

**ST2187**

**Business analytics, applied modelling and predictions**

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## International overview

The dataset provided contains data collected from 7 markets around the world: *Asia-Pacific* (APAC), *Europe* (EU), *United States* (US), *Europe, Middle East and Africa* (EMEA) and *Canada*. Exploring the data given has shown that APAC is the top market in sales of \$3.5 million, followed by EU with sales of \$2.9 million. Presumably, this is due to APAC being the largest market as it is home to approximately 4.3 billion people. The same could be said for the EU which has 447 million inhabitants. This would also explain Canada being the weakest market, as it includes only the country which has 38 million people. The *United States* is also similar for having its own market category, but places 3<sup>rd</sup> in top market sales which is explained by its population of 330 million. Interestingly however, it is the most profitable country among all countries and for this reason, I will be examining it more deeply going forward.

## Sales and profits overview

An overview of the sales and profit of the US market shows that there has been a steady growth of sales over the last 4 years and the forecast estimates that this will continue in 2021 to 2022. The forecast chart reveals that sales hit their peaks in specific months consistently, namely March, September, November and December. This would suggest that there is seasonality in this data, and it is evident in the bar charts that more sales occur in Q4. Looking at the forecast chart more closely, it can be argued that in the last two years a trend where sales are picking up in May and June seems to be forming and judging by how there is already a consistent trend where sales increase near the end of Q1, Q3 and Q4, the plausibility of sales increasing near the end of Q2 is high. Another thing of note is that the Furniture category has performed the worst among the 3 categories, making \$26 profit per customer and has a profit ratio of 2.49%. This can be explained by the number of Unprofitable orders, which remains the largest in the Furniture category. In comparison, the other two categories perform better, both having a similar profit ratio of 17%. However, despite Technology being the most profitable, the business has sold less Technology products and more Office Supplies. This suggests that our customers primarily seek the business when in need of Office Supplies.

**Recommendation:** It is recommended for management to investigate the possible sales increase in May and June as this could be an opportunity to capitalize from. Management should also consider building on its two strongest categories, i.e., Technology and Office Supplies by marketing more Technology and Office Supplies products to boost sales.

## Profitability of Products in States

Looking at the profit by segment chart, we can immediately identify the culprits behind the Furniture category's bad performance: Tables are the least profitable sub-category in all 3 segments, followed by Bookcases only having negative profits in the Consumer segment. It is also worth mentioning that Supplies have brought negative profits in the Consumer segment, and very little positive profits in Consumer and Home Office. Sorting the products by the least profitable, however, reveals that the 3 least profitable items are from the Machines category. These Machine products perform poorly in specific states: Ohio (-\$9,240), North Carolina (-

\$3,840), Colorado (-\$3,400) and Texas (-\$1,870). In California and Michigan, the positive profits do not exceed \$1,000. Similarly, not every state produces negative profits for all Table and Bookcase products, although many products under these two sub-categories produce negative profits. The same could be said for Supplies, however, there are only 3 products in this sub-category that perform poorly. For these 3 products, most of the states with positive profits yield less than \$100 in profits; it is only in California where profits exceed \$100, yielding \$538 profit out of \$13,581 sales giving a profit ratio of 3.96%.

**Recommendation:** For the 3 Machine products that produced large negative profits, the business could consider pulling them off the catalogue completely since less than 20 of each were sold over the years and all 3 have high negative profit ratios, i.e., more than -20%. For Tables and Bookcases producing a negative profit, the business could consider looking into reducing variable costs, raising the sales prices for each product or perhaps doing both. There are many products in this sub-category that produce a negative profit, however, which could make this process time-consuming. Therefore, the business could filter out the products with more than -20% profit ratio and take them off the catalogue. For the 3 Supplies products mentioned before, since the profit ratio isn't substantial for each, the business could consider raising the sales price or reducing the variable costs.

### Customer Insights

It must be stated that it is obvious for discounts to decrease profits, but what we want to know is if discounts help increase sales while also producing manageable negative profit levels. Using data about our customers, we learn that this is certainly the case and negative profit levels remain negligible. However, filtering by Furniture reveals something concerning; although the *Profit by Discount* chart tells us that we can expect an average profit to be positive albeit small, the size of Unprofitable customers and Profitable customers in this category are almost of equal size as shown in the scatterplot of *Profit and Sales by Customer*. Most of the negative profits in this category are below -\$1000. It should also be noted that in the 'Sales and Profits overview' earlier, this category also has the highest average discount of 17.39%

Sean Miller is our top customer in terms of sales. Despite this, the business did not make a profit from his \$24,043 purchases, with a negative profit of \$1,981 and a profit ratio of -7.91%. The next unprofitable customer is Becky Martin, who spent \$11,790 on purchases, but produced a negative profit of \$1,660 and a profit ratio of -14.08%. The negative profits made from these two customers come primarily from Technology purchases and this is also the case for the next customer that is unprofitable. Technology products contribute largely to a customer's sales figure, but it also contributes largely to a customer's negative profit figure.

**Recommendation:** If the business aims to improve profit levels for the Furniture category, they could consider reducing discounts along with the recommendations mentioned in 'Profitability of Products in States'. Management should also consider investigating the customers that produce negative profits despite high sales figures to find the reason for negative profits.

### **Shipping overview**

A large majority of orders have Medium priority, followed by High priority. Few orders have Critical and Low priority. Standard class is the most popular choice for shipping and most Medium priority orders are shipped by this mode. Low priority orders are shipped via Standard class only, but the average shipping cost is \$23 which is higher than \$15 which is the average shipping cost for Medium priority orders shipped via Standard. This can be explained by the high volume of Medium priority orders shipped via Standard class (2,085 orders). There is a relationship where the average shipping cost for a specified ship mode reduces the more orders are sent via specified ship mode. Interestingly, the average shipping cost of First-class shipping for Medium priority orders is \$1 higher than Same Day shipping despite having more orders shipped via First-class. Critical priority orders do not use Standard class shipping at all, however, the average shipping cost for these orders shipped via First-class is the lowest compared to Same day and Second-class shipping.

**Recommendation:** Management may want to re-evaluate the courier services used presently. We will want to aim for lower average shipping costs for Low priority orders because currently it is higher than Medium priority orders and it almost costs as much as Same Day shipping for Medium priority orders. The same is said for First class shipping for Medium priority orders; perhaps management could eliminate this ship mode for Medium priority orders or reduce the shipping costs by changing to a cheaper courier. Management may also consider eliminating Second-class shipping for Critical priority orders, as it is cheaper to ship via First-class shipping.