Marketing Analytics

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Lecture 10

What Consumers Want (Contd.)

Hello everybody. Welcome to week two session 4 of marketing analytics. This is Dr. Swagato Chatterjee from VGSoM IIT, Kharagpur who is taking this course. We were discussing about the conjoint analysis, the application of conjoint analysis in the last video. We will continue on that.

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So, in the last video we have talked about something called pricing decisions. How pricing can be done through conjoint analysis. So, there are lots of other pricing models we will discuss about, all of those things in details when we go to the pricing part of our marketing analytics course in a different module. But in this model I am just giving a hint that pricing can be done also through conjoint analysis.

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So another major variable is brand premium. It is very easy brand premium, how will you find out? So, first of all, what is brand premium? A brand premium is nothing but basically the extra money that you are willing to pay just because there is a brand written on that. So, for example, let say this is a water bottle, which is non-branded water bottle.

Now, for this non-branded water bottle how much money you are willing to pay, the money that you are willing to pay for this water bottle is basically the difference for a non-branded product whatever you are willing. Now, just imagine on the top of this water bottle it is written that this is Bisleri. Everything remains same you do not know what kind of water is there inside, whether the plastic is good or bad and etcetera. So, the only simple thing that is written on the top is Bisleri.

Now, for that keeping everything same, one is the same water bottle without any tag, any name anything written, and you have not tasted the water or whatever the water is there, but you have not checked the quality of the water. And the other thing is that there is a name written there. So, brand comes with certain kinds of promises, brand comes with certain kind of trust, brand comes with certain kind of, I would say quality expectations.

So, for all of these things, you are willing to pay a little bit more money. So, for a non-branded bottle of water, which I have just shown you can probably pay how much one liter bottle for 5 rupees at max. But the moment it gets branded you are willing to pay, probably

for one liter bottle 15 rupees, 20 rupees probably more than that. So, depending on the brand, the value of that particular water changes, it is a very commodity.

It is a basic thing that we have, but still you are willing to pay more, so that extra money that you are willing to pay more over and above something which is non-branded is something called brand premium. So, we can also find out the brand premium or probably what consumers are willing to pay or probably preference of the brands over what that brand A versus brand B when we talk about this conjoint analysis. How?

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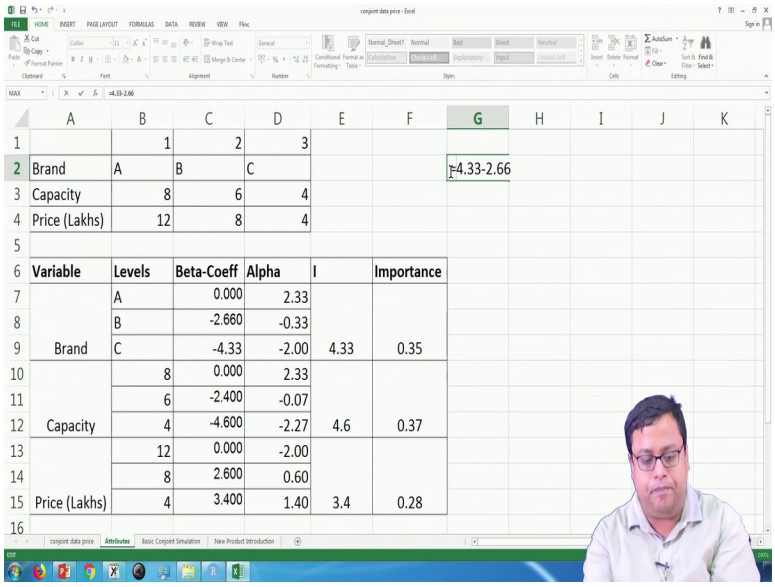
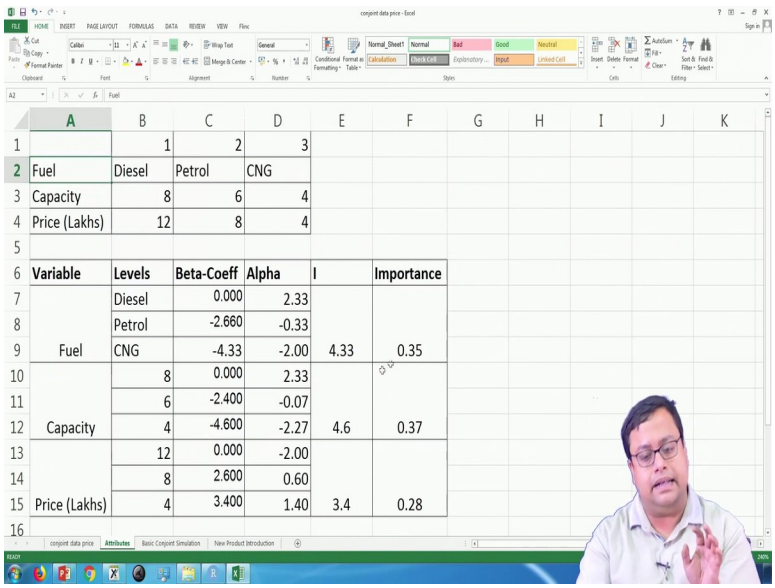


	A	B	C	D	E	F	G	H	I	J	K
1		1	2	3							
2	Brand	A	B	C			=4.33-2.66				
3	Capacity	8	6	4							
4	Price (Lakhs)	12	8	4							
5											
6	**Variable**	**Levels**	**Beta-Coeff**	**Alpha**	**I**	**Importance**					
7		A	0.000	2.33							
8		B	-2.660	-0.33							
9	Brand	C	-4.33	-2.00	4.33	0.35					
10		8	0.000	2.33							
11		6	-2.400	-0.07							
12	Capacity	4	-4.600	-2.27	4.6	0.37					
13		12	0.000	-2.00							
14		8	2.600	0.60							
15	Price (Lakhs)	4	3.400	1.40	3.4	0.28					
16											



	A	B	C	D	E	F	G	H	I	J	K
1		1	2	3							
2	Fuel	Diesel	Petrol	CNG							
3	Capacity	8	6	4							
4	Price (Lakhs)	12	8	4							
5											
6	**Variable**	**Levels**	**Beta-Coeff**	**Alpha**	**I**	**Importance**					
7		Diesel	0.000	2.33							
8		Petrol	-2.660	-0.33							
9	Fuel	CNG	-4.33	-2.00	4.33	0.35					
10		8	0.000	2.33							
11		6	-2.400	-0.07							
12	Capacity	4	-4.600	-2.27	4.6	0.37					
13		12	0.000	-2.00							
14		8	2.600	0.60							
15	Price (Lakhs)	4	3.400	1.40	3.4	0.28					
16											

Let us say in this particular table, instead of fuel, if by chance it was brand A, B, and C, some brands let us say, A is let us say Maruti, B is let us say some something else Tata Motors, and

then C is somebody else, some other make, I do not know, Ford probably. So, the moment it becomes A, B, and C, I know the brand A is most preferred, brand B is lesser preferred than brand A. That difference between preference is -2.66 and brand C is the least preferred out of this 3 brands and the preference is -4.33.

The difference between the brand preference of A and brand preference of C is -4.33. And by chance if instead of rating you, I told in the pricing decision you can also ask willingness to pay. So, by chance, if you have asked willingness to pay and then you did the regression and got this result, then it does not talk, these 3 values do not talk about brand preference, they are directly talking about brand premium how much extra money you are willing to pay?

So, you are willing to pay 4.33 lakhs rupees. Let us say if the unit is in lakhs, 4.33 lakhs rupees more when you get brand A versus brand C. So, instead of brand C if I give you brand A, keeping every other thing the same. You are willing to pay 4.33 lakhs more. So, keeping every other thing same instead of B if I give A, you are willing to pay 2.66 lakhs more. So, that is something that is brand premium. So, you can also say A, B are unbranded, and you can directly get the brand premium.

So, this is relative; the moment one of these things is unbranded, that becomes the absolute brand premium. Now, a quick question, can you say that what if instead of C if I give B how much more or less you are willing to pay? If I will say that instead of C if I give B, if I give you B in terms of the brand, then how much extra you are willing to pay? So, it is basically for C you will pay -4.33, for B you will pay 2.66.

So, if I instead of C, if I give you B, you will actually pay me more. How much more? This much more, sorry 4.66, 4.33-2.66 this much more. So, that is the value of the brand premium of B in comparison to C. So, something like that we can also find out through this thing. So, I will just go back to the old thing, yeah, so that is how I can also find out the brand premium that is number one, the second application of this conjoint analysis. There are other applications as well.

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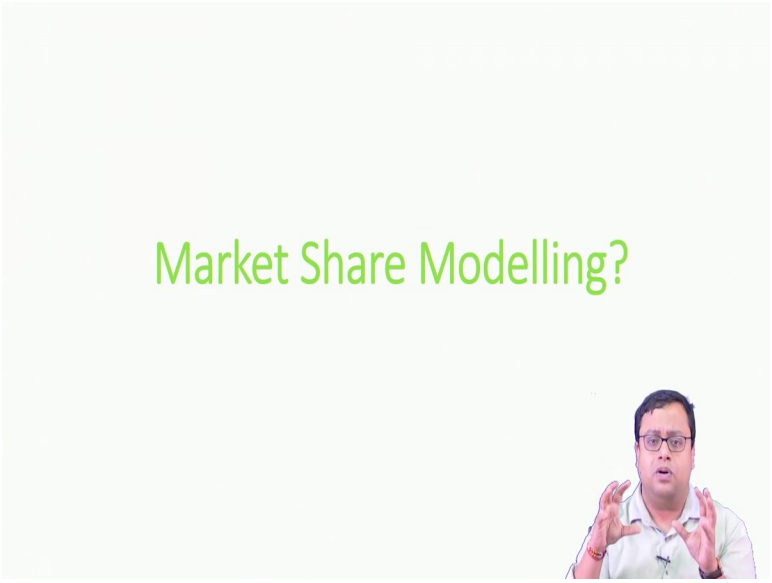

Now, the third and which is one of the most important application is called the Market Share Modeling. So, see conjoint analysis is used to check what kind of product combination? So, preferred after knowing the preference, what will you do? Let us say you come to know that this is the customer's preference, so what? This 'so what' part becomes very important in Marketing Analytics. So, we are not a data scientist; I will not just give you some data and say that do whatever you want with the data.

I will always ask you, 'so what'. So, I have to be a business guy; I do not only have to be a number cruncher. So, here I am asking you, 'so what'? So, I am giving you certain preference, what will you do with that? Now, comes you have to put on your marketing cap, and you have to say that, okay, 'With this preference, I will create a new product.' So, I will say, "So what? You will create a new product. How will I know that this product will work or not work? How much should the price be. How much should you launch, how much should be the success rate and etcetera.

So you say. "Wait, wait, wait. Do not worry, I will give you that if I launch this much what will be the expected market share of this product, how much revenue it will generate? How much profit will it generate? I will give you all those stories?" "You know, Okay, how?" Will say, "Just be with me? I will show you." So, to do that, the first thing that you have to do is, find out how conjoint analysis can be used to find out market share.

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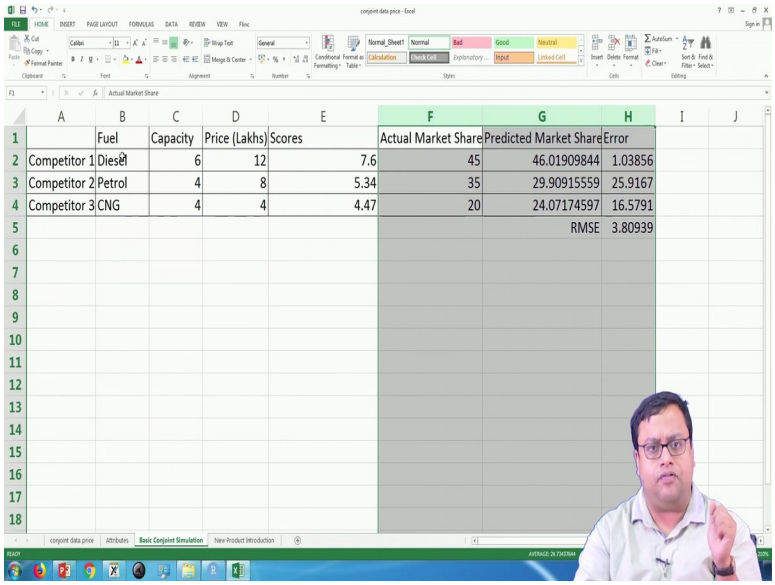
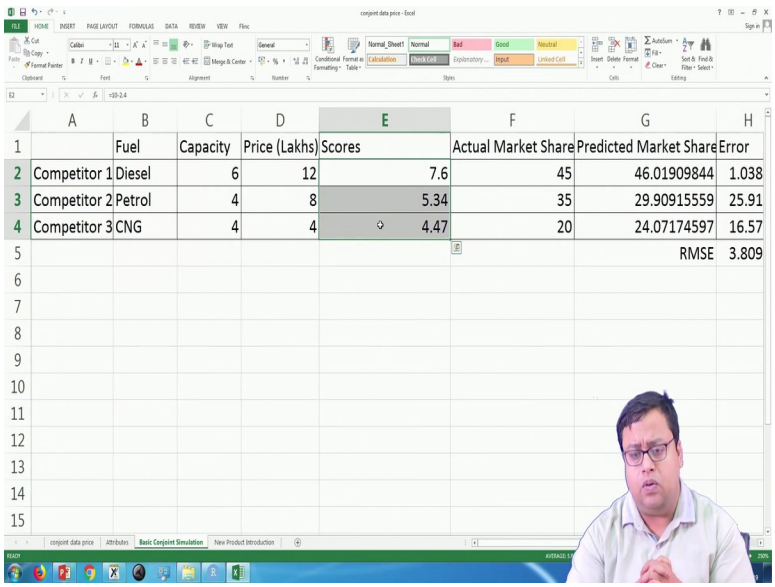


	A	B	C	D	E	F	G	H	I	J
1		Fuel	Capacity	Price (Lakhs)	Scores	Actual Market Share	Predicted Market Share	Error		
2	Competitor 1	Diesel	6	12	7.6	45	46.01909844	1.03856		
3	Competitor 2	Petrol	4	8	5.34	35	29.90915559	25.9167		
4	Competitor 3	CNG	4	4	4.47	20	24.07174597	16.5791		
5							RMSE	3.80939		



	A	B	C	D	E	F	G	H
1		Fuel	Capacity	Price (Lakhs)	Scores	Actual Market Share	Predicted Market Share	Error
2	Competitor 1	Diesel	6	12	7.6	45	46.01909844	1.038
3	Competitor 2	Petrol	4	8	5.34	35	29.90915559	25.91
4	Competitor 3	CNG	4	4	4.47	20	24.07174597	16.57
5							RMSE	3.809

So, let us say I will do that. So, let us say I have 3 options in the market. Right now, I have 3 products, 3 competitors in the market who are already there. So, do not worry about this part right now, just focus on this part. So, they will say that first option is diesel with 6 capacity and 12 lakh price, second is petrol 4 capacity, 8 lakh price and so on. Now, based on my equation that I have created, I find out their scores, what is a score that, our preference score that or rating that the customer is giving if they have got these particular combinations.

So, this is, it would just take 10 is the intercept, and then for each of them you are taking the values. So, just correct me if I am wrong, probably, I am right. So, 10 minus 2.4 is 7.6, 5.34 and 4.47. Correct me if I am wrong or you do your own calculations, but these are the expected ratings that the customers will give if the competitor 1, 2, 3 are presented in front of them. So, this is something that I get.

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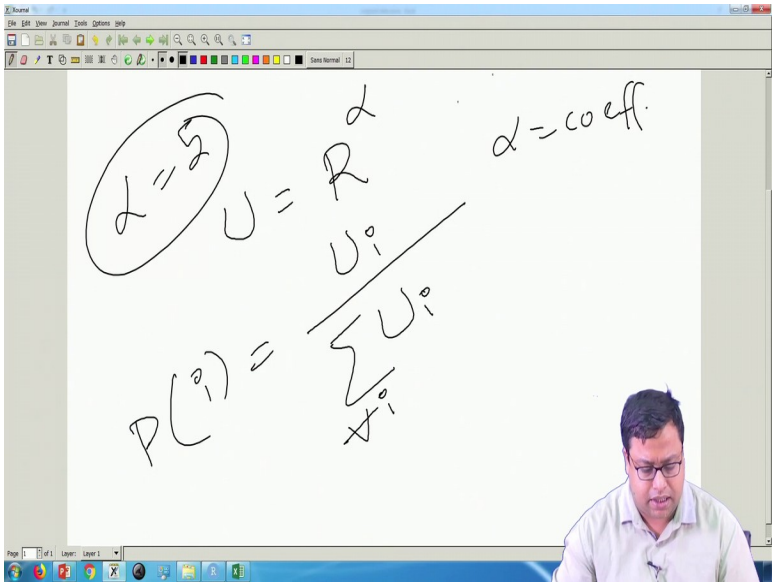
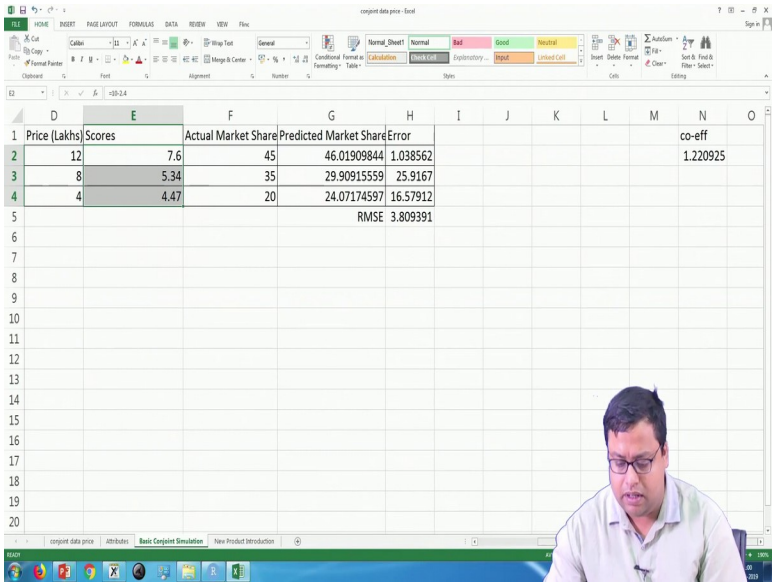
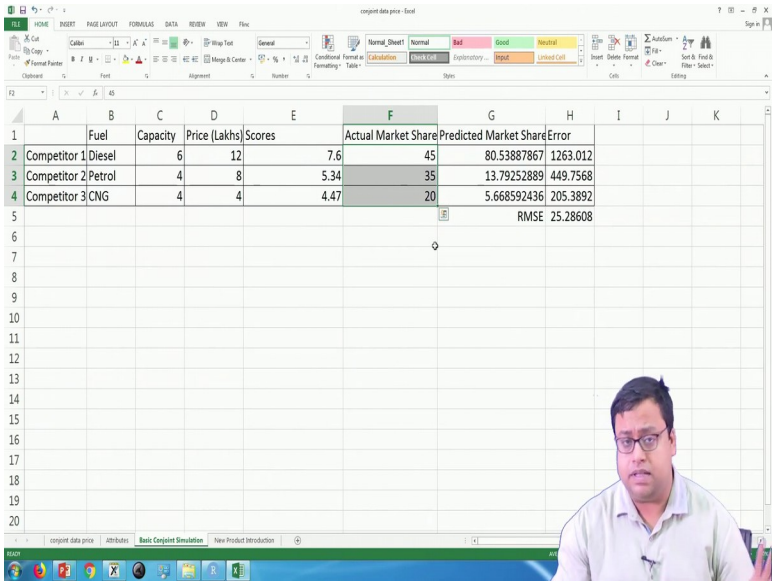
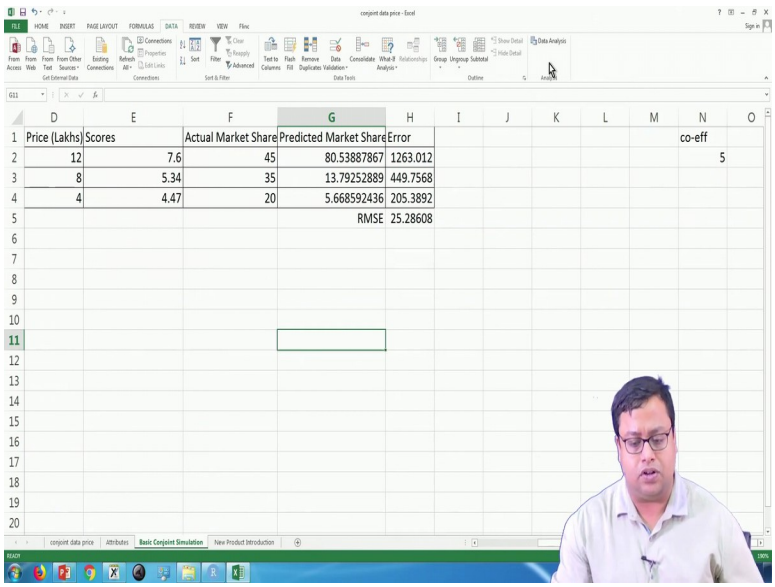




	D	E	F	G	H	I	J	K	L	M	N	O
1	Price (Lakhs)	Scores	Actual Market Share	Predicted Market Share	Error						co-eff	
2	12	7.6	45	46.01909844	1.038562						1.220925	
3	8	5.34	35	29.90915559	25.9167							
4	4	4.47	20	24.07174597	16.57912							
5				RMSE	3.809391							



	A	B	C	D	E	F	G	H
1		Fuel	Capacity	Price (Lakhs)	Scores	Actual Market Share	Predicted Market Share	Error
2	Competitor 1	Diesel	6	12	7.6	45	80.53887867	1263.012
3	Competitor 2	Petrol	4	8	5.34	35	13.79252889	449.7568
4	Competitor 3	CNG	4	4	4.47	20	5.668592436	205.3892
5							RMSE	25.28608



	D	E	F	G	H	N	O
1	Price (Lakhs)	Scores	Actual Market Share	Predicted Market Share	Error	co-eff	
2	12	7.6	45	80.53887867	1263.012	5	
3	8	5.34	35	13.79252889	449.7568		
4	4	4.47	20	5.668592436	205.3892		
5				RMSE	25.28608		

Now, we make an assumption here. So, our assumption is that it is the rating. So, I say that utility of this thing is basically rating to the power some alpha. So, rating to the power some alpha is something that I think is the utility that you get an alpha is a coefficient. I do not know what that value is. And I also say so, basically utility and rating are related to each other.

And I also say that the probability that you will choose ith product is utility of ith product divided by summation of utility of all the products for all i. So, this is something that is an assumption you can make many other assumptions, you can take, “No, it will follow a logistic formula.” So, it will follow e^ui divided by whatever to the power ui and so on. That is also okay. So, as per your assumption, you will see that this will all fall in place.

So, ui divided by submission of a ui is something that I will do and what is ui, which is regression to the power alpha. So, in this particular thing what I do is I assume an alpha. I do not know what is the value of alpha? So, for that, I find out that this is the coefficient value that I have taken. And let us see the coefficient values is 5 to start with, okay, 5, I have randomly have written 5. So, then what is the market share here? The actual market share is 45, 35 and 20 that I get from some market research. And if that value is five, what is if all my equations and etcetera, if the equation that I have written here is correct.

If I assume that it is to be correct, and the value of $\alpha = 5$, then the calculated market share comes up to be like this. And the calculated market share is basically for the first one you see carefully, E2 that means 7.6 to the power into means 5, so (7.6^5/(7.6^5 +5.34^5 +4.47^5))*100 because we are putting it in a percentage term.

So, 7.6 is the rating, R^α that means 7.6^5 divided by summation of all the R^ α. So, 7.6 ^5 +E3 means 5.34, 5.34 ^5 +E4 means 4.47, 4.47^5, I find out the predicted market share, I find for this one also, and I find it for this one also. The only thing changes is the numerator, the denominator remains same for all the 3 cases. So, this is my predicted market share, this is my actual market share, and they are different as per current form, how different?

I just find out the square error. So, I should not have written error; it is square error. So, (F2-G 2)^2. Similarly here if (F 3 -G 3)^2, (F 4-G 4)^2 and this there RMSE which is average of these 3 and then square root of that, root means square error. So, I calculate the square error, take a mean of them, and then take a square root of them, I get 25.28.

Now, you see, in the whole story that I have created, the only variable here, ratings are given rating is not variable, the only variable here is alpha. So, I have to find out the best possible alpha which will reduce this RMSE that means which will make sure that the actual and predicted values are very close to each other, then these equations are correct. If I find out the best possible alpha what this predicted market shares and the actual market shares are closer, then my equation is okay to go ahead with to do further analysis.

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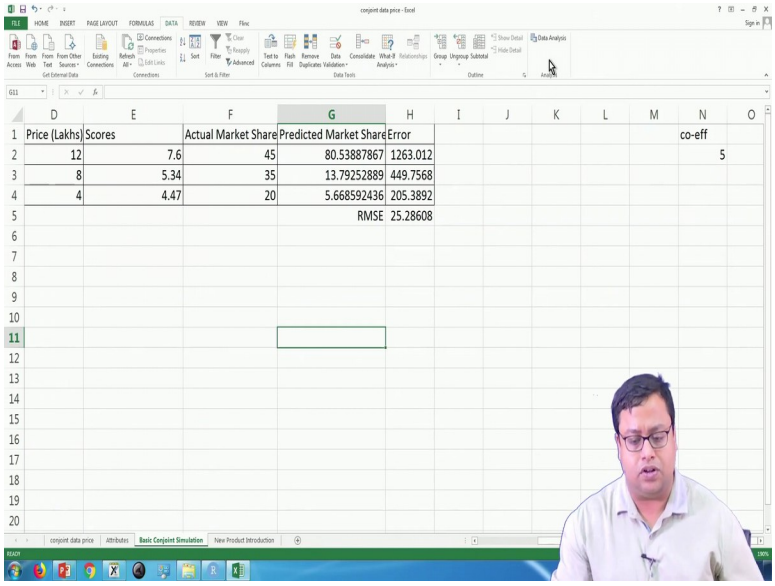

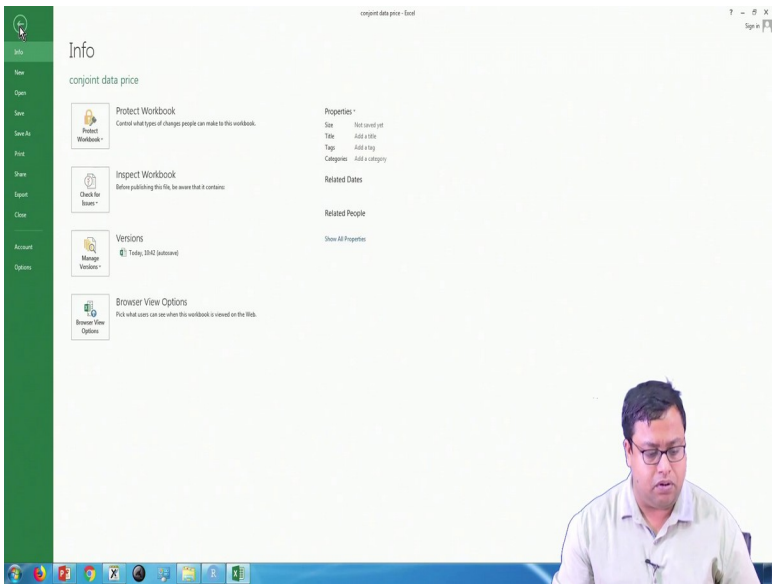

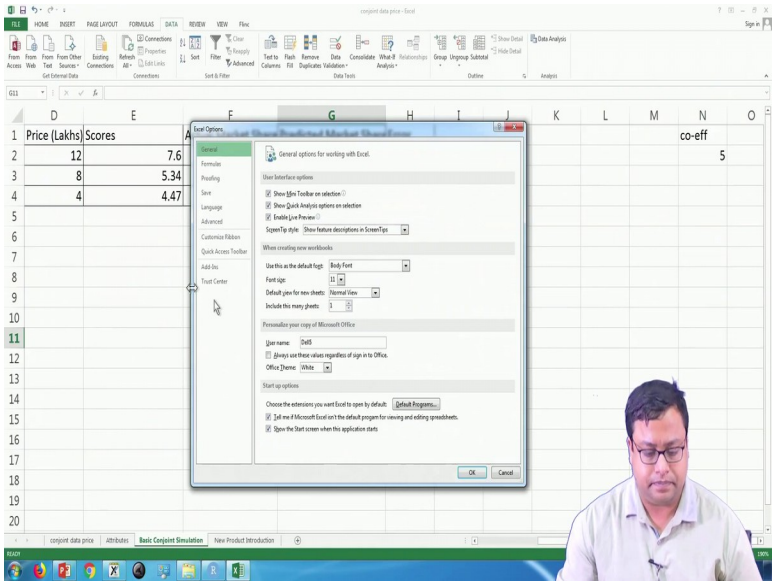
Price (Lakhs)
Scores
12
7.6
8
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General options for working with Excel.
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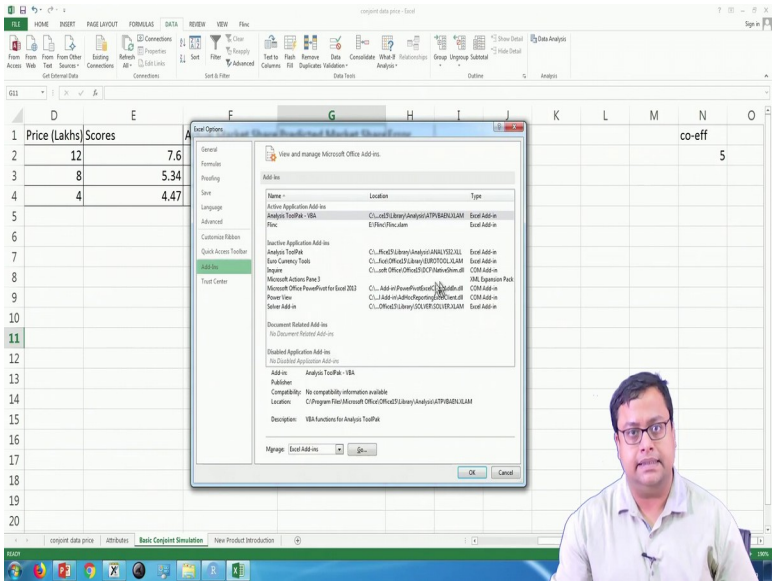
Attributes
Basic Conjoint Simulation
New Product Introduction
READY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Scores
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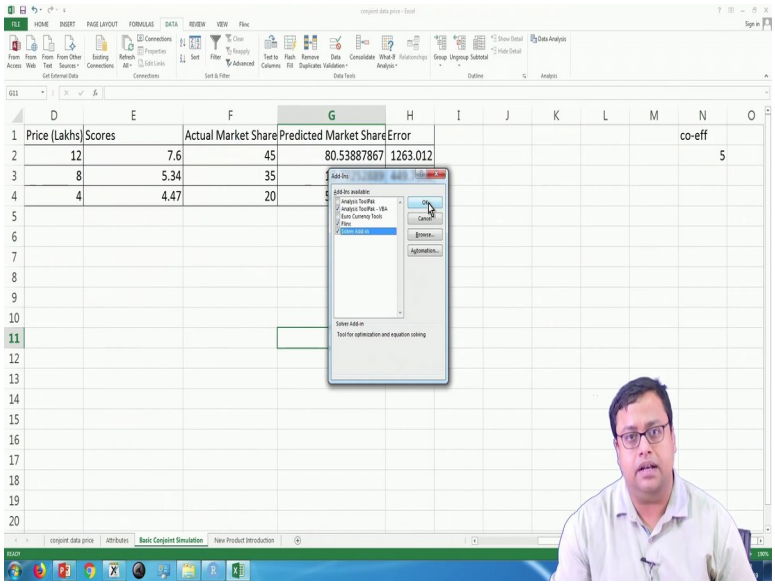
Price (Lakhs)
Scores
Actual Market Share
Predicted Market Share
Error
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7.6
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80.53887867
1263.012
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4
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co-eff
5
Add-Ins
Add-Ins available:
Analysis ToolPak
Analysis ToolPak - VBA
Euro Currency Tools
Inquire
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Solver Add-in
Tool for optimization and equation solving
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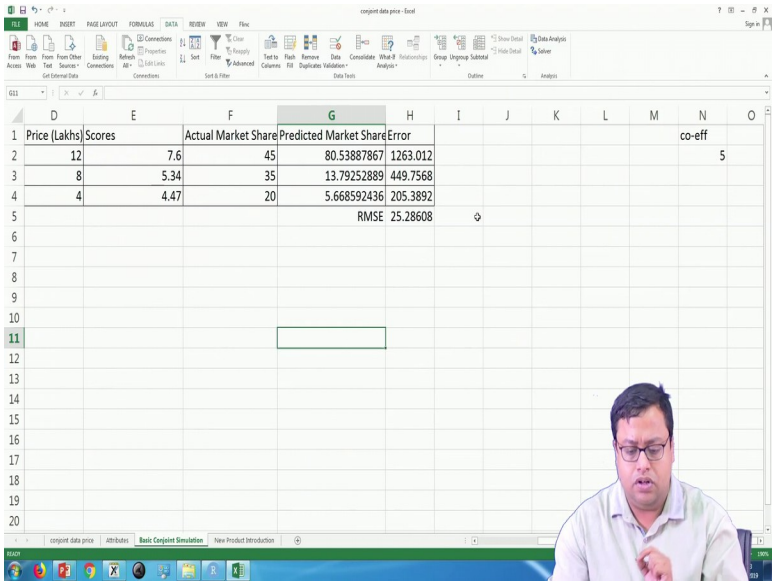

So, for that I will go and do a solver. So, here the solver in the data tab in Excel, the solver thing is not there. So, for that what I have to do I have to go to files, options, add in and here there is an Excel add in. So, I will click on that and I will just click on solver add in and then press, checks solver add in, press OK.

So, carefully see what I have done. And then you see that here solver comes. So if you could not follow me , pause, go back to probably 4, 5 or 10 seconds, 15 seconds and you will know about I have done and this solver is there right now.

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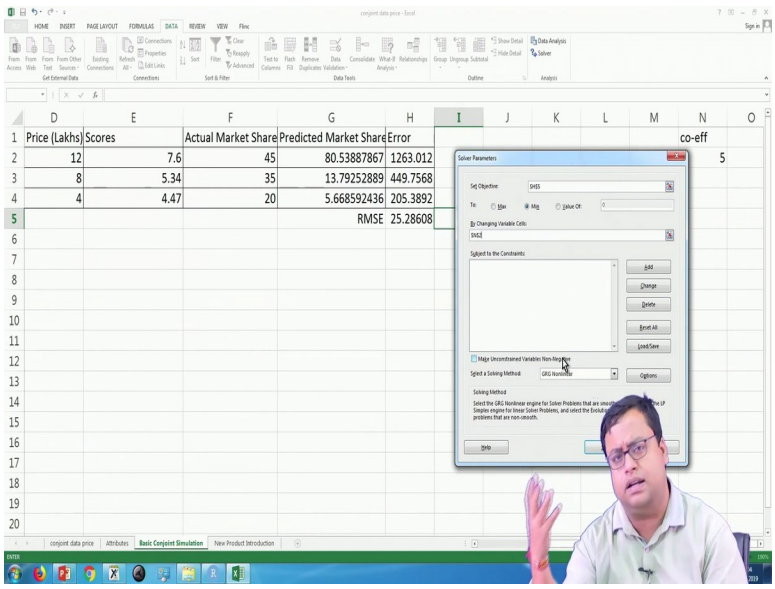

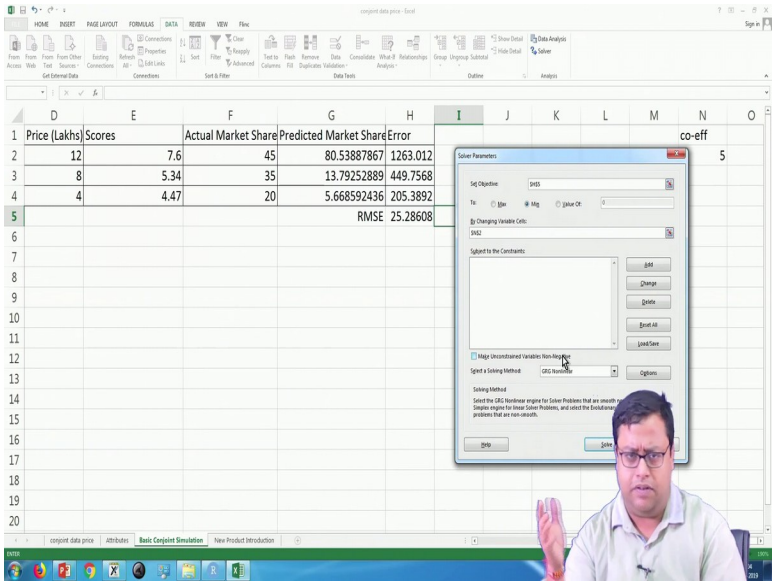
Price (Lakhs) Scores Actual Market Share Predicted Market Share Error co-eff
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8 5.34 35 13.79252889 449.7568
4 4.47 20 5.668592436 205.3892
RMSE 25.28608
Solver Parameters
Set Objective:
To:
By Changing Variable Cells:
Subject to the Constraints:
Add
Change
Delete
Reset All
Load/Save
Make Unconstrained Variables Non-Negative
Select a Solving Method:
GRG Nonlinear
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Solving Method
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Solve
conjoint data price
Attributes
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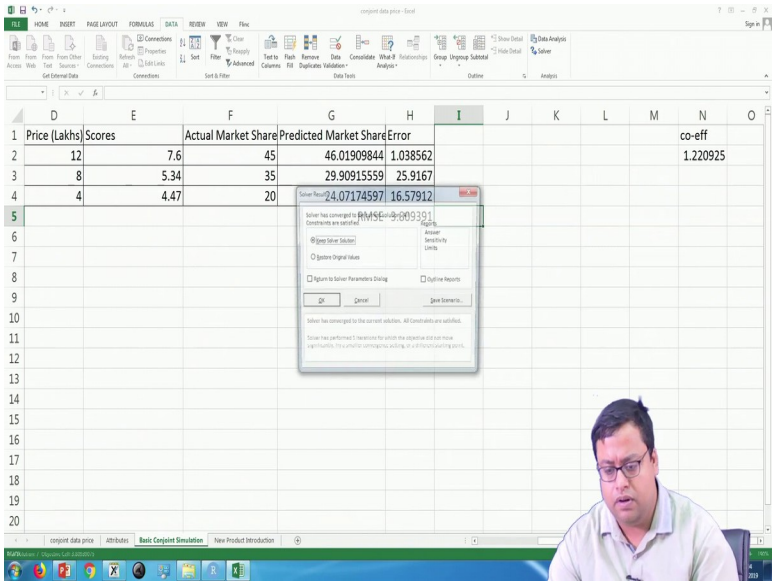
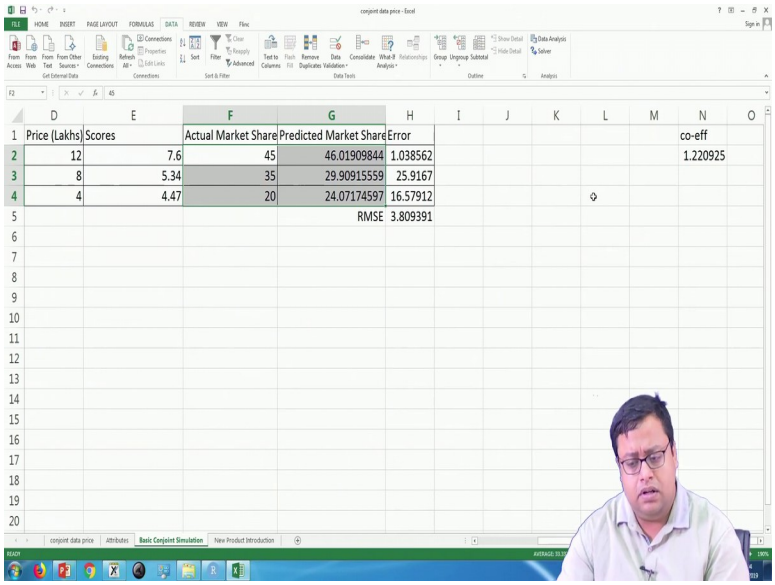
New Product Introduction


Price (Lakhs) Scores Actual Market Share Predicted Market Share Error co-eff
12 7.6 45 46.01909844 1.038562 1.220925
8 5.34 35 29.90915559 25.9167
4 4.47 20 24.07174597 16.57912
RMSE 3.809391
Solver has converged to the current solution. All Constraints are satisfied.
Keep Solver Solution
Restore Original Values
Return to Solver Parameters Dialog
Outline Reports
OK
Cancel
Save Scenario...
conjoint data price
Attributes
Basic Conjoint Simulation
New Product Introduction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So, what I do is? I go to solver and I say that solver, you have to set an objective here. So, I say solver make, minimize this H 5. So, H 5 I have selected here minimize this by changing what N 2, by changing N 2 and make in most probably your solver it will be checked, make unconstrained variables non-negative. What is unconstraint variable? What is variable here? N 2 is the only variable that changes.

So, you make it non-negative, if you check it, it will be always positive. I do not want to do that, I want alpha to take any value, positive, negative, any value. So, let it be, so I just asked you to solve and the moment I solve it gives me 1.221 something like that 1.2209 which gives you RMSE very low and these values are more or less similar not exactly similar, but more or less similar right now. So, 1.221 is something based on which.

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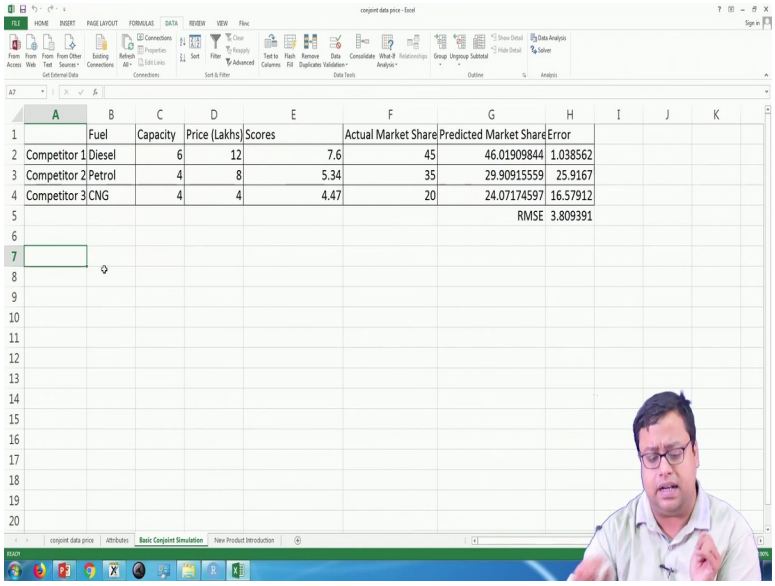

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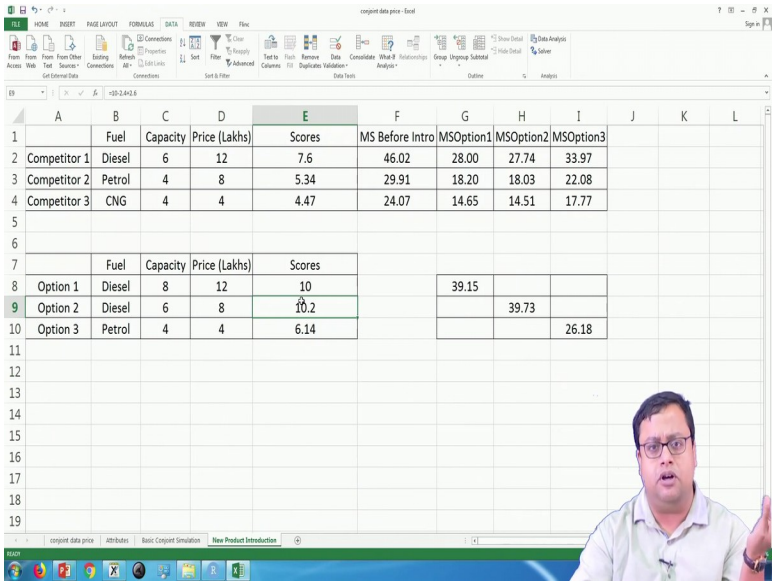
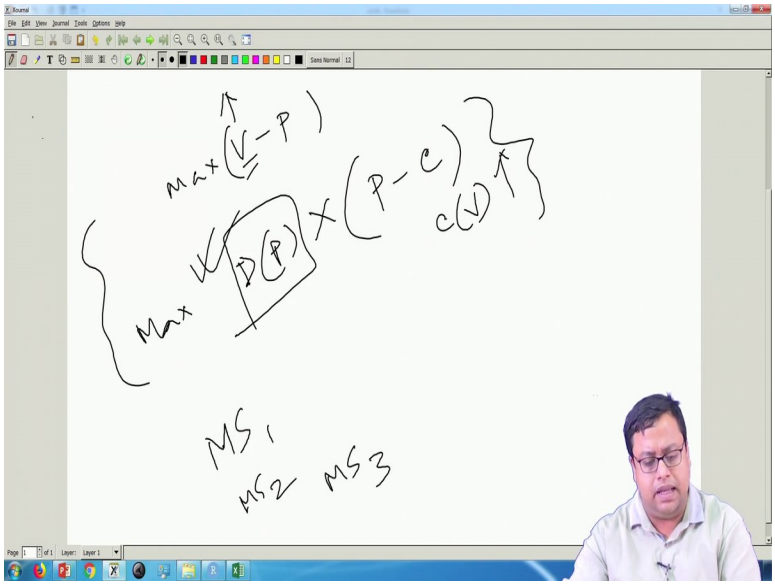
4	Competitor 3	CNG	4	4	4.47	20	24.07174597	16.57912
5							RMSE	3.809391

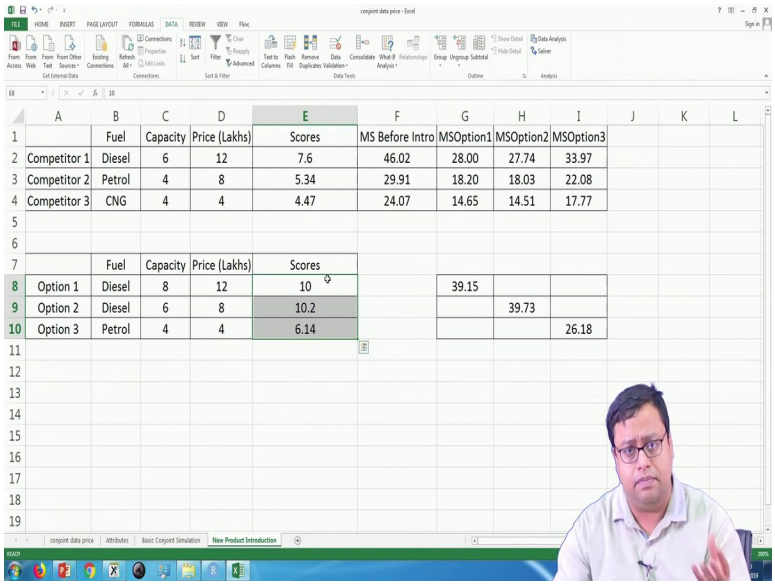
Now, if something else happens if you find out some other competitor, then I can find out how the market share calculation can be done using the similar formula that has been reported here, that is number one. So, market share modeling is done.

(Refer Slide Time: 15:25)



	A	B	C	D	E	F	G	H	I
1		Fuel	Capacity	Price (Lakhs)	Scores	MS Before Intro	MSOption1	MSOption2	MSOption3
2	Competitor 1	Diesel	6	12	7.6	46.02	28.00	27.74	33.97
3	Competitor 2	Petrol	4	8	5.34	29.91	18.20	18.03	22.08
4	Competitor 3	CNG	4	4	4.47	24.07	14.65	14.51	17.77
5									
6									
7		Fuel	Capacity	Price (Lakhs)	Scores				
8	Option 1	Diesel	8	12	10		39.15		
9	Option 2	Diesel	6	8	10.2			39.73	
10	Option 3	Petrol	4	4	6.14				26.18





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Now, if you do a new product introduction, I will always ask you so what? So, if you do a new product introduction, what will you do? So, let us say you have these 3 competitors again, I will come back to this thing. You have the same 3 competitors same 3 scores and instead of 5, I have used 1.221 as my alpha value directly and if I calculate 1.221 it is coming 46.02, 29.91 and 24.07 as 3 market shares of competitor one, competitor two, competitor three as per the formula currently.

Now, I, as a competing company, where competitor 1, 2, 3 are my competition, I have 3 options in my hand, I can either come up with this, either come up with two or come up with 3, corresponding scores are given. Now, you can directly say that okay this score is high, I should go for the score obviously, because as scores goes up your market share goes up. So, you should go with this code.

Why we are doing all the maths? Because, as I told you before, that scores are related to, so if you remember, scores are related, what we are trying to do? The customer is trying to do this, customer is trying to do maximize v-p, something like that. And what I am trying to do? I am trying to maximize D(P) that means demand as a function of price into basically price minus cost. So, I will not always choose that option where the V is the highest. Because for that v, this cost is a function of v actually. How much v are you trying to produce then?

So, if v goes up my cost also goes up. So, that will reduce all the whole Kahani. So, we have to find out what is optimal? And if we use lots of things I have to consider cost, I have to consider the probably how much extra benefit that I can give, how I can change something that I have available with me, but will be the demand function and etcetera etcetera, all of various things together will actually decide that which options.

But one step of that, the first step of that is to find out the market share for option one, market share for option two and market share for option 3 because at least I will know the demand by doing that. Then I have to optimize lots of stuff. Cost part we are not bringing in right now. So, will bring it later. We are just trying to find out how to maximize that, how to find out which one will have how much market share, that is all, that is my job here.

The rest of the part, which one considering the cost considering the innovation, etcetera, etcetera, is a different ball game. It is another mathematics we have to do, which is beyond conjoint analysis. But you should do that at a later point in time as I was telling that any marketing decision is actually a combination of lots of marketing decisions taken or lots of small, small analytics done sequentially or parallely sometimes. So, this is one part, then you find out the cost part, how? What is the cost when you give this what is the cost when you give this and so on?

And then you combine their market share and the cost and the prize together and run an optimization, which is another analytics to find out which is your best option. Right now, we are not going up to that level. We are just asking you how much will be the demand, if I go for option 2, option 3, option 4? So, I do the same thing the same math, but in the denominator, so this G column is about when option 1 is introduced H column is when option 2 is introduced and I column is when option 3 is introduced.

And I am not introducing all the 3 things or more than one options together. So, when I introduce option 1 only, the only thing that comes extra is this part. So, eight that is 10 into,

10 to the power 1.221 in the whole story and I calculate the market share for this, this, this and this. And similarly I do it for option 2 these 3 guys and this and these 3 guys and this

So, I can clearly see, obviously for 10.2 the market share will be the highest 39.73. For 10 it is also pretty cool and 6.14 it is smaller that is okay, that is obvious. What I also want to find, want to mention is just see that who is getting affected most, you will see that the guy who is probably getting affected most in this case, in this case, where petrol 46.14, I am getting 26. For all of this case, I am actually taking up 46.02, so here from here it is coming up to be 28, here it is coming up to be 27, so almost a drop of 20, 18, 20 percent market share.

But here, this guy is dropping probably only 10 percent on 11 percent and here not even that 7 percent. So, the jump whenever you come up with something which of a higher score, the most provoked, the biggest guy, the highest most guy will get affected and that is something that we are trying to represent here. And then based on many other factors, we will try to find out which combination is better than others. So, till now, we have talked about for a rating based what kind of works you can do.

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So, there are other kinds of conjoint analysis also. In the last class, we discussed about that a little bit, there is something called choice based conjoint, and there is something that I have not discussed, which is called adaptive or hybrid conjoint. So, choice based conjoint is different from this conjoint because there you do not give all the options, 27 options or 9

options, 10 options together, and ask them to rate. Rather than in choice based conjoint you give 3 – 4 options in each set, choice set.

And then so we also do this kind of decision making, we if you remember in marketing there was awareness set, considerations set, choice set and then choice. So, before you make a choice you create a choice set. So, here I am giving you the choice set, if the choice set is like this, which one will you choose? So, I give you 10 – 15 choice sets depending on the overall number of options available, and you choose.

Now, that is a one zero decision or probably multi dominal decision, choice one, choice two, choice three, choice four. And we do conditional logit, we will talk about that conditional logit is given, this choice which one you will choose, that kind of a logit function, we try to estimate that and find out the options. So that is number one that is something that we will do in the next video.

And then we will also talk about basically we are not going to detail of that. But there is adaptive conjoint where it says that not all options are very distant from each other. Some options are actually very close to each other, and some options are very differentiating. So, it is very important to find out which of the options are differentiating from each other.

So, remember in GRE exam or many other online exams, the questions that come up are actually trying to find out that they are adaptive in nature as you give good answers; they try to give you more hard questions or something like that. So that they find out in the whole normal curve where you fit exactly. So, here it is similar kind of operations done where based on your responses that you are giving, I try to find out the minute details between probably category A and category B.

And the more you give the results, the responses which are closer to each other, I try an adaptive mechanism to give you certain options which are closer and ask you to differentiate them. So that is an adaptive mechanism which is used only in this can be used probably successfully in the online environment. In offline environment it does not work because you cannot do that maths like this. So, that is one thing, that is another option that you can adopt.

So, these are all about conjoint analysis, in the next video we will talk about the choice based conjoint, we will talk about a little bit of choice modelling first and how to solve the choice based conjoint. Hope you have enjoyed this particular video where I have shown lots of applications of conjoint analysis in marketing problems, will continue in the next video. Thank you.