--===Europe sales analysis using SQL, Tableau ,Python and Excel along with Insights and recommendations====--
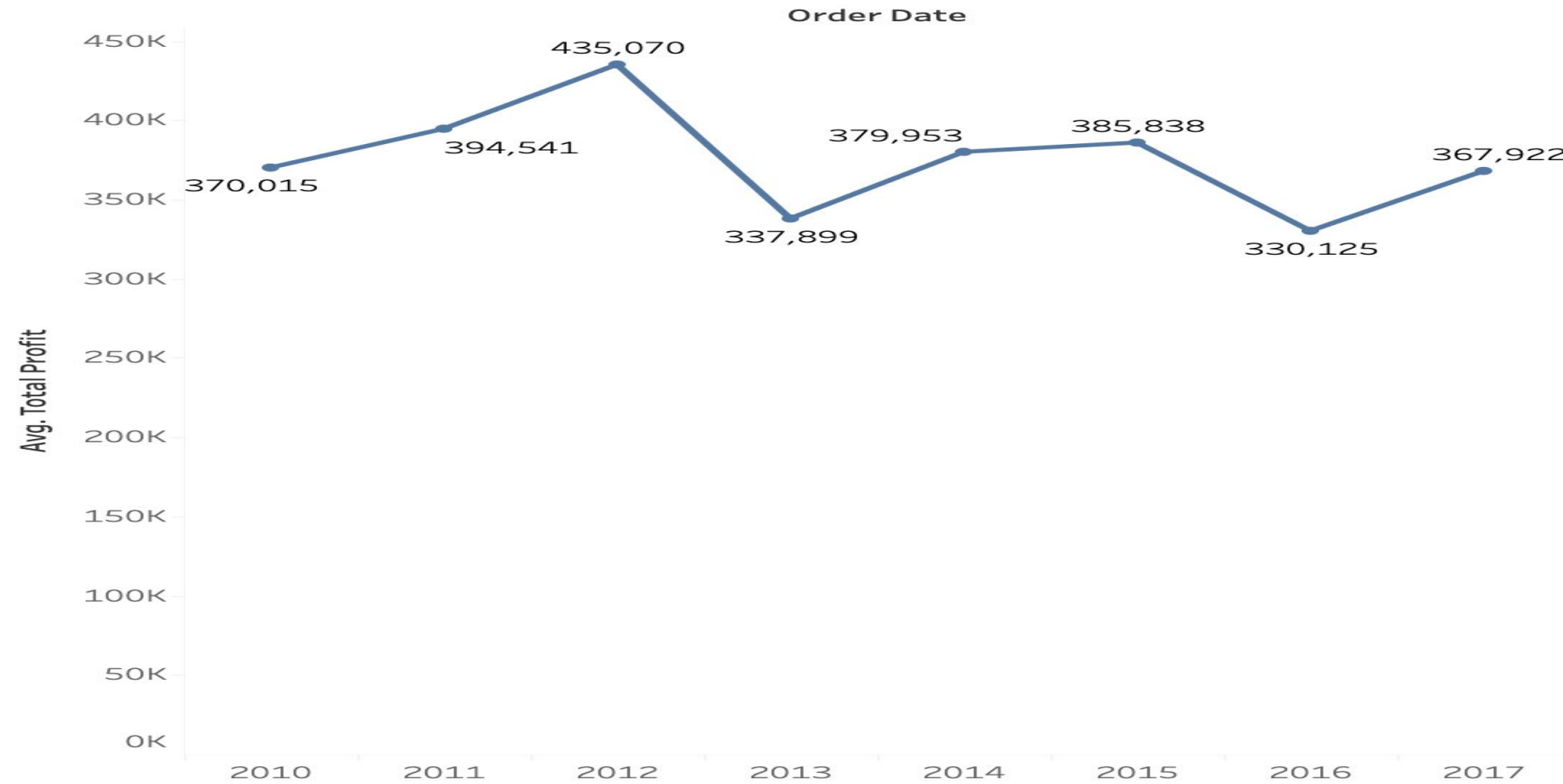
Bala Mira G

Yearly average profit trend
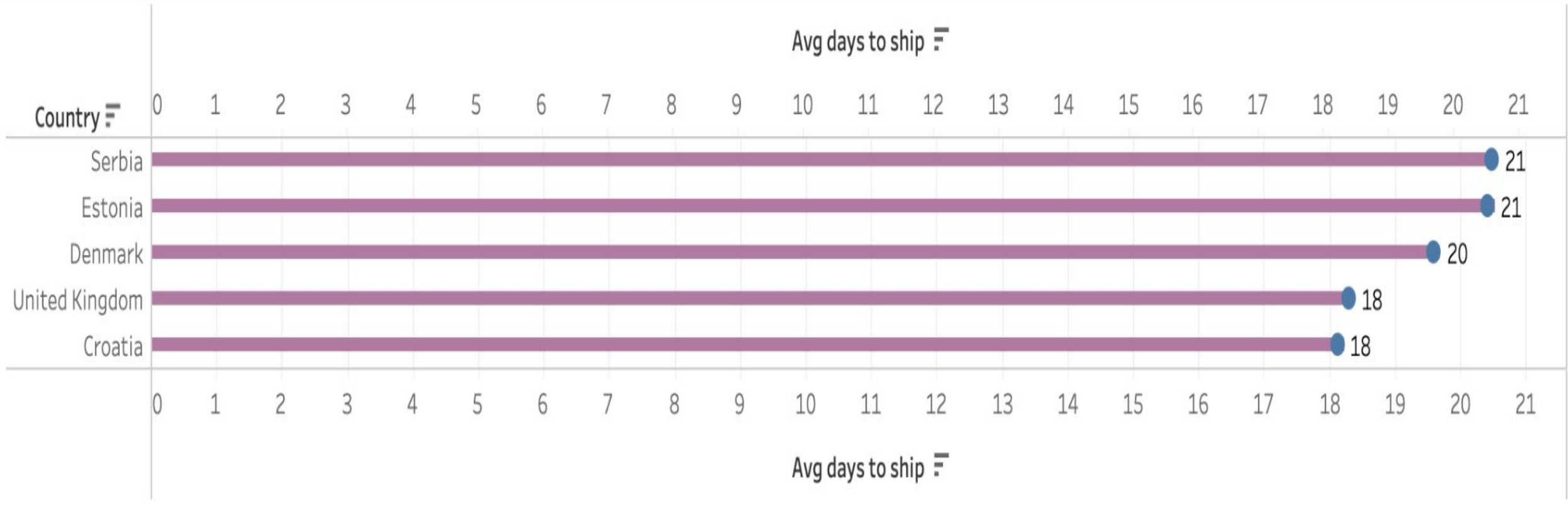
Order Date

Lowest 5:Avg days to ship by country

Avg days to ship ⊟

Country ⊟	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Serbia   21

Estonia   21

Denmark   20

United Kingdom   18

Croatia   18

Avg days to ship ⊟

--===EDA Insights===--

Avg profit by Sales Channel

Online 374,009

Offline 380,372

Yearly contribution of Total Avg profit
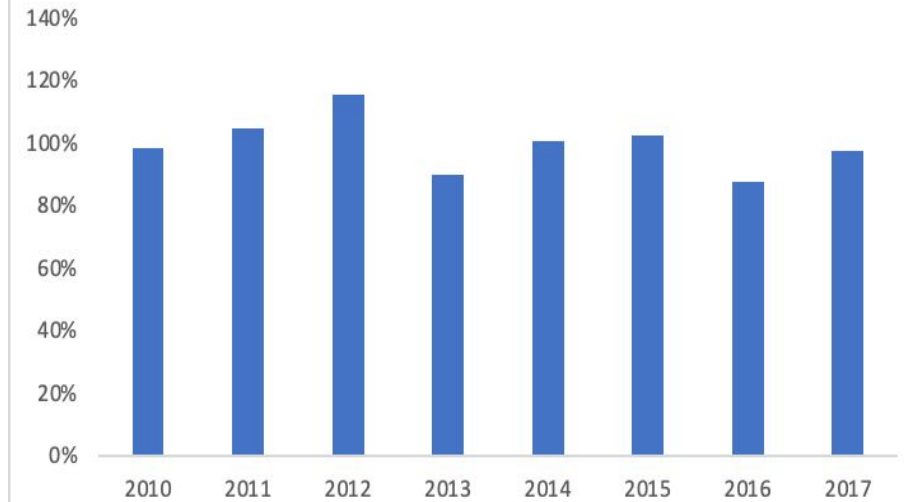
YOY & difference in Avg Profit

Average of Total Profit — YOY % difference

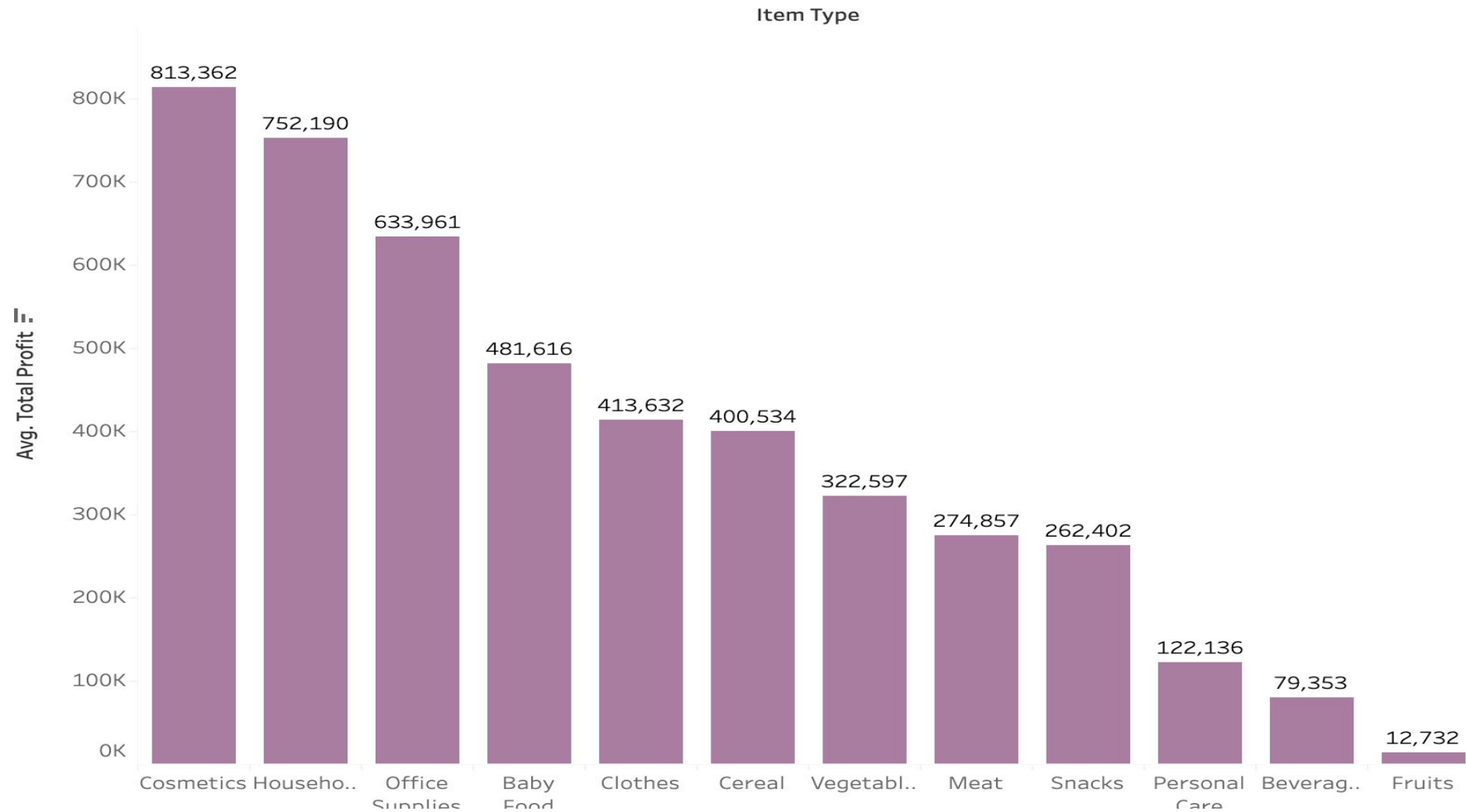--===== 5 countries with highest Avg time to Ship and lowest Avg profit by country =====-

Highest 5

Avg days to ship

Country	Avg days to ship
Hungary	33
Georgia	30
Austria	29
Slovakia	28
Luxembourg	28

Avg days to ship

Avg profit by country

Country	Avg profit
Netherlands	240,104
Georgia	247,725
Vatican City	278,862
Belgium	287,541
Moldova	287,602
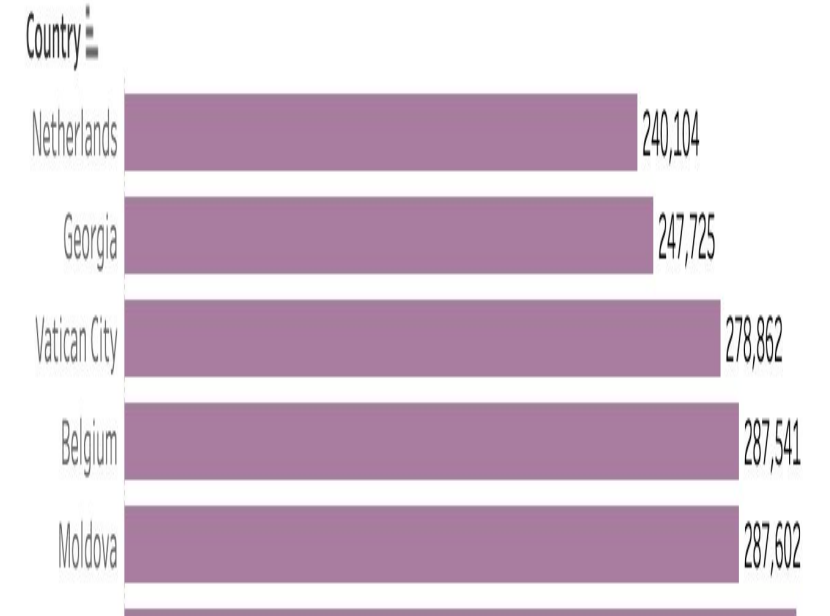
Avg profit by Item type

Item Type

```
#Avg profit by item type#

with cte as(SELECT

    ROUND(AVG(`Total Profit`), 0) AS avgprofit, ROUND(AVG(`Total Cost`), 0) AS avgcost, `Item type`

FROM

    europe

GROUP BY `Item type`)

select * from cte where avgprofit>avgcost;
```
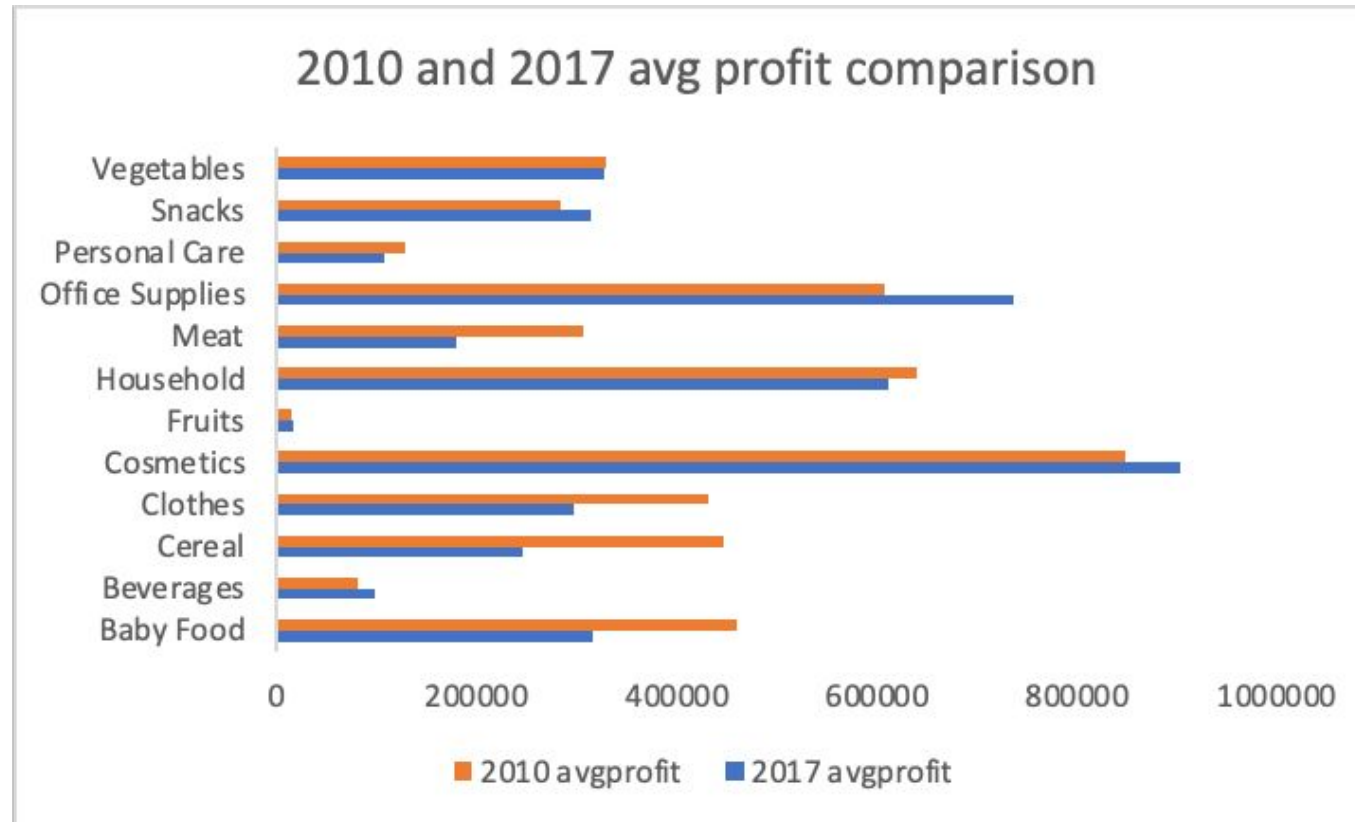
avgprofit	avgcost	Item type
413632	201859	Clothes

Avg days to ship by item type

Item Type

| Item Type	Avg days to ship
Clothes	22
Beverag..	22
Househo..	23
Personal Care	23
Snacks	23
Vegetabl..	23
Office Supplies	25
Fruits	26
Cosmetics	26
Meat	26
Baby Food	28
Cereal	28

Insights:
-

2010 and 2017 avg profit comparison
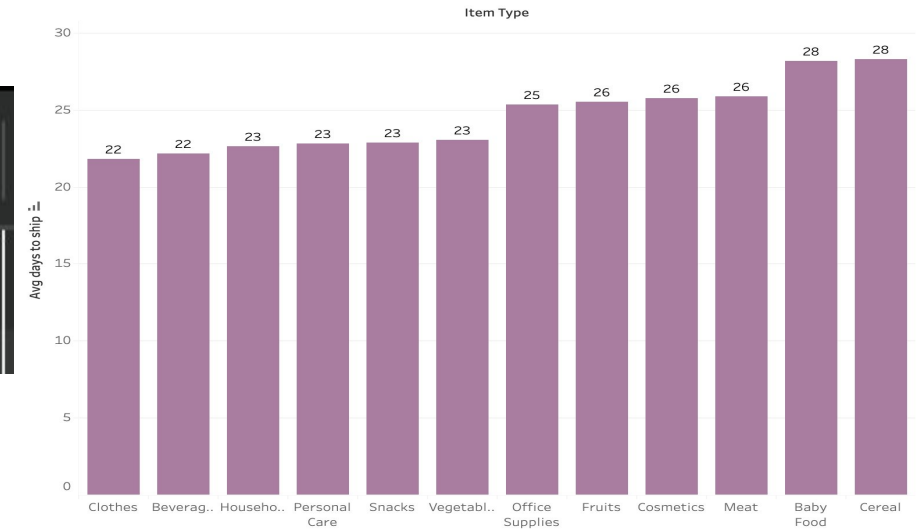
Insights:
- Beverages, Cosmetics ,Fruits, Office, Supplies and Snacks are those whose profit in 2010 is lower than that of 2017.
- Steps can be taken for the other Item types to increase their profit in future.

--==== Correlation between Avg profit and Units sold====-

	Units Sold	Avg Profit
Units Sold	1	
Avg profit	0.59474029	1

Units sold and Avg Profit
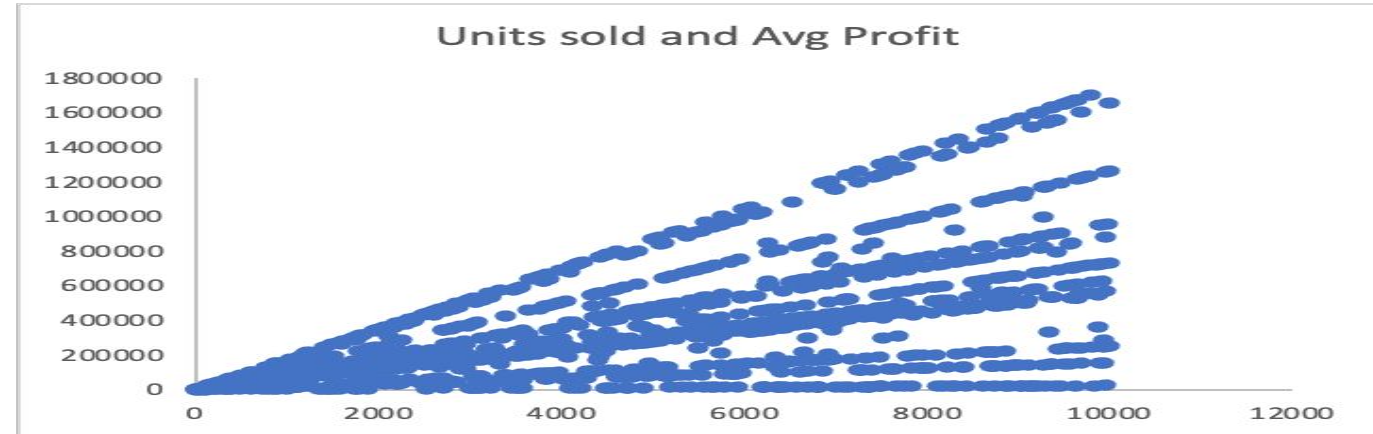
Business case scenario:

The business wants to introduce a "Combo sale season" and would want to check if increasing the number of units might increase the average profit.

- We did a correlation analysis between these two variables to analyze the historical data.
- The correlation coefficient between units sold and average profit is approximately 0.5947.
- This value indicates a moderate positive relationship. As the number of units sold increases, the average profit also tends to increase.
- However, correlation does not imply always causation. Though there is a positive correlation, it does not necessarily mean that increasing the units sold causes an increase in average profit. We can further analyze this by using Regression analysis.The output and interpretation of the results are mentioned in the following slides.
- Avg units sold is the independent variable and avg profit is the dependent variable.

--==== Regression analysis between Avg profit and Units sold====-

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.59474028
R Square	0.353716
Adjusted R Square	0.35319396
Standard Error	294736.215
Observations	1240

ANOVA

	df	SS	MS	F	Significance F
Regression	1	5.886E+13	5.886E+13	677.566534	1.708E-119
Residual	1238	1.0754E+14	8.6869E+10		
Total	1239	1.664E+14			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8845.0427	16539.5852	0.5347802	0.59289789	-23603.673	41293.7579	-23603.673	41293.7579
X Variable 1	74.8663941	2.8761461	26.0301082	1.708E-119	69.2237347	80.5090535	69.2237347	80.5090535

- **Multiple R**: This is the correlation coefficient between the independent and dependent variables. In this case, it is 0.5947, suggesting a moderate positive correlation.
- **R Square** (Coefficient of Determination): Approximately 35.37% of the variance in the dependent variable (average profit obtained) can be explained by the independent variable (avg units sold). This indicates a moderate fit of the model.
- **Correlation:** There's a moderate positive connection between the number of units sold and the profit.
- **Explanation:** About 35% of the changes in profit can be explained by the changes in the number of units sold.
- **Model Significance:** The overall model (relationship) is quite strong and not likely due to chance.
- **Prediction:** For each additional unit sold, the profit is expected to increase by around 75 units.

–-==== Regression to plan inventory stocks====–-

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.94601601
R Square	0.8949463
Adjusted R Square	0.87743734
Standard Error	136.554106
Observations	8

- The business wanted to know if the avg units sold would increase or decrease for the following years.
- We implemented a regression model between year and avg units sold to find out more.
- R Square: The coefficient of determination (R^2) is approximately 0.895, which means that about 89.5% of the variability in the average units produced can be explained by the linear regression model.
- X Variable 1 (Year): The coefficient for the year variable is approximately -150.64. This indicates that, on average, for each unit increase in the year, the average units produced decreases by about 150.64 units.
- Overall, the regression model suggests a strong negative linear relationship between the year and average units produced, indicating that over time, there has been a decrease in the average units produced.

ANOVA

	df	SS	MS	F	Significance F
Regression	1	953117.357	953117.357	51.1136451	0.00037756
Residual	6	111882.143	18647.0238		
Total	7	1064999.5			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	308189.143	42425.9946	7.26415834	0.00034614	204376.474	412001.812	204376.474	412001.812
X Variable 1	-150.64286	21.070756	-7.1493807	0.00037756	-202.20114	-99.084575	-202.20114	-99.084575

--==== Regression to plan inventory stocks-Prediction====-

```
Regression Results:
Intercept: 308189.14
Slope: -150.64

Predicted Values:
Predicted average units sold for 2018: 4191.86
Predicted average units sold for 2019: 4041.21
Predicted average units sold for 2020: 3890.57
Predicted average units sold for 2021: 3739.93
Predicted average units sold for 2022: 3589.29
```
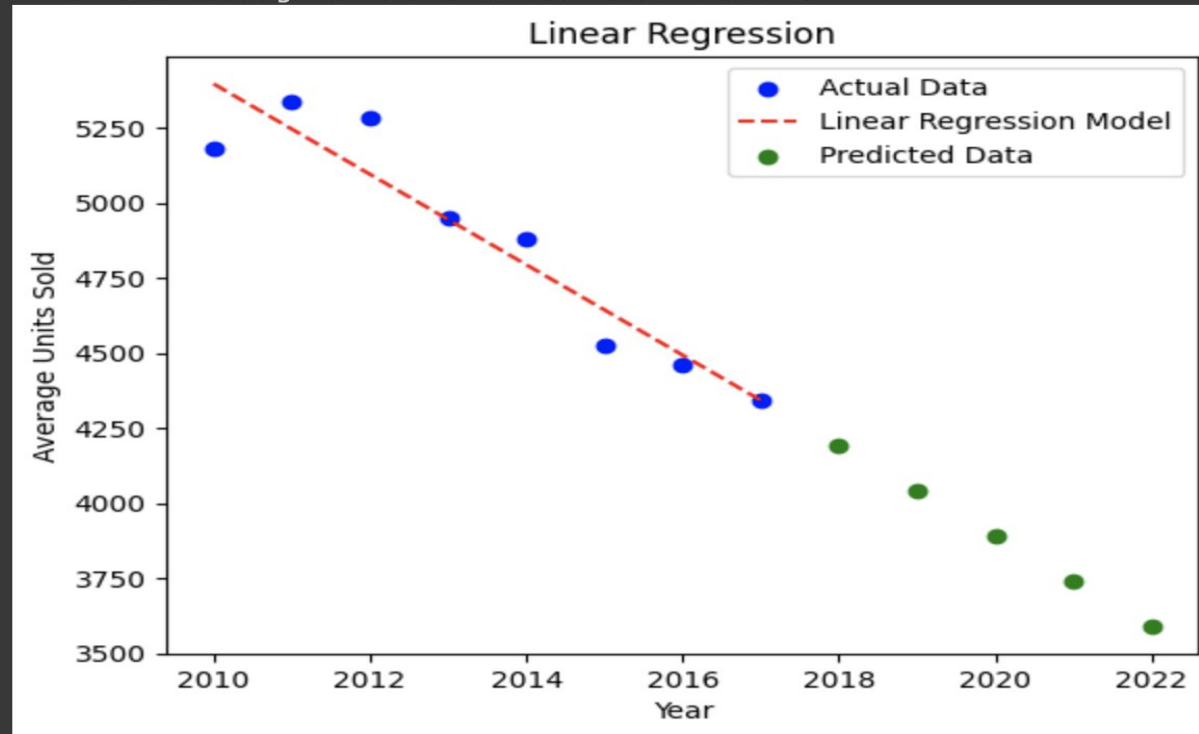

- Slope: The slope of -150.64 represents the rate of change in the average units sold for a one-unit increase in the independent variable (year).
- In other words, for each increase in the valuer of year, the average units sold decrease by approximately 150.64 units.
- Given the negative slope, the predicted values decrease as the year increases, indicating a declining trend in the average units sold over time, as suggested by the regression model.
- However, it's essential to interpret these predictions cautiously and consider additional factors that might influence sales trends.

Conclusion:

- Over the years, the trend is showing a decline in the number of units sold.
- So, if this trend continues, we might sell fewer units in the future.
- The sellers might have to study customer patterns, market behaviour and trends to increase the average units sold in the upcoming years.

Overall Insights and recommendations:

- Croatia & UK are some of the countries with the lowest avg time to ship.
- Cosmetics has the highest avg profit whereas Fruits have the lowest. Steps can be taken to ensure that the profit for Fruits section improves.
- Every year on average, the model predicts that there would be a decrease of about 65 units in the number of items sold. If this trend persists there might be a decrease in the overall profit.
- The only department in which the avg profit is more(almost double) than avg cost was the Clothes department.
- Moreover, their avg days to ship is one of the lowest which makes them a sure shot "Winner" 🤩
- Sellers might have to prioritize on marketing and promotion strategies by introducing different sale seasons to boost profitability.
- The yearly average profit was the lowest in 2016 and the highest in 2012.
- The Avg profit between 2012 and 2013 has been the lowest which is -22.33%.
- Hungary has the highest avg days to ship followed by Georgia.
- The latter has to improve on the trade performance since its avg days to ship is one of the highest and avg profit is one of the lowest.
- Online sales have generated less profit than offline sales and steps can be taken to improve the latter's performance.