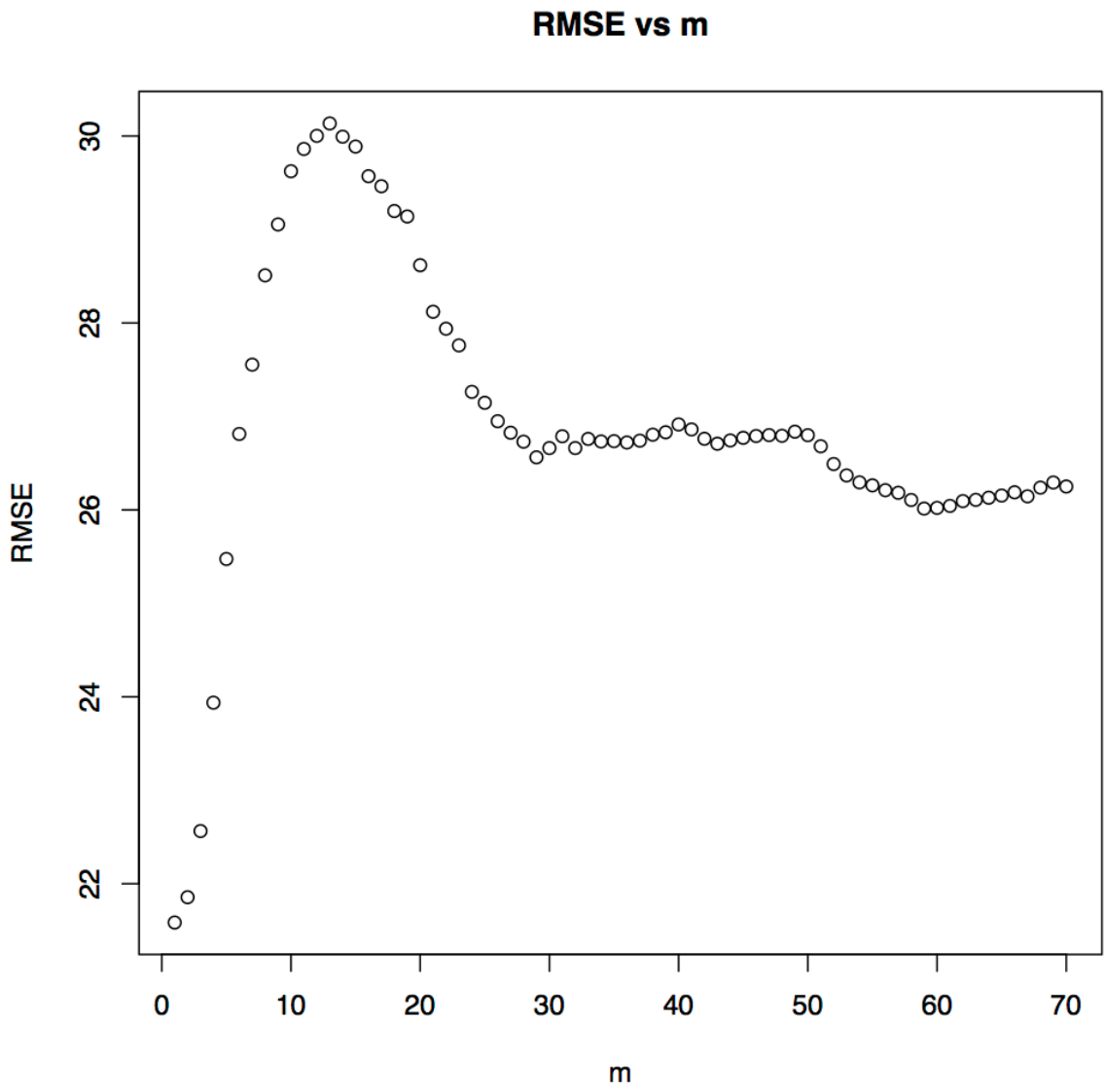
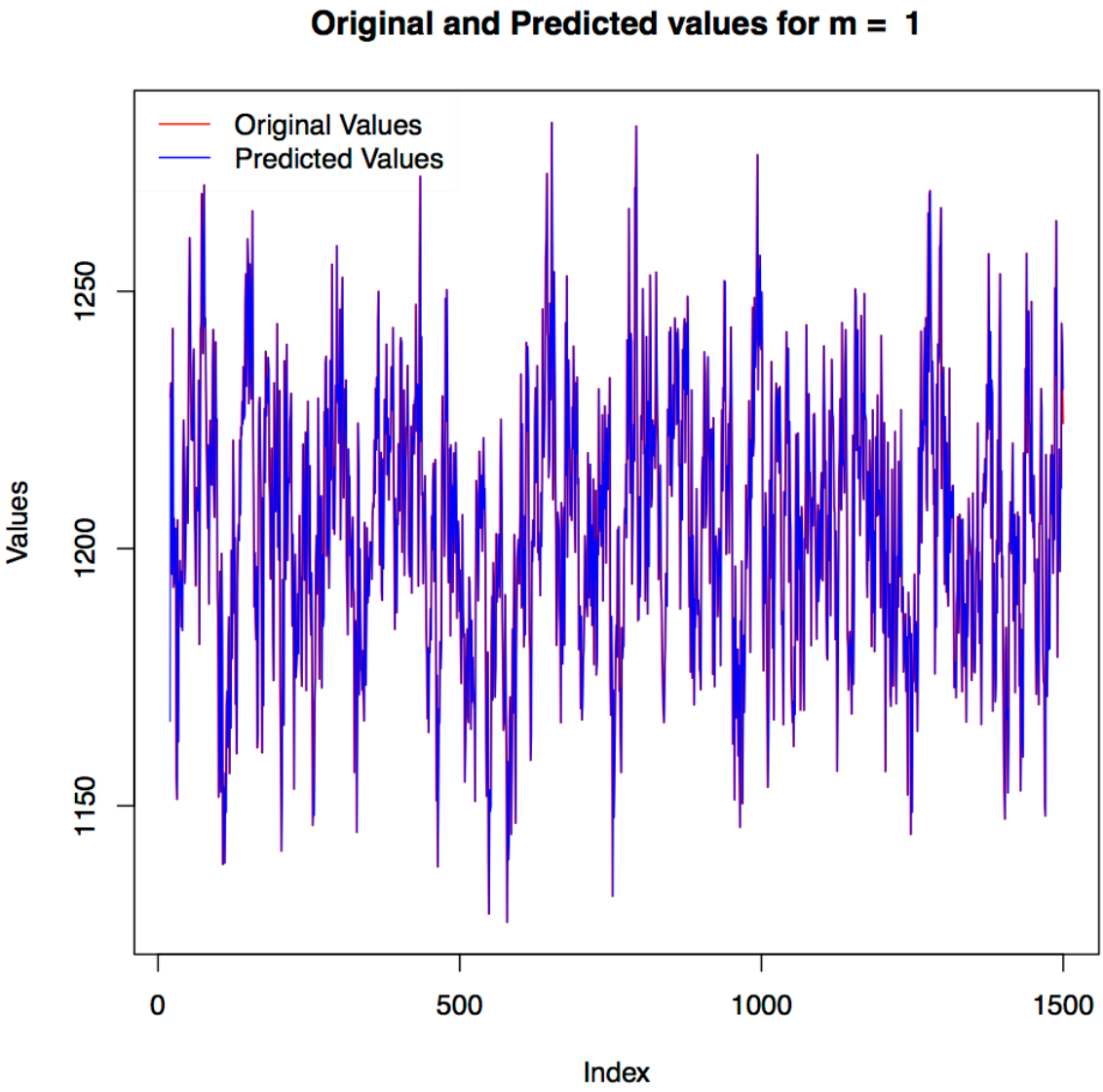
Simple Moving Average

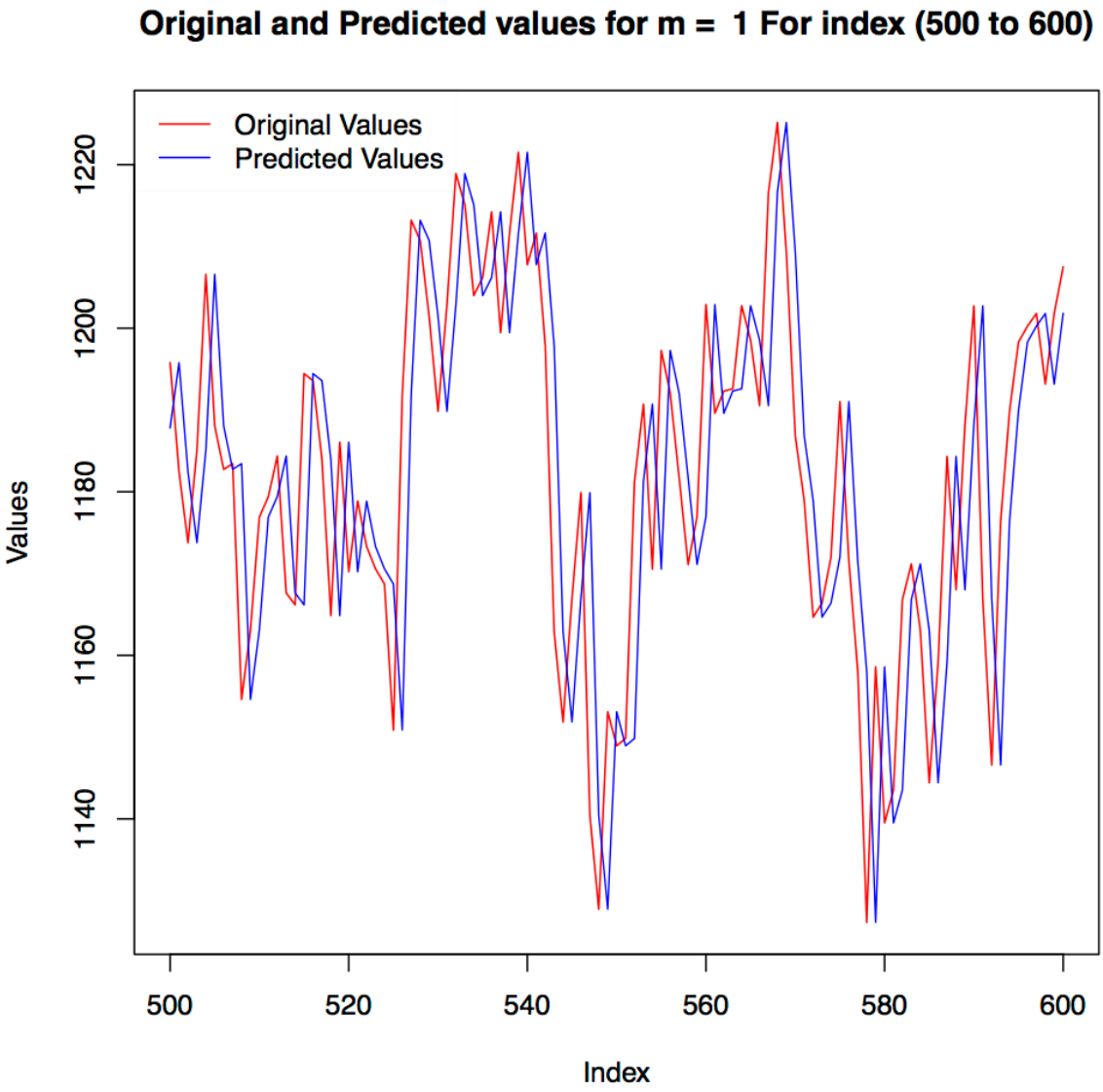
I tried to fit the model with different m value and as the data fluctuates very much best value for m is 1. We can derive the result from the graph of RMSE vs m



So we chose the m=1 and plot the Original values vs Predicted values.

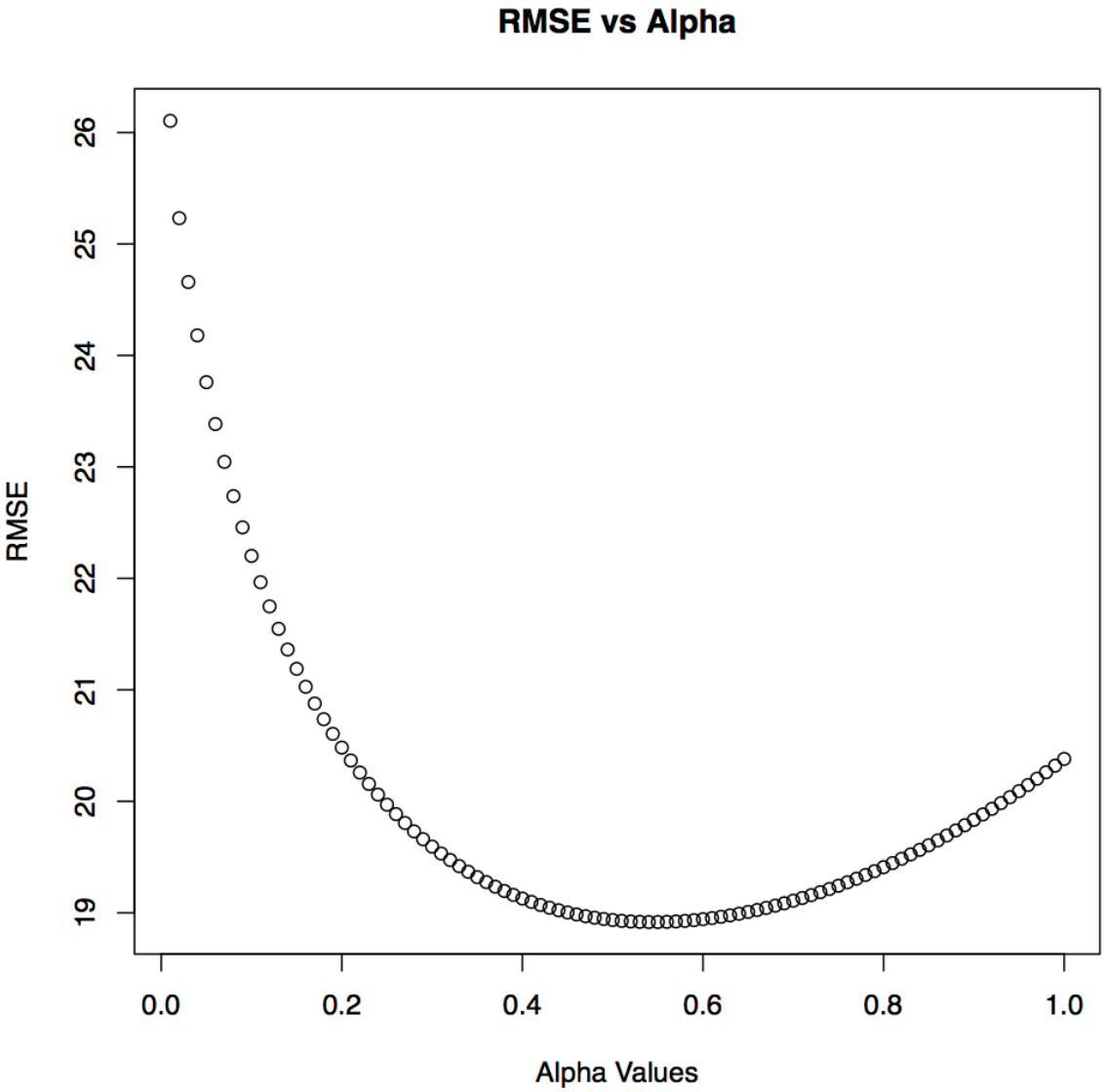


We can see that it follows the trend. We can see it better by zooming the graph.

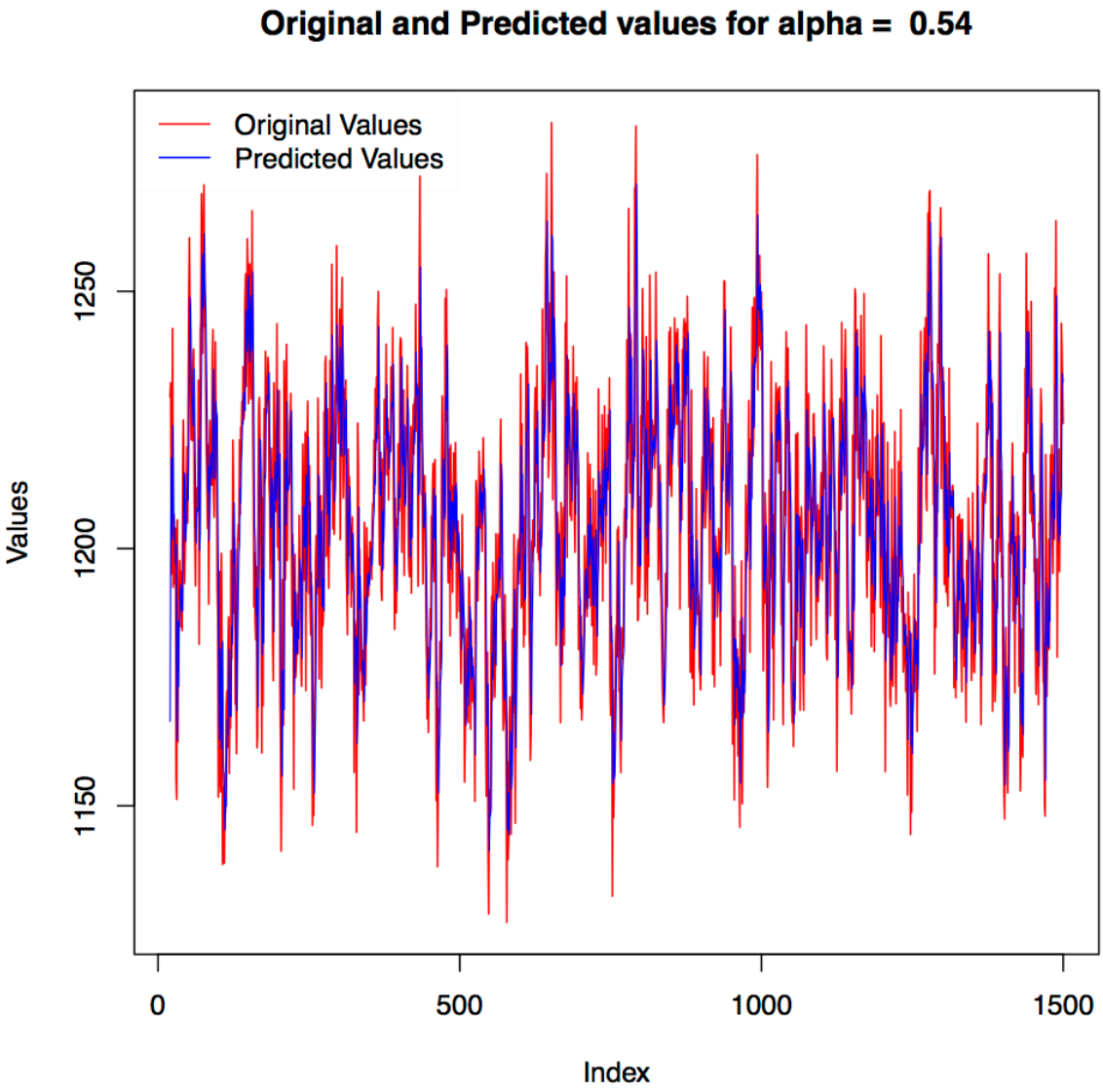

Original and Predicted values for m = 1 For index (500 to 600)
Original Values
Predicted Values
Values
1140
1160
1180
1200
1220
500
520
540
560
580
600
Index

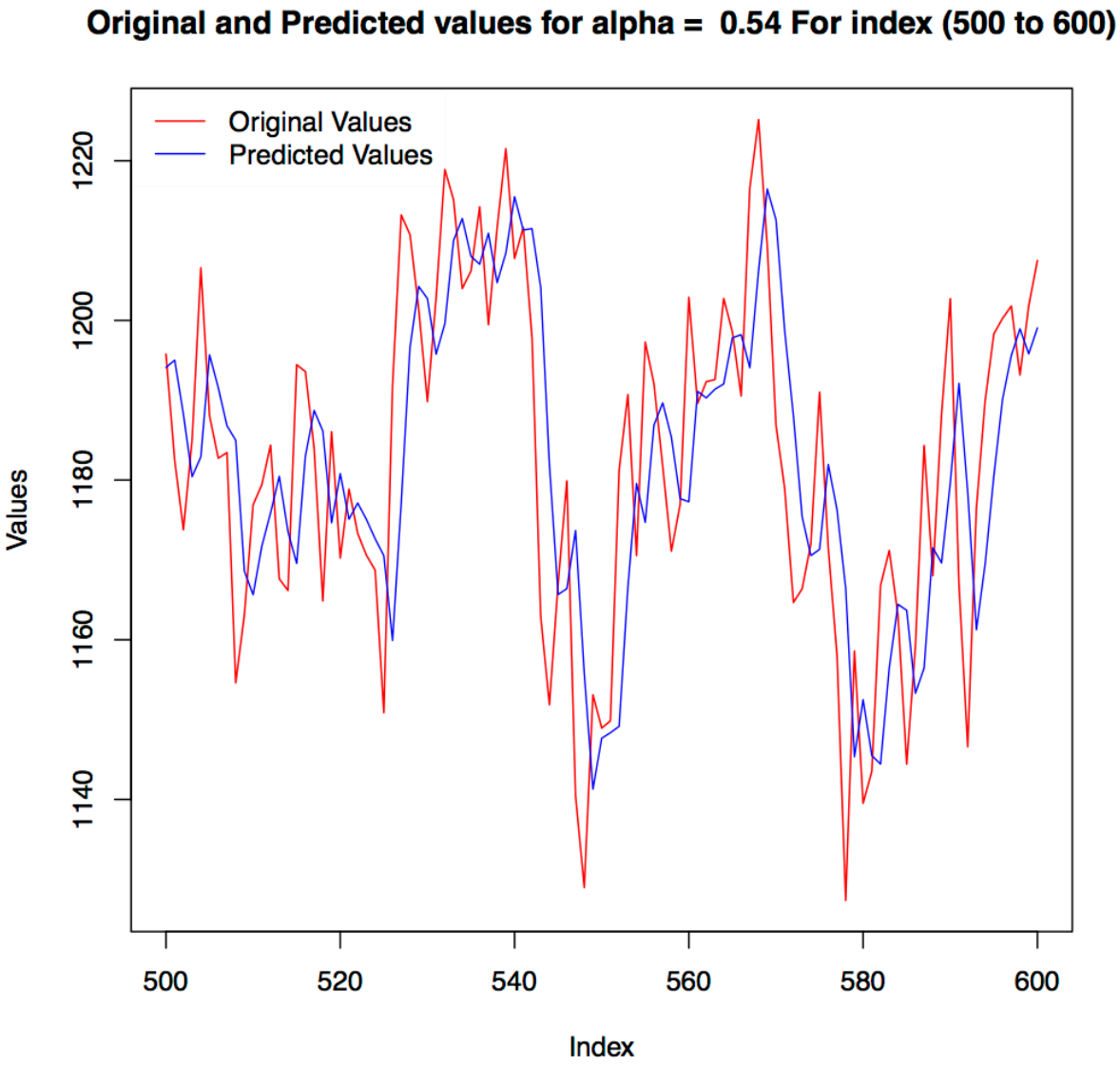
Exponential Smoothing Model

For the exponential smoothing the parameters is alpha. Alpha takes values from 0 to 1. SO I fitted model with values all from 0.01 to 1. And calculated RMSE and plotted the graph for RMSE vs Alpha value. We can see that the best value for alpha is 0.54.



So for alpha = 0.54 I fit the model.

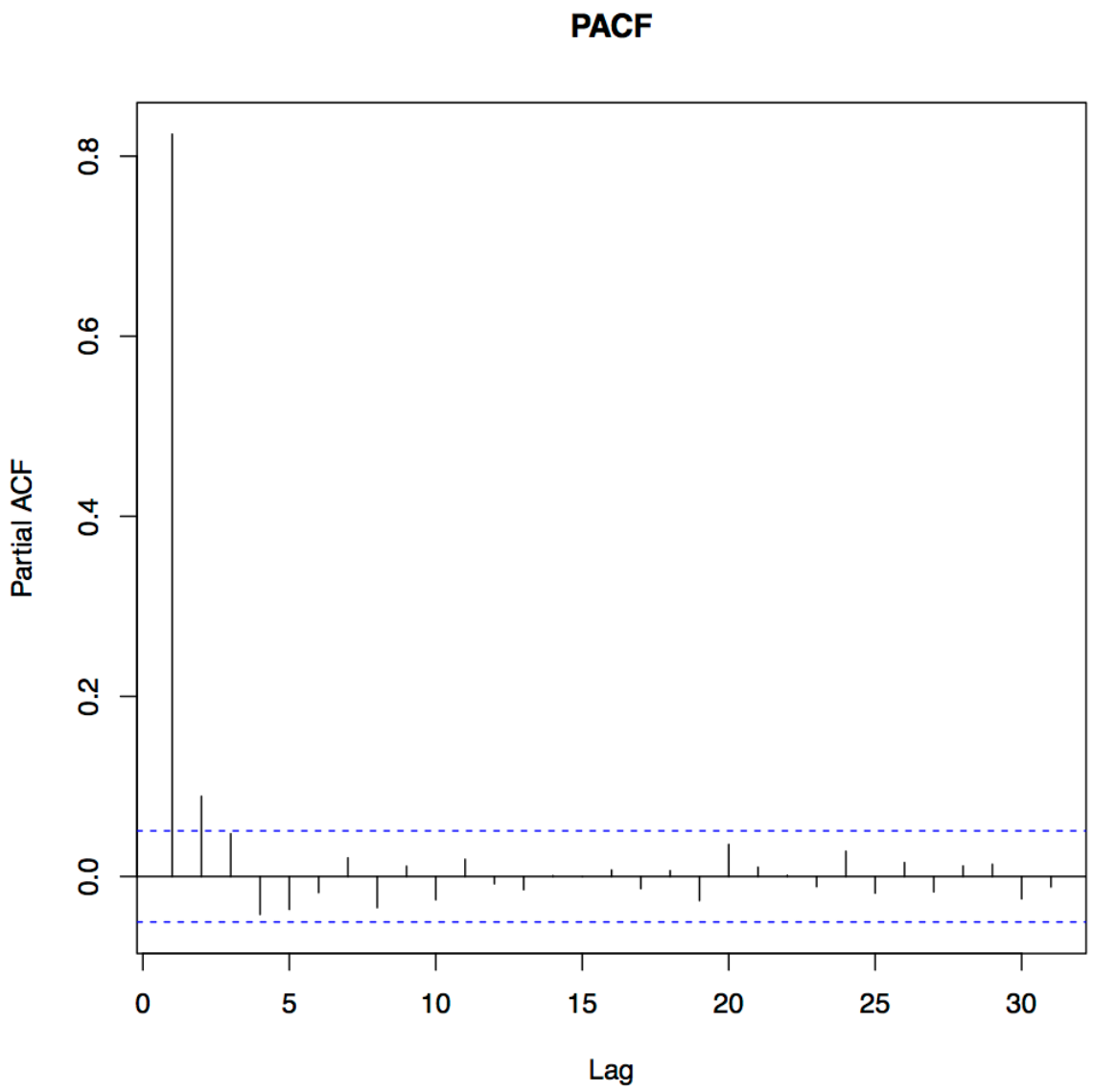

Original and Predicted values for alpha = 0.54
Original Values
Predicted Values
Values
1150
1200
1250
0
500
1000
1500
Index



We can see that this model is better than simple moving average and yields lower RMSE.

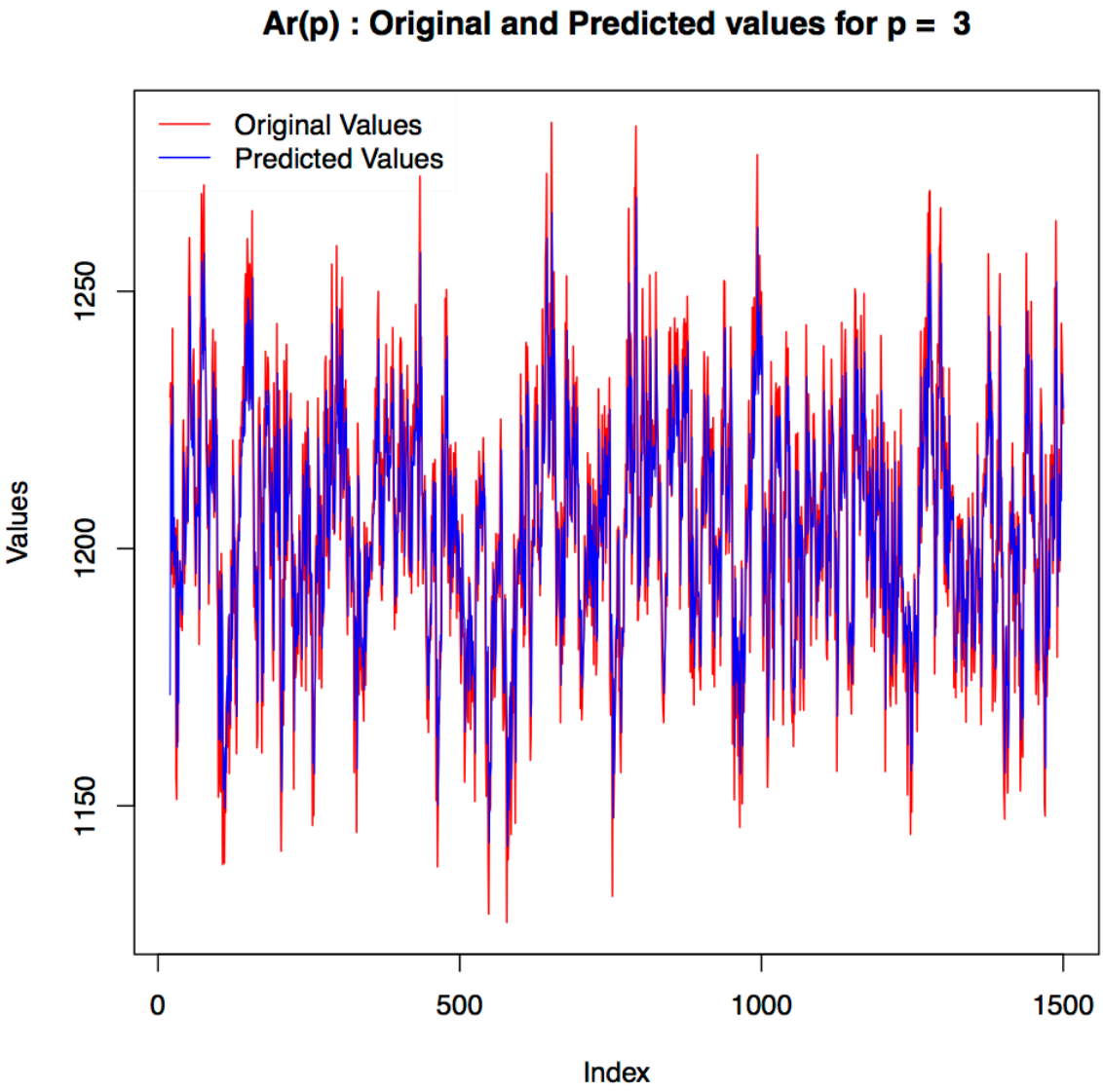
AR(p)

We first plot Partial Autocorrelation and we get the below graph.

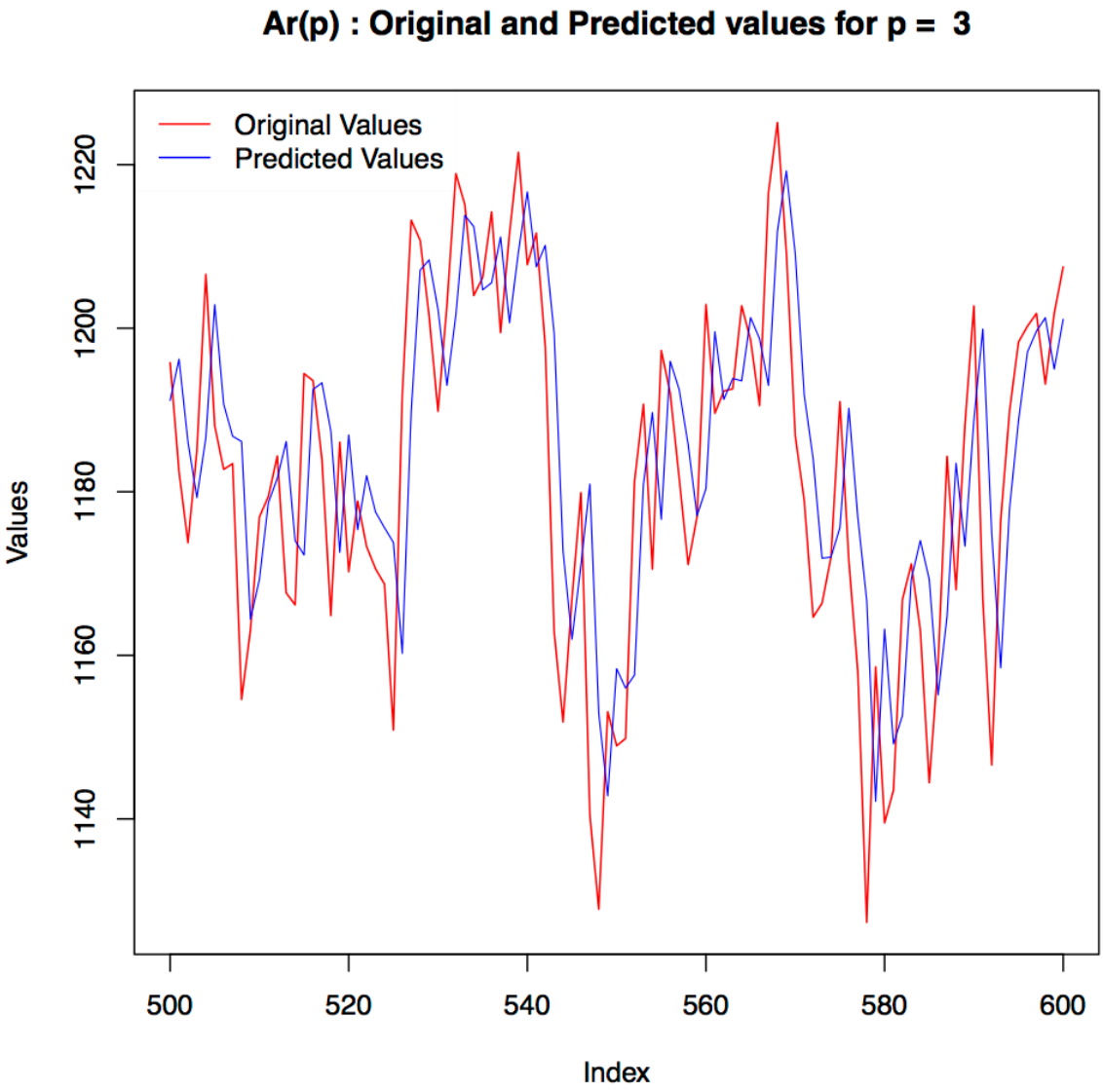


We should select the p when pacf goes below 0.2 but here we select p=3 as it tends to zero. And we fit the model and plot the graph.

The parameters we get from model fit are :
0.7469 , 0.0534, 0.0475

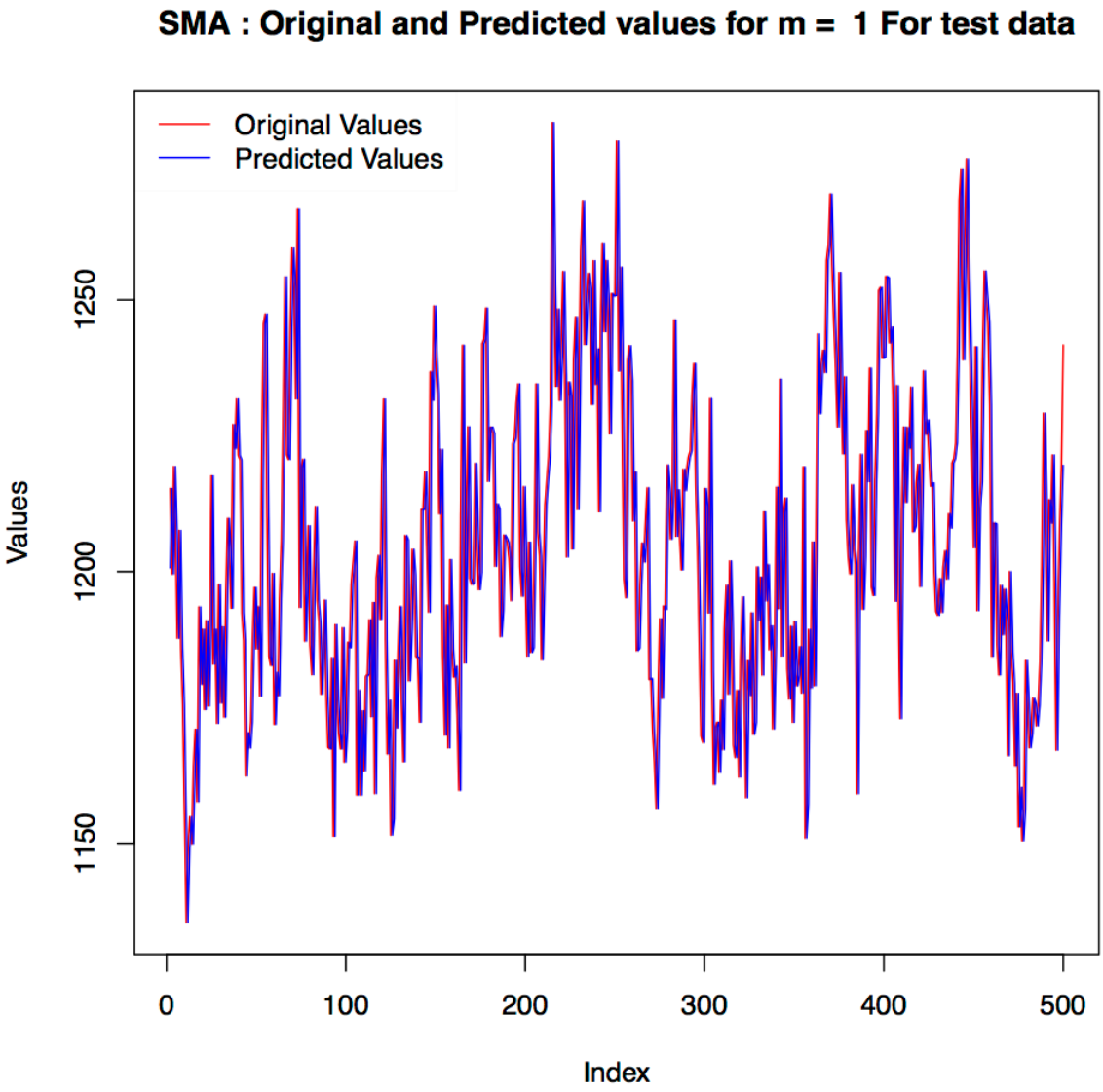


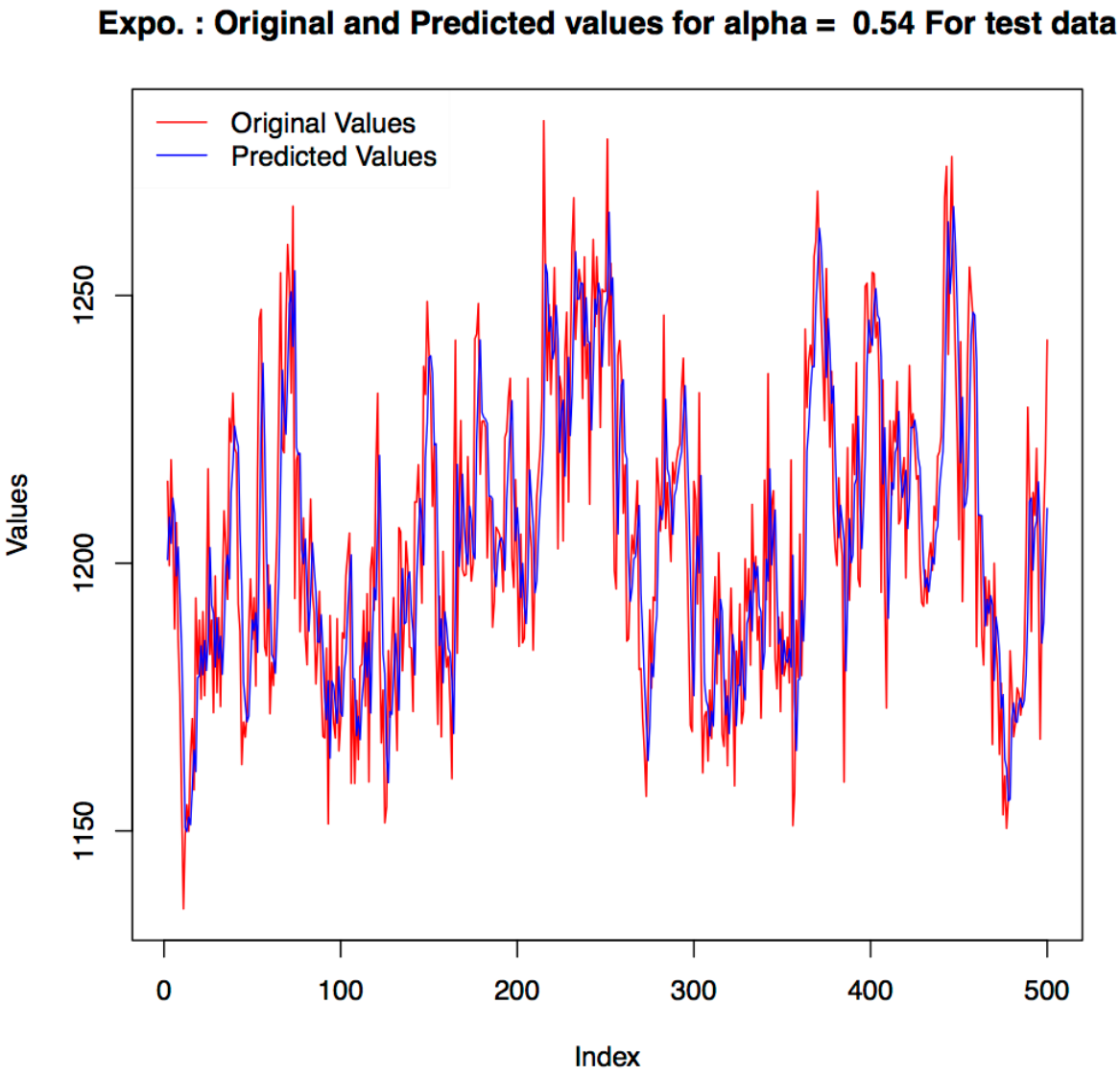
We can see the goodness of our model by zooming the graph.

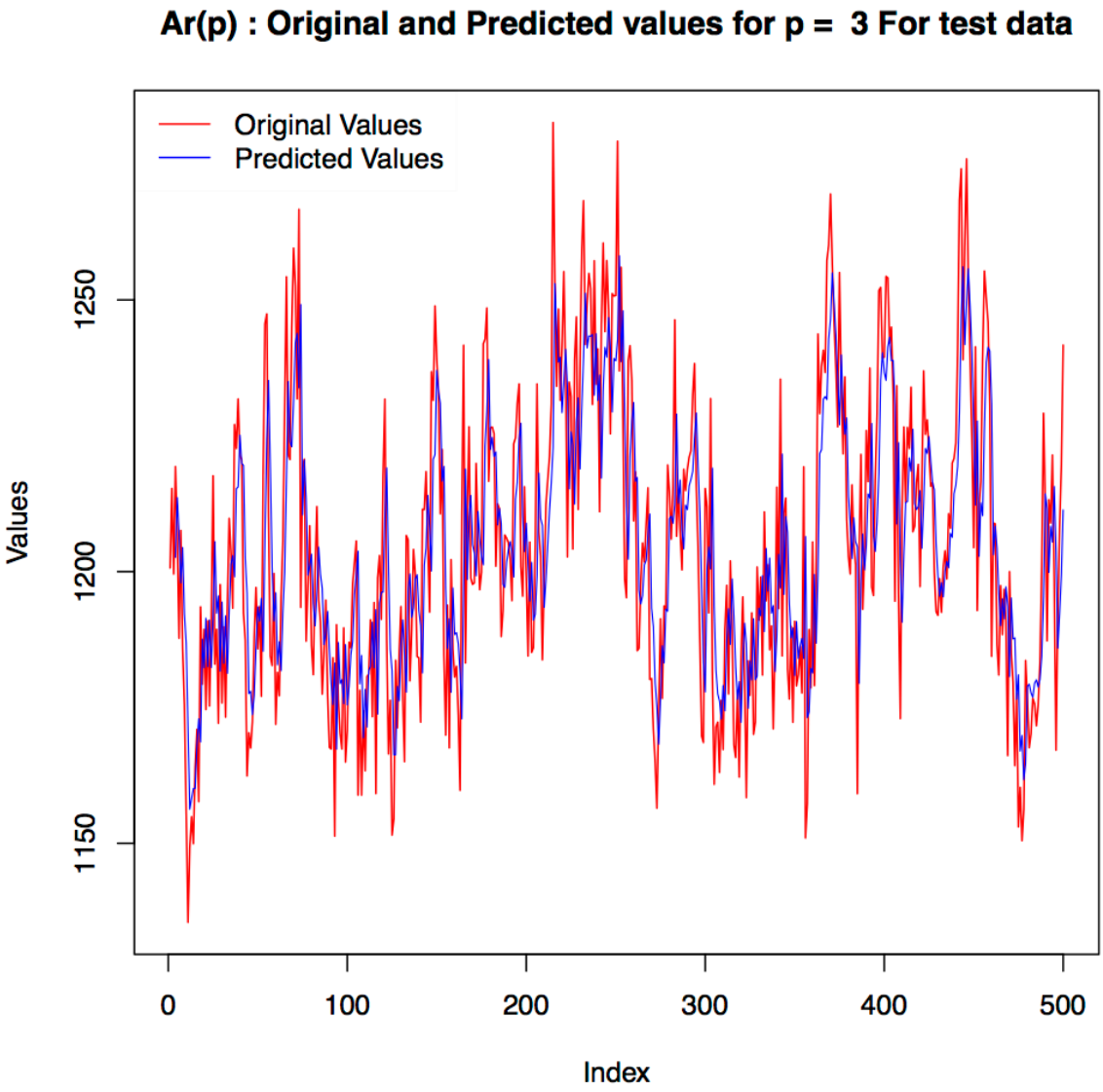


Forecasting Test Data

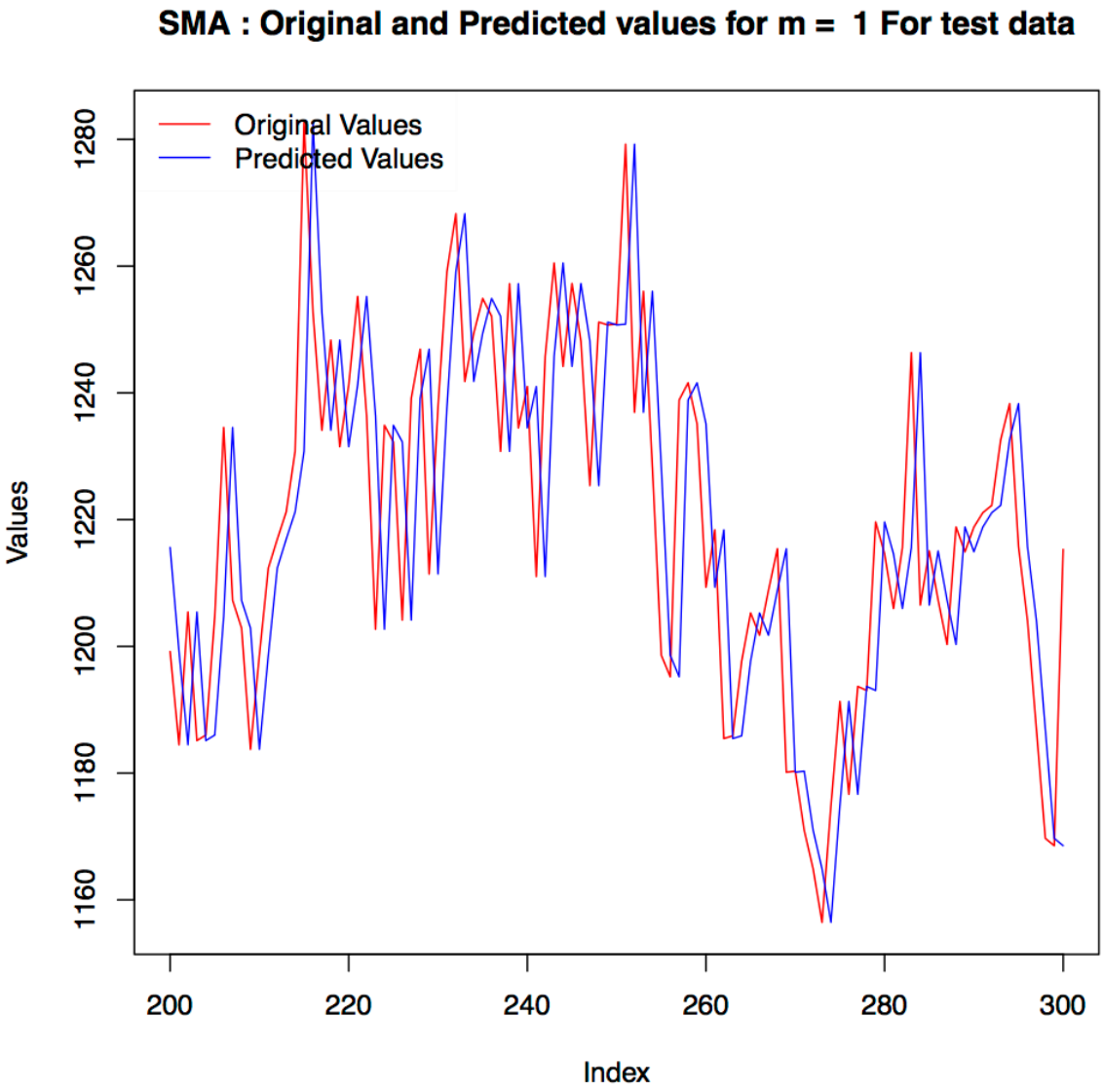
We fit all the models i.e. Simple Moving Average with m=1, Exponential smoothing with alpha = 0.54 and AR(p) with p = 3. And we get below results.

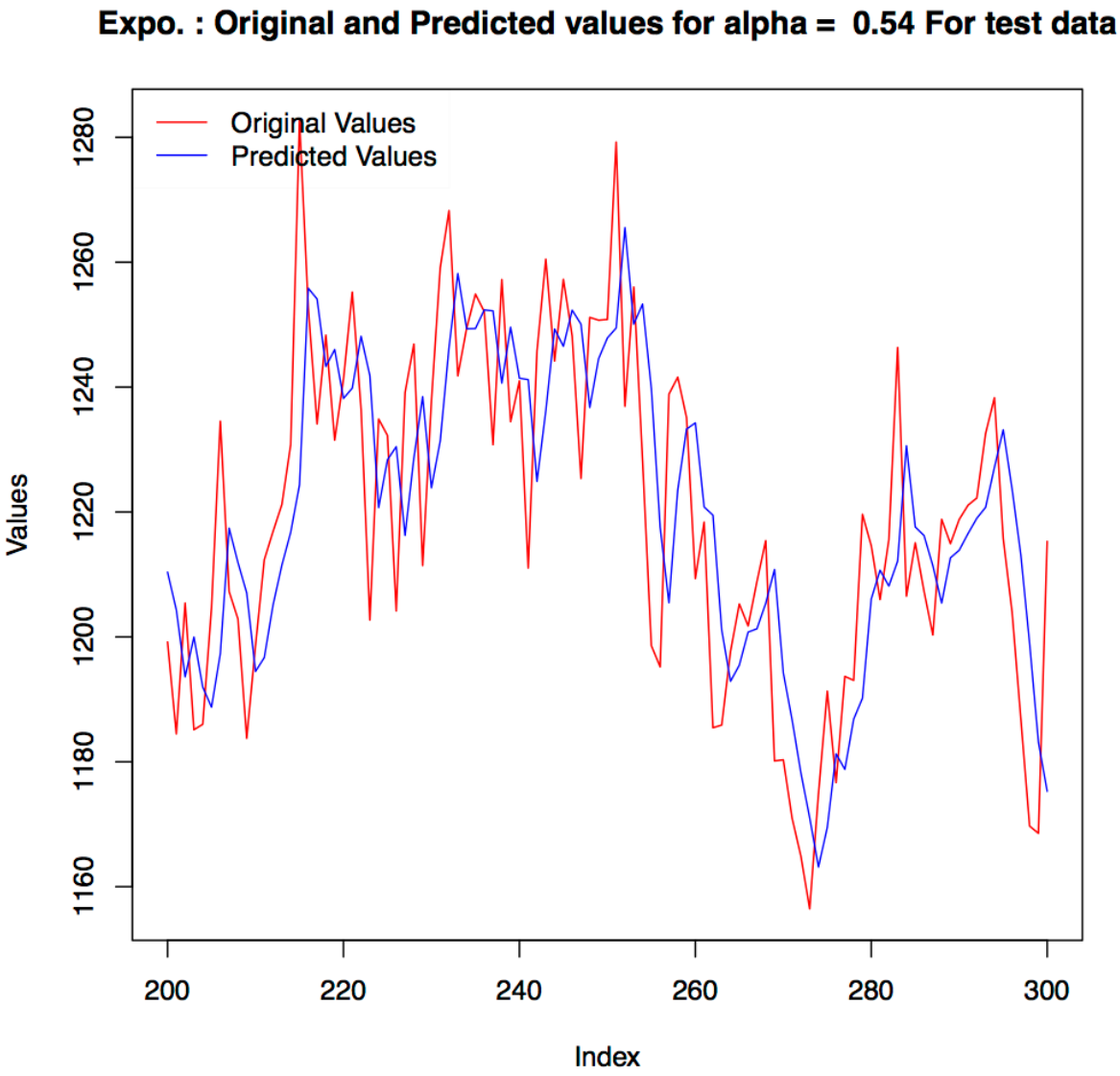

SMA : Original and Predicted values for m = 1 For test data
Original Values
Predicted Values
Values
1150
1200
1250
0
100
200
300
400
500
Index

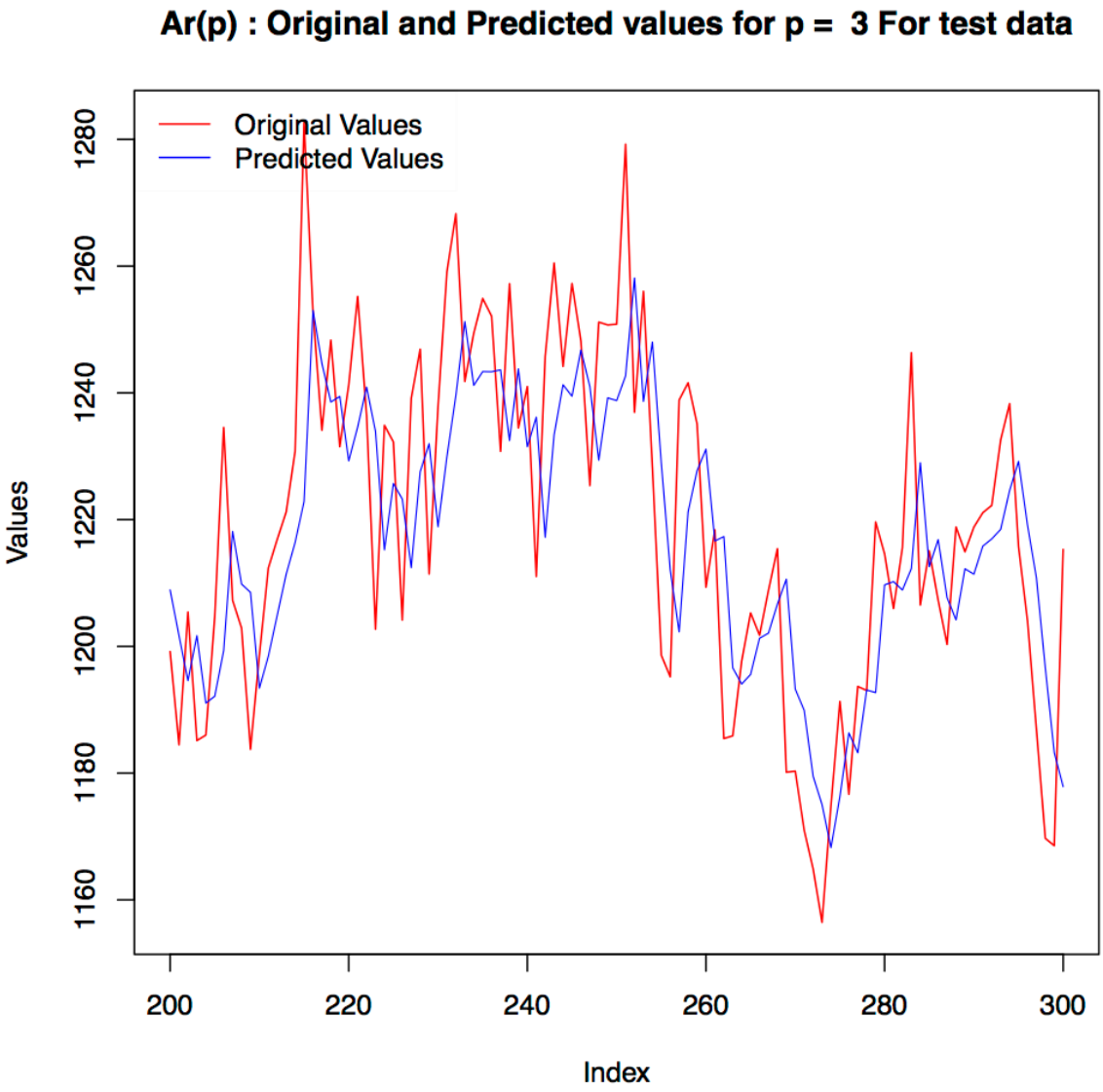

Expo. : Original and Predicted values for alpha = 0.54 For test data
Original Values
Predicted Values
Values
1150
1200
1250
0
100
200
300
400
500
Index



And RMSE for all these models are :
Simple Moving Average : 11.6789912763793
Exponential Smoothing : 10.8442419103208
AR(p) : 10.5126297709238
So the AR(p) is the best model. We can see this in **zoomed graphs**.


SMA : Original and Predicted values for m = 1 For test data
Original Values
Predicted Values
Values
1160
1180
1200
1220
1240
1260
1280
200
220
240
260
280
300
Index


Expo. : Original and Predicted values for alpha = 0.54 For test data
Original Values
Predicted Values
Values
1160
1180
1200
1220
1240
1260
1280
200
220
240
260
280
300
Index


Ar(p) : Original and Predicted values for p = 3 For test data
Original Values
Predicted Values
Values
1160
1180
1200
1220
1240
1260
1280
200
220
240
260
280
300
Index