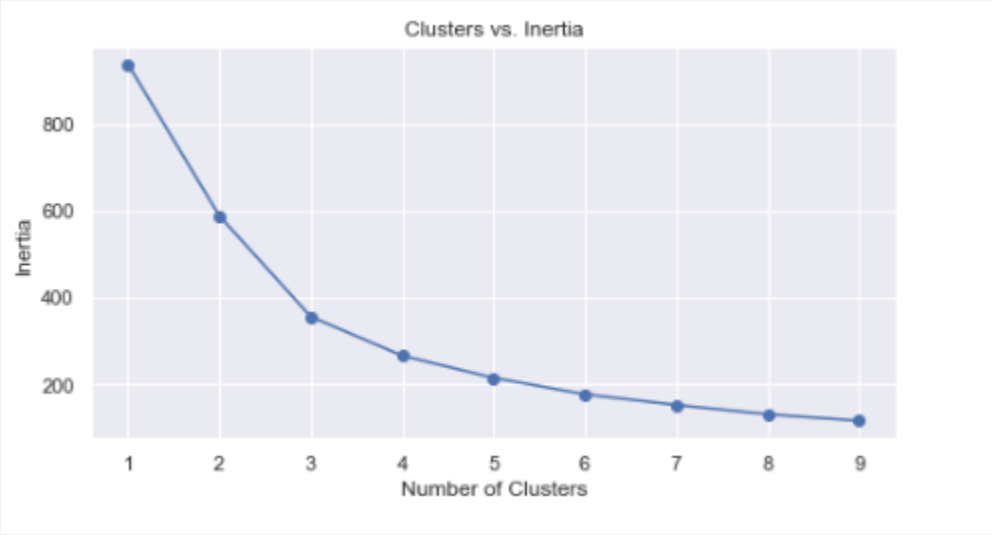


Customer RFM Analysis

```
Sliver      180
Bronze      148
Gold        100
Basic       29
Platinum    11
Name: LoyaltyGroup, dtype: int64
```



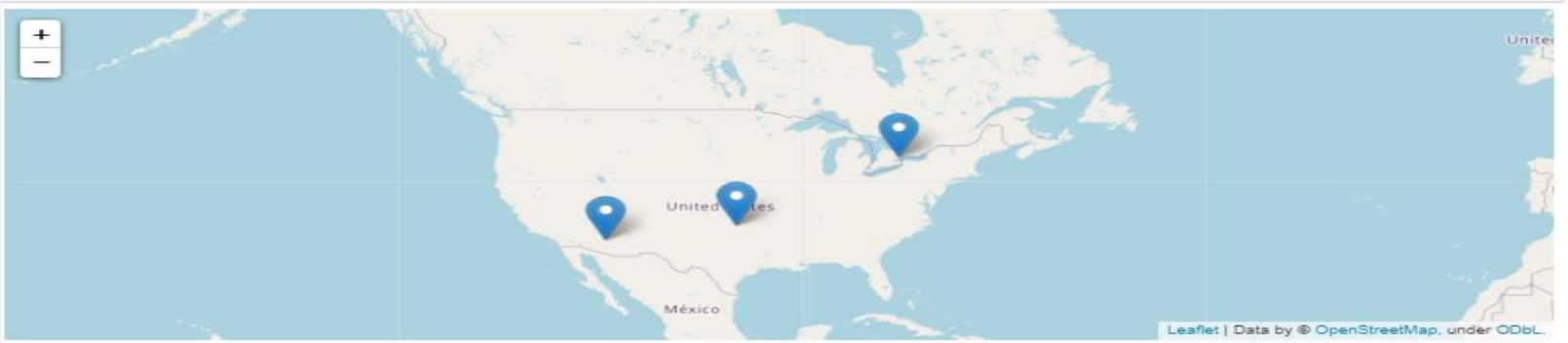
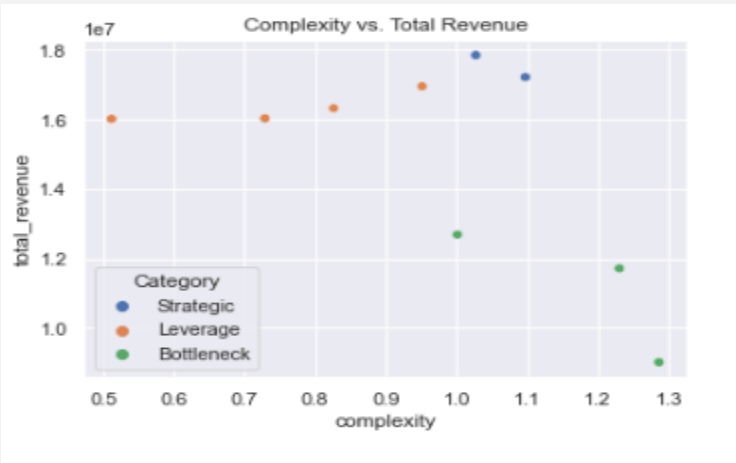
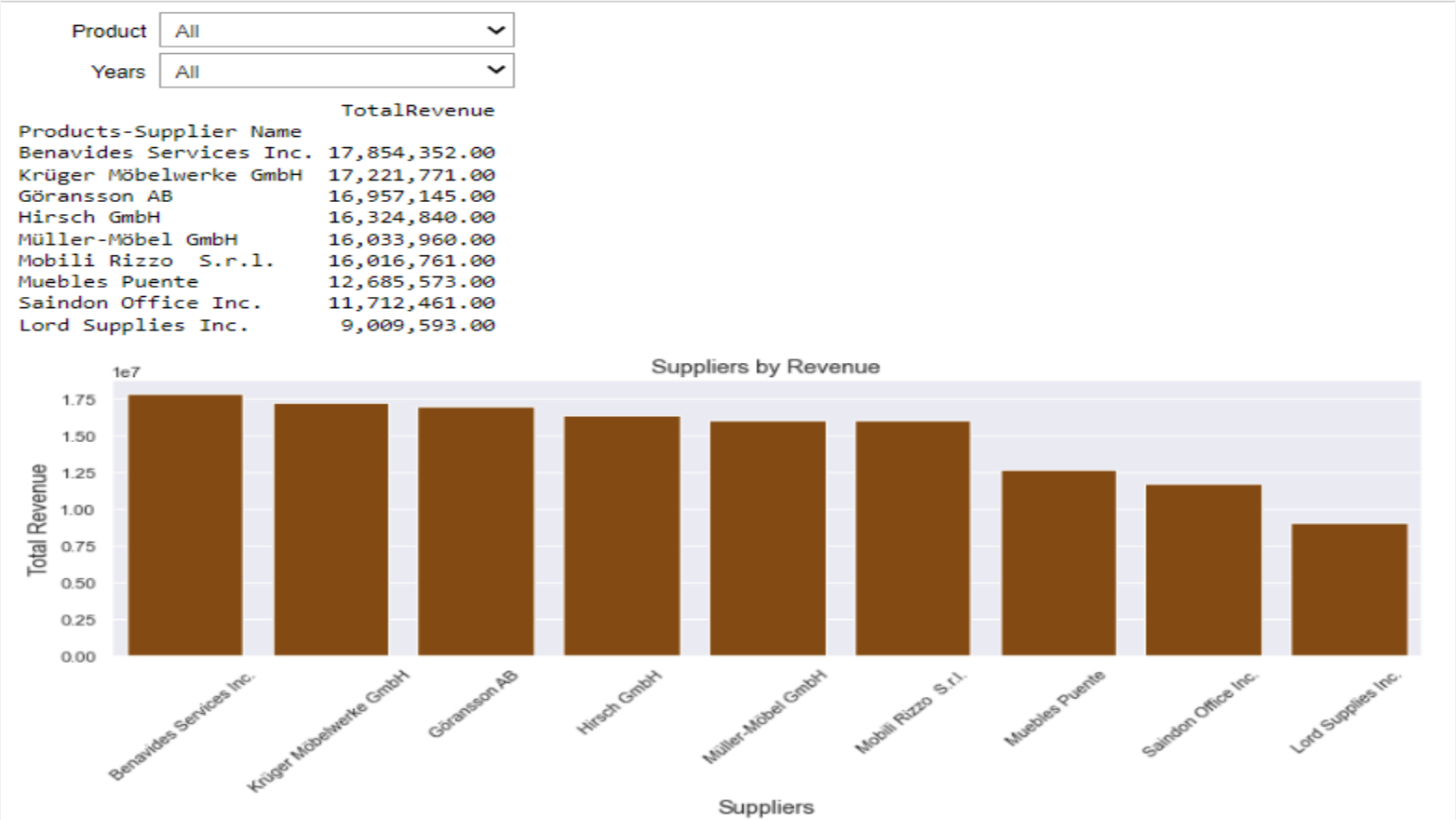
Customer Clustering Analysis (based on Income-Level and RFM Score)



- Customers can be segmented into the following segments:
- Customers with large purchasing power and large annaul income.
 - Customers with large purcahsing power and low annaul income.
 - Customers with low purchasing power and large income.
 - Customers with low purchasing power and low income.

The marketing team should customize the promotions and discounts according to those clusters. For example, customers with large purchasing power and low income should be given big promotions for their loyalty to the brand, while customers with large income level and large purchasing power should be given promotions for expensive items.

Suppliers Analysis



Product Analysis



Top 3 Products in All Branches in All Years in All Product Ranges by Total Quantity Sold

Quantity Sold

30000

25000

20000

15000

10000

5000

0

PIX7190

YAL5080

CAM1475

Products



Top 3 Products in Banbury in 2016 in Brainster Product Range by Total Quantity Sold

Quantity Sold

400

300

200

100

0

BRN1395

BRN3810

BRN6650

Products

Product Ra...

All

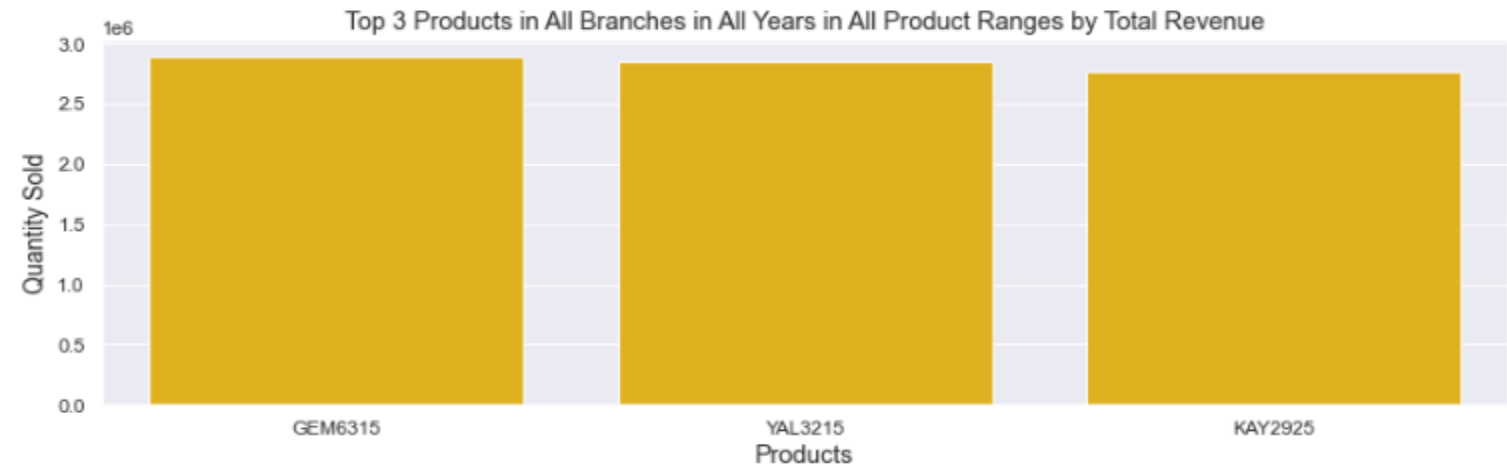
Branches

All

Years

All

Total Revenue	
Products-Product	
GEM6315	2.888053e+06
YAL3215	2.847076e+06
KAY2925	2.772239e+06



Product Ra...

Camindu

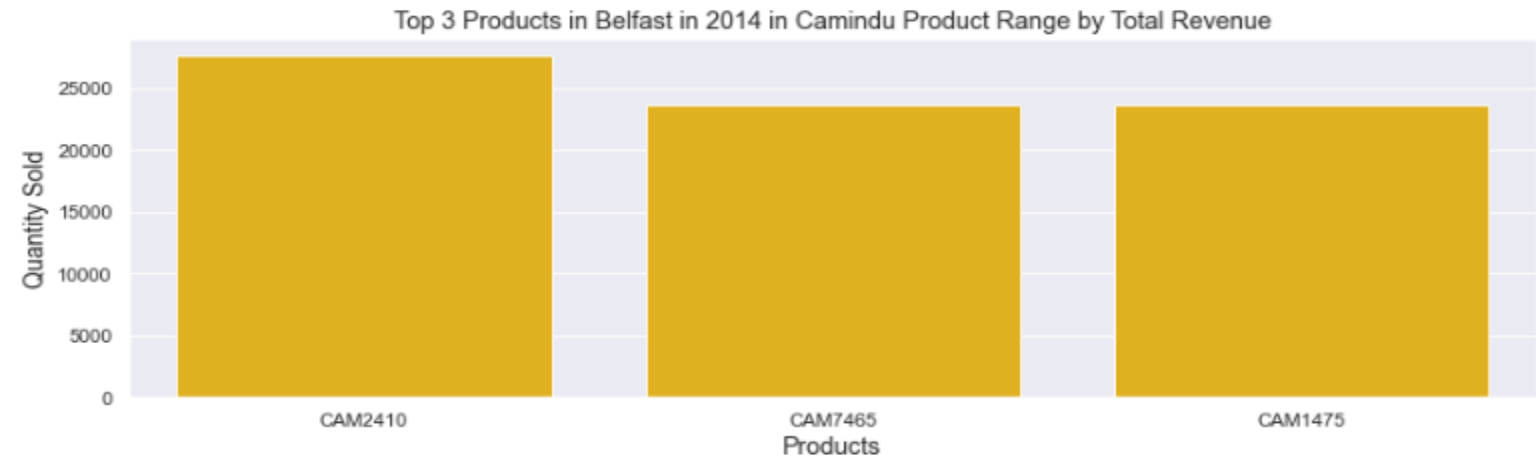
Branches

Belfast

Years

2014

Total Revenue	
Products-Product	
CAM2410	27,596.60
CAM7465	23,678.96
CAM1475	23,670.44



Product ABC Analysis



Products Recommendation List

User-based Approach

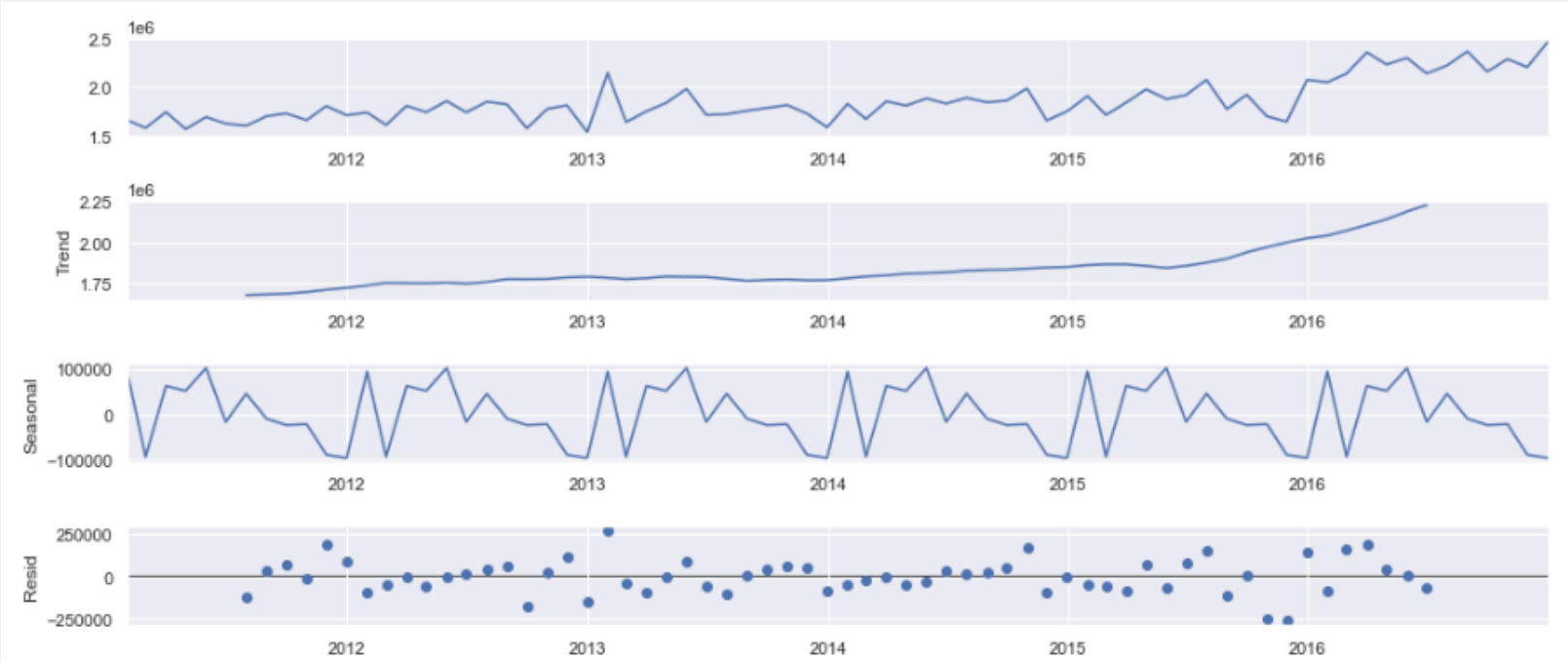
Items to be recommended to customer with the ID 459		
	Products-productid	Products-Product
0	58	DIG1180
1	66	BRN1395
2	30	DIG6320
7	10	PIX2715
10	34	CAM7465
11	26	DIV2710
13	16	MYT2345
16	29	PIX4910
18	61	PIX1905
20	23	BRN3550
35	39	BRN3810
42	63	YAL4135
45	33	DIV4580
56	7	MYT2590

Products to be recommended with product of the ID 2		
	Products-productid	Products-Product
14	28	DIG5630
18	61	PIX1905
26	13	CAM4175
27	36	GEM3940
37	41	DIG4505
43	51	DIG2995
44	64	YAL5320
55	9	CAM2410
62	1	YAL1940
63	32	YAL6285

This process can be repeated for ALL the products of interest

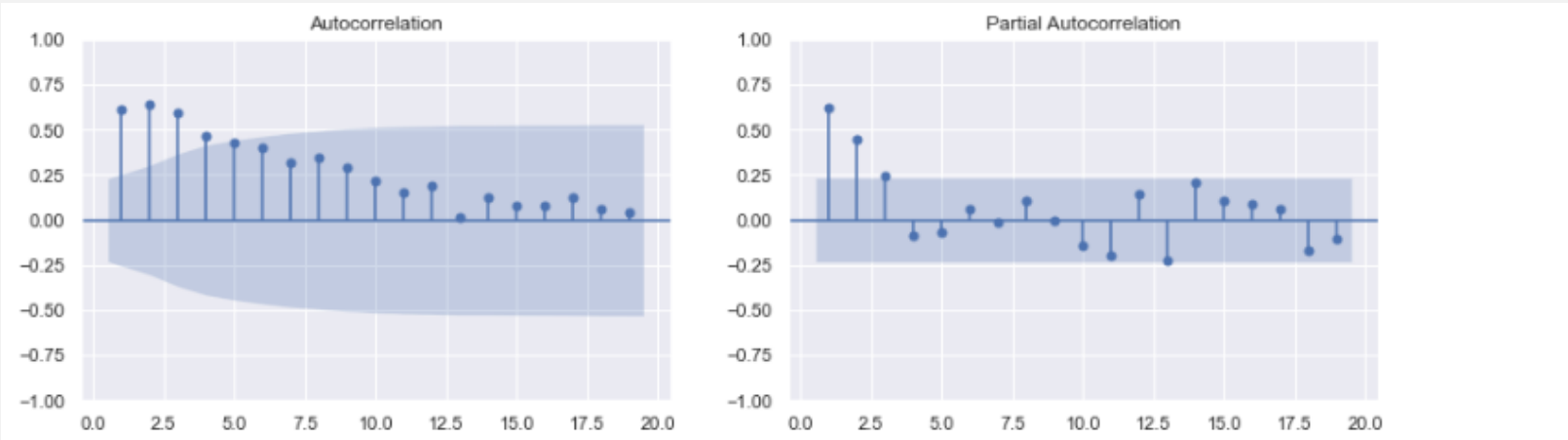
Forecasting the Revenue for the 2017-Q1

Breaking-down Revenue Timeline



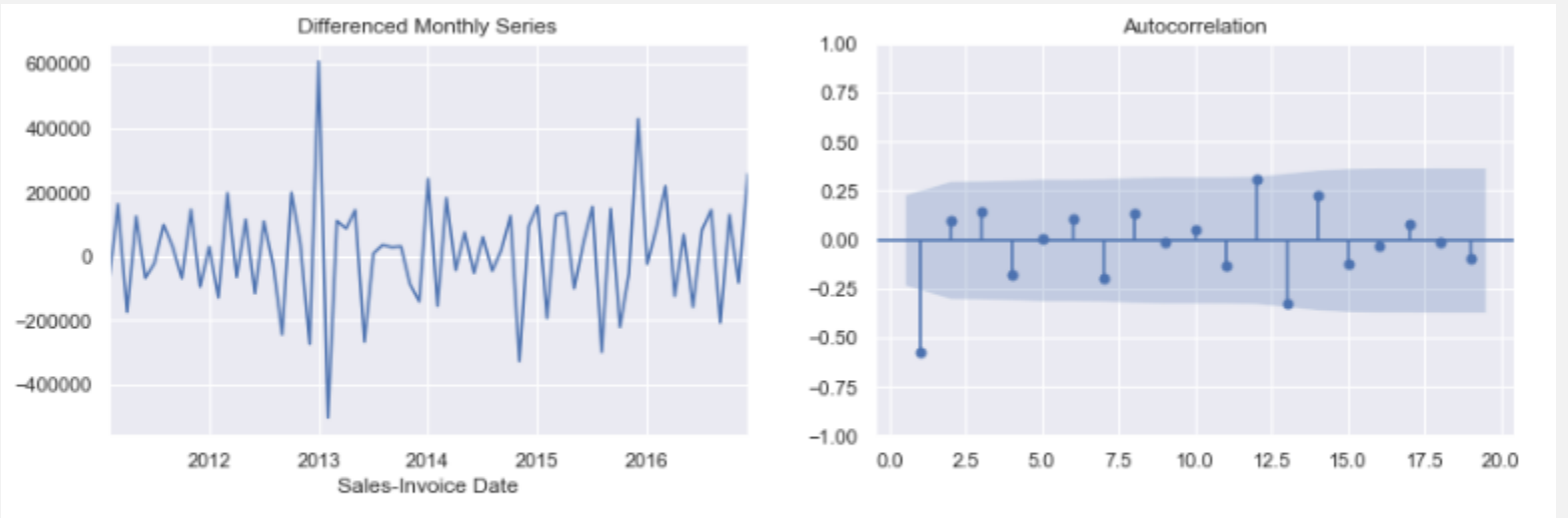
It can be seen from the graph that this series is not stationary due to seasonality and trend

Checking the Autocorrelation and Partial-Autocorrelation Functions



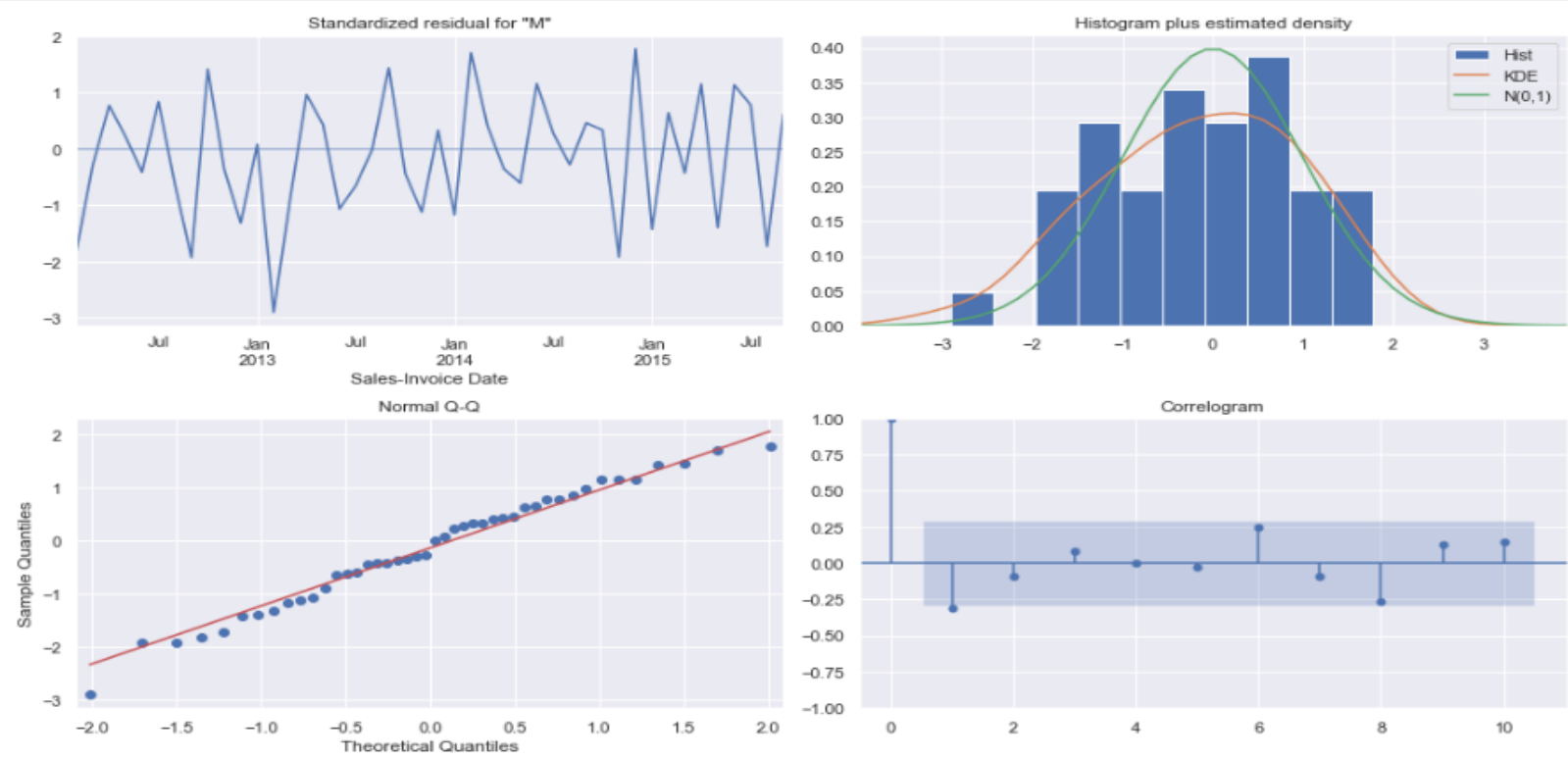
From the graphs of acf and pacf, it can be seen that this is an ARIMA model, and since the series shows seasonality I will use SARIMAX model to include the seasonality effect

Checking the Autocorrelation and Partial-Autocorrelation Functions after Differencing

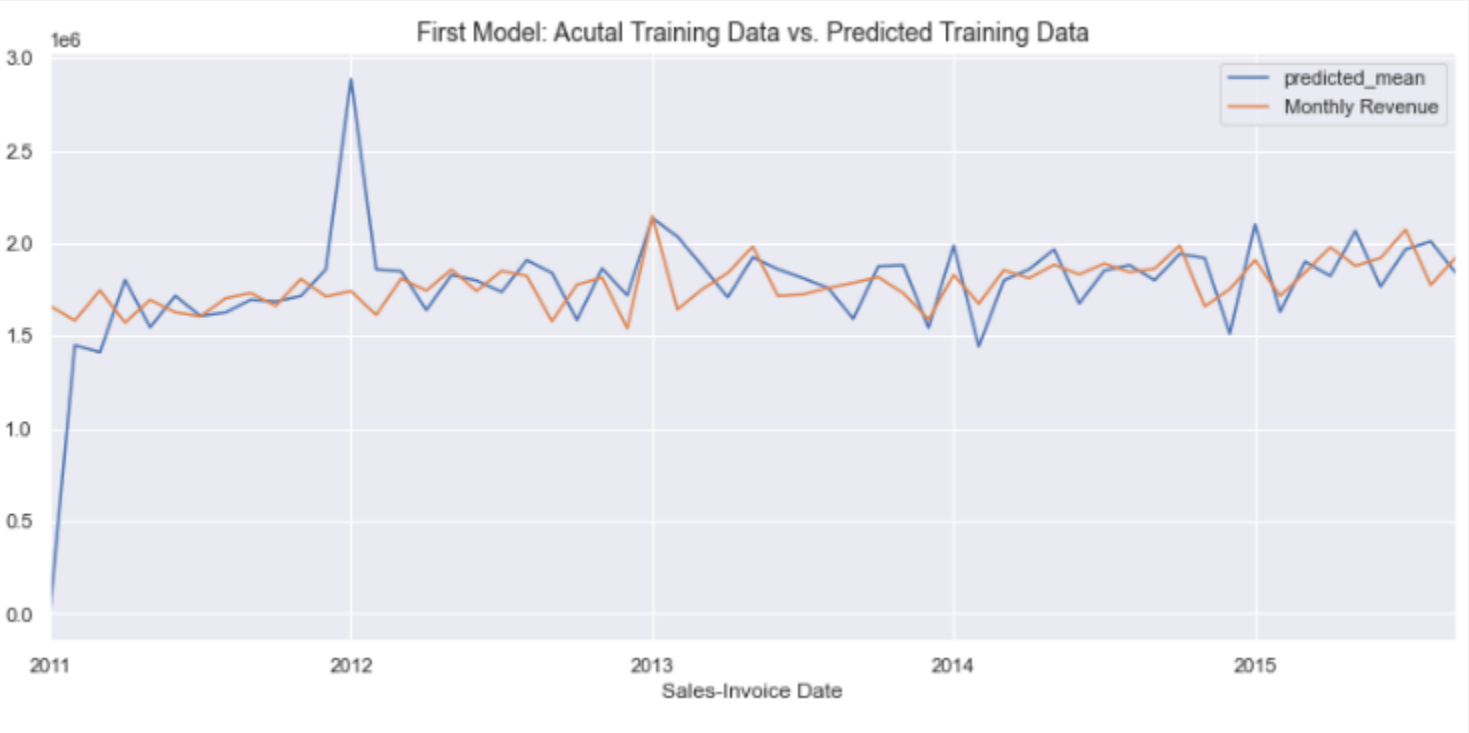


It can be seen from the plots that $p = 2$ and $q = 1$

Model Diagnostic Plot

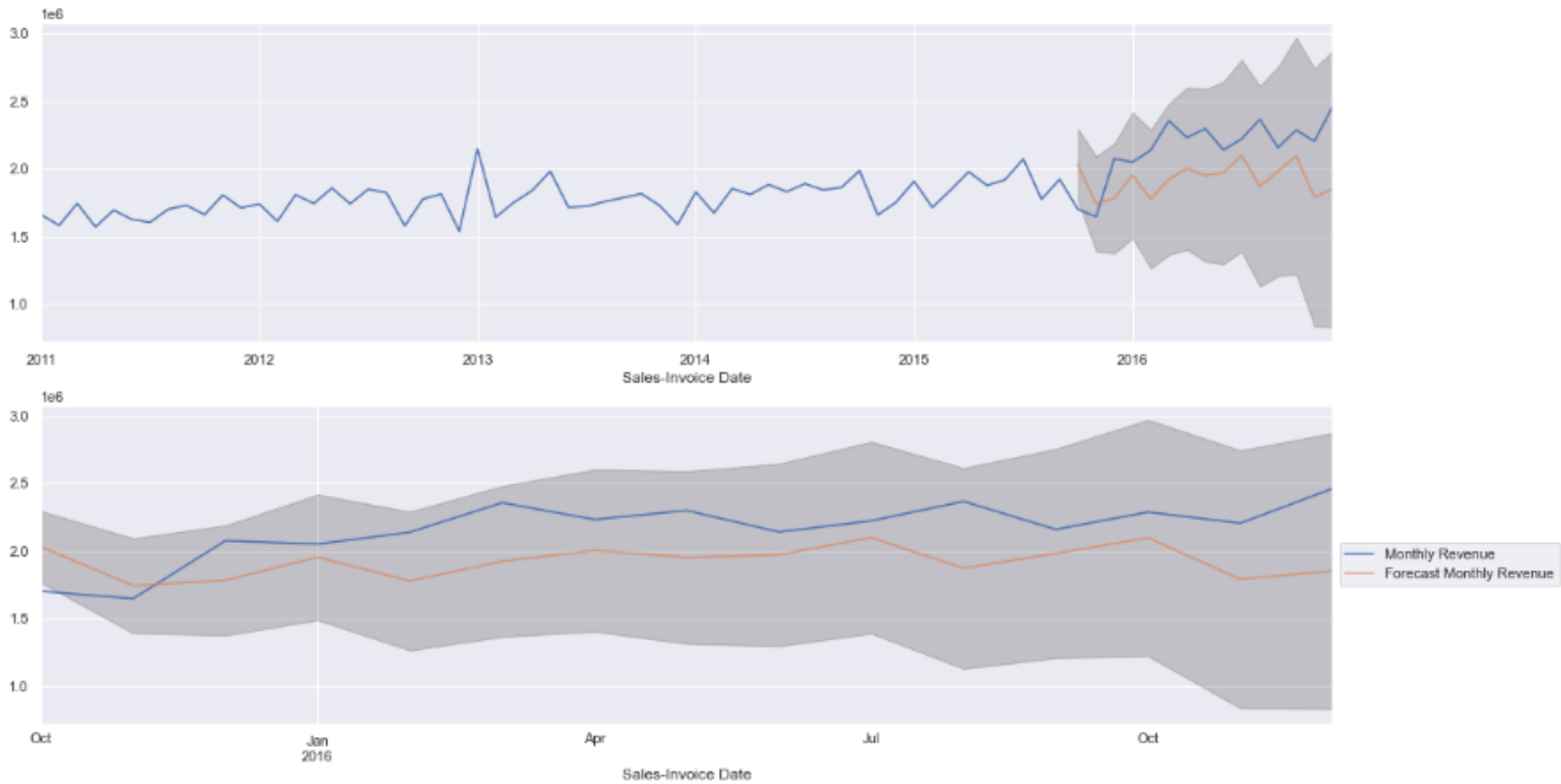


Actual Training vs. Predicted Training



Actual Test vs. Predicted Test

First Model: Actual Test Data vs. Predicted Test Data



Prediction

