

A minimalist interior scene featuring a light-colored wooden chair, a small round wooden table, and a vase with lilies.

# PRODUCT RANGE ANALYSIS

FINAL PROJECT  
BY BAR BRENDER



## Description

This project is on an online store specializing in household goods. Key tasks include conducting exploratory data analysis to understand the structure and nature of the data, scrutinizing the product range to identify bestsellers and under performers, and formulating and statistically testing hypotheses to provide data-driven insights.

# Goal

The insights aim to optimize the store's product range and enhance overall business strategy



# Product range 2019

**18,929**

Total orders

**28,027**

Avg daily revenue

**104,329**

items returned

**5,187,066**

Items sold

**9,353,024**

Total revenue  
include returns



# Daily Trends

## Revenue

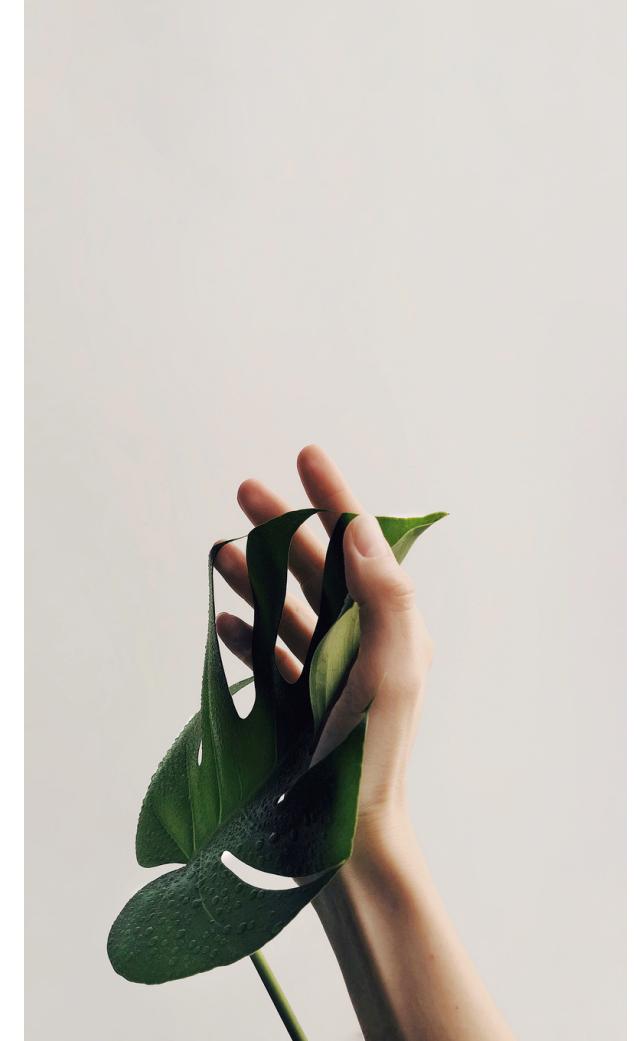
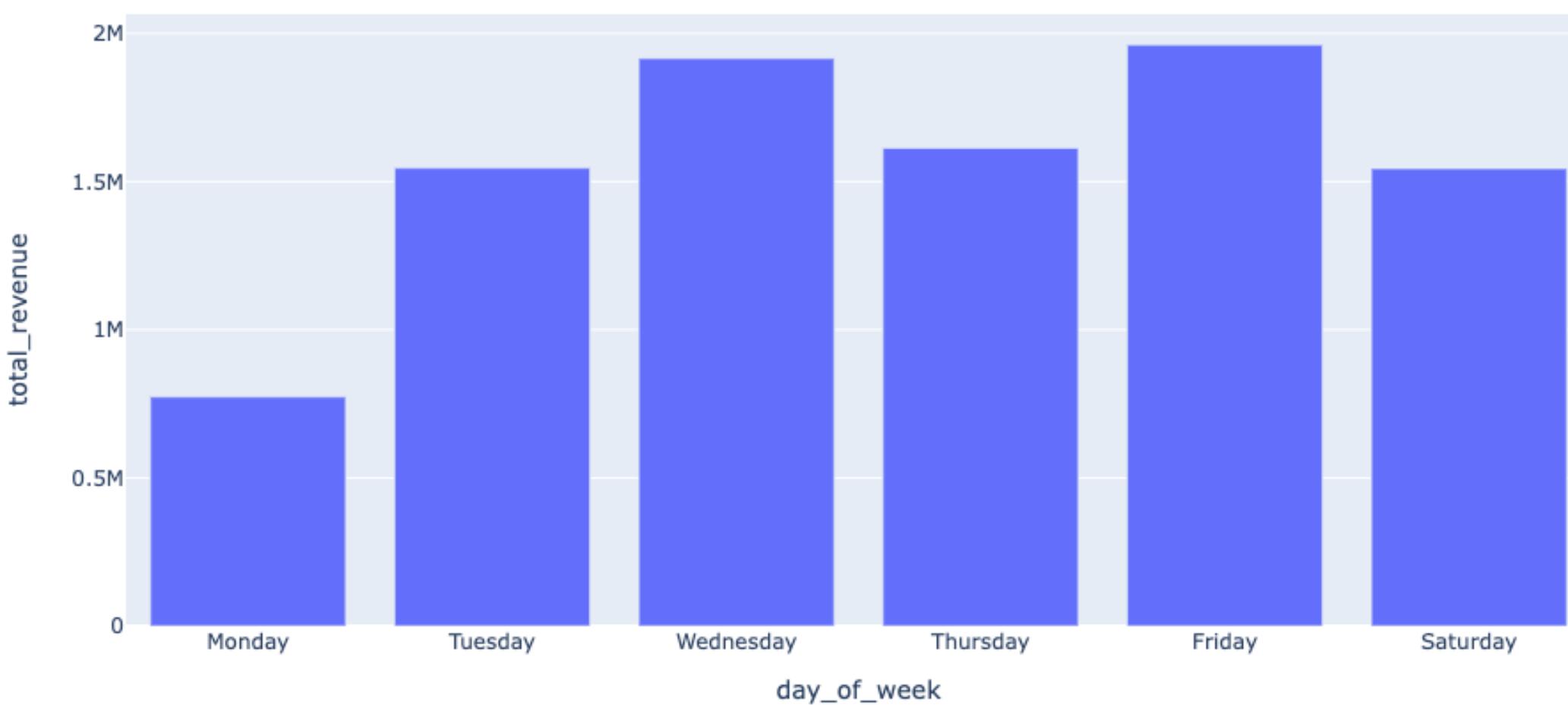
Most profitable day **Friday 21%**

Most profitable day **Wednesday 20%**

Less profitable day **Monday 12.5%**

Sunday is off

Total revenue for each day of the week



# Weekday VS Weekend Trends

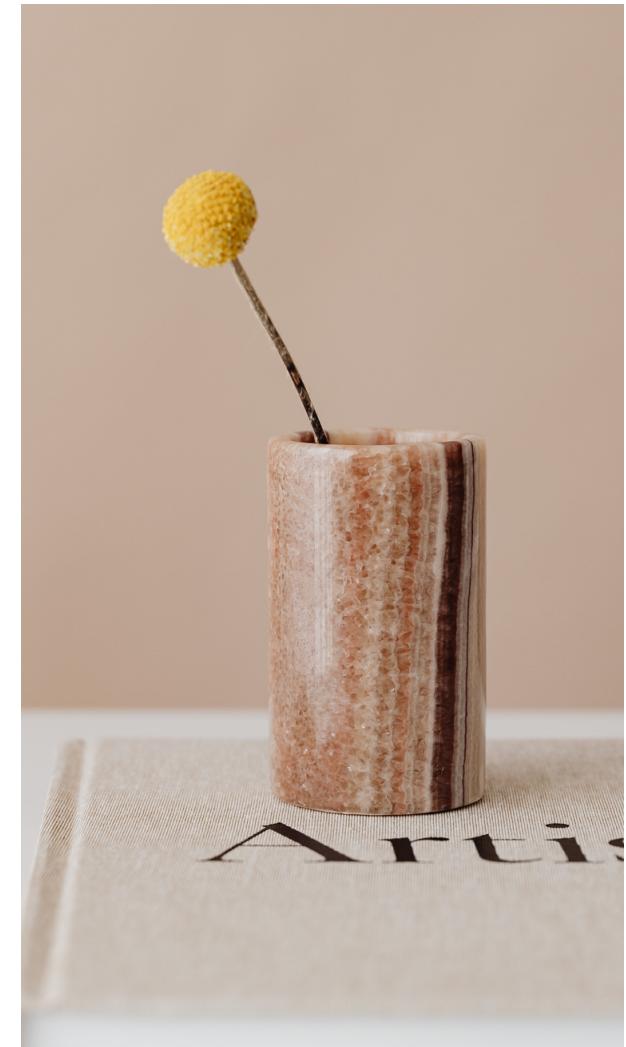
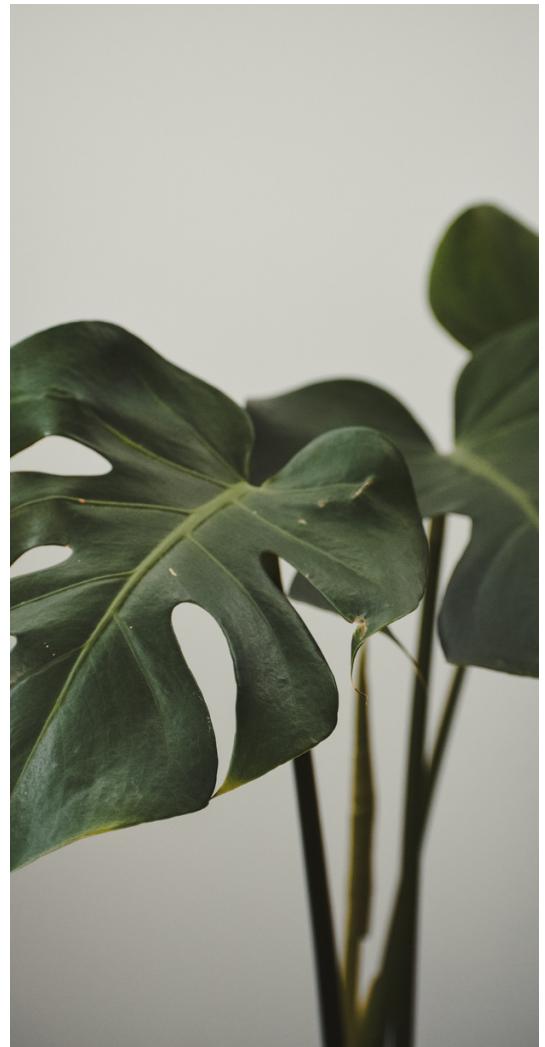
Total & Avg revenue

Most profitable **Weekday 84%**

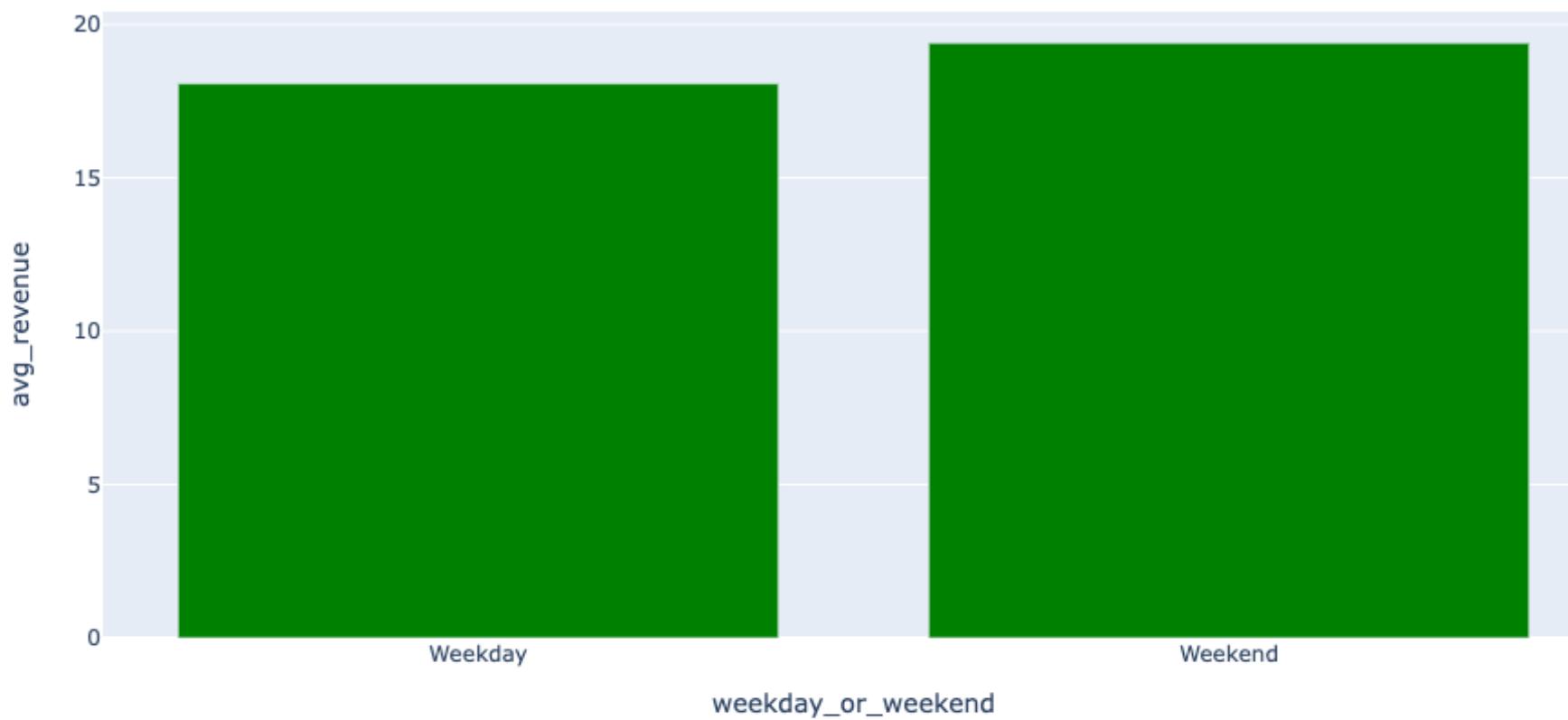
Top Avg revenue **Weekend 52%**

Statistically Significant different in the revenue

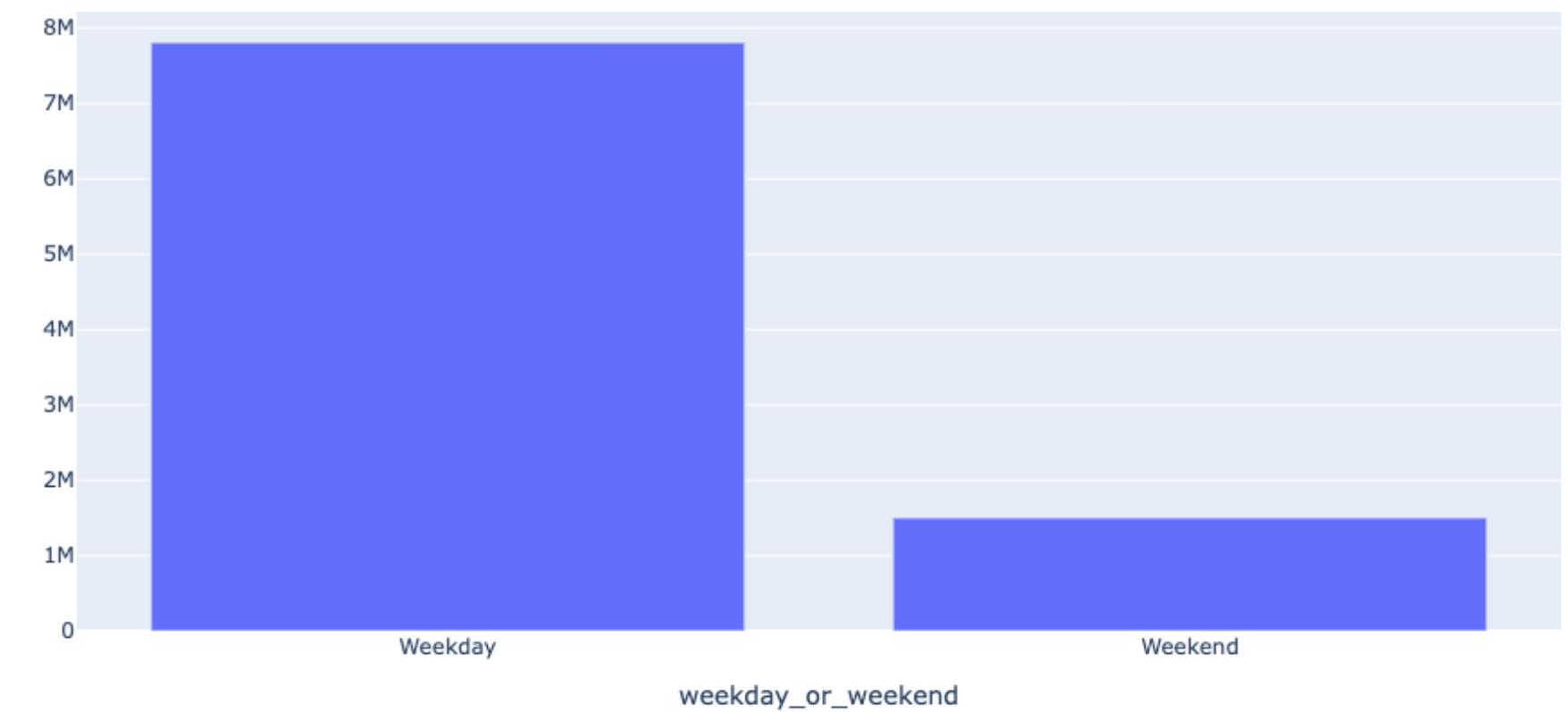
Sunday is off



Avg revenue per weekend/day



Total revenue per weekend/day



# Monthly Trends

revenue per month

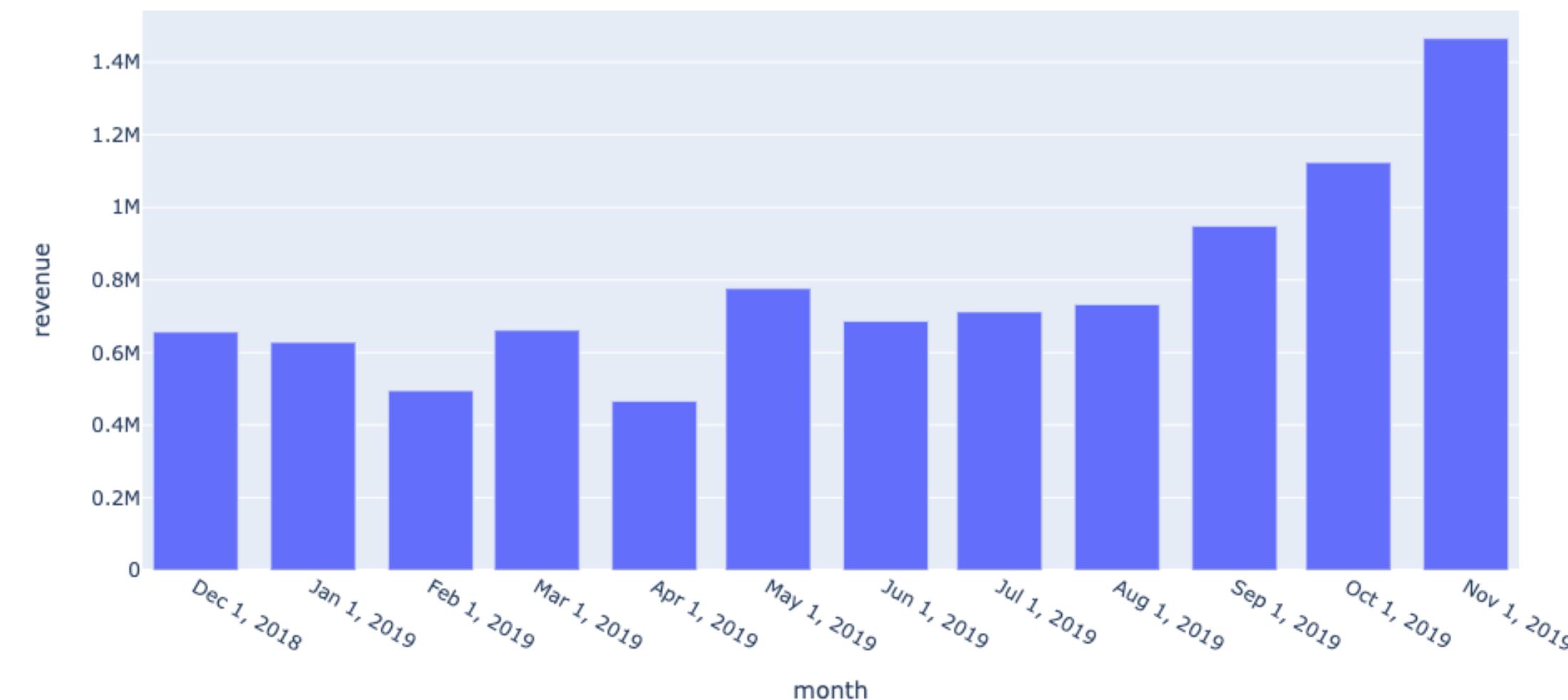
Most profitable month **November 16%**

Most profitable season \***Winter 38%**

Less profitable months **February/April 5% each**

\*winter: september-November

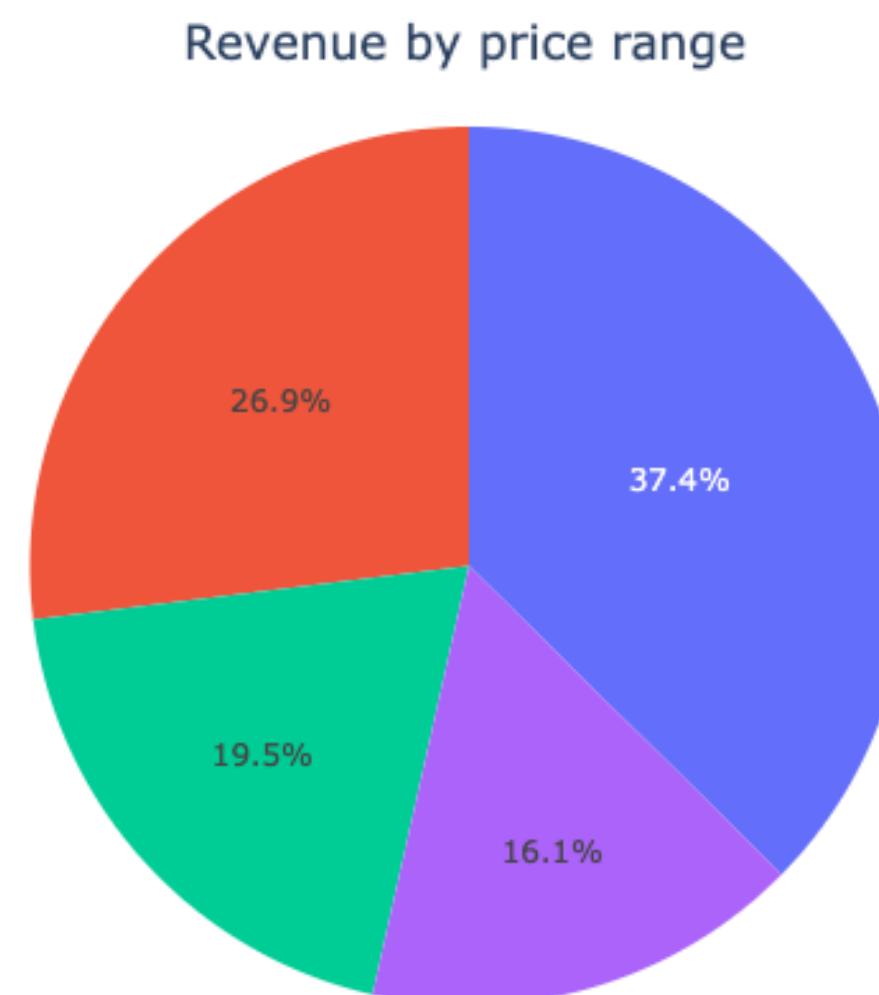
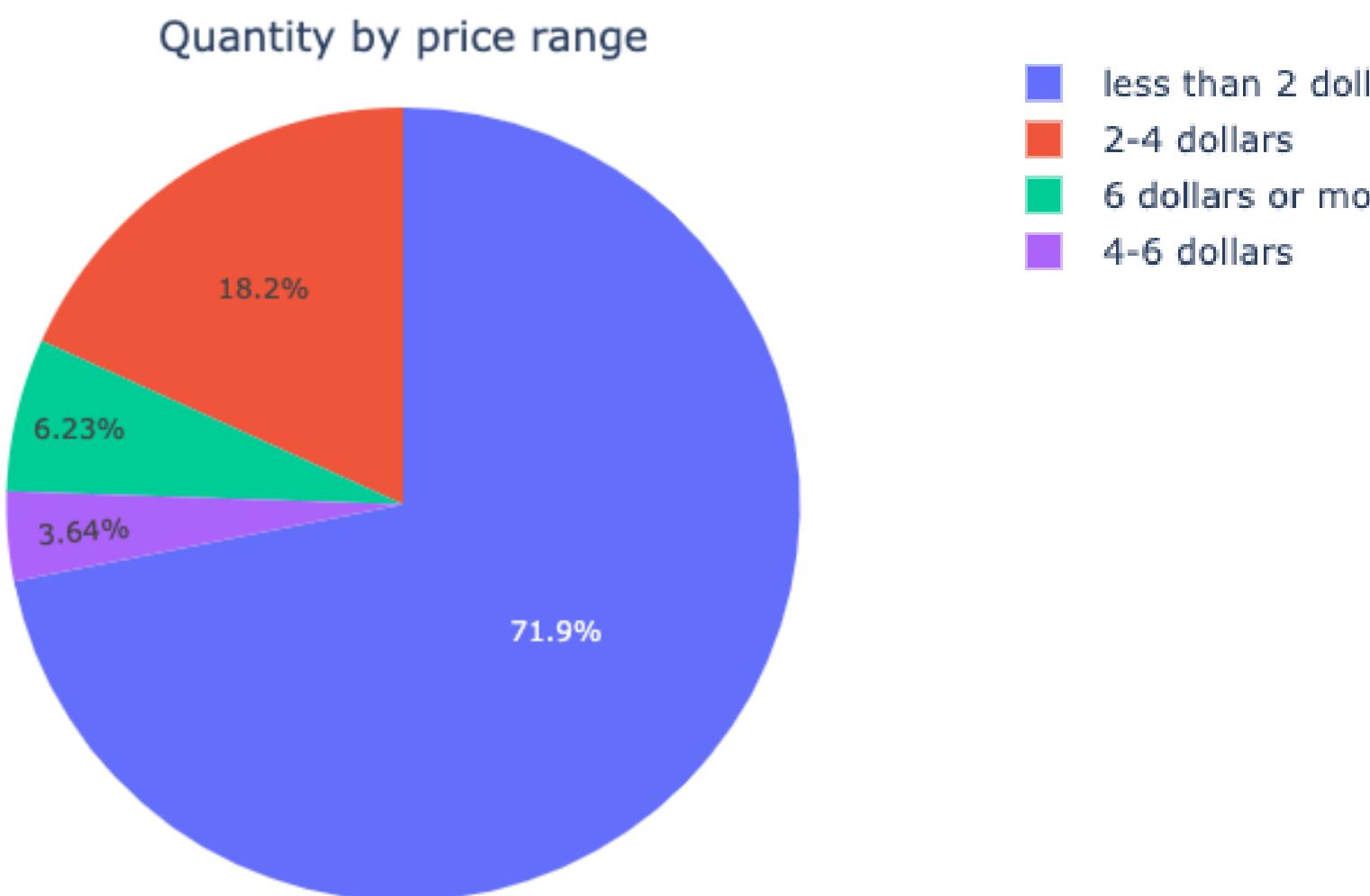
Revenue by months



# Price Range

## 4 Groups:

- Less than 2 dollars
- 2-4 dollars
- 4-6 dollars
- more than 6 dollars





# Monthly Trends

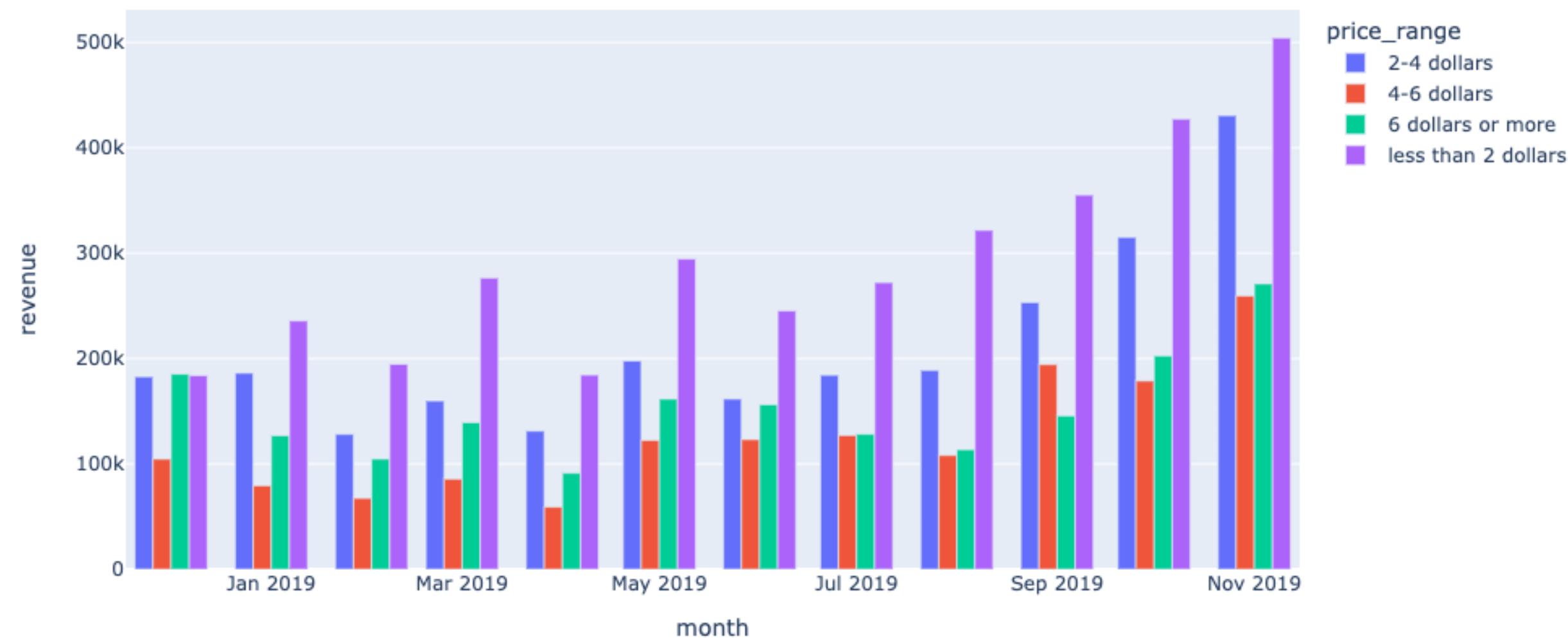
revenue per month by price range

Most profitable range **Less than 4\$ 37%**

Most quantity product sold **Less than 4\$ 72%**

Prefer cheap products

Revenue by months

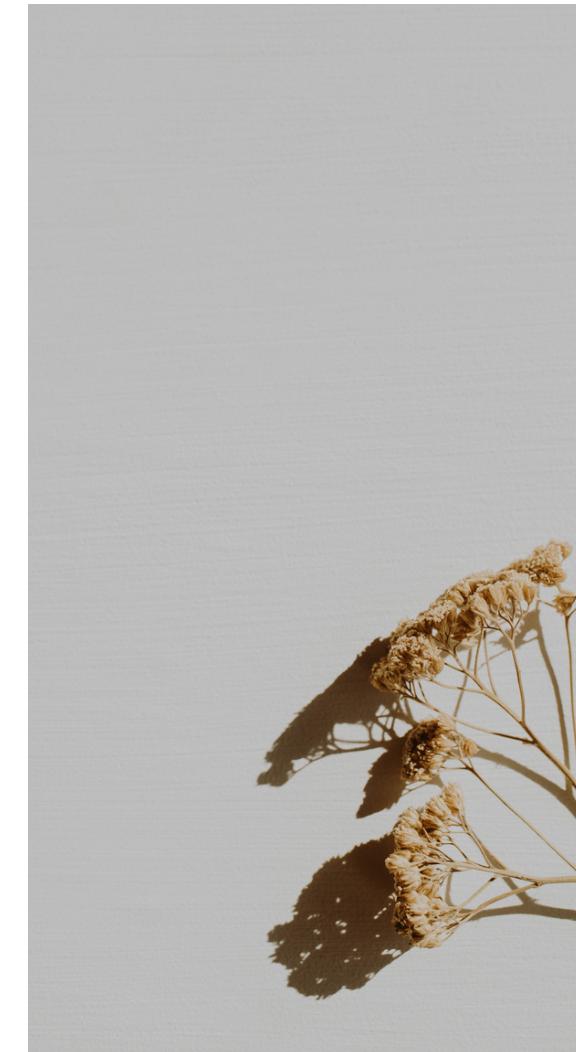
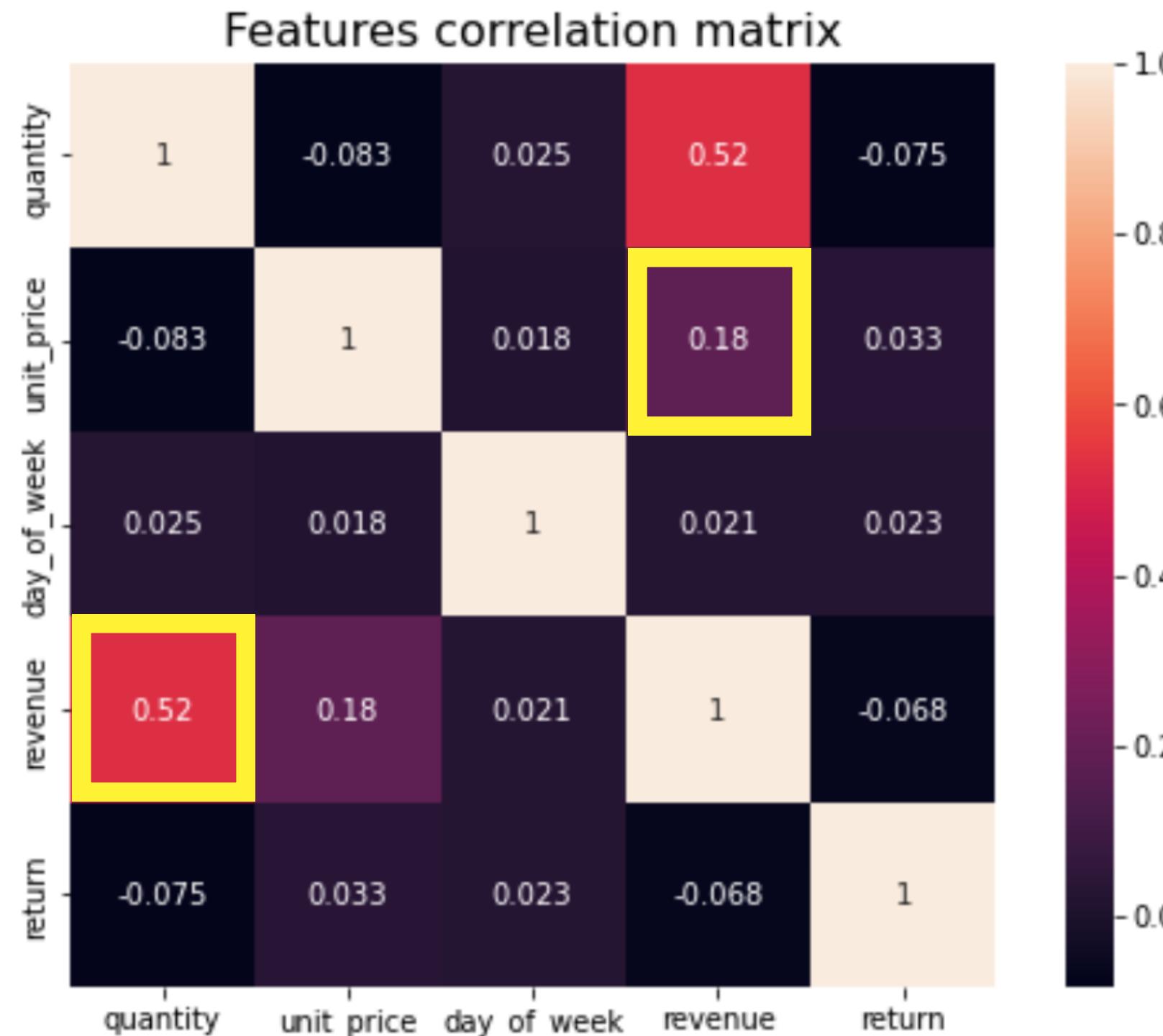


# Correlations

revenue per month by price range

Revenue VS Quantity **Medium positive correlation 0.52**

Revenue VS Unit price **Low positive correlation 0.18**



# Revenue Trends

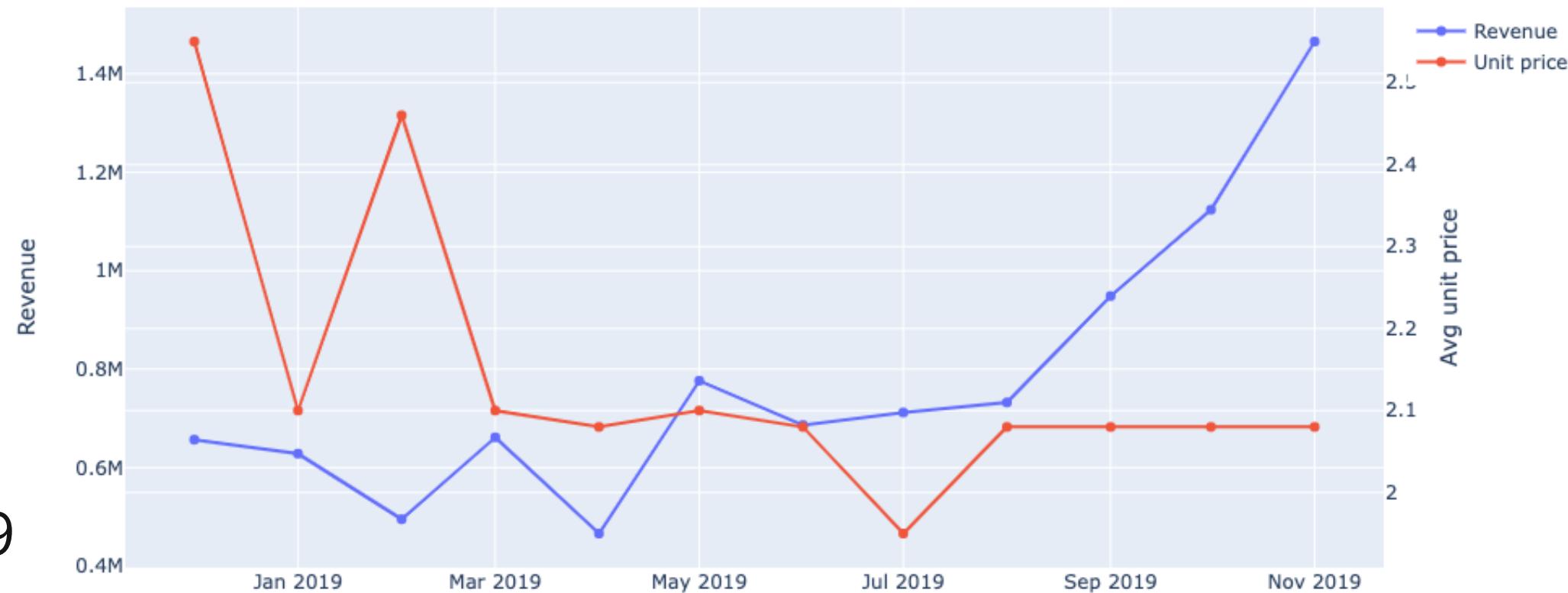
Revenue VS quantity per month

Quantity ↑ Revenue ↑

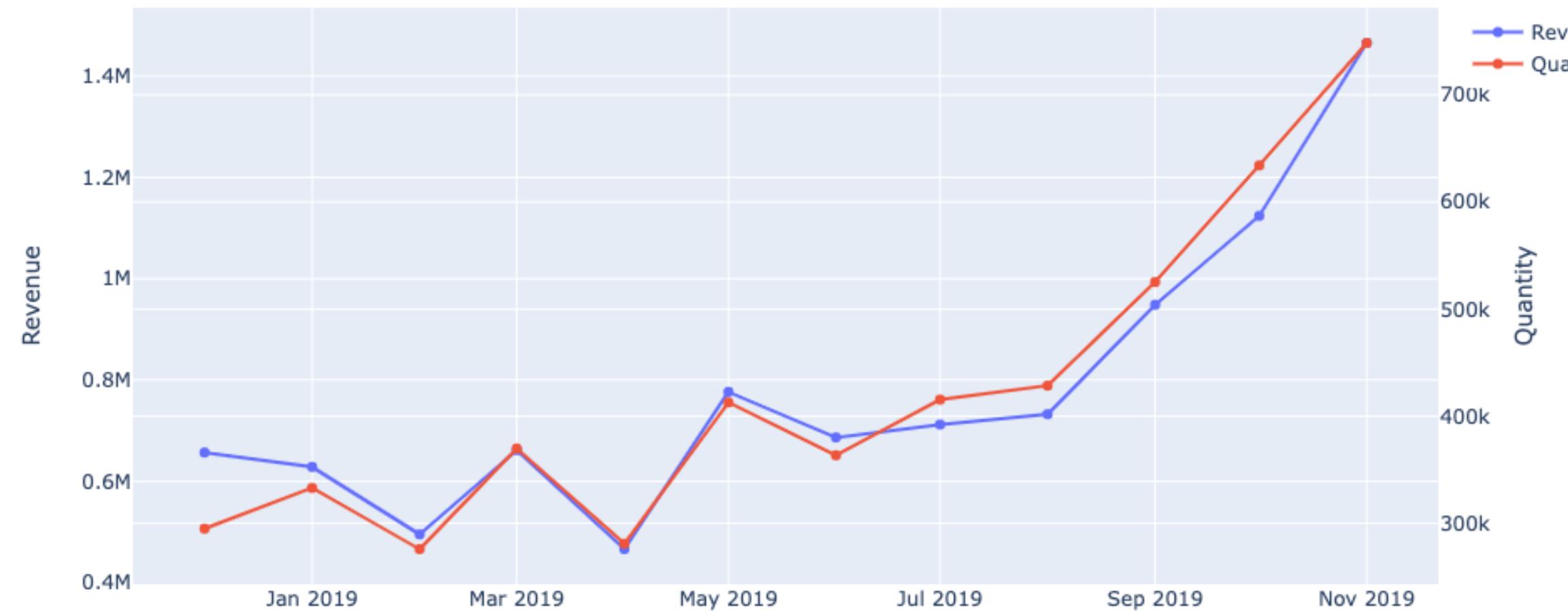
Unit price ↓ Revenue ↑

**123%** Increment from Dec 18 to Nov 19

Revenue VS unit\_price over time



Revenue VS quantity over time



# Best Seller

Top 10 revenue items:

stock_code	description	total_orders	avg_price	total_quantity	total_revenue
22423	REGENCY CAKESTAND 3 TIER	2102	12.75	12335	156098.85
47566	PARTY BUNTING	1685	4.95	17930	97686.34
85123A	WHITE HANGING HEART T-LIGHT HOLDER	2218	2.95	33931	95870.05
85099B	JUMBO BAG RED RETROSPOT	2073	2.08	46306	90326.54
23084	RABBIT NIGHT LIGHT	920	2.08	27300	59172.11
22086	PAPER CHAIN KIT 50'S CHRISTMAS	1067	2.95	16947	57186.65
84879	ASSORTED COLOUR BIRD ORNAMENT	1418	1.69	34916	56556.84
22502	PICNIC BASKET WICKER SMALL	464	5.95	1807	50728.27
79321	CHILLI LIGHTS	633	5.75	9619	50706.40
22197	POPCORN HOLDER	1375	0.85	51544	46595.49

**760,927** Total revenue

**8%** Of total revenue



# Least Seller

Top 10 revenue items:

stock_code	description	total_orders	avg_price	total_quantity	total_revenue
84227	HEN HOUSE W CHICK IN NEST	1	0.42	1	0.42
90084	PINK CRYSTAL GUITAR PHONE CHARM	1	0.85	1	0.85
84201C	HAPPY BIRTHDAY CARD TEDDY/CAKE	1	0.19	5	0.95
84206B	CAT WITH SUNGLASSES BLANK CARD	1	0.19	5	0.95
21009	ETCHED GLASS STAR TREE DECORATION	1	1.25	1	1.25
35597A	DUSTY PINK CHRISTMAS TREE 30CM	1	1.25	1	1.25
35597B	BLACKCHRISTMAS TREE 30CM	1	1.25	1	1.25
37461	FUNKY MONKEY MUG	1	1.25	1	1.25
84569C	PACK 4 FLOWER/BUTTERFLY PATCHES	1	1.25	1	1.25
84743C	ORANGE FELT VASE + FLOWERS	1	1.25	1	1.25

**130**

Products ordered only once

**3.44%**

Of all products

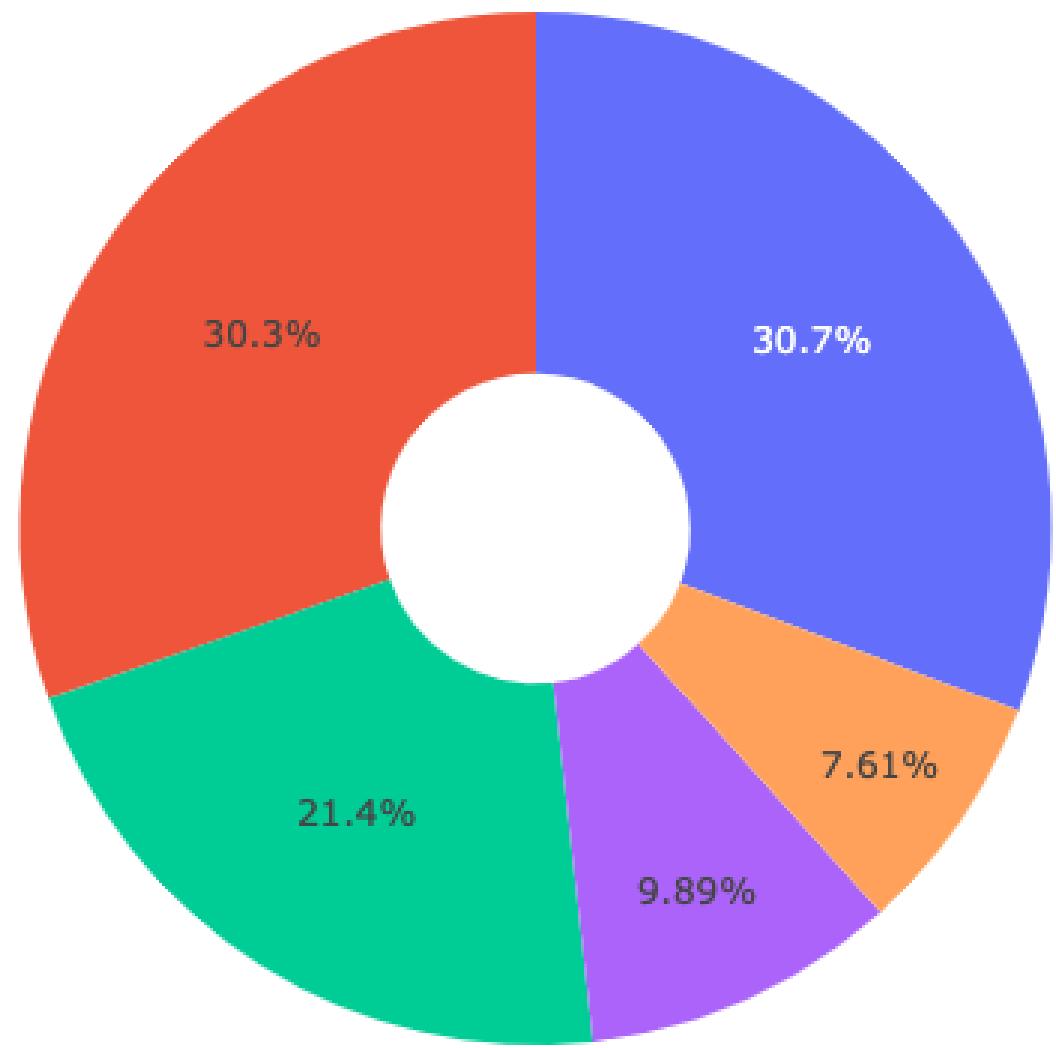


# RFM\* analysis

\*registers only

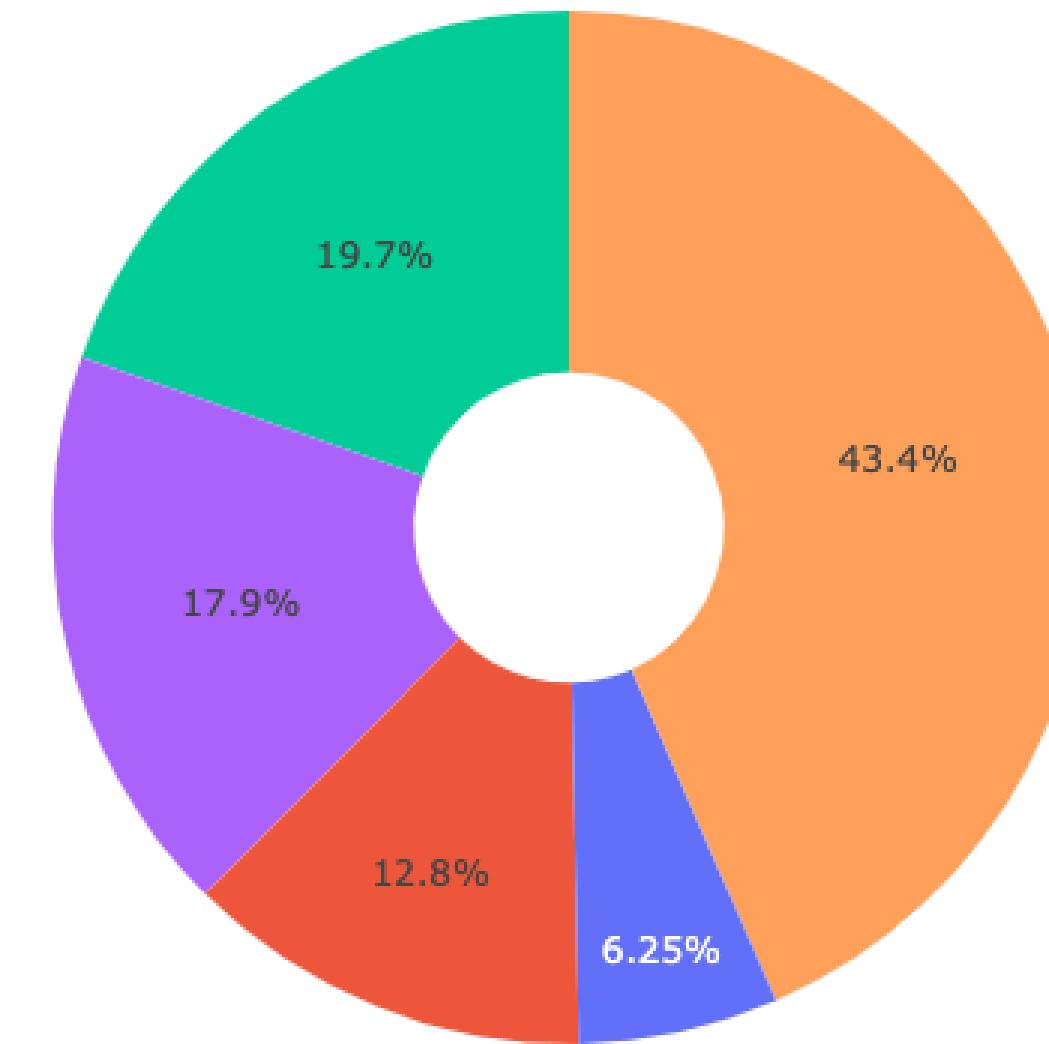
**15% Unregistered customer revenue**

Customer segments



- Lost Customers
- Low Value Customers
- Medium Value Customer
- High value Customer
- Top Customers

Customer segments by revenue



We should consider change our registration police in order to increase retention rate.

# Returned items

Top 10 returned items:

	description	total_returned	total_revenue	percentage
0	REGENCY CAKESTAND 3 TIER	178	-9631.35	2.12
1	JAM MAKING SET WITH JARS	84	-974.54	1.00
2	SET OF 3 CAKE TINS PANTRY DESIGN	71	-720.20	0.85
3	STRAWBERRY CERAMIC TRINKET BOX	59	-440.75	0.70
4	ROSES REGENCY TEACUP AND SAUCER	54	-1150.35	0.64
5	POPCORN HOLDER	47	-360.40	0.56
6	RECIPE BOX PANTRY YELLOW DESIGN	45	-415.15	0.54
7	WOOD 2 DRAWER CABINET WHITE FINISH	45	-1240.70	0.54
8	LUNCH BAG RED RETROSPOT	44	-854.70	0.52
9	GREEN REGENCY TEACUP AND SAUCER	42	-393.05	0.50

**-226,830** Total lost revenue from returns

**2.31%** of total revenue



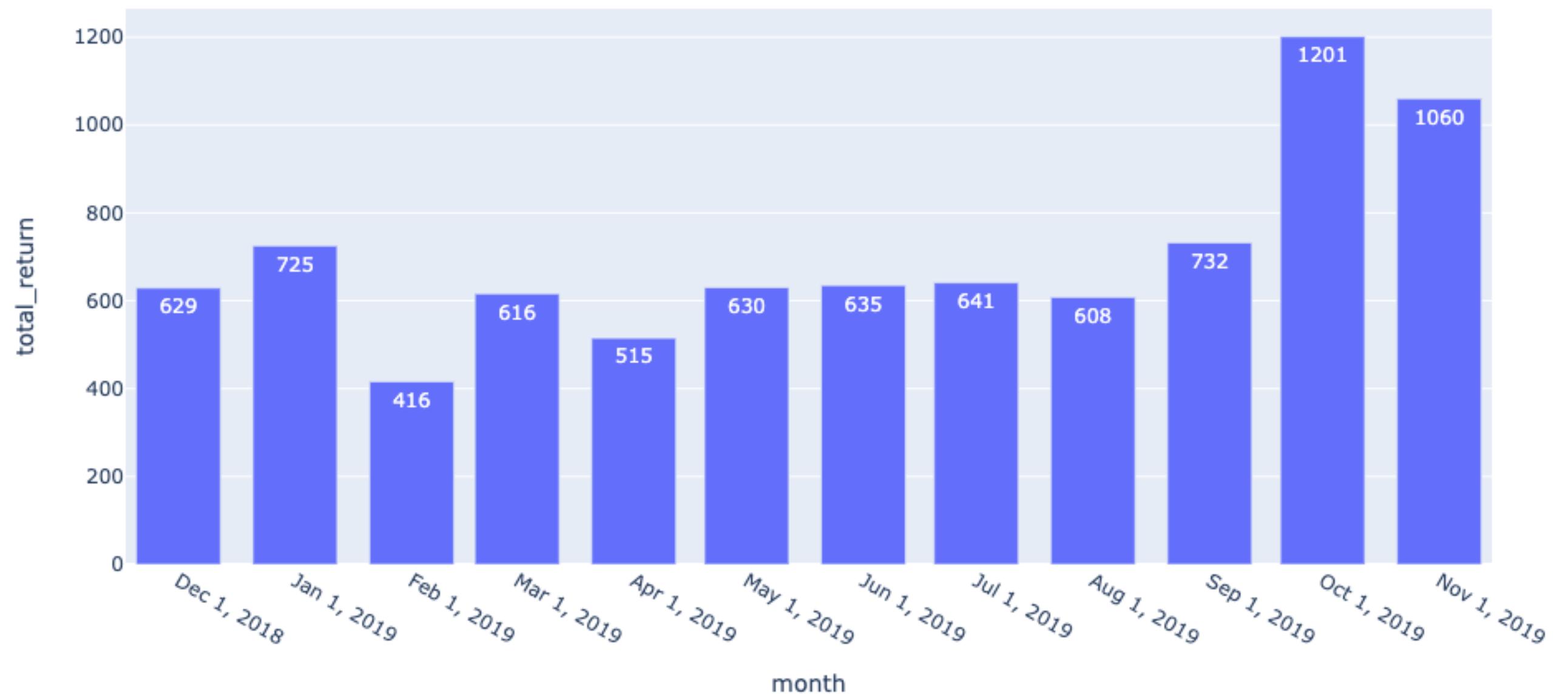
# Returned items by month

Top returned products **October 14%**

Top returned products **October-November 27%**

Least returned products **February 5%**

Montly returned products





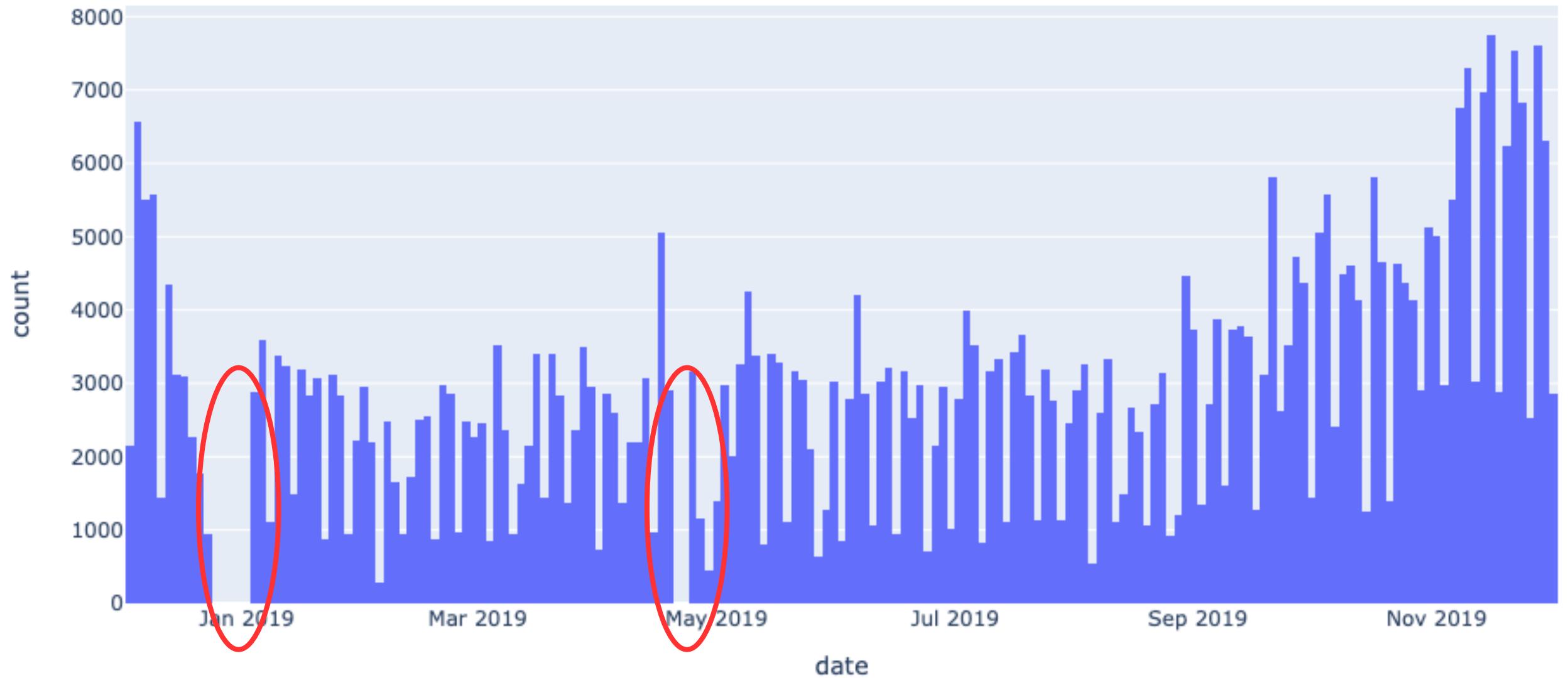
# Sold Vs returned

	<b>Sales</b>	<b>Returns</b>
<b>Revenue</b>	<b>9,579,854</b>	<b>-226,830</b> 2.31%
<b>Products</b>	<b>3765</b>	<b>1905</b> 50%
<b>Invoices</b>	<b>18929</b>	<b>3311</b> 15%
<b>Items</b>	<b>5,187,066</b>	<b>104,329</b> 2%

# Days off - no revenue

**26%** Days off a year

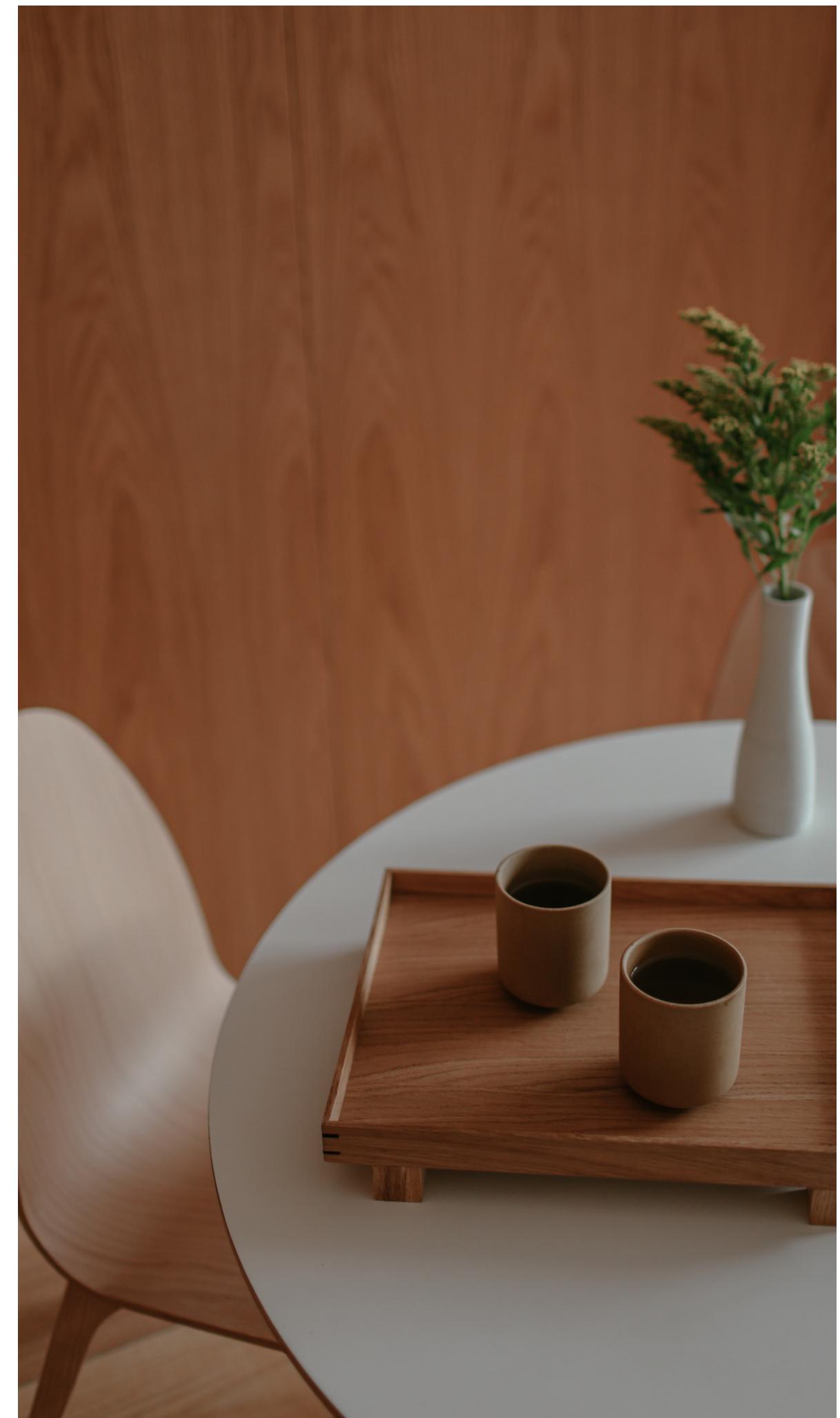
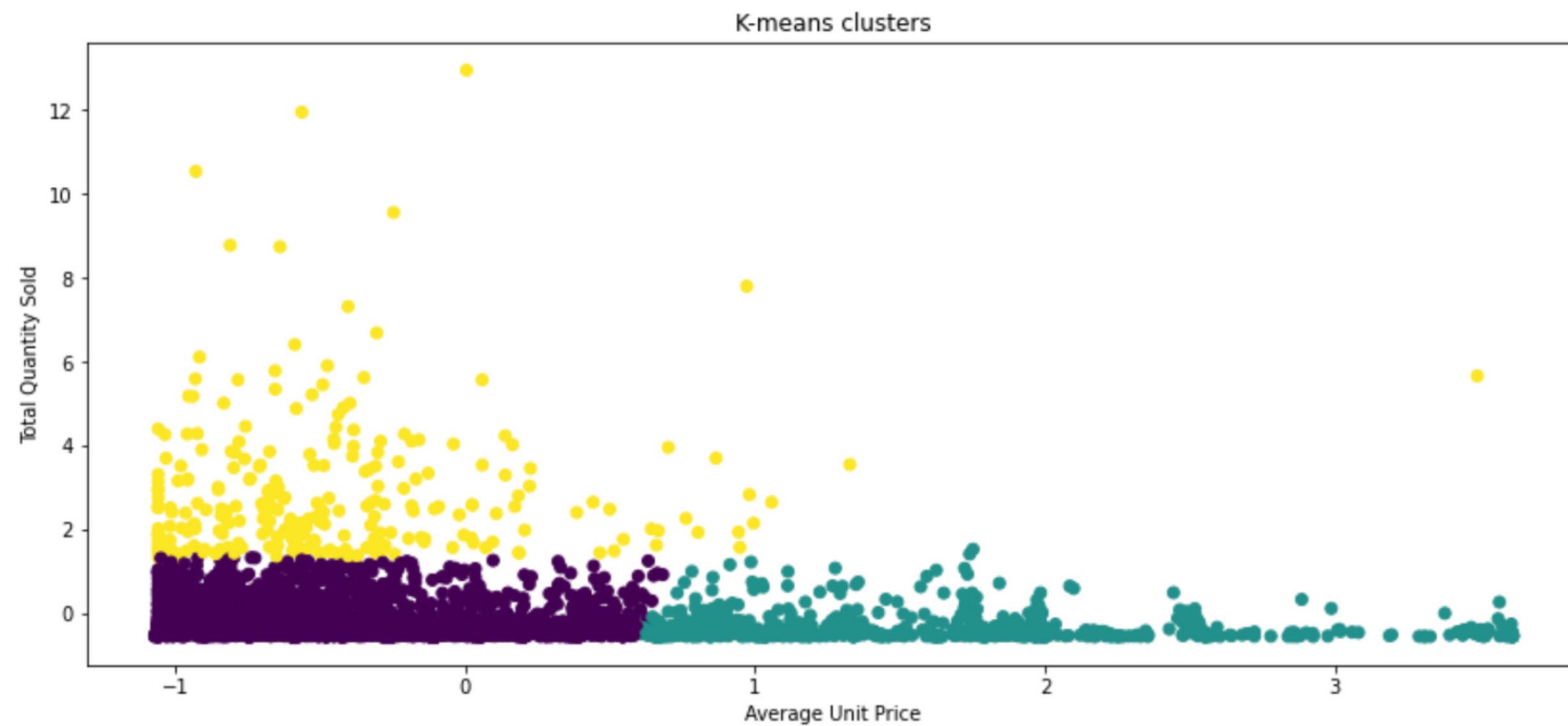
- Last week of the year (10 days)
- 19-25/04/2019 (7 days)
- Sundays off (52 days)



# Machine learning

**3 groups:**

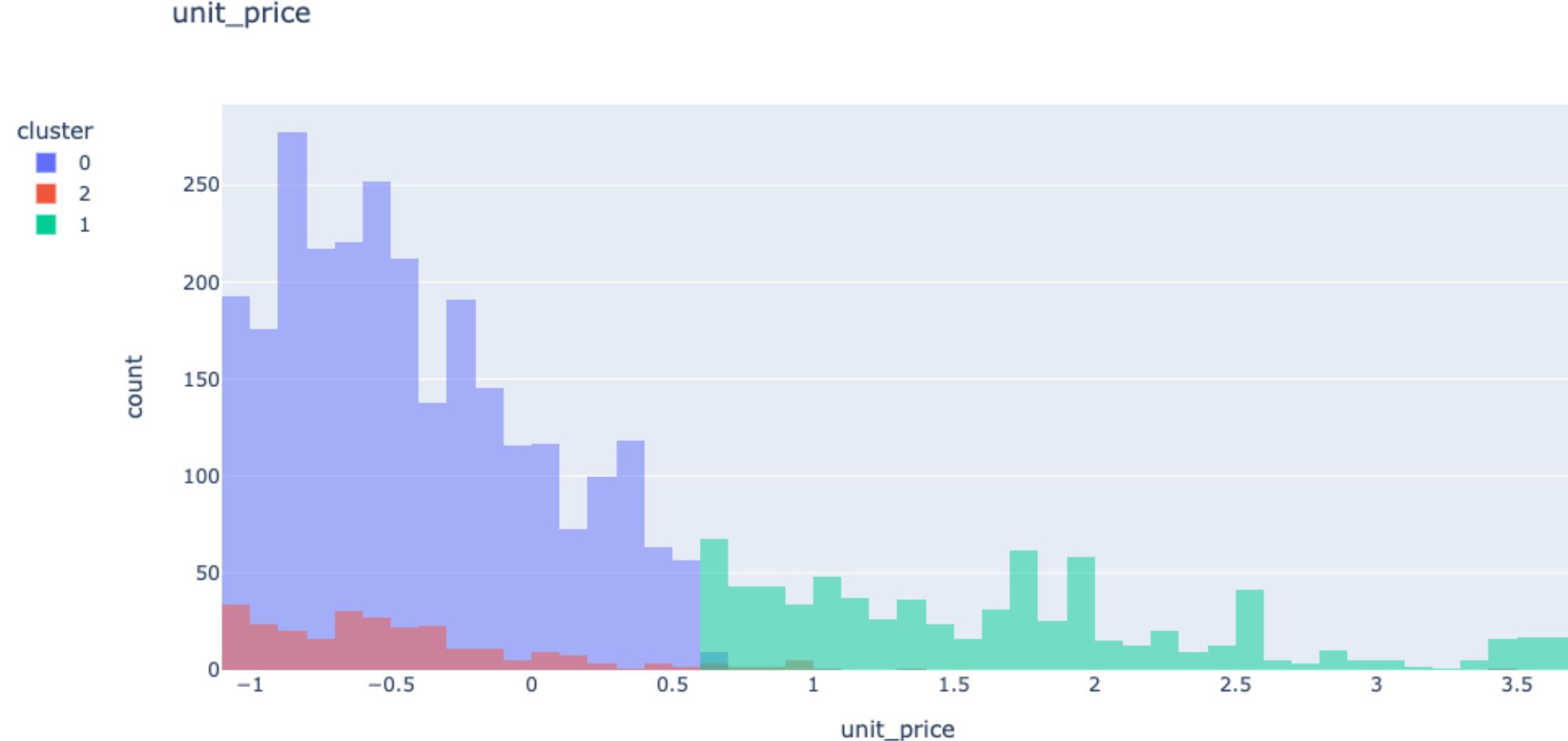
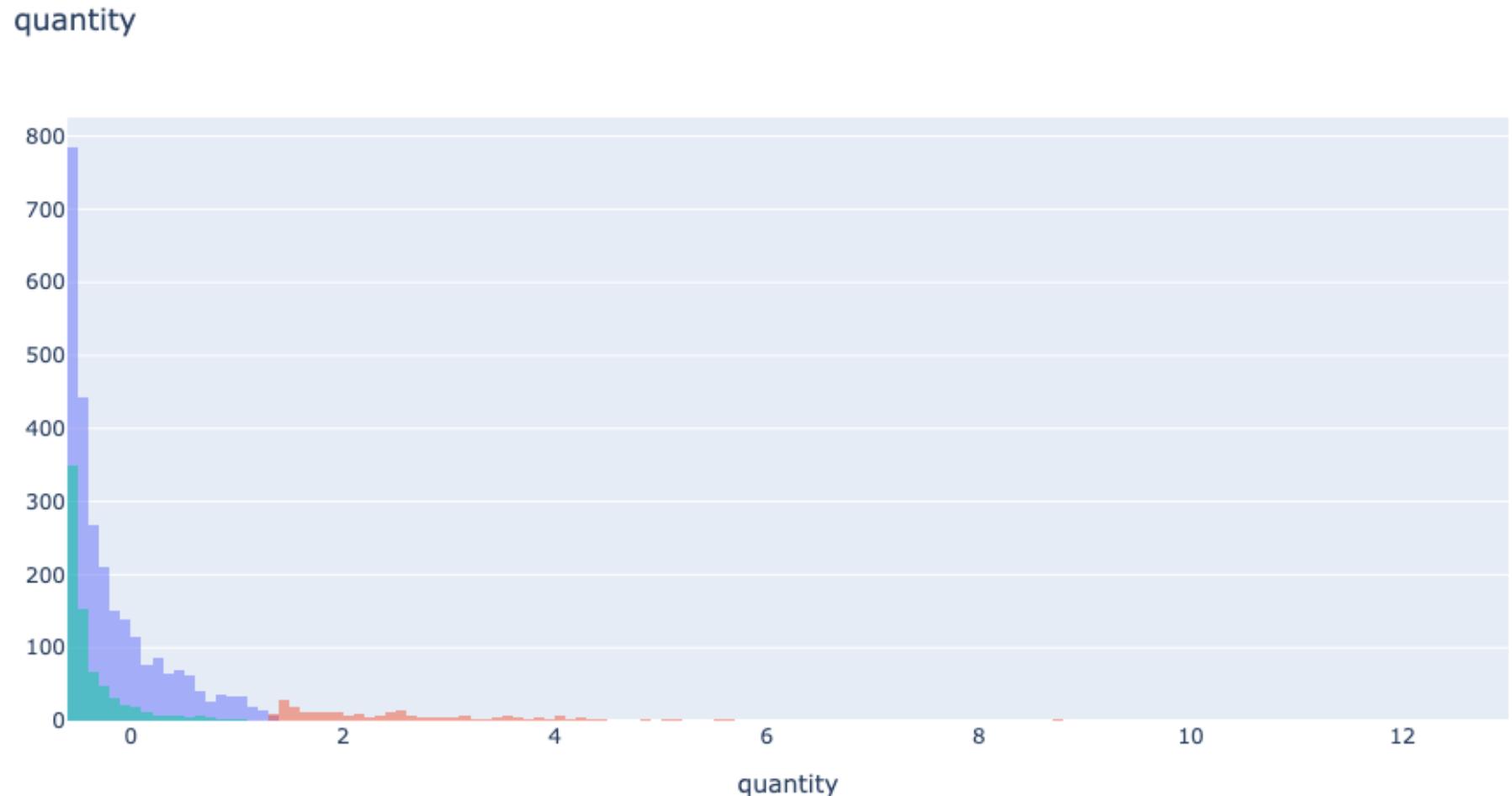
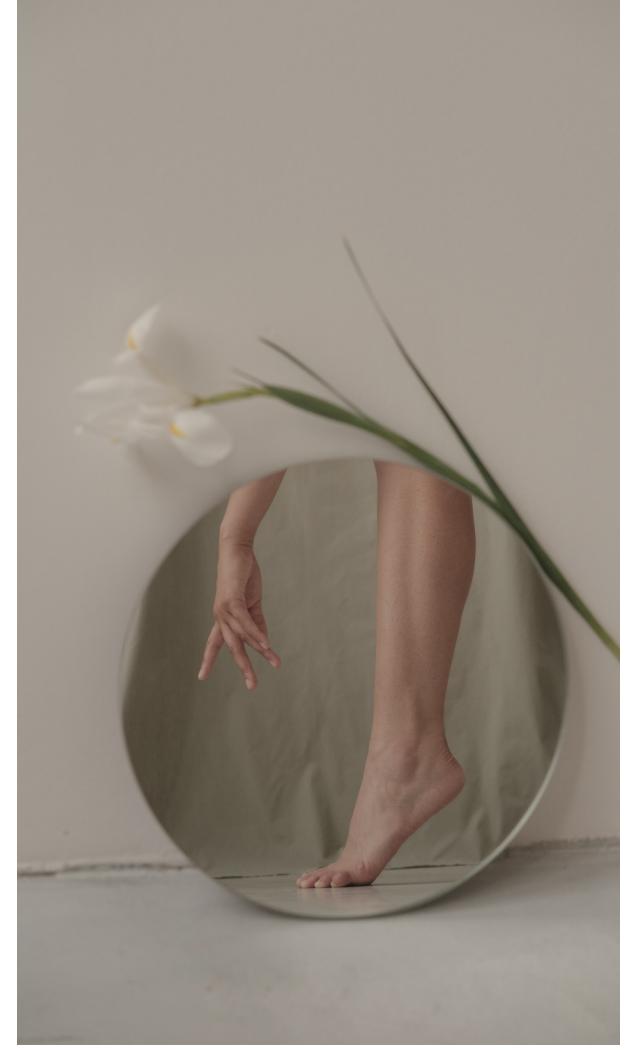
1. Low quantity and low unit price
2. Low quantity and higher unit price
3. Higher quantity and low unit price



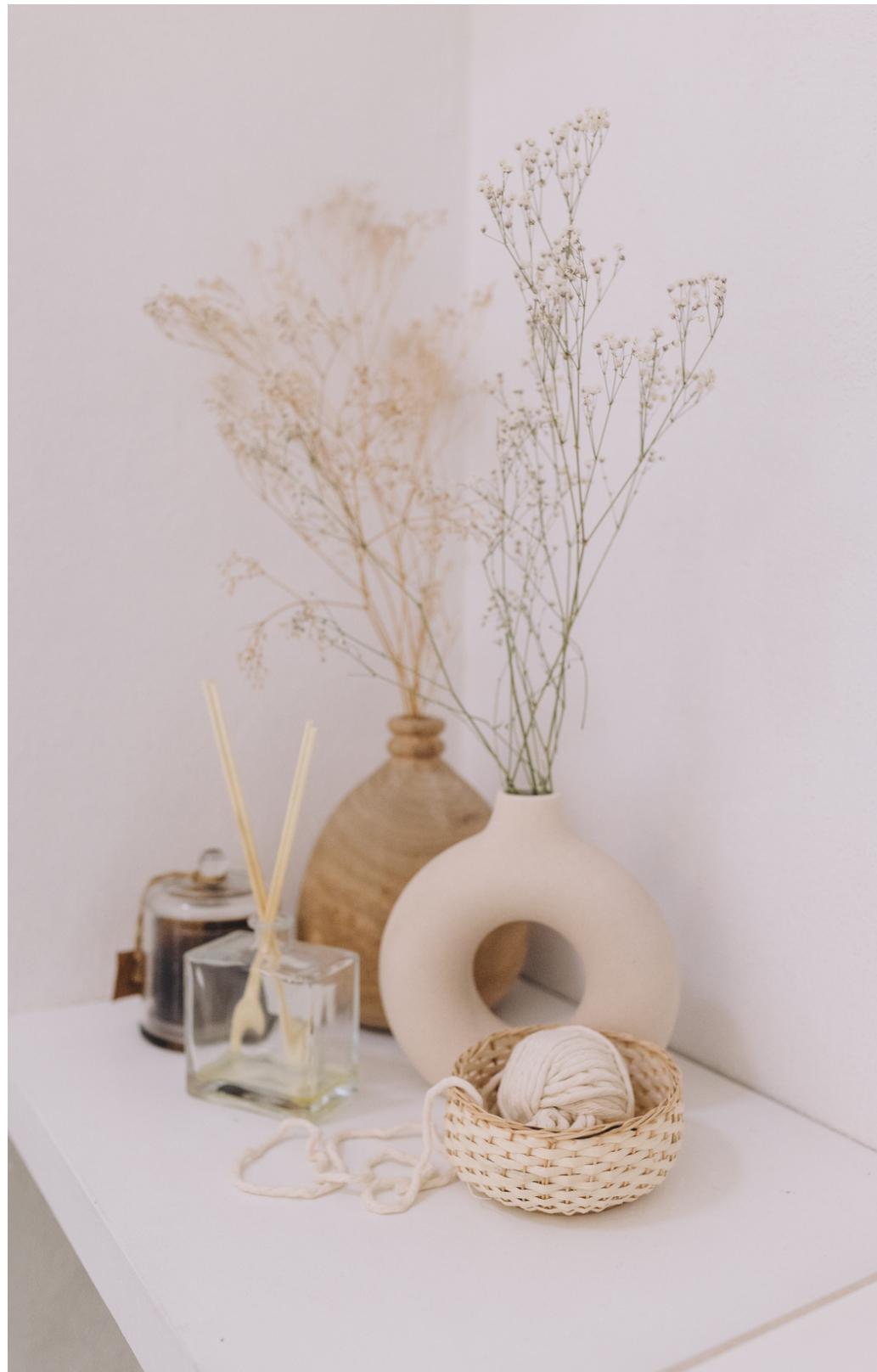
# K-Means

## Quantity & Unit price

- Cluster 1 buys more expensive & low quantity
- Cluster 2 buys more & lower price.
- Cluster 0 buys low price & low quantity
- Cluster 0 is bigger than 1,2



# Statistical Hypothesis



# Statistical Hypothesis tests

Hypothesis 1

There is a significant difference in sales between weekdays and weekends

alpha=0.05

Revenue between the weekdays and to weekends is different

Hypothesis 2

There is a correlation between the quantity of items purchased and the total sales

alpha=0.05

There is a medium relation between the quantity and revenue

Hypothesis 3

There is a significant difference in sales between different product categories

alpha=0.05

The revenue between the groups is different

# Conclusion

## General Findings:



Identified that most users are unregistered, the best selling product is 'WHITE HANGING HEART T-LIGHT HOLDER', and highest sales occur on weekdays.



Medium positive correlation between revenue and quantity, and low positive correlation between revenue and unit\_price.

The revenue growth in 123%.



Highest revenue periods during winter/holidays and on Fridays and Wednesdays, with a significant increase over the year. Noted no sales on Sundays.



Most products are priced below 2 dollars, contributing to the highest revenue and quantity sold. Higher-priced products see less quantity sold.



### RFM:

Most customers are categorized as lost or of low value, suggesting changes to registration policy might boost customer retention.



### Machine Learning:

Identified 3 customer clusters: customers who buy small quantities of cheap items, customers who buy small quantities of expensive items, and customers who buy large quantities of cheap items.



### Hypothesis Testing:

Confirmed significant differences in sales between weekdays and weekends, a correlation between items purchased and total sales, and significant differences in sales between different product price ranges.



# Recommendation



## **Encourage sign-ups:**

Target unregistered customers with incentives to sign up, increasing customer retention



## **Optimize product range:**

With customers showing price sensitivity, gradually introduce mid to high-range priced products to measure customer response.



## **Seasonal promotions:**

Exploit sales spikes in November and on Wednesdays and Fridays by launching timely promotions.



## **Expand popular lines:**

Capitalize on the demand for party and decor items by expanding these product categories.



## **Minimize downtime:**

Aim for year-round product availability to maximize sales opportunities.



## **Use Machine Learning insights:**

Tailor strategies to customer purchasing behavior identified in K-means clusters, such as offering product bundles or promoting complementary items.



# Bar Brender

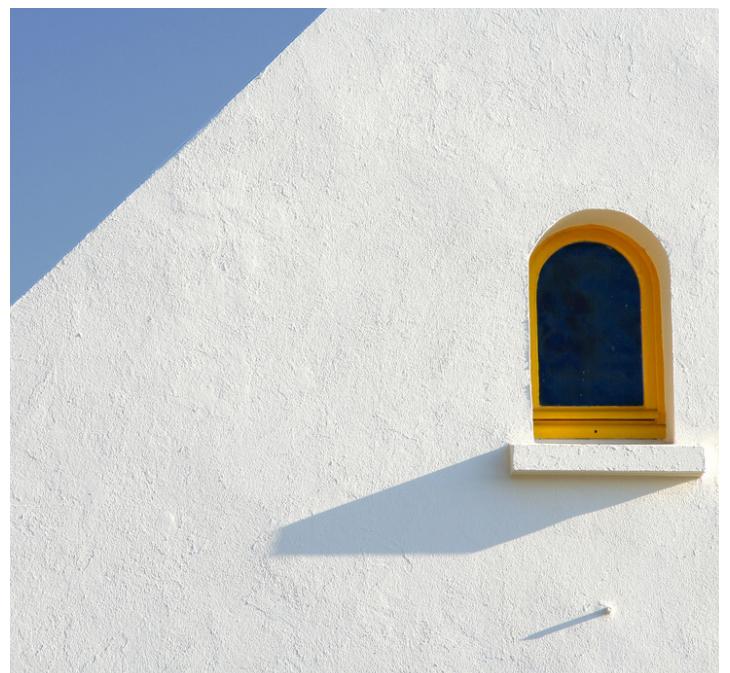
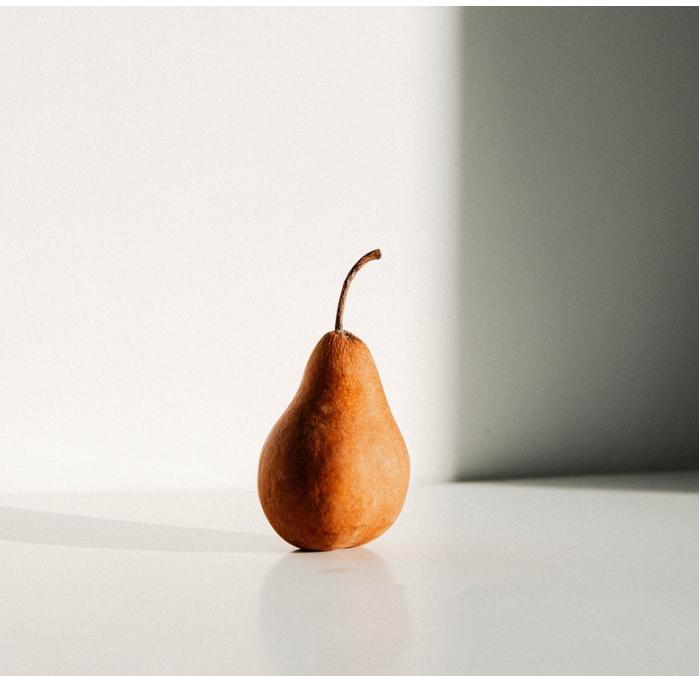
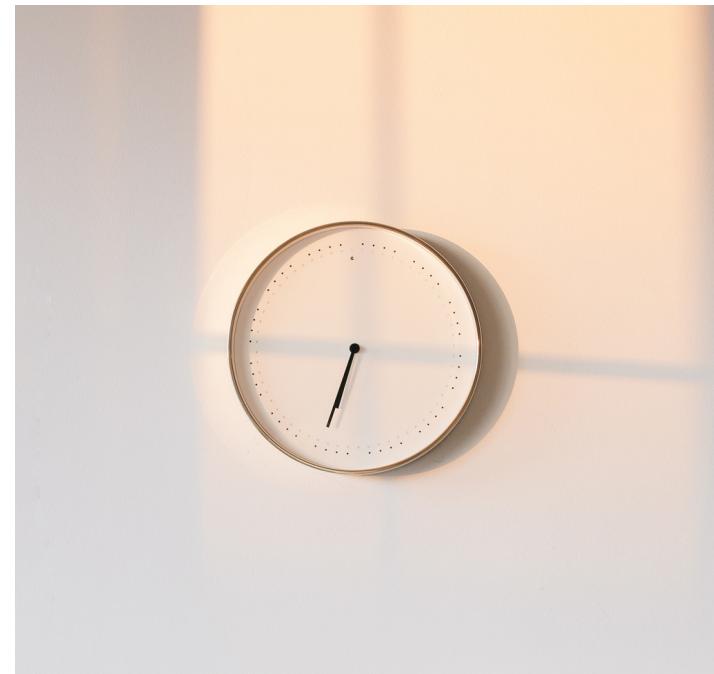
## Data analyst



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**THANK YOU**