

Walmart Forecasting Presentation

Project Goal

- Managerial Presentation & recommendation
 - High-level review
 - Factors affecting seasonality trend
 - Business recommendation to managers
- Technical Presentation & approach
 - Deep dive into the data
 - The Forecast Models tested
 - Data Analysis - Results from tested forecast models
 - Most accurate forecasting tools/approach
 - Forecasting & Business Conclusions



Background

- Historical data from 45 stores, across 99 departments
- Stores located in different regions
- Data sampled from years 2010-2012
- There are 3 types of stores that vary in size
- Annual sales are held 4 times a year
- This historical data will be used to forecast future sales



Managerial Presentation



Summary

Goal: Analyze past store sales data to identify trends in the data that affects WalMart's sales

Several Forecasting Models Tested:

1. Autoregressive Integrated Moving Average (ARIMA)
2. Naive Forecast
3. Exponential Smoothing
4. Holt Winters

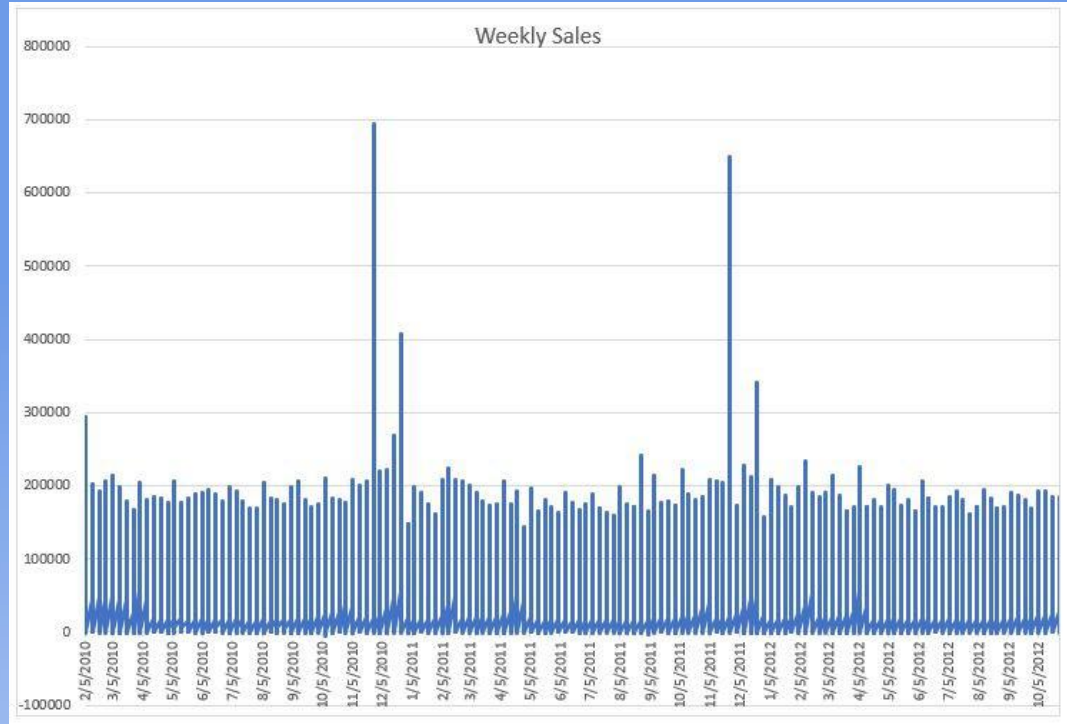
Forecast model with the lowest MAPE is the most optimal



Factors Affecting Seasonal Trends: Major Holidays

There are 4 major holidays identified with peak sales demand:

- Super Bowl Sunday
 - Mid February
- Labor Day
 - Early September
- Thanksgiving/Black Friday
 - Late November
- Christmas
 - Late December
 - Large spikes in end of year sales
- Other Factors Affecting Trends:
 - Department
 - Store size



Seasonality Trend Observed - Demand Spikes Around Holidays



Recommendation

In order to capture the most revenue dollars during peak holiday weeks where we see the strongest demand, sustain sufficient product inventory levels prior to those weeks

The appropriate product inventory will vary by store type, department, and the approaching holiday sales week as each holiday will affect the demand for various departments differently



Technical Presentation



Approach

Aggregated sales data into 12 periods

Analysed season sales by store type

Ran various Several Forecasting Models:

1. Autoregressive Integrated Moving Average (ARIMA)
2. Naive Forecast
3. Exponential Smoothing
4. Holt Winters

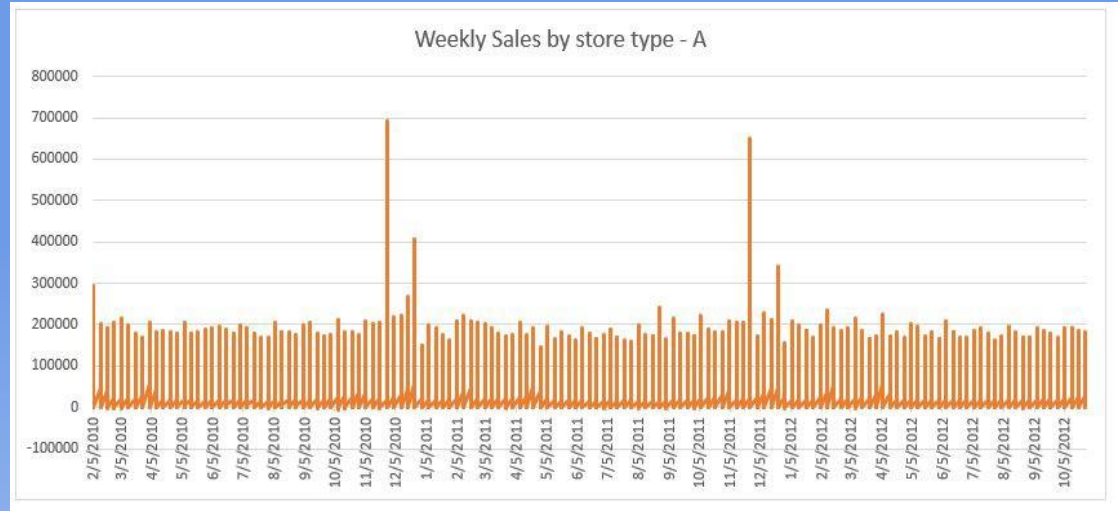


Data Analysis - Store A

Seasonal trends for Store Type - A

Time Series Analysis from Past sales data

Notice the spikes in sales. This showcases that seasonality is present in the data

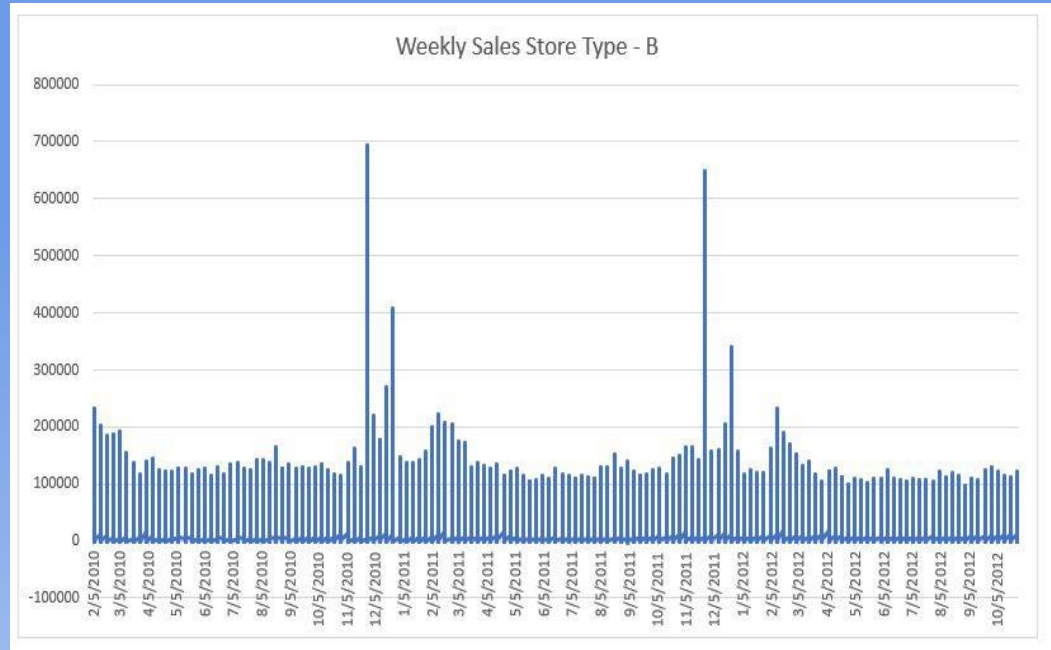


Data Analysis - Store B

Seasonal trends for Store Type - B

Time Series Analysis from Past sales data

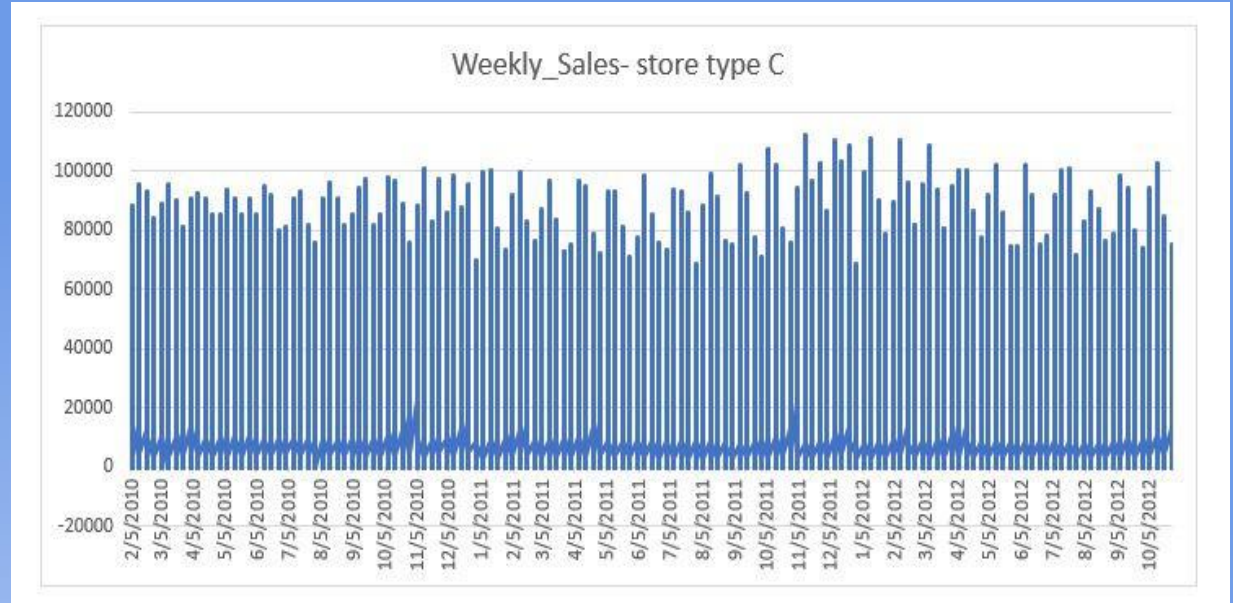
Notice the spikes in sales. This showcases that seasonality is present in the data



Data Analysis - Store C

Seasonal trends for Store Type - C

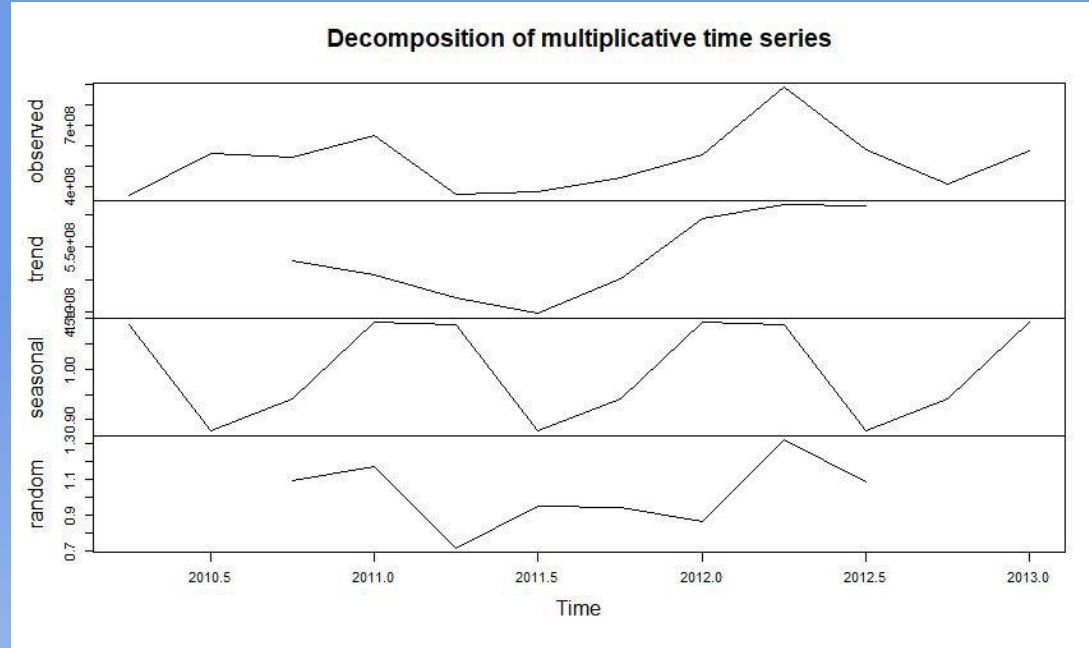
Time Series Analysis from Past sales data



Time Series Decomposition

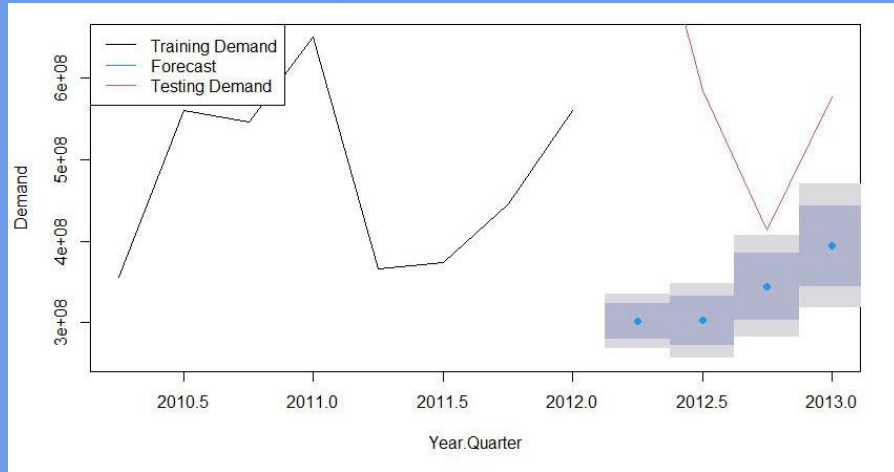
Breaking down time series into several components can be a very powerful tool to identify patterns

By analysing the data, we assume that the spikes in sales correspond to the holiday weeks with Thanksgiving & Christmas holiday season building before a post-holiday drop off

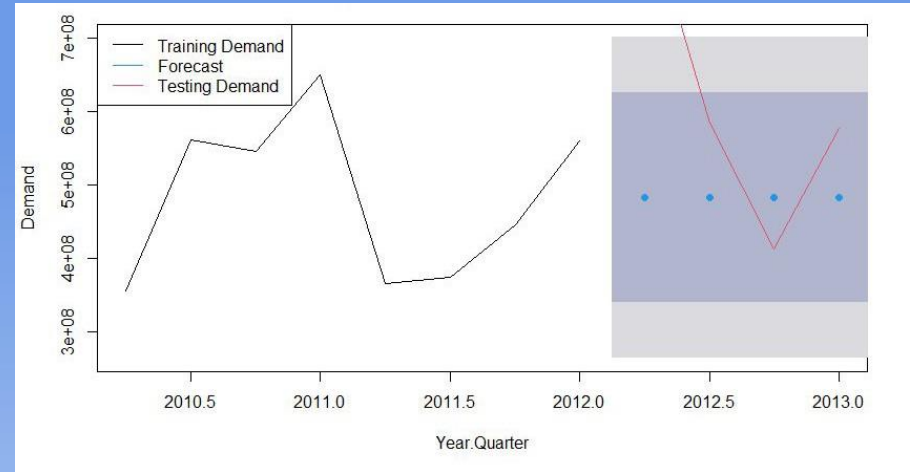


Forecast Models tested

Holt Winters- measure 3 exponents slope, trend and seasonality to make ST predictions.

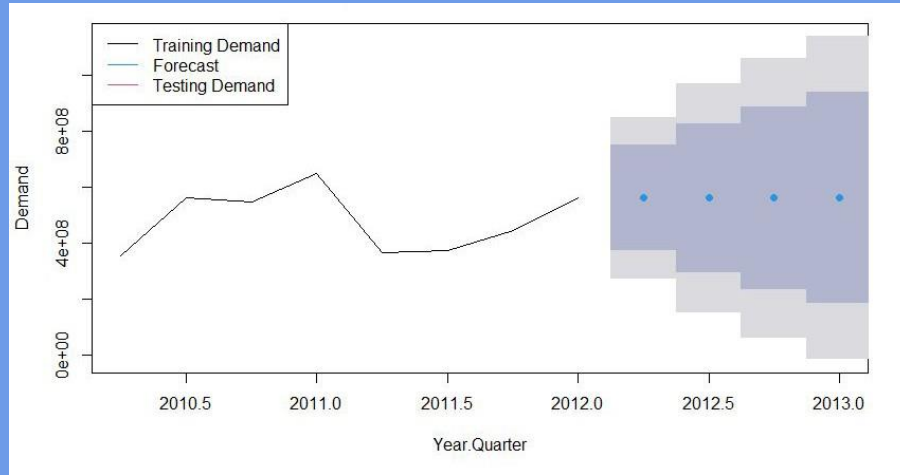


ARIMA- used to explain autocorrections in the data

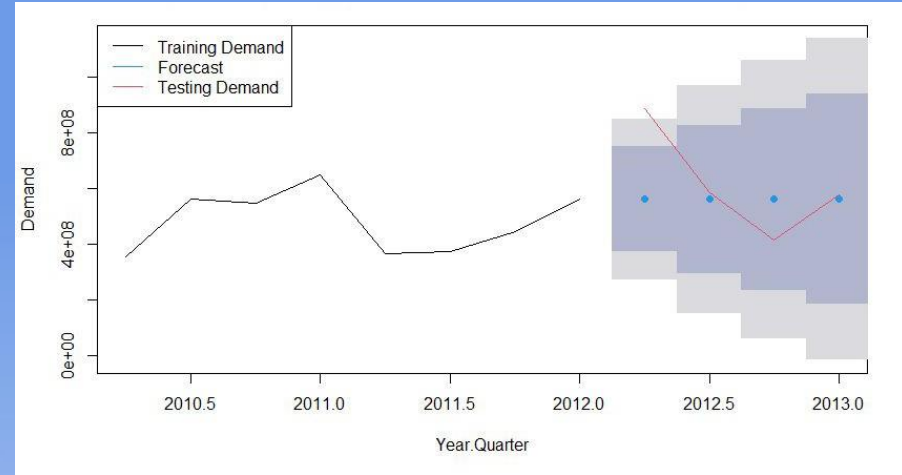


Forecasting Models tested (Cont)

Naïve- Uses most recent data collected as predictive measure.



Seasonal Naïve- Uses past season data to predict for that same season in the future



Data Analysis: MAPE of Models Tested

Holt Winter

Year	Actual demand	Forecast	error	AD	MSE	MAD	MAPE	bias	TS
2013	576838647	393852024	-182986623	182986623	1.15E+17	279869846	40.65352	-111947938	-4

ARIMA

Year	Actual demand	Forecast	error	AD	MSE	MAD	MAPE	bias	TS
2013	576838647	482357627	-94481021	94481021	4.70E+16	167765826	24.07833	-532379522	-3.173349



Conclusion: BEST Model's Results

ARIMA prevails as BEST model!

- Of all the models tested ARIMA has a significantly lower Mape
- Likely best forecasting tool to be utilized

