We have already talked about the moving average aw the first technique in time series analysis.

We now start exponential smoothing which is indeed a type of moving average.

In exponential we assume that the forecast for the next period is equal to forecast for this period plus a fraction of the gap between this forecast and the actual that we have observed in this period.

The fraction that we multiply and that fraction is shown by alpha and alpha is

something between 0 and 1. we can manipulate this equation and write it like this and then we can put f's

together and a together and we can get out with this equation so when it goes to exponential smoothing

we may use this formula or we may use this formula

i personally like the last one so in my in the rest of my lectures i use forecast for next period is equal to 1

minus alpha times forecast for this period plus alpha times actual for this product and now let's go to work

we have this data with this year from period 1 to period 24. i assume an initial alpha of 0.5 for forecast of the

first period i have several options for example i can compute the average of all data that i have

or instead of average i can compute intercept using regression

of my demand values and the time periods

that can also be assumed as my forecast for the first period so average of all periods or intercept of the regression

line as my forecast for the first period but i want to make it simpler and i just assumed

forecast for the first period is equal to actual for that period

and that's it forecasts are actual for the first period are the same and therefore no

matter what alpha is forecast for next period will be the same as this two equal to one minus alpha

and i have typed alpha here which is point five and i like it because i'm going to copy it down always 1 minus

alpha 1 minus beta 1 minus gamma in all other types of exponential smoothing forecasting techniques that we will

discuss 1 minus them will be multiplied by forecast they themselves will be multiplied by

actual and usually the first part of the equation is easier to compute so let's conventionally learn from now on that we

first use one minus something time forecast and then

that thing by itself times actual so i have 1 minus alpha and i multiply it by forecast

plus alpha and i lock it because i need to copy down

multiplied by actual because these two are the same for the

first period period two forecast is equal to actual and forecast for period one

but things start changing as i copy that therefore for the last period

here 1 minus alpha times forecast for the previous period plus alpha times actual

for the previous period and then i can copy down and that would be my forecast for period 25. now in moving average and

also in exponential smoothing as soon as i forecast for next period the period that i don't have any data for it if i

want to go beyond that for period 26 i simply assume that forecasts for these periods are equal to the forecast for

the previous period therefore that would be a straight line for other periods i will take this one

and bring it a little bit down and that is my forecast for next four periods now we continue computing

everything exactly the same as we computed them for moving average error is the gap between

actual and forecast absolute value of error equal to amps square of the rule

absolute value of error divided by actual

data and then copy them down

now we need to compute math mse and map as long as we use

mix referencing we can compute one and copy to the right how compare

equal to average average of absolute difference

colon another e5 comes up and then i put a dollar sign in front of the first e5 from e5 to e5 but the first e5 is the

first five is absolute and this is for all of them this is the average of all component of

this column this is the average of up to 10 of that column

now if i just take this one and copy to the right because that is mix referencing

it goes from column e to column f and then

i can copy down and this is mse and then i can also copy to the right

and that is average of the absolute value of error divided by x we have everything tracking signal is

also simple equal to summation of all errors from here to itself

and make the first one absolute d5 make it d dollar five

two to d5 that is the average of those numbers divided by mad

enter copy down in situation like this because something

is divided by zero and it's error we can go here and type if

error that's just one word and then we put our statement over there comma

nothing and that will put nothing over there but when we

copy down other things will be pasted now

this is my mat this is

my mse and this is my map

or my mark we said that if we use mad

net forecasting technique then standard deviation of forecast is 1.25 multiplied by

math if we compute mse then standard deviation of forecast

is equal to s cubed or t of mse mse and if

we are using map that would be again 1.25 so i copy this and i paste it over there

and i add to the decimal points therefore my forecast for next period is this much

894 and a standard deviation of forecast if i'm using mad it would be 11 55

if i'm using mse it will be 1158 and if i am using map that would be 0.079 of

the forecast that i have now let's see how can we compute the

best alpha i type 0 here and i type

0.1 here then i come here and i type equal to this 0

then for m6 i will type equal to what is in the previous cell plus

this increment which in this case is 0.1 and i lock the increment so that is 0.1 now if i copy down

0.3.4.5.6.7.8.9 and one of all these numbers i'll go here

one to the right of this cell and one to the north i go over there and i type my

measure of effectiveness i can type math or mse or map i'll select math

click on it then i come here and i mark all these components so the

whole rectangle is now marked data what if analysis

data table do you have one variable or two variable i have only one variable and that is my

alpha is it typed in a row or in a column it is type in a column so i click it is typed in a column and what is it

it is alpha okay and this table

is filled mad is computed for all values between 0 and 1 and that is what i want

then i come here and i have equal to minimum of

these numbers then i'll go and mark this column i go to conditional formatting

home conditional formatting highlight

equal to let's see if it is equal to this one paint it

okay now it is painted based on what is painted here i know this was the minimum minimum of these numbers minimum mat and

therefore i know my minimum is here around point three so i'll go and

change that one something before point three point two five for example and this one instead of point one increment

i make it 0.01 increment and now i know it is around 31. so i'll go here and i type

point 3 0 5 and then

i make it 0 0 1 you see with three decimal points now i

have the best alpha i can use up to as many as the small point i want

there is another technique which helps me to find optimal alpha data

solver please look at

my mat you can click on here or here or

down there as long as they are mad and the same okay look at that by changing here i

should be very careful to click on the alpha that i have used i cannot click on something else so my alpha was here by

changing that alpha minimize my math and also make sure at make sure this alpha is less than or

equal to 1 add and make sure that that

alpha is greater than or equal to because you want it between 0 and 1

okay solve okay

0.314.314 so we learned two procedures to compute optimal alpha this is an alpha which

minimizes math instead of math i could have typed mse here and then i would have found

the minimal mse over there so it's around here

and then i can continue the same way as i did it before i can also

type m a p e here

and then look where is the best alpha the alpha that i get

for the three procedures are not exactly the same

for many reasons one of them is non-linearity of their

function but they will be reasonable all of them will

try to minimize to find an alpha all of them will try to find an alpha to minimize that measure of effectiveness i

think i covered everything we needed here thank you very much for attending

this session