Moving average

Let's first copy this page to another page and create a new version

This data is for one of the Littlefield technologies games.

Let's first compute some descriptive statistics

Average,

Standard Deviation

Is a standard deviation of 10 larger, a standard deviation of 1000, or a standard deviation of 2000?

It depends on un average

100 StdDev compared to 100 average is large

But 100 compared to 10,000 average is not large

CV – StdDev/Ave

Max

Min

Range

Median

Range to median

But since these are not a snapshot but observations over time- let's go to moving average

I will apply moving average, exponential smoothing, and regression methods to this data to better understand the level and trend of Demand and to use this information for capacity planning.

In this lecture, I go through basic concepts in moving average.

Applying basic and advanced Excel applications in time-series and regression methods on the Littlefield game may take several 10-15 minute lectures.

In all these lectures, I start from fundamental concepts mainly to apply them to the game. But then use the game environment to go into more advanced excel practices and move concepts a little forward.

I have data for the first 50 days. I have hidden some rows to make the explanation easier.

Rightclique unhide.

Rightclique hide.

I want to forecast for the next period

Actual data in column A (At)

Forecast in column B (Ft)

Let's first prepare a scatter graph for actual data

Mark period and actual data

Insert

I can Type Demand apace Forecast Space

And I can join these two

And put it into the title

Make the letters black

Change fonts

Change graph color

Control 1

I have the Demand for 50 periods

and I want to forecast for period 51

One solution is to set the forecast for the next period to the actual for this period - we may refer to this as an aggressive solution- Quickly reflect on what has happened

Another approach, a conservative approach, is to set the forecast for the next period equal to the average actual of all actual data up to this period

One approach takes one piece of data to forecast, and another includes all available data

To apply both approaches from period 2. These are our forecasts for period two based on what we observed in period 1 and the average of what we observed in period 1.

Let's apply both approaches starting from period two and compute the forecast for all periods.

There are other approaches between these two extremes that we can apply.

For example, let us compute the average for the first two periods. That is two period average in period 2 that we consider our forecast for period 3. If we copy it down, it will become a 2-period moving average.

This is a 2-period moving average in period 3. We assume it is the forecast for period 4.

This is a 2-period moving average in period 4. We assume it is the forecast for period 5.

This is a 2-period moving average in period 50. We assume it is the forecast for period 51.

Our forecast for periods 52 and more is equal to that of for period 51

Now let's go to period 8 and compute the average for period 8. Then we assume it as our forecast for period 9.

Copy it down- it is an 8-period moving average.

And we can forecast for the period 51

3-period moving average

3-period forecast period moving average

In all these cases, forecasts for periods after 51 are the same as forecasts for period 51.

attempt is obviously the same as Demand

for period ten so that will not resolve

my problem I should come here mark the

first b2 and push f4 to lock it now if I

copied down for period to demand is

equal to average of period one to period

one but if I copied down the first b2

because it is absolute it remains that

v2 and then the second b2 becomes p3

before b5 b6 let's see what will happen

here this is the average of period one

to period two and I am assuming as

forecast for period three if I copied it

down that is average of ticket one two

three four which I consider it as

forecast for period five and then I can

do click-click forecast for period 51 is

equal to average of all numbers from

period one to period 50 these are two

extreme points one always compute the

average of all periods up to that video

and consider it as forecast for the next

period and the other one just takes the

last item or previous item and assume it

for this period or this period for next

but we can find something in between two

for example we may say forecast for

period three is equal to average of

period 1 and 2 so we average two periods

period 1 2 and consider it as forecast

for period 3 and then if I copy down it

will be average of period 2 and 3 which

I considered for period for as forecast

for period for if I copied here that

would be the average of period 3 and 4

which I considered for period 5 and then

I can go all the way down and use

average of that last to opinion and I

considered as my forecast for the next

video oh I may say I wanna compute

average of 1 2 3 4 5 6 7 8 and then

consider it as forecast for period 9 the

average of PV it 1 2 3 4 5 6 7 8

forecast for period 919 I go all the way

down and compute the forecast for the

next period using 8 period moving

average forecast just using one period

forecast using all periods forecast

using 2 periods and forecast using eight

periods these are all legitimate

procedures also let's compute some

descriptive statistics for our actual

data average of actual dinner average of

these numbers

and I go up and then I come down out

when you come down if you have not

locked it everything will go once all

down so I take it up and then in here

instead of average I type standard

deviation of the sample which is this

one and I entered it

that is the standard deviation that I

define coefficient of variations as

standard deviation divided by average

which is just one that is coefficient of

variation median I just go and copy

average copy paste and then I double

click on it it has come a little bit

down so I put it back in where it should

be and it's stopped average I type

Max is equal to max of these numbers

play and then I lock it before and that

is max then I copy down because I have

locked it it doesn't go down it stays

over there but they come here instead of

max I type mean see the range is equal

to maximum minus minimum range divided

by media these are all computations that

I needed now let me go here we have this

graph I go and click on this one right

click select data and at what what are

your X values my X values are from

period one to period 51 these are my X

values

what are your Y values I have for

forecasting techniques these are mine

why values is a forecast based on one

period moving average actual of last it

is considered as forecast for this

opinion again I go here like click on it

select data add I enter all periods X

values from 1 to 51 and these are my Y

values ok ok now this is the average of

all periods and that one was the one

period moving average or what we call it

naive technique oh here we go here

select the data pad and then I come here

again I select from three one two

fifty-one those are my X values for Y

values I go and choose Q period moving

average which start at period three okay

and that is that one again I say add my

XS are from one 251 one 251 and my Y

values are 8 period moving average from

period one to period 51 ok ok and they

have offices of data here which is the

same as this first the question is which

one of these forecasts are better in

order to compare several forecasting

techniques and in order to estimate

standard deviation of four times we need

to use a criteria that criteria could be

mad mean absolute deviation or Mar

mean absolute relative deviation or M is

a mean squared error Farsight discussed

two things mad mean absolute deviation

and tracking signal again I'll take this

one move or copy I move it to the end

and create a copy this one no suppose I

am going to do six period moving average

and consider it as forecast for period 7

what I will do I will go to period 7

equal to average of one two three four

five six one two six and considered as

forecast for three seven and then I copy

down and this is my forecast for next

period using six period moving average

then I come and I go for a period when I

have both actual and forecasts which is

period seven equal to actual - forecast

correctly and then I copy down this is

actual - forecast and not go to period

51 for a simple reason because here I

have forecast I don't have actual so I

cannot go there I also cannot go to

period one to period six because I have

actually but I don't have forecast so my

computation format starts from period

seven and ends at PD 850 Matt does not

rely just on errors because some of the

errors as you see they are positive some

others are negative and they cross each

other's out because we don't want to let

them to cross each other's out in slow

dealing with the actual values with the

signs we compute their apps values

absolute values therefore we remove the

sides and I copy down

is the absolute differences between

actual and forecast how I come here I go

to this period because before that I

don't have deviations I don't have the

forecast I have actual about this

forecast again here is equal to average

that is average of absolute value of the

arrows average of the absolute value

there is average of this one to itself

okay go ahead and put a dollar in front

of eight I can put the doll in front of

both E and eight but it is enough

because I'm in column E the time doing

this computation so X and fine enter and

then if I come here it will be the

average of all these numbers if I go all

the way down but not to period 51 then

that is the average of absolute

deviations tracking signal is defined as

summation of errors divided by mad so I

come here as a equal to summation of

errors summation of what this error

which is negative to itself I can mark

this and put a fourth or I can just put

a dollar in front of eight this one is

enough enter when you copy down here

when you double click on it it is

summation of all these numbers and if

you go all the way down here is

summation of you all your number we

cannot go there because we have the

forecastle actual up to period 50 not

murdered but tracking signal is defined

as summation of errors divided by mad so

I go here divided by mad in turn it down

and this numbers are my tracking signal

now I go from 37 to period 50 insert in

a select this one and that is my

tracking signal correct if I don't like

this color I click on it control one one

markers which is blue black okay that is

the line around it

markers that is fill and line also make

this one black so it's white block that

is my signal if you want to make it

quite black okay so that is my tracking

signal usually we want tracking signal

to be around zero random up and down

because summation of all errors we want

it to be equal to zero

upper control limit or lower control

with some books say it is plus 375 and

minus 375

it is not correct based on our data we

need to find our own upper control limit

and lower control limit here I have

assumed they are negative five and five

this is to draw the lower control limit

in period seven I am negative five in

period fifty

I am negative five so I'll go here

select data and I go hop what are your X

values in seven and fifty what are your

Y values negative 5 and positive 5 but

here it has two points I don't like it

like that I right-click on it change

series chart type

orange one I do make it like it's like a

lie okay but I made a mistake here it

seems I have to click on it again select

data I need to go here edit my x-values

start from seven to fifty okay no it is

fine now the graph is here I need to

draw another graph I click on this

select data add my X's are seven and

fifty and my Y values are five and five

okay

but I need to go and change the style I

got change cities type I go here and I

say make it like a line okay so I have a

line over there I have a life over here

but they don't like that color control

one go here select this red perhaps five

and negative five or not good let's make

it negative obviously there is a problem

in this forecasting technique that we

have used perhaps there is a seasonality

in the data because you see up down up

down up down and we have not considered

it also actually is greater than

forecast and is because a minus F is

continually going up perhaps there is

something in our actual data that we

have not captured it either seasonality

or trend or both of them

now I go and define to others measures

move or copy create a copy go to the end

okay suppose we have again going to use

six period moving average go to PD 74 to

average on the first six periods 1.33

copy down and that is my forecast for

the next period so I'm already know

instead of computing the absolute value

of the gap between actual and forecast

what I will do there are two ways to

remove the sign negative sign one is to

do absolute value the other one is to

square actual - forecast square and then

I copy down so that is the square of the

gap between actual and forecast then I

average it for all periods equal to

average for this one I click on it : d8

and d8 I don't make both 8 and D

absolute like this I just keep it with 8

to it because I want to show you a trick

here underneath if I copy down here that

is the average of all numbers after

there and then I should go down to

create 15 but not to 51

so that is period 51 I should so that is

MSE and then I will make my judgment

based on the final MSE

I like it for acidity to have a lower

let me see there are two ways to

estimate the standard deviation of

forecasts so if I ask you what is your

forecast for next period you will say

its average is 550 and it's the standard

deviation is SQ Part II of this number

this is my forecast for next billion

this is the standard deviation of that

forecast there is another way to do the

same thing this was my mad my forecast

for next bit is is five point five

standard deviation of forecast is equal

to 1.25 times mad

therefore both 1.25 times mad and square

root of MSE are unbiased forecasts for

standard deviation of error of

forecasted or my forecast for next

period has average of five point five

standard deviation of 205 my forecast

for next period has average of five

point five standard deviation of one

point nine move mad and MSE are good

estimators for standard deviation of

demand coefficient of variation of my

forecast for next period is standard

deviation divided by average standard

deviation divided by average there is

one other factor that I need to talk

about and that is mean absolute

percentage error mean absolute

percentage error or what I like to call

it mean absolute relative deviation so

that is M ad but it has an extra R and I

will explain to you what is that extra

or

I come here I compute the gap between

actual and forecast which is actual -

forecast as format i compute its

absolute value ABS and then I divide it

by the actual which was zero divided by

zero doesn't have any meaning rest of

numbers have meaning how can I remove

those things I come here and say if

you're wrong if what you have computed

is error

put a blank order rotation space

quotation enter so it puts a space so

otherwise it puts in numbered so that

ugly things are gone and then mark is a

quarter average of these relative gaps

which is this one to itself and then I

can go ahead and put it and that is my

math and this is the Matt for the last

period one trick that I could have used

because this is the average of the salt

on the left-hand side I could have

copied this because these on average of

those numbers copy and if I paste it I

will get the same thing which was there

before prism here is 68 undo 68 redo 68

and that is married so I almost covered

everything I believe we can make out

find the best procedure by looking at

the best man or at the best MSE or at

the best remedy man

all of them are good Matt and MSE

provide the standard deviation of Demand

to that is a square root of M SC or 1.25

mad

this was another quick review on moving

average thank you very much