We have these data

We draw it

I can see 1,2,3, 4…1,2,3, 4

I can assume that the periodicity is 4

Periodicity means after how many periods seasonality repeats

We may also try seasonalities of 3 and 5, but 4 seems fine to me.

A trend and seasonality forecasting has 3 smoothing parameters

One to smooth level - alpha

One to smooth trend- beta

And One to smooth seasonality- gamma

The same as trend adjusted exponential smoothing,

In trade and seasonality adjusted exponential smoothing,

I need an initial level and initial trend

I also need initial seasonalities

For initial seasonalities- since we have assumed 4 seasons

We divide the data of periods 1-4 to the average of these 4 pieces of data

Based on these seasonality indices,

period 1 is low season

period 2 is a little bit higher

Period 3 is high season

then going down in period 4

Now we have seasonality indexes in periods 1 to 4

The same as trend adjusted, we need to compute the level and trend

There are several ways to compute level and trend

one way is just to assume the level is equal to the first piece of data

The trend is equal to the last piece minus the first piece divided by the number of periods minus 1

There is also an approach using seasonality enhanced regression that we will discuss later

We follow a third approach proposed by Seyed Iravani

The level is equal to the average of the first 4 periods

The trend is equal to the average of the last 4 periods

Minus

The average of the first period

Divided by (the number of periods minus periodicity)

28-4 in this case

Just to make it general

Count minus periodicity

Now we have

level in period 0 (L0)

Trend in period 0 (T0)

Seasonality in periods 1 to 4 (S1 to S4)

F1= (L0+T0)S1

Now we need to compute

L1, T1, F2, and S5

When we are in period 0 out forecast for level in period 1 is L0+t0

This must be multiplied by (1-alpha)

But what is multiplied by alpha

The actual demand is multiplies by alpha

The actual demand in period 1 is 21, but we cannot multiply it by alpha

Why

Because in has seasonality in its stomack

We need to remove sesonality

Theirefore it must be divided by S1

Level for period 1

(1-alpha)(level in period 0 plus trend in peripd 0)

And that is forecast of level in period 1

Forecast is always multiplied by 1-

That is 1-alpha

And actual which should be muliplyes by alpha is 21 but ewe need remove sesonality

That is 21/S1 or 21 divided by seasonality oin period 1

L\_(t+1)= (1-alpha) (A\_t+T\_t)+alphaA\_(t+1)/S\_(t+1)

The formula may look complecated- but if you think a little it becomes clear  
Trend in period 1 is (1-beta) multiplied by forecast

Forecast of trend for period 1 is trend in period 0

So we have

(1-beta)T0

And then we need beta

To be multiplies by the actual trend in period 1

Actual trend in period 1 is is level in period 1 minus levelk in period 0

T\_(t+1)= (1-beta)T\_t

now let me to explain how level and

trend are computed for period one we had

them for period 0.

now we want to compute them for period 1

and also compute seasonality

for period 5 which is the same as period

1 but

every 4 periods they are adjust how can

i come from here to here always we have

one minus something

multiplied by something

plus

something

multiplied by

something

1 minus

this thing

multiplied by something and then this

thing

itself

multiplied by something else

for level this thing is alpha let's

start with

alpha equal to 0.5 as we said and beta

and gamma also equal to i have level i

should multiply by one minus alpha

what is my forecast for period one

without seasonality is this one plus

this one so summation of these two

should be multiplied by 1 minus off that

is my forecast multiplied by 1 minus

alpha 1 minus alpha and

lock it multiplied by

my widowed seasonality forecast for

period one and that level plus trend

enter

so

1

minus alpha part

is done

alpha part is also a little tricky so

i'll go here

plus

alpha

and lock it

okay then i should

multiply it by actual level we may think

it is this one but it is not because

this 21 already has seasonality in it

and because this level shouldn't contain

seasonality therefore i need to remove

seasonality from this one how i do it by

dividing it by seasonality index so if i

go here and i type equal to

21

divided by

this seasonality index that

28.5

is without

seasonality

actual data for that period which was

later affected by this seasonality and

was

lower than what it should be if there

were no seasonal alpha

multiplied by

actual that i have observed divided by

seasonality of that period that was for

level what about trent aim i have one

minus

something this time that is one minus

beta and like it

one minus should always be multiplied by

forecast and what was our forecast for

trend it was this one which we added a

two level to come out with forecast for

the next period and then multiplied by

seasonality one minus beta need to be

multiplied by the forecast for threat

and then always this should be followed

by plus

beta

and lockheed

f4 enter

now what should be

beta multiplied it should be multiplied

by actual

by actual trend

what is actual trend the same as trade

adjusted exponential smoothing is the

gap between this level and previous

level

multiplied by parenthesis

this minus

radius of

level for period one

and i have trend for period one all i

need is to forecast

seasonality for period five and as long

as my forecast for next period is

concerned my forecast here was

level

plus

slant multiplied by seasonality my

forecast for next

level

plus

trend

multiplied by

seasonality of this period

let's see how i compute this one again i

have one minus

gamma

one minus gamma

lucky multiplied by

forecast for

this season and forecast for this season

was this one then i go and add to it

gamma

and i lock it

multiply

by what

it should be multiplied by actual

seasonality that i have observed what is

that actual seasonality my forecast

without seasonality was summation of

these two what i observed was this

therefore i should

divide this one i should divide this one

by

the summation of these two

multiplied by

what i observed divided by

what i had which is this one

plus

this one

all my computations

i have my forecasts i can bring these

things down

i can bring these things

these things down

i will compute it once again for period

2

as another practice

let's go to period 2. i need to compute

level i need to get

1 minus alpha and multiply it by

forecast what is my forecast for here

that is summation of

trend and level summation of these two

would be

my forecast for period two what is the

actual for period two actual for period

two is this 27 but i don't want

seasonality to be involved because i

don't have seasonality involved here

therefore what i should do i should

divide this by its seasonality index

and that could become

released from seasonality actual

actual multiplied by alpha forecast

multiplied by 1 minus alpha let's

practice

equal to

1 minus alpha

and logic

times

actual actual

is

this one

plus

this one or i can simply put summation

of those two that is the

forecast part and the actual part

alpha

locate

multiplied by

actual of this period but free of

seasonality this is not index

that is what i have

now i need to compute trend here

1 minus beta multiply by forecast what

is my forecast it is this one so

multiply one minus beta by this one but

what is the actual trend

this is my current level

and this is my previous level trend in

these two periods is the difference

between these two that is the actual

side this is the focus equal to

one minus

beta

multiplied by

forecast

plus

beta

multiplied by

actually you have observed is

this level

minus

previous level

seasonality for here

is equal to

one

minus

gamma

multiplied by what multiplied by

forecast of seasonality and that is

forecast of seasonality multiplied by

forecast that is one part

and then

plus

gamma

multiplied by

actual seasonality that i have observed

and that is

what i have seen

divided by

my forecast for that which is

level

plus

actual

which were my forecast free of

seasonality

now i can copy this down

and these two

and

this one has a forecast

and this one for the other period

now we want to do

here

i have these

four numbers two i come here for

forecast equal to

level and lockheed

trend

and lockheed

multiplied

this period

minus

this period

and then multiply

everything

by its

seasonality and

now

one other thing we need to do is to

compute mse for example

e2

equal to

actual

minus

forecast

mse

data

minimize

mse

by changing

alpha beta gamma and

alpha

[Music]

greater than or equal to

zero

that

alpha less than or equal to one

add

beta

less than or equal to

one

add

gamma

less

greater than or equal to

zero

at

gamma

greater than or equal to

zero

okay

solve

we see our forecast is much better now

because in the previous situation we

just had an arbitrary alphabet on gamma

and now we have the best one

thank you very much

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