Dr. Jogendra Kumar Nayak
Department of Management Studies
Indian Institute of Technology Roorkee

Good morning everyone welcome to the session of marketing research and analysis till now at the moment we have discussed about several issues like research design scale sampling and always thinks, so today we will get into another most important parts of the you know research process which is the hypothesis okay.
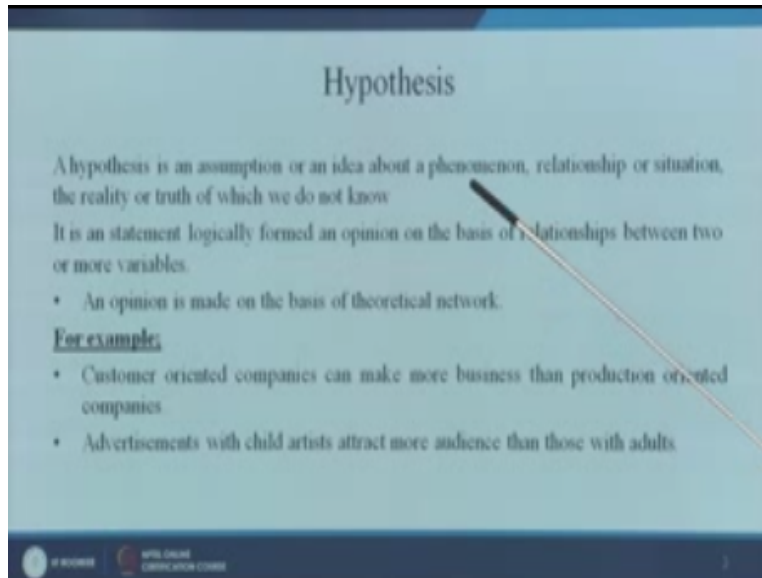
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So let us understand hypothesis can be in fact every researcher wants to test something so you wants to know the purpose of research on the whole is to just understand okay whatever we have a we are thinking or we are feeling is it true or is it not true is it correct or is it not correct right,

so to do that we have to basically two ways of conducting something so one is basically the probably the more you know elementary one which we say is a research question okay, so research question as in the beginning we discussed.

The research question is used whenever a researcher is studying a kind of doing an exploratory research where it does not have any idea and these in the formulation process okay, so in such a situation the researcher tends to ask questions so what as we do basically ask questions so by asking questions he wants to finally get into an get a solution for the question or an answer for the question this is one way right the other way is the next another way is to develop and hypothesis right.

To develop an hypothesis right a hypothesis so now the hypothesis is nothing it is similar to research question but the only difference being that while designing a hypothesis or while making an hypothesis the researcher at least has some certain idea about the object or the study that is doing or she is doing okay so let is see what exactly how do you define right, so as if you in a simple way if you want to understand you can say the hypothesis is nothing but as an assumption which is made by the researcher and then he wants to test this assumption okay so what is he is saying and hypothesis.

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Hypothesis

A hypothesis is an assumption or an idea about a phenomenon, relationship or situation, the reality or truth of which we do not know.

It is an statement logically formed an opinion on the basis of relationships between two or more variables.

- An opinion is made on the basis of theoretical network.

For example:

- Customer oriented companies can make more business than production oriented companies
- Advertisements with child artists attract more audience than those with adults

Is an assumption or idea about of phenomena right so you might say for example that nature then you know you know the earth was formed after the big bang okay, when a stars collided and then maybe the hypothesis is that there is there was a development of stars on the earth right the solar system came into place relationship so when you are saying a relationship maybe you are trying to say that people whose suffered from let say the yellow fever are people who went to Africa right so my assumption is if somebody is having an yellow fever either he had gone to several some parts of Africa.

Or he had you know maybe got infection from somebody who has visited that place okay, so our situation basically right, so the reality or true the which we do not know at the moment so but we are interested to know okay it is a statement logically formed and opinion on the basis of relationship between two or more variables as I said again so let say there are two or more variables and you want to certain frame a relationship as I said that African case right so suffering from yellow fever.

And we are saying maybe the place right so there is a relationship between the place and the disease right or the infection right infectious person so we are saying infection infectious person right, so w are trying to say okay yellow fever the disease right ahs you know relationship with the place or a person who is infected right now this is an example he says it says then the opinion is made on the basis on theoretical network so all these theories when you are saying that people who exercise will leave longer is an hypothesis right.

Is it necessary there are certain situations there are conditions where we have seen that people who have exercised have not leave long maybe they have you know because of some other reason they have expired right or they passed away but on the other hand we also seen cases where a parson has been on maybe on in the hospital for due to went for several years and all but they are still surveying after maybe some kind of diseases, so this is a out of theory but we are saying if you exercise if you are giving in more and add your lungs.

And you know keeping yourself fit then you would tend to live longer now this is hypothesis for example customer oriented companies that means companies who are more favoring or oriented towards their customer will make more business or have larger profitability you can say then production oriented companies then companies who are more bothered about or more focused about their inventory raw material quality control only and not on the customer right so like the customer is whether is happy or not happy on this things.

Similarly advertisements with child artist now there are several hydrogen for example like companies are trying to introduce small children's into the advertisement because it is felt that this would attract more audience right that means the viewership audience here I have mistakenly you can understand as a viewer the view more viewers would be there if the artist who are there involved in the advertisement are children's the if there is a adult right so these are some of the hypothesis but it might not be true in all the cases okay so how do you make it let say.

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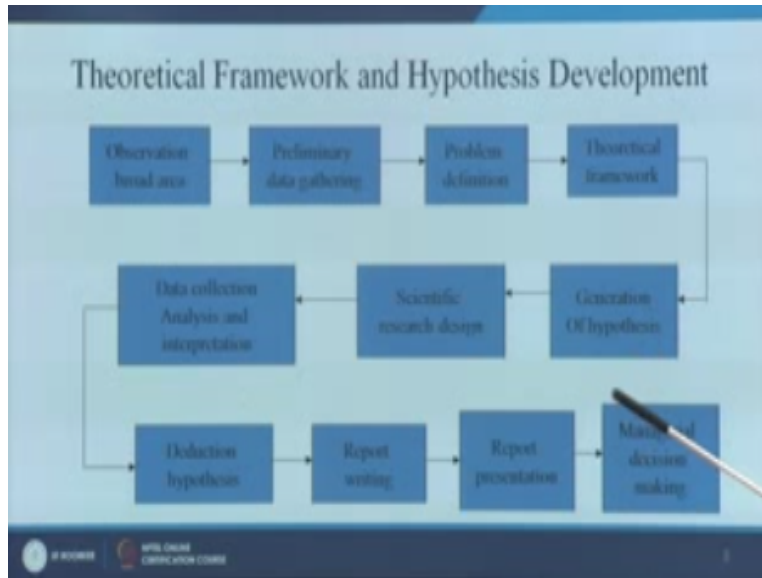
So there is an observation right from the observation we are making preliminary data gathering okay so we have to make some preliminary analyze collection of data we have define a problem we have defined a problem then through the theoretical frame work that means a literature review or something from here this is you have to be this is very important because this process helps you also during the writing research paper or even we know writing your report PH.D report or something right.

So once you have the theoretical frame work what is the theory behind it you see no research should be a or if I say other way around every research has to be back to by strong theory if there is not a backing of theory then it is something like somebody is trying to hit in the dark right, it does not know anything and just he is trying to say a prove is words or he is you know statement so it has to be backed by some theory some argument okay so then you generally the hypothesis and then through after that you.

Do your research design basically there is what scales sample and all these things then you collect the data and then you deduce or check the hypothesis and then write your report right, this is the entire process okay now what is a good hypothesis let say it be it must be adequate for it is purpose that means the hypothesis when you are framing a hypothesis you need to be careful that you are not you are in their topic that means you are saying what exactly is your objective of research is do not you know get into or get diverted into some other topic right it be test it must be testable so I have a hypothesis.
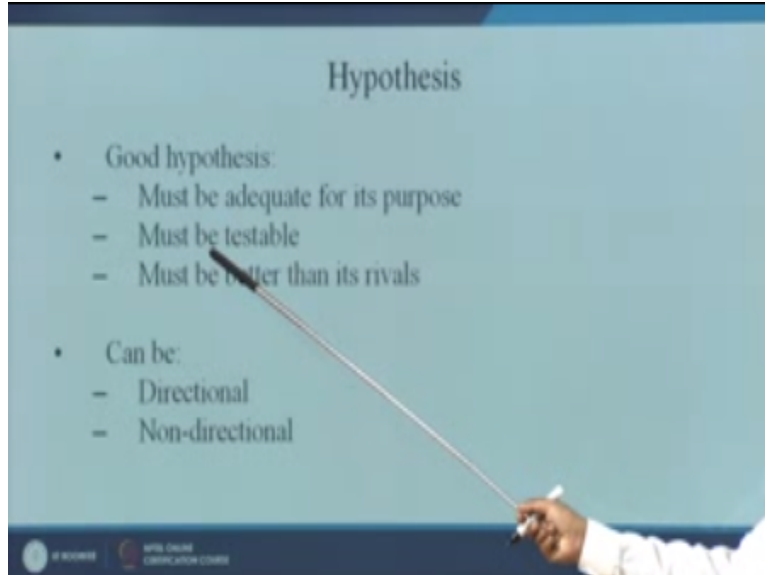
That let say you know in the somewhere in the milky way there is something right if I throw something it would have a kind of a change in weight or density but now that is, is it testable I do not know I right within my limitations to I cannot test it right with my limitations must be better than it is survival where I was now what does it mean when you create a hypothesis there are possibly not one hypothesis that you can make that can be several hypothesis that you can reduce right so it is possible that one hypothesis is more logical.

And more you know affective you can understand logical right then another right then another right and this can be also tested through a statistical measure okay next is the hypothesis has to be check whether it is directional or non directional now what do I mean of let us see this now if you remember we have in the last class also we spoke about the normal distribution right so why I am a talking about a normal distribution the reason is a normal distribution with the help of the normal distribution we will test or hypothesis okay.
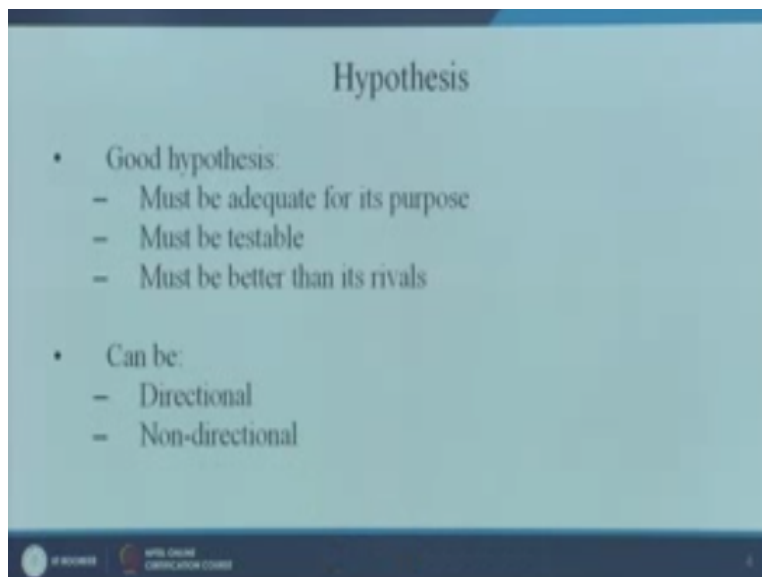
Now how now generally when we are saying this is a normal distribution then the mean median and the mode will lie at the center until analysis it is cued but if it is quid then it is a different case right suppose now this is case where it is the distribution is positively skew we say right and otherwise it could be something like this right so this is a negative skew that means the distribution is skewed to the right okay and a positive skew is a something where you see generally it is more towards the right side right the area is to the right side covering the right.

So when you are when you have the skewness problem when you have a problem of skewness in such situations right the researcher as to understand okay what is what is effect of this skewness on the hypothesis.

We will see very slow right so when I am talking about directional first of all let us understand when I am testing the hypothesis actually I wanted to sell this actually so okay let me draw it again, so what I am saying so when I am having a hypothesis and hypothesis can be possibly can be possibly right I can have I have two things and acceptance do not which I said in the last class right.

So this is my confidence interval okay and this is the area which is my rejection zone now in this case if you see what I have said I have got one expectance in the middle but two reactions zones in two sides of the aim distribution now this is a case which I am saying that means what if I theoretically tell you then it means that there are two areas of rejection that means the this study can move in both directions so this is a case where I am saying it is non directional.

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So what is an example let us say when you are saying who much would, somebody score 60 marks in the exam right I am saying even through will your average of all the subjects be 60 I am saying I do not know so μ the question is $\mu = 60$.

No I do not know, so μ or no $\mu \neq 60$ let us say the $\mu \neq 60$ so if $\mu \neq 60$ that means $\mu > 60$ right or μ could be less than 60 so it be greater than 60 or it could be< 60 so if it is both ways if it is moving then we are saying it is a non directional not probably there is not one direction to it but on the other hand if I am saying μ only $>$ than 60 I am sure that the μ is > 60 only right the price of the product has to be > 100 let us say.

So in such a condition we will say the what happens to the you know the zone of rejection for example is that suppose it as assumed the rejection zone lies here only to the right now what do you mean by telling that it falls only the right it falls to the right means that it is having a higher value the rejection falls at a higher value to the right that means the right is the positive side let us say this is the positive side this is the negative side.

So when I am saying the rejection zone falls in the right means when to at a higher value or an extreme value suppose let us say the price of a product people would except reject the product on bases of the price let us say if the price is two high they will reject the product now two high we will fall not here obviously right it will fall here okay but on the other hand if you say certain other products like which are luxury goods and states oriented if the price falls beyond the certain range.

Then people try to connect it with their status symbol so they would say if price falls beyond a certain level then also they would reject right or let us take another simple example of let us quality now if quality falls beyond a certain level then you would reject that so quality comes in the left hand side okay so my rejection zone falls either here or here some times when I do not know.

It can be on their side okay so directional is when I know what is a direction is it left side or right side then it is a directional but when I do not know this is a case then we said non directional now let us see this.

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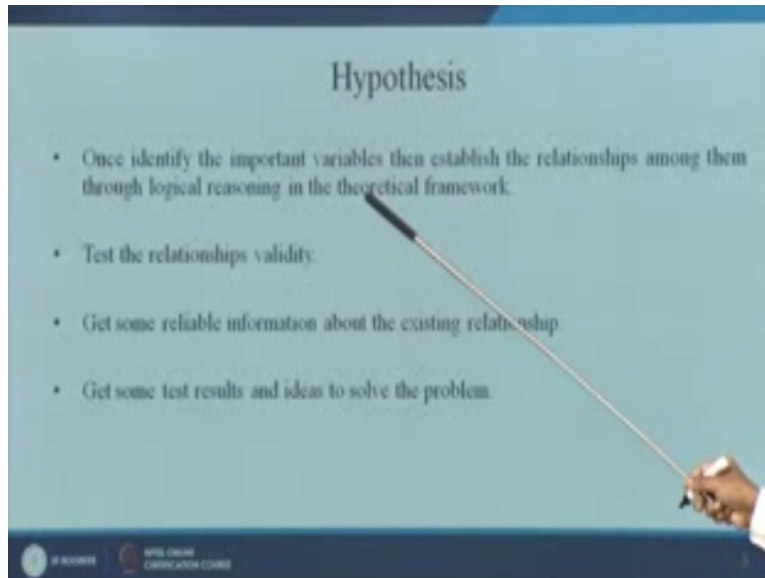
So once you identify important variables then establish a relationship among them through logical reasoning in the theoretical frame work so once you know that the variables what you are trying to study for example somebody is trying to say that if more advertisement meant or more promotion is done promotion let us say promotion and sale are related okay.

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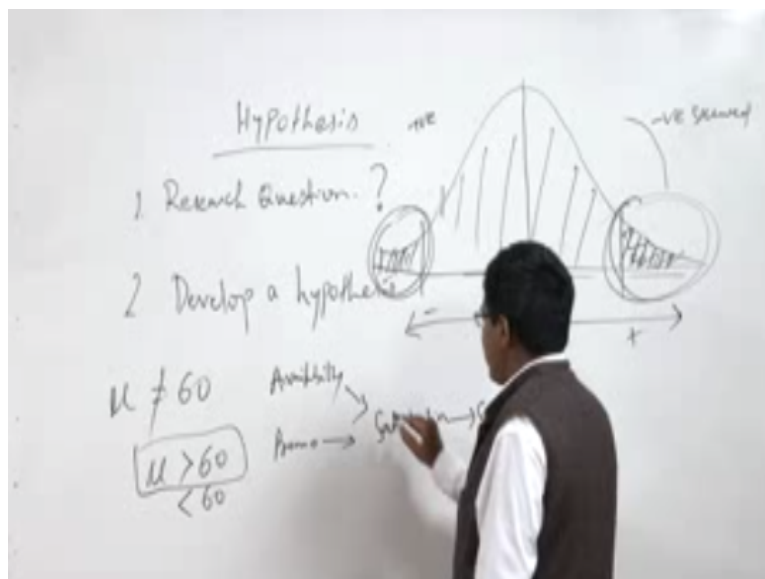
Now higher promotions will lead to higher let us say sale so promotion is directly affecting sales okay so in such situations what happens we are saying once we establish the relationships then we will say well it is there is a relationship but this could this is only two variables, now let us

assume let us assume there are other more than two variables also possible right, so let us say not only promotion but promotion and availability okay effects sales right.

But now I am what I am doing is I am breaking it up I am saying this is bring in another factor let us say satisfaction okay and satisfaction then leads to sales suppose I mam trying to say now I have brought in a variable in between right which might mediate the relationship or which is an intermeeting variable which is you know affecting the relationship between availability and sales okay.

So it has if it passes through this variable then it is giving a better impact or you know solution sorry.

So three things test the relationship validity weather relationship is valid or not so you have if you have told about the coasted validity like detriment validity convergent validity and all earlier in the last sections get some label information about the existing relationship so you have to collect information okay now finally get the test results not test results which we will be doing it a part of the hypothesis testing in fact once you develop the hypothesis then you get into the hypothesis testing okay.

In hypothesis there are2 types of hypotheses first let us go with that right so I said hypothesis can be anything okay so is an assumption basically so if the assumptions are there what I am saying here is that there are 2 hypothesis null and the alternate.

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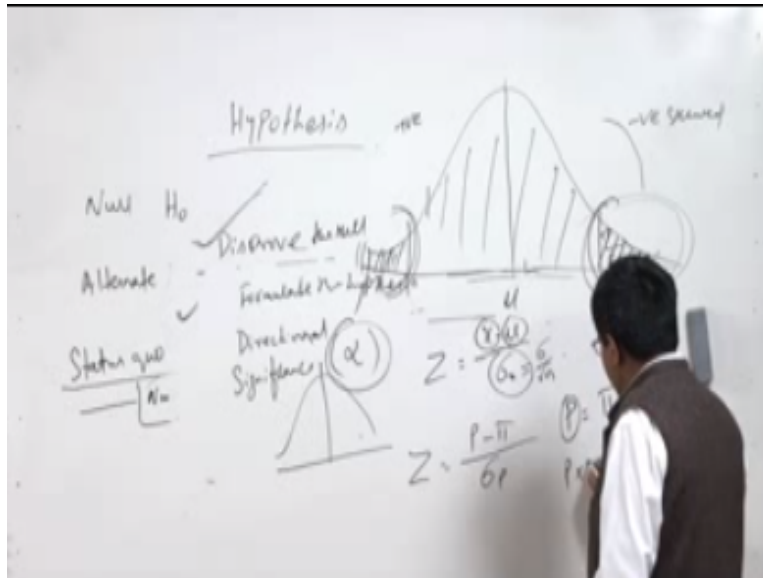
Okay null is always defined as H0 and alternate as the Ha okay what is the null one has to be very clear please null is something where it is the stooped that means it is the case of static scope now what is static scope means d that means something will be there will be no change it will something will remain as it is right and it will not change right so let us go to let us understand always give the example Newton's law of it says that everybody tents to be in state rest or motion until and unless am external force is applied over it.

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Right so I do not want to change anything I do not want to establish anything new right so the it is the normal whatever is happening will continue to happen that is my feeling okay so that is the null hypothesis okay so it says that there is no statistical significance between the two variable right this is not a statistical significance they are equal to they are same right.

So we cannot say whether there is a difference exist or not between two variables but just understand do you want to conduct a research the finally to say that there is no difference every researcher actually wants to find out or no that actually does it happen effect or not suppose I am eating I am taking a medicine will this medicine have an effect or not but null hypothesis would say no the medicine would not have no effect.

Because is going as it is so I cannot claim anything so the medicine will have no effect I am saying but as a researcher I do not want to know whether the medicine will have I want to know with the medicine will have an effect actually right so good or bad is secondary thing now good or bad if I say what will happen it can say two directional so it can be good right hand side or it could be bad in left hand side right.

So whatever it is you to understand that the null is something equal to case example if one pant is fed with club soda now in a you know flower vase you are putting this flower plant you are putting soda and another similar plant you have putting plain water okay now if you are now what us your null hypothesis there will be no difference in growth between the two plants that means if I am suing water or soda it does not make an impact it will be the growth of the plant would remain the same okay.

So same is so I am saying so the growth of the soda is equal to growth with water okay so this is mine null hypothesis oaky but what my alternate with them is no there is the difference between the growth in soda to the growth in water but remember in this case am I saying okay whether it is going to growth of water or the plant with water will be better or the soda I am not saying right.
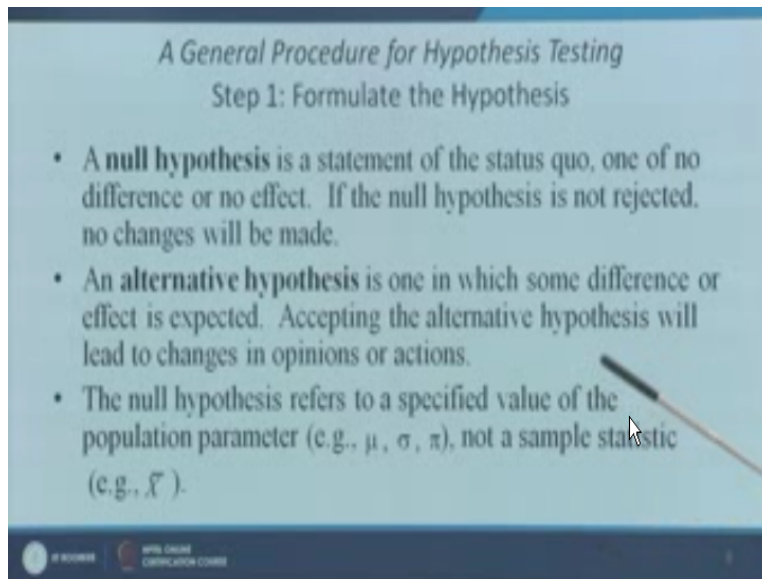
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So this is the case again which I have started with this is a non directional or you say two directional non directional or two directional right to directional so it can move both sides right or the normal distribution okay so alternate hypothesis is the hypothesis is concise to the null hypothesis if one plant is fed club soda for one month and another is fed with plain water the plant is fed with club soda will grow better than the plant that is fed with the plain water let say now this is he has taken in this case in this example as taken an one side right.

Now what did I said the one which is using club soda will grow better right s this is the one direction right but if I would say to know it is not equal to then it would be what I said earlier it is the by two directional either side it could be better or could be inverse okay but in reality I am sure that it will never be better obviously right the alternate hypothesis is never be the correct in this case but still for a theoretical perspective.

If somebody says that fed with club soda will grow better then that is it is only the one plain okay so how do you what I am saying in this case you see an alternate is one which some differences or effect is expected now why I use this expecting the alternate hypothesis will lead to changes in opinion or action just one second just imagine this case where I am saying what is the researcher actually want the researcher wants to know actually wants to always, always this prove the null hypothesis or you can say mostly is not all the time.

It is most of the time we want to disprove the null right this prove the null rather expect the alternate now what is my alternate now let say in the case we were saying if I use club soda the plant would grow better may be this true also who knows I have the advise on the chemical composition or the there or hat is actually relationship between the growth of plants and what soda has and water has I do not know.

I am going through a conventional method that water has been given to the plants so water must be good but may be soda has got some chemical composition which is good for the growth of the plants so as a researcher I would always try to this prove the null hypothesis or reject the null hypothesis right but I would try to except the alternate okay.

So now let take this what are the basically what are the parameters statistical parameters involved now for example when you talk about a population parameter you say for example let say the μ stands for you talk about μ you know and stands for let say π now this are this is the population mean this is the population proportion.

Now what proportion let say is the population proportion or the ratio proportion of people passing a test or failing attest right so the P value the proportion might be π so this are some notations I am just trying to explain were as this is for the population this is for a sample okay for sample we will denote the mean as X bar and here I will denote it just by P, so p is the sample proportion okay. So now let us take this case,

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It says null hypothesis may be rejected but never be accepted okay. In classical hypothesis testing there is no way to determine whether the null hypothesis is true right. So let me take this case, in marketing research the null hypothesis is formed in such a way rejection should be the acceptance of the desired conclusion. Now as I showed you as example, now this is the case of proportion right, so please understand we generally what we do is we to, we want to reject the null and accept the alternate.

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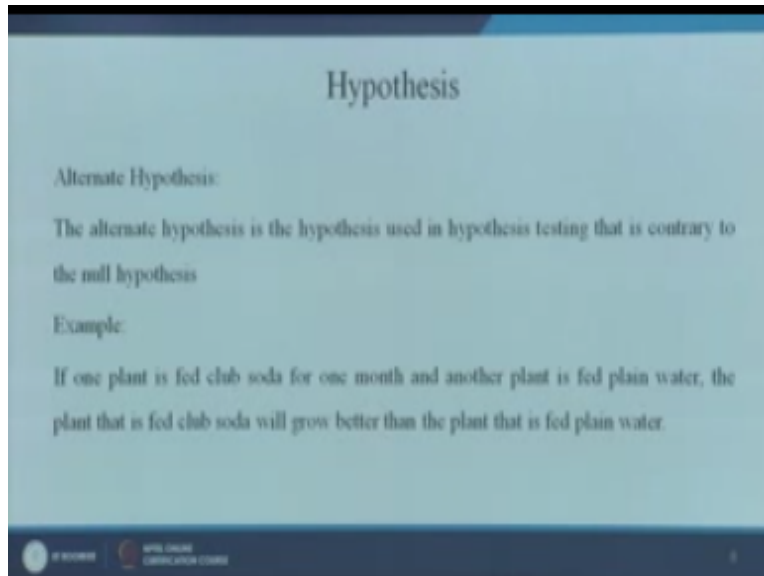
So alternate something is that the researcher something wants okay, he wants to accept the alternates, to prove the null basically okay. Now what are the steps how do you test the hypothesis. Infact the first step is to formulate the hypothesis, these are some parameters for example this is used for in case of the population and this is the case of sample right, so there are some rotations which you might face in books or something. Now this mean, population mean okay, this is the sample mean okay.

So this is the population proportion, this is the sample proportion, so these are some of the you know for example the standard deviation is used for the population right where as use this as population right whereas we use this S for sample right. So these are the sum of parameters okay. So now let take this.

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A General Procedure for Hypothesis Testing
Step 2: Select an Appropriate Test

- The **test statistic** measures how close the sample has come to the null hypothesis.
- The test statistic often follows a well-known distribution, such as the normal, t, or chi-square distribution.
- In our example, the z statistic, which follows the standard normal distribution, would be appropriate.

$$\text{where} \quad z = \frac{p - \pi}{\sigma_p}$$

$$\sigma_p = \sqrt{\frac{\pi(1-\pi)}{n}}$$

Once the steps for hypothesis, your first step for testing is once 1st you formulate the hypothesis okay, after you formulate the hypothesis then you have to decide what is type of testing I am using before that also you have to understand what is the direction of the test? Is it the two direction test or it is 1 directional test that also we will decide? Why it will be important? According to the direction of the test my rejection zone will rather on both the sides and only 1 side okay.

So therefore one has to decide what is the direction of the test okay, 3rd is you have to find the significance level, now this is the term which I am going to say now, so what is the significance level? A significance level is a level of basically rejecting the null hypothesis when it is true right, we are also say α or significance, as it is α is the amount of the value of the rejection. When the researchers rejects right the null hypothesis when it is true, null hypothesis is true still it is rejected this chance is called as α or the significance level.

Now how much of α significance level researcher is ready to take that means he is ready to take in the researcher. Suppose α we take 5% as the value of, so when you are saying 5% that si my confidence level is 95% okay so 5% significance. That means 5% mistake could be possibly there as good as that you can understand. How do you test this we basically in the last session also we said that we measure the all the G value. Now the G value we say in terms of mean and proportion that are two formulas.

For example in terms of mean we say x – σx so this is what I interacted in the last session also I said, so x is my sample mean, this is my population mean, this is my standard error right this is the standard deviation, the distribution of the standard deviation okay. So this is = σ on the other hands, suppose in the case of proportion in this case if you see Z = P – π P is the sample population is π upon σ. Now σ P if you can see is nothing but.

Π (1- π)/n so π is nothing but the rate of success basically which you in simple if you understand it is nothing but P = sample π population is, so P x Q/ n as good as that right. So when we use this we are able to calculate the z value. This z value helps us to determine then we will find out whether the null hypothesis as to be accepted or rejected. Now suppose your Z value calculated value let say more than the critical value.

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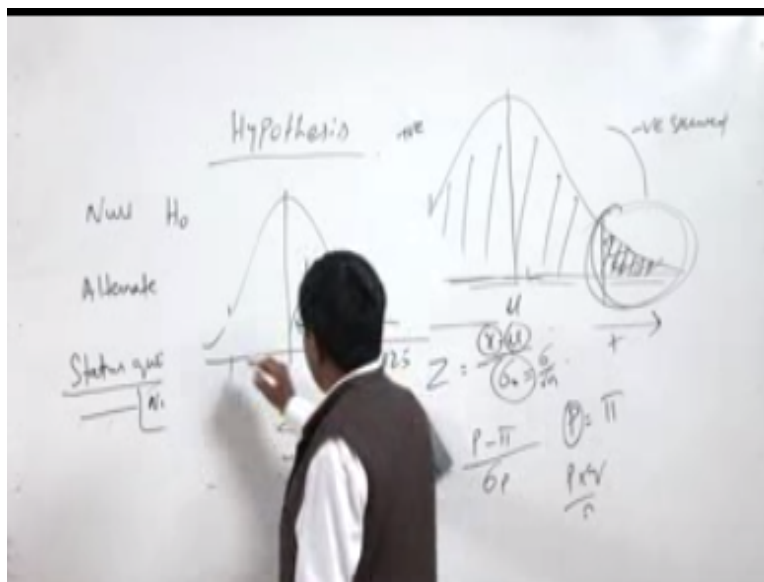
Now this is critical value for the 5% confidence level is 1.96, now suppose you are calculating value for Z comes somewhere here at say 2.04 or 5 then we would say, since it is going beyond it is crossing the critical value them you will reject the null hypothesis, so the null hypothesis need to be rejected and suppose it would have been somewhere here let say 1.64 then we would have said that it is falling within the limit. So it decides your null hypothesis is accepted or rejected on the basis of Z value right.

So if it is more than the table value or the critical value then we reject, because simple it is going to the rejection zone okay, but suppose it is less then it is in the acceptance zone so you accept it

right. This value of Z you have to decide where it depends upon the direction suppose it is for example in the case of 95% but on the two side then it is 1.96 so you have to know what is the direction of the test and according the z value will change and as per that you have to calculate your whether the hypothesis is to be expected or rejected okay now something as I said.

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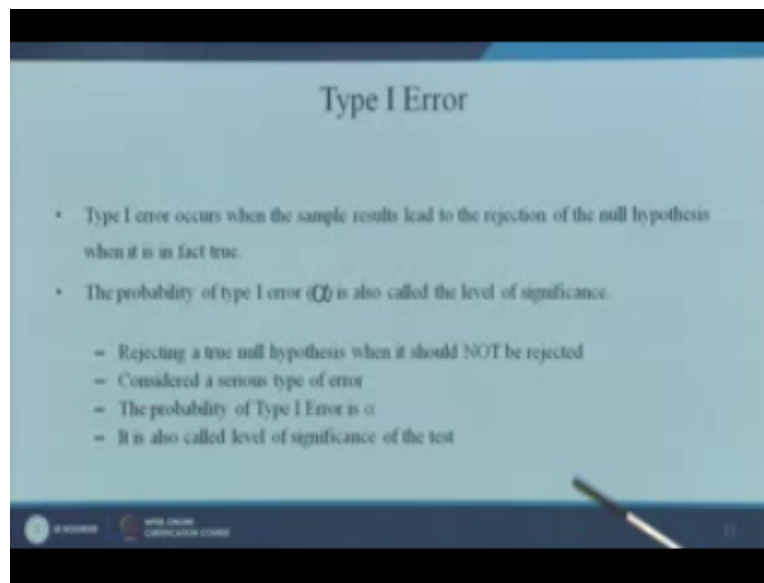
 The probability of what is this α or this is the type one error right or the significant level which I was just saying type error this is the two errors that occur in any research process type 1 error occurs when the sample results leads to the rejection of the null hypothesis when it is in fact true that means you are rejecting a hypothesis you are rejected a true hypothesis so that is the as an error okay so now this error how much of error is perceivable or permitted in the by the researcher sometimes it is 5% as I said or it could be one 1% it depends okay.

So this error is called as type 1 error or α I will show you right it is also called as level of significant okay so rejecting a true null hypothesis when it should not be rejected it is a serious type of error obviously and if you can understand from here it is many other times it is called as manufacturer problem because suppose a company has done some is producing some tables or something now if you are making the cars.

And let us say the car is good but suppose you are rejected you have found the sample you have rejected it saying that this car is not good because the sample does not say it so in that case it is

the loss to the manufacturer that is why we say it is manufacturer problem right the probability of type one is α.

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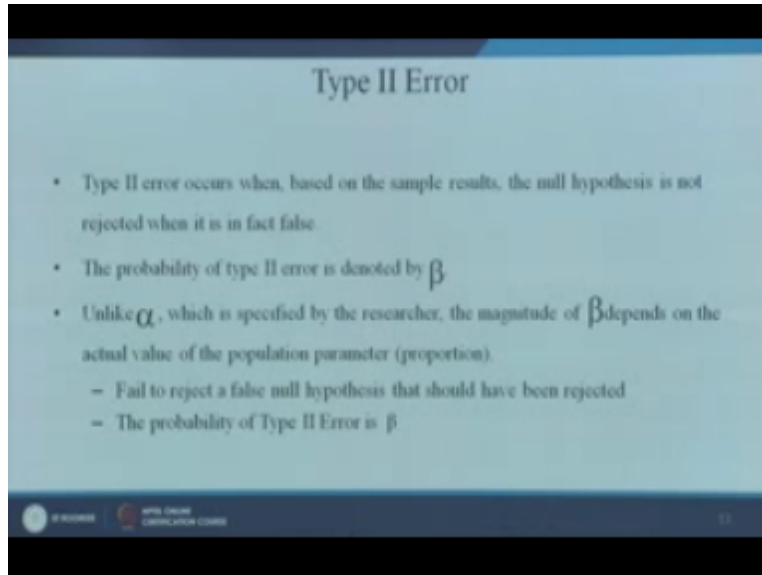
 Okay I have said similarly there is a problem when a product is not good but you have ellorbate right that means the null hypothesis is not true but you have accepted it so when you do such a problem when you face such a problem it is call the alternate time 2 error right or β so the probability of type 2 error is dented by β right so what it saying it is basically saying failing to reject a false null hypothesis that should have been rejected actually you should have been rejecting it but you did not reject so in such a condition you will say it is a β right.

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Decision	Actual Situation			
	Hypothesis Testing		Legal System	
	H0 True	H0 False	Innocence	Not innocence
Do Not Reject H₀	No Error $(1-\alpha)$	Type II Error (β)	No Error (not guilty, found not guilty) $(1-\alpha)$	Type II Error (guilty, found not guilty) (β)
Reject H₀	Type I Error (α)	No Error $(1-\beta)$	Type I Error (Not guilty, found guilty) (α)	No Error (guilty, found guilty) $(1-\beta)$

So let us see this example we will close to this example so when you this is the case the hypothesis the two different cases do not confuse this is that theoretical part okay this is the theoretical part and this is an example I have brought okay now suppose your h0 is true that means the null hypothesis true actually true and this is not true right you are rejecting a null hypothesis you have two options not reject the null hypothesis or reject.

The null hypothesis actually you never say you should never say except the null hypothesis because testing the exceptional of null hypothesis highly possible it is very difficult okay so we said so do not reject the null hypothesis and the null hypothesis is true when the null hypothesis is true and you should not reject it so it is a correct case right but when the null hypothesis is false and you are still not rejecting that means you are let us say there is bad medicine and you are allowing it to the market.

So it is a false it is bad product and you are nor rejecting it is a β if this problem is called type 2 error and the other hand if you are null hypothesis is true but you are rejecting it the manufacturer of the car if the car is good but he is rejecting so this is the manufacturers problem so this is called okay if you can think if this is the manufacturer problem this should be if you will think you can get a idea this is the consumer problem this is called the consumer relied okay because you are excepting allowing a bad product into the market.

So it is not good for the consumer okay so this is the type 1 error or α and this is the again the no error stage so this two are no errors and this is the case of two errors okay now take this legal

system case where you see and this is the again the no error stage so this two are no errors and this is the case of two errors okay so now take this legal system case where you see in India or any many of the countries a innocent till somebody is not found guilty is innocent okay.

So if it is actually innocent which is actually innocent and you are not you know putting any penalty on him then it is good condition so he is innocent and you are not doing anything no penalty on him but suppose is not innocent right and he is not innocent but what you have done you have accepted you are not rejected means basically to understand in language you understand is accepted so you have accepted him but he is actually the criminal he is a guilty guy.

So this is the β okay on the other hand if he is innocent but you have put him behind bar you have given him 5 years of jails for example then this is a problem with poor thing the poor has to go to jail he has not make any mistake so this is the α again if he is if you have rejected him and he is not innocent then it is the correct condition okay so these are the stages this are the you know different conditions in which we say the null hypothesis.

And the alternate hypothesis you know go through and this are the two basic errors that you find in research and in this section we also discussed about the how to test the hypothesis how to formulate the hypothesis what is the tail of a test and what is the significant level and finally how to test the hypothesis right this is only the beginning so may be in the next section we will continue right with further things okay thank you so much.