Introduction to Environmental Economics
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Lecture - 30
Hedonic Pricing Method

Hello everyone. Today we will be discussing Hedonic Pricing Method. As you understand that in case of revealed preference approach; we are having four different methods to value at the known market goods and services. So, hedonic pricing method is; obviously, a revealed preference method and here we are trying to understand so what exactly is this hedonic pricing method, what are the different uses and applications of this hedonic pricing methods and how we are saving the hedonic price functions?

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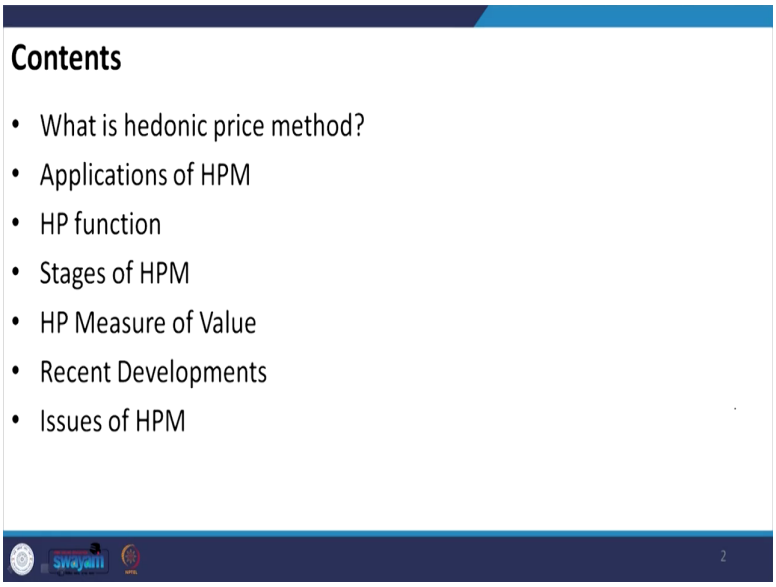

And if you have to apply this hedonic pricing method, then what kind of or what are the different stages that we need to follow? And then we will be discussing what are the recent

developments in this hedonic price method? Then finally, we will be discussing; what are the different problems that we are facing in the application of hedonic pricing method?

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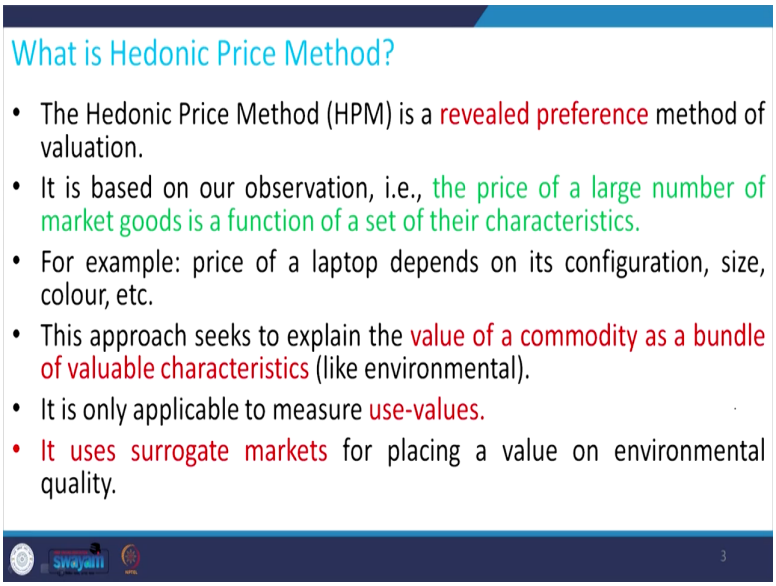

So, let us start with the hedonic pricing method as it is. So, that is the minimum definition of this hedonic pricing method. So, as you understand this hedonic pricing method are popularly known as this HPM method is a revealed preference method. And revealed preference method they are based on the actual observations right. So; that means, here we want to find the from our general observation we are finding that, the price of a large number of goods and services that we are found in the market; so they are the function of a bundle of its attribute or characteristics.

So, for example, if you have to say that price of a car; so price of a car it depends upon the fuel efficiency or you can say the safety information or safety standards that is there in the inbuilt safety standards there they followed in the particular car or how reliable the car is. So, like I see one explores your own examples that how the particular market good is a function of asset of or a bundle of its attributes or characteristics.

So, when you are talking about the non market goods like your the environment then the same approach will be trying to explain the value of the particular commodity as a bundle of the attributes, its attributes right. So, again I just want to highlight that; so as this is falling under the revealed preference method, then this hedonic price method is a only applicable to measure the use values of known market goods and services.

And again as a basic feature of non revealed preference method; this hedonic pricing method it also uses not the actual market, but the surrogate market for finding the value of environmental quality or a environmental goods and services.

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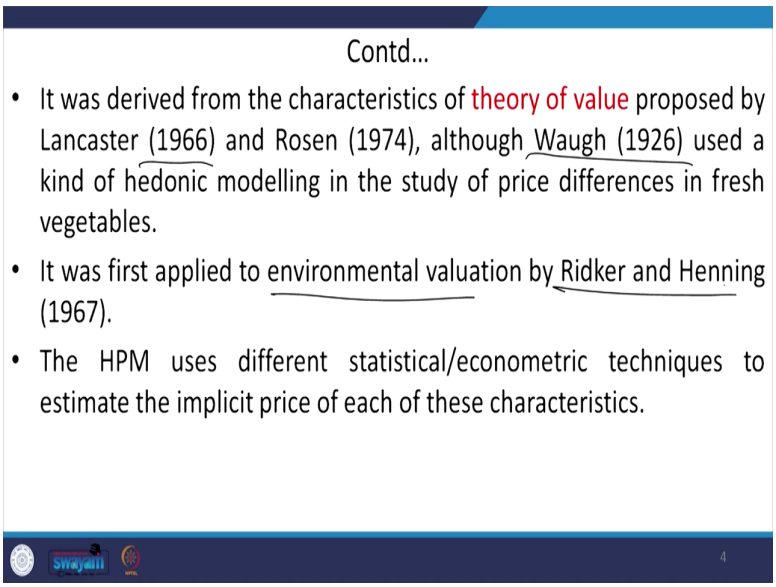

And if you try to see that what is the theoretical background of this hedonic pricing method, it has an established theory that is known as the theory of value. So, this theory of value you can follow from Lancaster and even Rosen has expanded this theory of value and how systematically model this hedonic pricing method based on the berry theory of value. And so this is what the broad theoretical remark.

Although this two fellows that is Lancaster 1966 and Rosen 1974; they systematically I tried to model this hedonic pricing method, but first of all it is Waugh in 1926 long back; he used this kind of hedonic modeling in the study of the price differences basically fresh vegetables.

So, again so far this hedonic pricing method is concerned in the environmental valuations. So, this these two fellows Ridker and Hennin they have applied it in case of this environmental valuations. And this hedonic pricing method it tries to use different kind of technique basically the statistical techniques or economical techniques to estimate the implicit price marginal cost of each of this characteristics of a particular good or particular service right. So, that is why we can actually find out what is the impact of a particular quality on the value itself.

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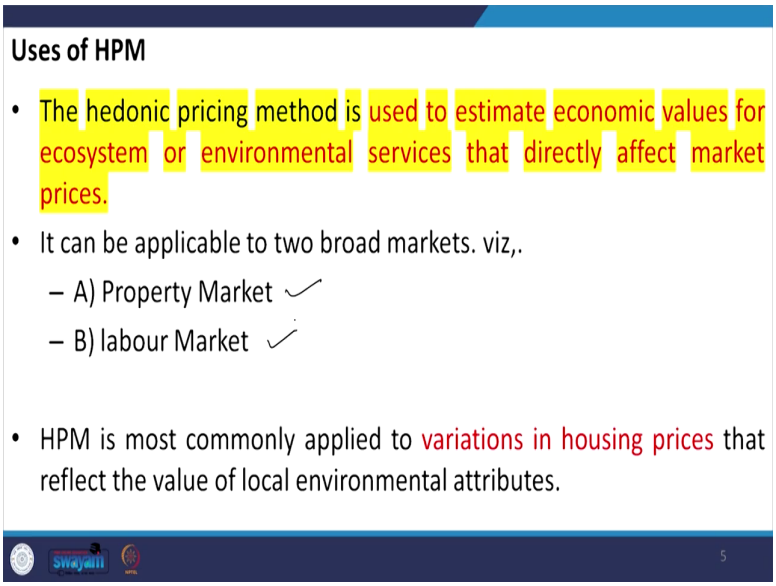

So, in this context you can say the application of this hedonic pricing methods; although nowadays we are we can say it is varied, but still it was applicable for a typical cases like your property prices or wage price different determination that is wage determination of labour. So,

this hedonic pricing method it was used to estimate the economic value for the ecosystem or environmental services that directly affect the market prices.

So, among these characteristics we can say, it can be applicable to two broad markets that which two broad markets that we can use this method to estimate the economic value of the particular environmental good or particular environmental characteristics. So, these are typically the property market and labour market right. So, although we are saying that this initially the; this HPM method it was popularly applied to this property market, in order to find this variation in housing prices right and this variations in housing prices actually reflect the value of different environmental characteristics right.

So, you are saying that this housing prices are functions of different local attributes of the environment where the particular house is situated and that is why there we are having price differential of this houses.

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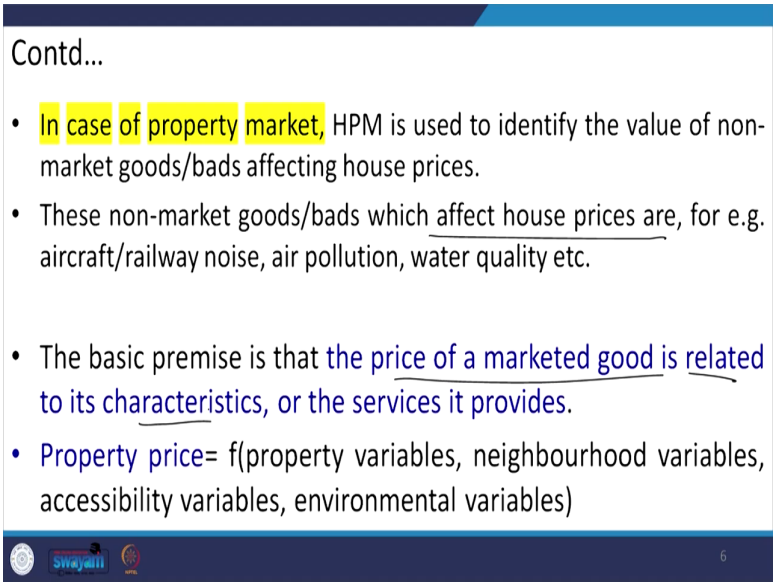

So, especially when you are talking about this property market. So, this method is used to identify the value of non market goods and services or goods or bad civil that can affect the price of housing. And this non market goods and services or goods and bads which can affect the housing prices; let us say it is the we can for housing prices or for demanding a particular house or to choose a particular house at a particular prices; we are taking into account so many attributes of this house.

Whether, we are having frequent noise in terms of rail noise or your aircraft noise passing across or passing through; passing over or even nearby this noises or what is the standard of air quality over there in that locations of your house. What is the kind of water quality we are finding maybe the surface water for other purposes or grounded or for your one consumption.

So, that these are the variables we are taking into account and these variables are likely to affect the housing prices. So, from this example of your property market; we can actually say that this is the basic premise of this hedonic pricing market that is related to the property market is based on these the price of a market good, it is related to its characteristics right. So, here we are talking about this property market; the property market that is housing market its related to the very characteristics of that particular house or particular location his house.

So, in universally can say that in this example; we are trying to find this property prices as a function of different variables. Let us say the property variables right. So, what is the structure of the variable, what is the location of the variable or you can say the neighborhood variables further it is safe; it is a relatively safer area or it is a remote area or it is a crowded area or so far the accessibility is concerned that is I actually value a particular property where the distance from this property to a good school should be there.

So, that is why I will be valuing this particular property. So, accessibility to different needs like your infrastructures like your schools or hospitals; we are also taking into account and that is also reflected in the property prices. We are also taking into consideration the variables like the environmental variables right; like the quality of air, quality of water or we are saying the other different amenities variables that is related to environment on of that particular property; we are also taking in account. And all these factors, all these variables are actually responsible

in increasing or decreasing this property prices. So, that is how we can say that price of a marketed good is relative to its characteristics or the attributes.

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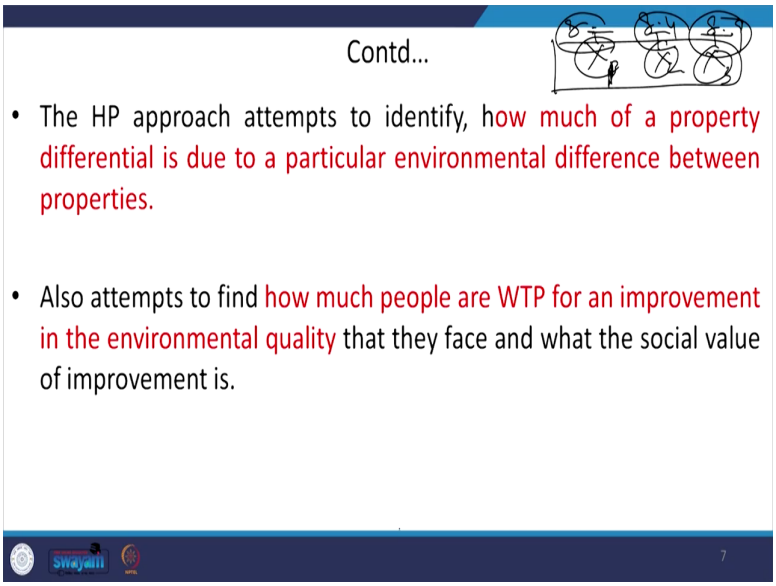

So in this case, the hedonic price approach it will be trying to identify how much a property differential, how much the price differential right is due to a particular environmental difference between the properties. So, if you are saying that you are actually the option of let us say three different; let us take two types of houses in a particular local locality.

So, this is X 1, X 2, X 3 building options. So, among this building options you can purchase one and these are located in the; in a particular area; so very related area or yes in a particular surrounding even you can say, but; however, the prices of all these three buildings are different.

So, in this case we just try to identify what are these different factors because of which we are finding differences in prices. So, suppose it is 8 lakhs rupees and it is 8.4 lakhs and it is 8.9

lakhs. So, why this price differential is there and what are the factors that can predict for this differences in this value of the property?

So, that is how the hedonic pricing approach it tries to identify and again this hedonic pricing approach, it also tries to find out that how much people are willing to pay for an improvement in the environmental quality. Let us say the air and the quality of the air got improved right in a particular locality. And because of its this improvements how the people will be willing to pay for this improvement right. And because of this improvements all the individuals are willing to pay and finally, the air quality in that particular location got improved, they have done some treatment, from mechanisms then we need to find out what is the social value of this improvement.

So, this hedonic pricing method helps us in two directions; first of all it is helpful in identifying those factors which are responsible for differential in property prices and the second it also identifies how much people are willing to pay for an improvement in the environmental quality right. And as a result what is the social value of this improvement, we need to measure that. So, that is what the hedonic price approach it is helpful in finding out.

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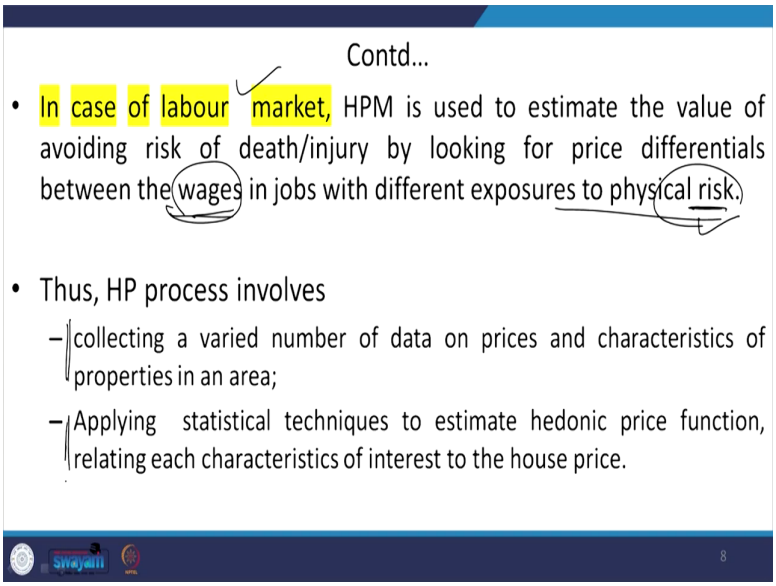

And in case of the second example that is the case of the labour market and as you know that this in this labour market also hedonic pricing method is also popularly used. Basically, you need to find out in order to find the wage differences. So, here take this method is used to estimate the value of avoiding that risk; it is risk of injury, risk of sickness, risk of death.

By look at the price differentials of the jobs or between the wages in the jobs with different exposure to the risk. So, here we are trying to find two things one is the risk that is likely for a particular job and because of this differences in risk; so what is the differences in the avoid risk right? So, in labour market also we are trying to find the value of avoiding the risk, how the workers they are valuing to avoid the risk of suffering from any injury or suffering from any sickness or death and it also talks about the risk with respect to the different wages right.

So, whether this risk is reflected in the wages or not that is also taken into account. And basically, so in this process and the hedonic pricing it actually tries to collect so many examples, so many data on the prices and the characteristics of properties in a particular area.

So, when you are talking about this labour market the application of hedonic pricing in labour market or you can say, the application of this bidding pricing in the property market then; obviously, this hedonic pricing process in order to carry out this process, we need to collect different variety of the data.

So, collection and compilation of data on different prices and the characteristics of properties are very essential in the hardening pricing process. And more about the second thing that we need to consider that what kind of statistical techniques, we can use to estimate the hedonic price functions or that is related to different characteristics of the particular property or particular house. So, these are the two essential elements are compositions prerequisite for the hedonic price method to process.

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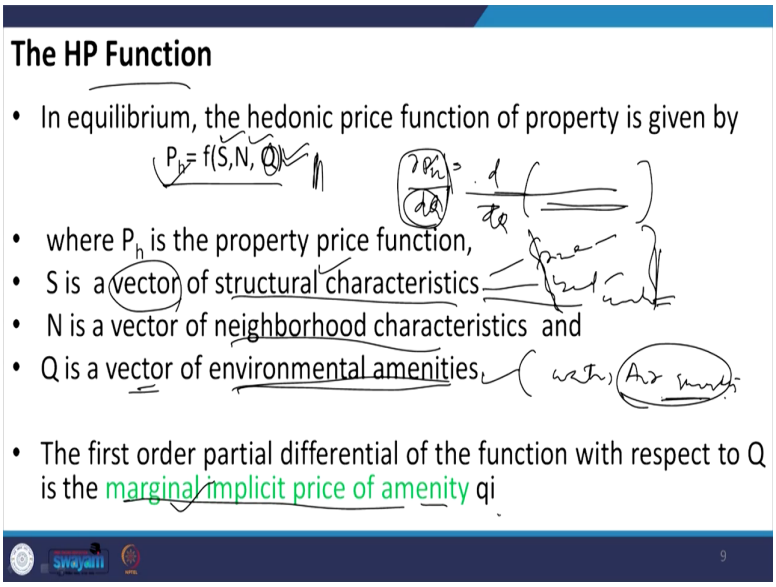

So in this context, we can say that assuming the equilibrium in the market; so far the prices of the property price is concerned, then you can say in this equilibrium condition the hedonic price function of the property can be explained in terms of this function that is the property

price function is a function of your space; this structural characteristics that is S, then neighborhood characteristics that is N and Q that is the environmental amenities.

So, we are trying to build the hedonic price functions right. So, here you are trying to say that this property price is dependent on some parameters or variables. So, which are these variables? So, these variables are structural characteristic variables. So, when you are saying this variables under the structural characteristics; it may be like what is the size of the houses, how many bedrooms are there, so how many wash rooms are there. So, they are; this is related the structure and this is these are different variables under the structure.

So that means, you can say that we are taking a vector of this structural variables, we are preparing this variables in terms of a vector that explains this structure. So, likewise we are; we can take the vector for the neighborhood characteristics that which kind of locality is this, whether it is; whether middle class people are low are residing over there or these are the slum areas people or they are educated enough people.

So, that is should not be; that should not be any kind of on safe situations to happen that particular area. So, these are the vectors on never able; neighborhood characteristics that we are also taking apart from this environmental amenities. So, if you have to after preparing this environmental function; so this is the hedonic price functions.

So, after doing this exercise by identifying that which are the factors that can affect the pricing of this particular housing or property, then the second thing that we must actually understand that we need to have; you need to estimate the marginal implicit price of the particular characteristics, that whether you are interested in finding that what is the marginal implicit price of the environmental amenities.

So, if you have to find it then; obviously, you need to have this partial differentiation of this functions. So, here you can say you are interested in finding out the marginal implicit of this amenity that is Q. So, what you have to do? You have to find the partial the faster partial differential function of this price right.

So, with related to the; environment amenity that is with respect to dQ. So, you are finding after doing this differential that the del of this functions P h functions with respect to your Q

right. Then you are finding the marginal implicit and doing the rest of this things. Then you are finding this d by dQ of this functions, then you are expanding this functions right this function.

So, what are you doing here? You are finding the marginal implicit price of amenity Q and as you understand this environmental amenities; this is a vector right. So, which environmental amenity you are talking about? Whether it is related to the water quality right or whether it is related to the air quality, you can identify by differentiating with respect to this variables right. So, this is how the hedonic pricing function can be carried out.

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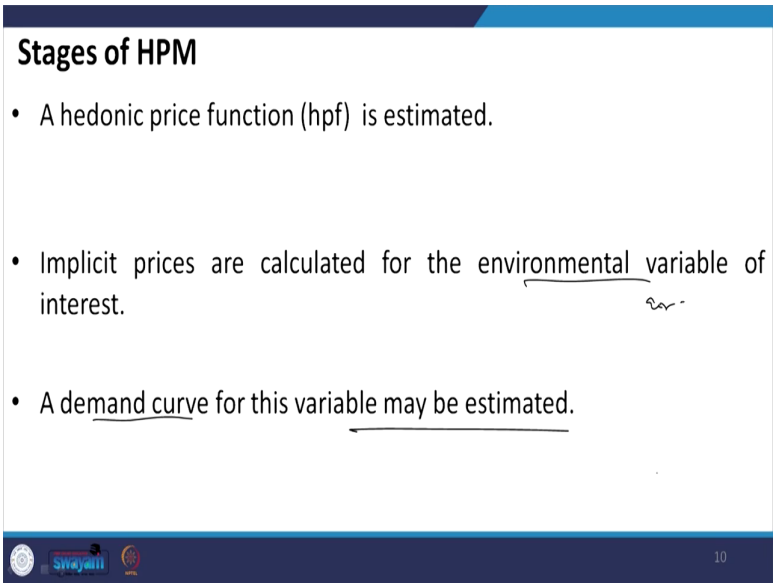

So, what are the; if you have to actually use it; somewhere here in the applicable situation; so how what kind of stages are what are the different stages that are essential to be followed? So, first thing is that as you understand that hedonic price function is estimated; we have already done that right. And then we need to calculate the implicit price corresponding to this environmental variable that you are interested in; whether you are interested in the quality of air or water or other environmental qualities that we need to say.

And then finally, we need to find out based on this information; you can find you can find this demand curve for this particular variable, let us environmental variable of air quality we can estimate that how you are demanding the air quality in that particular area of location for your house.

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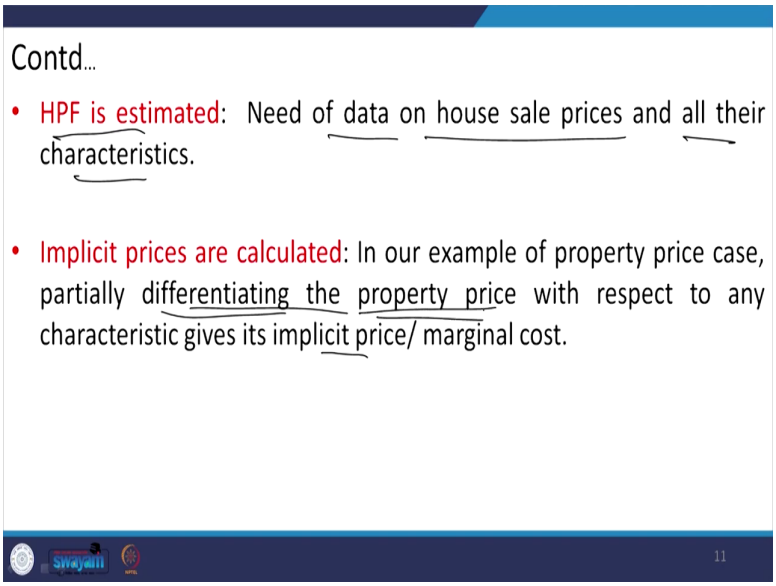

So, first thing is that we need to actually have for finding this hedonic price functions, we need to estimate this hedonic express function based on this vector of parameters. So, for the region; we need to collect data. So, which kind of data are required?. So, these data may be related to the data on the house sale price on that particular locations and let us say were having a 100 plots, but that locations and if each of these plots are actually in the market right. So, we need to actually collect the housing sell prices of this 100 plots and what are their characteristics?

So, we need to collect this data for finding the hedonic price function; so that we can estimate it. So, what is the second state? As you understand that we need to find out the implicit price,

we need to estimate its implicit price. So, in this example of our property price; so we can actually partially differentiate this property price with respect to the characteristic; that is interested and that is of our interest. So, maybe the quality or maybe the other environmental parameters that we are interested and the way you are valuing it.

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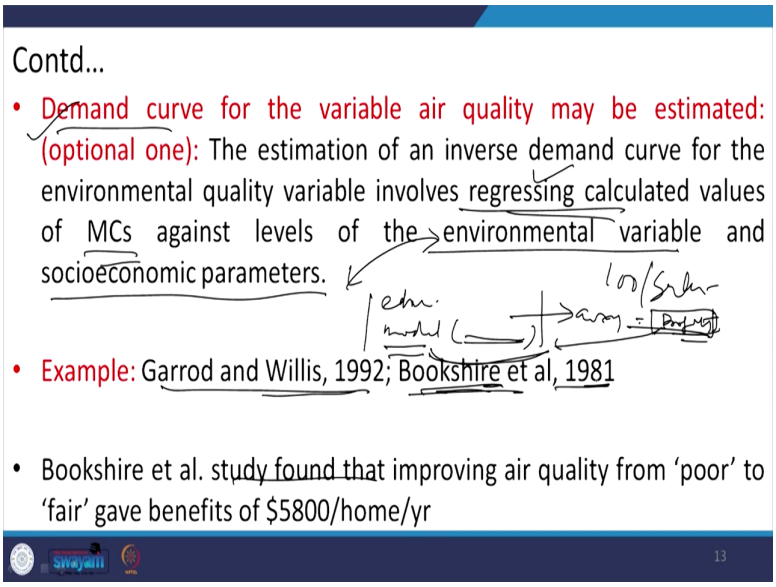

So, we can actually do this differentiating with respect to this attributes corresponding to the property prices. And finally, we need to have this estimate demand curve for this variable of air quality or water quality. And although the literature says that these are optional, so it depends that whether you need to find this demand curve or not because your majority of works are done when you are our valued, when you have already valued these environmental qualities; let us say air quality or water quality in terms of finding this implicit prices right.

So, these actually tells the whole story that how the non market goods like your water quality or air quality is being valued and it is reflected in the pricing of the house. So, for finding this demand curve; obviously, we need to take into account all this data set right and we are

finding that how from based on this let us say 100 sales price at the year; based on this you can derive the demand.

So, the estimation of this of this demand curve, it is and inverse demand curve for the environmental quality. And we can find by doing this exercise of regression right and you can also find out this regression after doing this regression, we can calculate the values of this marginal cost against different kind of environmental variables and also the social economic parameters right.

So, that means, not only we are we can find the importance of environmental variable, we can also find out how the individuals based on different socioeconomic parameters they are valuing this environmental variable. So, if I drawing this demand curve, this picture is getting clear or it will be clearer. So, that how a particular educated person let us say; so middle class people or a from income level of this range right.

So how this person is valuing this environmental or let us say air quality in that particular locality and how it is reflected in the in his property prices ; purchase of the property prices right. So, if some other people, other consumer is there right. So, his education level is not actually good, but he is rich; so how it is reflected how his preference is reflected in the property prices; so that we can also find out from this.

So, this; so if you want to explore this kind of real life examples or examples that is already existed in the literature, you can explore to this literature Garrod and Willis or Bookshire. So, interestingly you can find that in case of the second article that is by Bookshire in 1981; these are the co author. So, they found on that the improving, for improving the air quality from this status that is very poor status to relatively fair status, the consumer they gets they are interested to pay 5800 dollar per year right. So, this is how you can find out that how the consumers or families basically for home.

So, how the families they are interested to increase the status of their air quality from the status of poor air quality to the fair kind of air quality. So, this is how the HP method is helpful in find out in finding out; what is the value of particular environmental parameter for the consumers or for the individuals.

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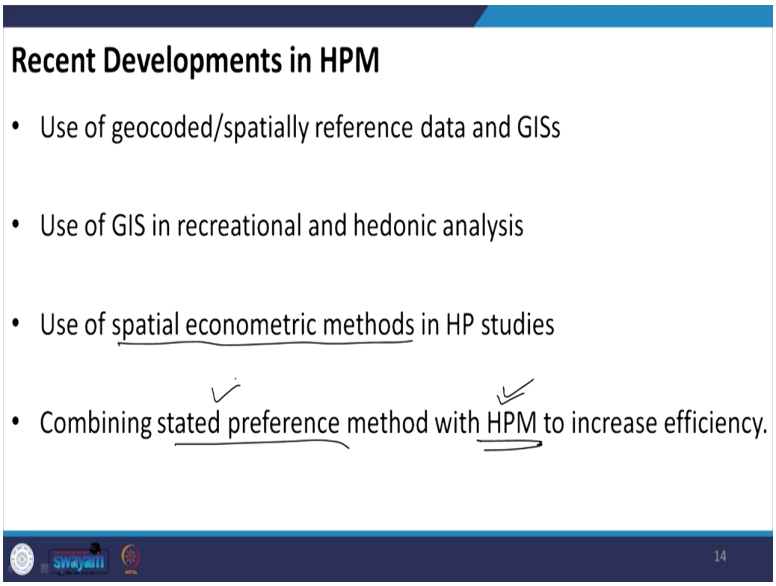

So in this context, we have some developments in the hedonic pricing modeling itself. So, earlier we are not using this geo coded data; right now this geo coded data is available after the improvement of the geographical information sciences. So, now a days the literature or the applications are based on this data; that is geo code and spatially reference data and we are also using a spatial econometrics.

So, earlier we are using the statistic; the different estimating like your statistical statistics or econometrics like your regression, generally we are using this kind of methods in finding this hedonic price modeling, but right now we are also using spatial econometric methods. So, that is again the additions or a improvements in the hedonic price modeling and we are also finding some literature that is also related to the combination of stated preference, as well as this revealed preference that is hedonic price method.

So, earlier we are only focusing on hedonic pricing method that is purely based on the revealed preference method. And you know what is the provision and concept of hedonic

pricing method and that is why right now we are using this hedonic pricing method and also the stated preference method like contingent valuation or your choice modeling we can use combined so that the efficiency can be increased in the applications. So, these are the recent developments in the hedonic price method.

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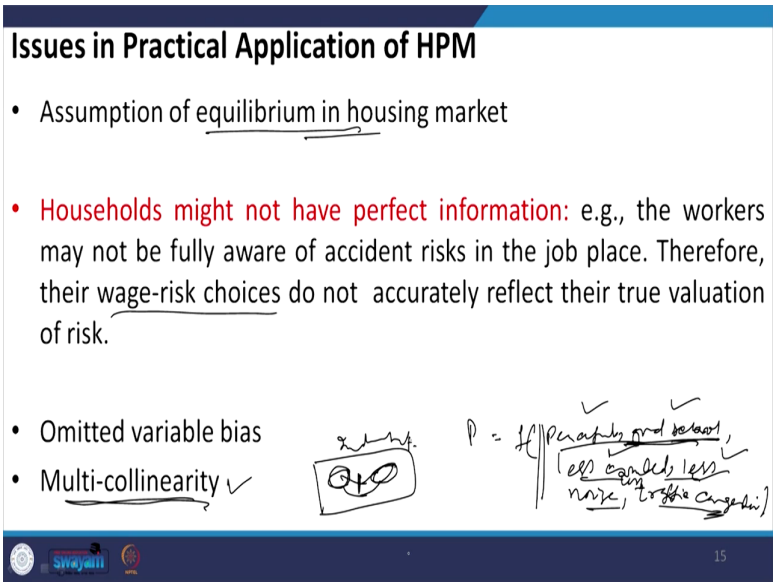

So, what are the different issues that we are facing in applying this hedonic pricing method? So, first thing is that when was a; when we are deriving this hedonic price function what we assume that there is a equilibrium in the pricing marketing, that is housing marketing prices. So, this is and again whether the equilibrium is there or not in the housing market you can (Refer Time: 28:57); you do not know even. And the second limitation of this hedonic price method is lack of perfect information.

Households may not actually have perfect information on particular housings right and their prices or even if it is related to the wage differences; then households or the workers may not

be fully informed about the risks from different jobs and how these the risk is actually covered or is reflected in terms of increased wages.

So, they may not know even; they do not know what kind of risks they will be facing in a particular job. So, therefore this wage risk choices do not actually reflect in the very valuation of risk by those workers and another limitation of this hedonic express method is the omitted variable bias. So, what is that when you are talking about; when we are talking about the hedonic price function we said these are the a function of set of variables; maybe your structure, maybe the environment may be other things, but exactly what would be the different variables under each of the vectors is very difficult.

So, there is very likely that we may omit some of these variable under each of these vectors. So, in that case it will be biased; so estimation will be biased one, so it can also happen. And another thing is that this hedonic price modeling; it may suffer from the multi collinearity problem. And again I just want to remind that we are using different statistics; statistical method and econometric method in order to measure this hedonic price model right. So, this file applying these, hedonic price method we may suffer from the multi collinearity.

So, let us talk about what is multi collinearity? When the variables under the consideration they do have correlations right. And here these are the independent variables, when the independent variables they are having certain correlations and we are taking both these variables; then we are suffering from issues econometric issues which is known as the multi collinearity.

For example, you can say we are talking about the property price is a function of right; peaceful area right. Then you are talking about good school, then you are talking about less crowded, then we are also talking about less noise and we are also take into account traffic, less traffic jam congestion right.

So, now analyze for good school generally good schools are located in a peaceful area, in a less crowded area, in a less noise area, in a less traffic congestion area, but you are taking all these variables which are having its correlations right. So, here we need to be very careful that

what kind of variables we are taking into account in a single vector; whether they are very related or not. So, that is what there is a challenge and this hedonic price, pricing model it may be prone to the multi collinearity issue this is an econometric issue.

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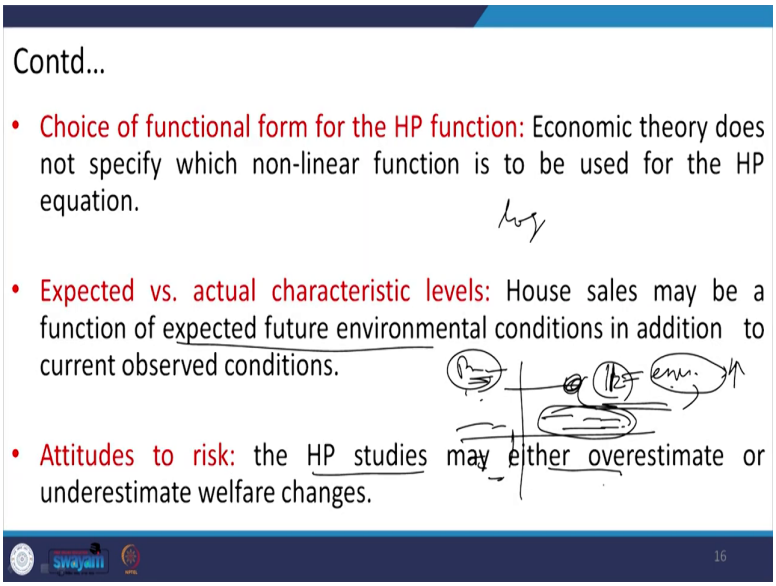

An another a limitations we can also have that is the choice of functional form of HP function that how to find this hedonic price function? Because it is not likely to have a linear function; it will be non-linear function, but again under this non-linearity which kind of nonlinearity right?

So, the literature say that we can talk about the logarithm functions right; it is generally used, but exactly we need to be very careful about taking into account the functions especially. Another limitations can be the difference between the expected acted characteristic levels of those properties that we are taking that you are considering and actual characteristics of the properties that we are considering. So, what may happen that house sales may be a function of

expected future environmental conditions right, but this expectant future environmental conditions; they are not reflected so; that means, it is not observed.

So, while finding out this hedonic pricing function, you may not be able to take those object conditions. So, in this case this estimation of your functions would be a biased one. So, what is expected future environmental conditions? That may be the property dealers, they know that is some kind of policies are there because of which after 2 years or after 1 year in the very environmental attributes would be changed.

So; that means, the environmental attribute is going to be improved, but when collecting your data on these because we need to collect so many data level for finding this hedonic price functions. But even you cannot actually observe this changed environmental variable right, but actually the property dealers, they do know and the consumers they also know about this policy that after 1 year, this these are the likely environmental changes going to happen in this particular locality.

And that is why there will be their choice is reflected in terms of increased property prices, but the variables will be lacking here because these variables are the object variables; we may not get the object data for this. So, in this case it will be we will we can get a biased results because which one is to be taken into account, which characteristics attributes whether it is expected attributes that is proposed; that will be happening after 2 years or 1 year and what is the; what is the actual characteristic that is observed over year right now.

So, another limitation would be attitude to the risk and some may be; a some consumers they are actually the risk taker and some are risk avoider. So, in that case the hedonic price studies; it may either over overestimate the welfare changes or it can also underestimate the welfare changes right. So, that is all about if you doing pricing functions and how we need to be careful in implementing this hedonic price pricing method. And what kind of data and what kind of stages, we need to actually go through for finding this hedonic pricing functions.

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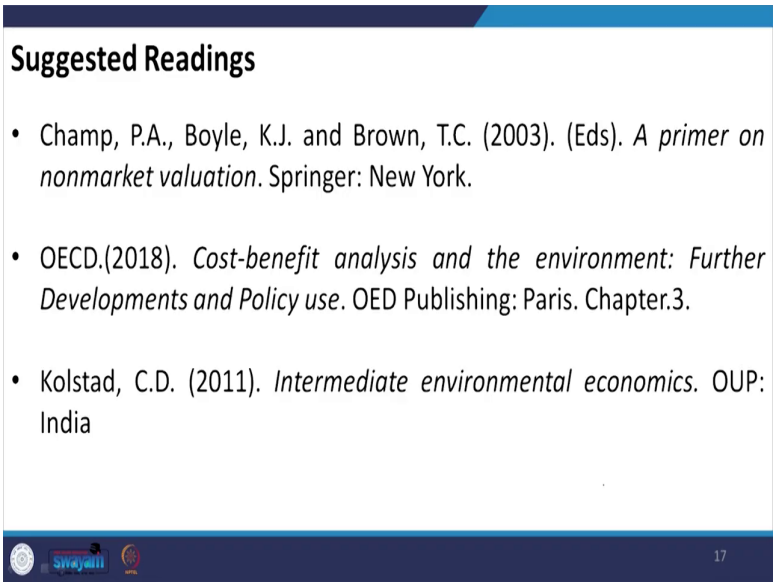

So, these are the basic suggested readings that you can follow.

Thank you very much.