




FACTORS AFFECTING SUPERMARKET X'S SALES

PREDICTIONS OF SALES

Presented by Le Thi Phuong Anh



OVERVIEW

- **Data description**
 - **Objectives**
 - **Objective 1: Analysis**
 - **Objective 2: Predictions**
 - **Conclusions & Recommendations**
- 



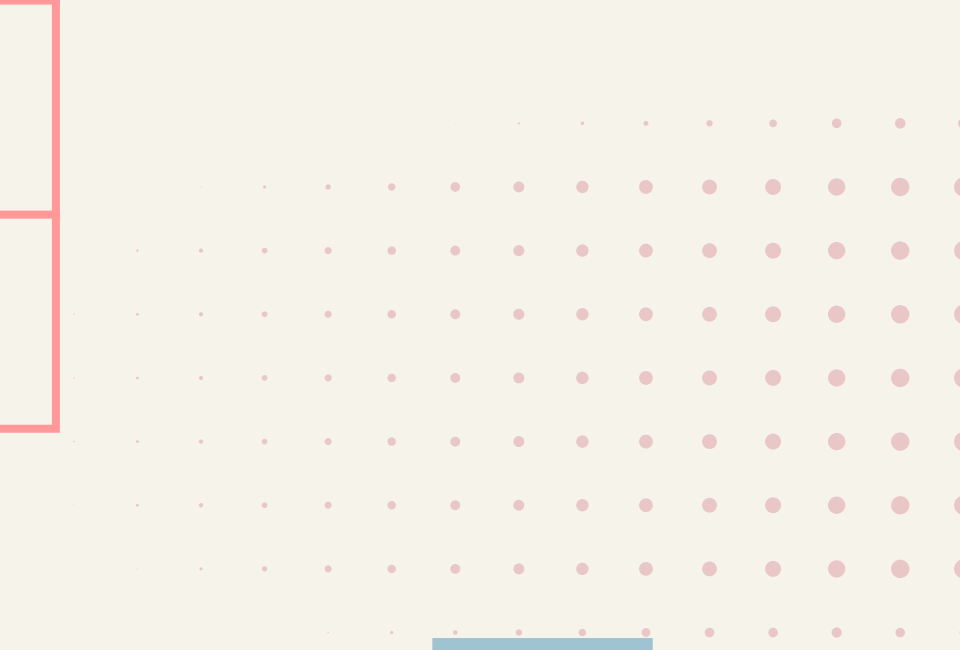
DATA DESCRIPTION

| | |
|--------------|--|
| Store | 45 stores denoted by 1, 2, 3,.....45 |
| Date | Time series including 143 weeks |
| Weekly_Sales | Sale of each week |
| Holiday_Flag | it equals 1 if that week was on holiday, otherwise it equals 0 |
| Temperature | The average temperature of each week |
| Fuel_price | The average price of fuel on each week |
| CPI | CPI of each week |
| Unemployment | The unemployment rate of each week |



DATA DESCRIPTION

| Holidays | Date |
|--------------|--|
| SuperBowl | 12-02-2010, 11-02-2011, 10-02-2012, 08-02-2013 |
| LabourDay | 10-09-2010, 09-09-2011, 07-09-2012, 06-09-2013 |
| Thanksgiving | 26-11-2010, 25-11-2011, 23-11-2012, 29-11-2013 |
| Christmas | 31-12-2010, 30-12-2011, 28-12-2012, 27-12-2013 |






OBJECTIVES

● **Analysis on factors affecting sales of store I**

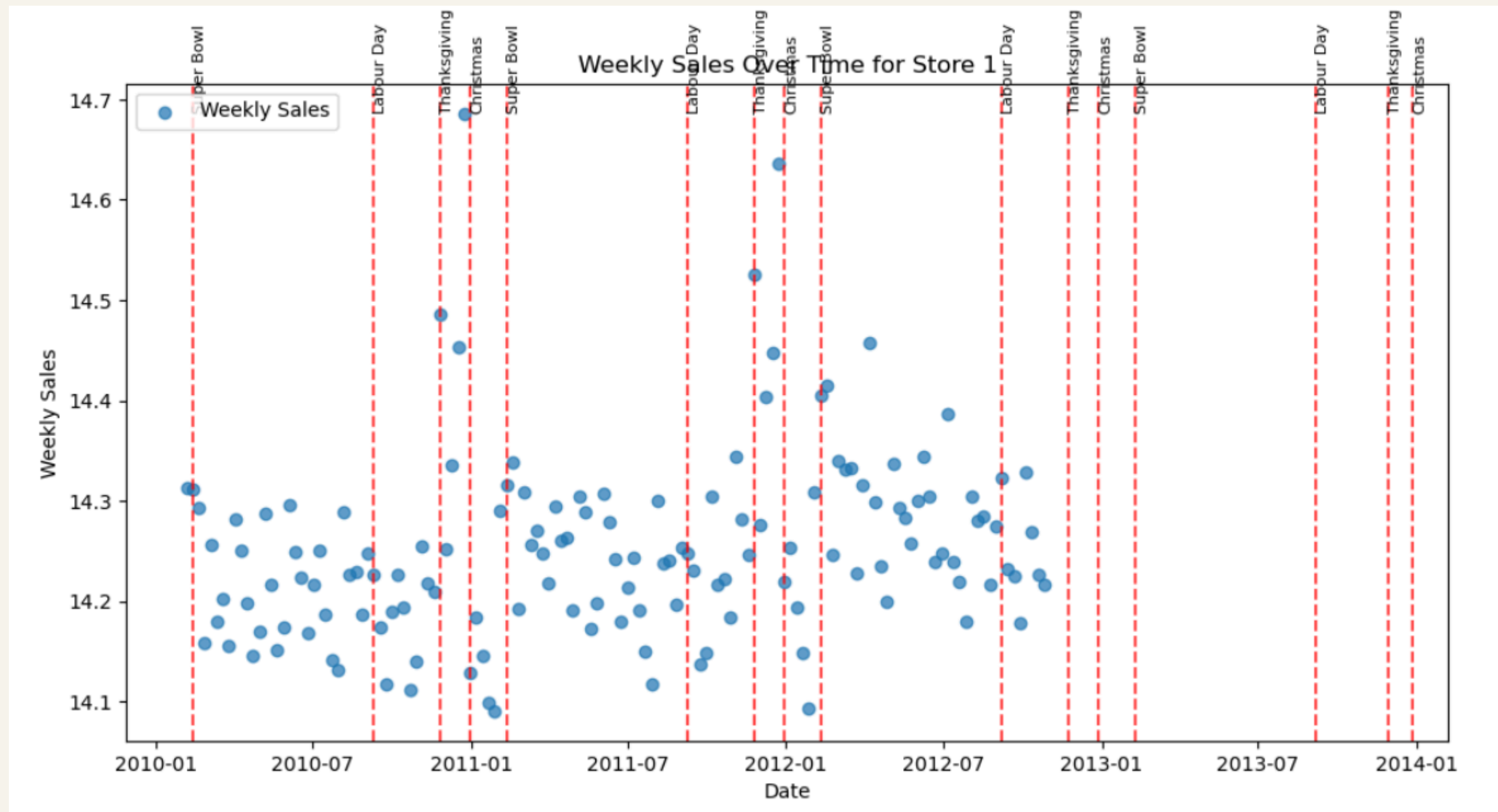
How did holiday events, temperature, fuel price, CPI and unemployment rate make an impact on the sales of each store over the period from 05-02-2010 to 01-07-2012?

● **Making predictions of sales of store I**

Based on the affections of these factors, a model is built to make predictions of sales on each store over the period from 01-07-2012 to 26-10-2012.



OBJECTIVE I: ANALYSIS



On Labor day, Thanksgiving and Super Bowl, sales of store 1 indicated a significant fluctuation. Meanwhile, in terms of Christmas, fluctuations of sales were recorded on the week before happening this event. Therefore, instead of using Christmas, the previous weeks before this event were studied.

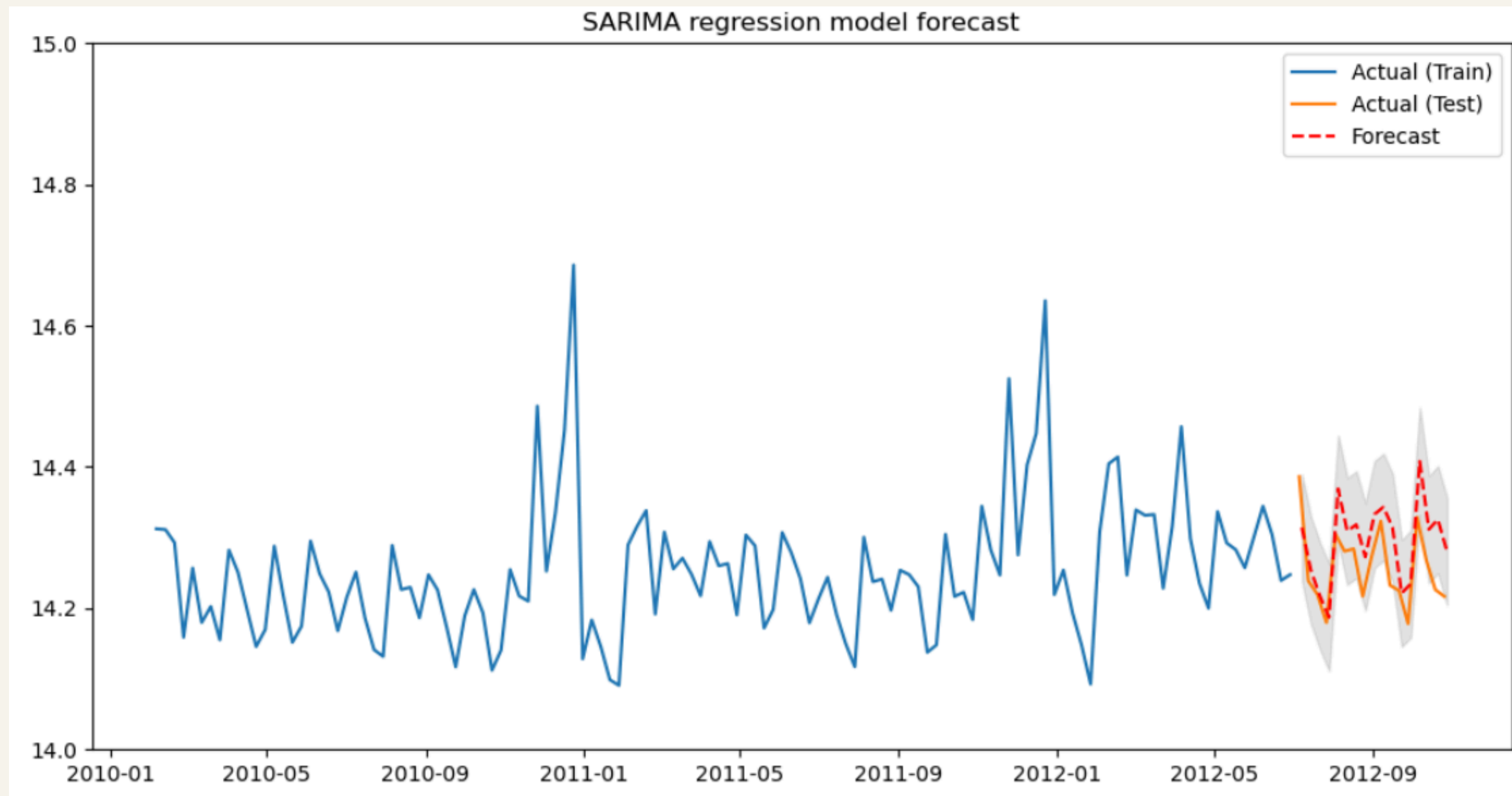
OBJECTIVE I: ANALYSIS

| | coef | std err | z | P> z | [0.025 | 0.975] |
|--------------|-----------|----------|----------|-------|----------|----------|
| Christmas_1 | 1.696e-08 | 1.08e-14 | 1.57e+06 | 0.000 | 1.7e-08 | 1.7e-08 |
| LabourDay | 1.652e-09 | 1.67e-13 | 9911.499 | 0.000 | 1.65e-09 | 1.65e-09 |
| SuperBowl | 2.706e-08 | nan | nan | nan | nan | nan |
| Thanksgiving | 6.127e-09 | 1.16e-14 | 5.27e+05 | 0.000 | 6.13e-09 | 6.13e-09 |
| Log_CPI | 1.9829 | 0.801 | 2.475 | 0.013 | 0.413 | 3.553 |
| Unemployment | -0.0638 | 0.033 | -1.908 | 0.056 | -0.129 | 0.002 |
| Fuel_Price | 0.0303 | 0.024 | 1.286 | 0.198 | -0.016 | 0.077 |
| Temperature | 0.0009 | 0.001 | 1.252 | 0.211 | -0.001 | 0.002 |
| ar.L1 | 0.0590 | 0.148 | 0.398 | 0.691 | -0.231 | 0.349 |
| ma.L1 | -0.9846 | 0.202 | -4.872 | 0.000 | -1.381 | -0.588 |
| sigma2 | 0.0015 | 0.000 | 4.061 | 0.000 | 0.001 | 0.002 |

ARIMA model was used to analyze the impact of those factors on sales of store 1. The results indicated:

- Holidays such as Labor Day, Super Bowl, Thanksgiving, and previous weeks of Christmas affect **positively** on the sales of store 1
- CPI affects **positively** on the sales of store 1
- Fuel price affects **positively** on the sales of store 1
- Temperature affects **positively** on the sales of store 1
- Unemployment rate affects **negatively** on the sales of store 1

OBJECTIVE 2: PREDICTIONS



Evaluation of this model:

- Mean Square Error:
0.0029728314308438536
- Root Mean Square Error:
0.05452367770834845
- Mean Absolute Error:
0.046228651678658854
- Mean Absolute Percentage Error:
-0.002600303104398742

Lower values of MSE and RMSE are better, Regarding MAE, this error is small relative to the values being predicted, it might be considered good. Despite the slight bad value of MAPE, generally, this model is good enough to be used to make predictions of sales of store 1 in the future.

CONCLUSIONS & RECOMMENDATIONS

Holidays have an positive impact on the sales of store 1, which means that the increase in holidays will increase the sales of weeks which are on these holidays. Sales of weeks which were on Super Bowl were slightly higher than sales on other weeks. Additionally, sales of weeks which were on Thanksgiving and the previous weeks of Christmas increased significantly relative to other weeks. However, the sales of weeks on Labor Day did not show significant differences compared to other weeks.

Based on the evaluation via 4 metrics, ARIMA model built is good enough to make some predictions of sales

Store 1 should launch some more attractive promotions on Super Bowl, Thanksgiving and Christmas to increase more sales. Additionally, store 1 should take Labor Day into considerations because this event is not really effective.

Store 1 can use this model to make some predictions of sales to make careful preparations on these holidays.