Exploring Survey Data on Health Care Prof. Pratap C. Mohanty Department of Humanities and social Sciences Indian Institute of Technology, Roorkee

Lecture - 34 Random Effect Model in Healthcare

Welcome friends once again to my NPTEL Mooc module on Exploring Health Care Survey Data. We are in the seventh week of explaining panel survey data. This is the lecture meant for the random effect model.

In the previous lectures, we explain very clearly understanding the fixed-effect model in health care. Without explaining further details in the previous lectures, I think it is time for the random effect model it is based on the distribution of the panel data and usually, there are different forms of data in cross-sections we have different forms you need to taste whether it falls under fixed effect model or under random effect and accordingly we take the appropriate decision.

The random effect model is important because of its drawbacks to the fixed effect model. One of the drawbacks of the fixed effect model is its value to identify any components of beta corresponding to the regresses that are time-invariant for a given individual,

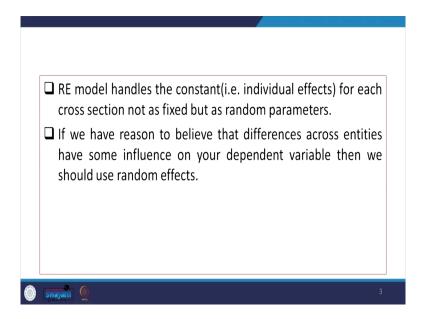
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	Random Effect Model (REM)
	\Box A drawback of the fixed-effect model is its failure to identify any components of β corresponding to regressors that are time-invariant for a given individual.
	Assumption
	> In the random effect model, the individual-specific effect is a random variable that is uncorrelated with the explanatory variables $[cov(\alpha_i, X_{it}) = 0]$.
	\Box It is assumed that α_i are random factors, independently and identically distributed over individuals and hence treated as error term.
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so, the beta which is actually also, having issues of time invariance are actually not discussed correctly, in the earlier model. so, accordingly, we take off the estimation of beta based on the time component. So, there are assumptions of the random effect model the assumption here is that the individual-specific effect is a random variable that is of course, uncorrelated with the explanatory variables.

Hence the covariance of the covariance between alpha I and the X it the explanatory variables are actually equal to the covariance is equal to 0. so, it is assumed that alpha i are random factors independently and identically distributed over individuals and hence treated as the error term of the distribution.

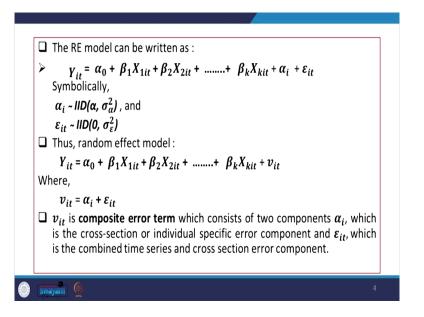
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so, we will also, combine those alpha components in the error term while estimating the random effect model. That is going to be shown in our slide.

The random effect model handles the constants that are the individual effects for each cross-section not as the fixed component but rather as a random parameter. If we have reason to believe the differences across entities have an influence on your dependent variable, then we should use random effects. Instead of a fixed effect.

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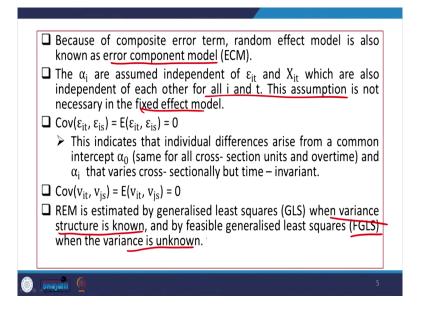


The standard model of random effect is presented here that is the dependent variable is with i Y it is equal to the constant term, with the beta coefficients and its explanatory variables.

And at the end we have two components, that is the alpha i component and the error component. so, both are we have already said that they are actually independently and identically distributed. so, alpha is distributed with its mean alpha and standard deviation, sigma square. And the error term is actually distributed within its mean 0 and standard variance.

Thus, the random effect model can be actually composed of this error term. Since they are independently and identically distributed. so, the alpha i content and the error term both the components are actually capsuled with vit, and the rest we are going to estimate. so, vit is in fact the error term that is presented here.

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And that consists of two components as alpha i and epsilon it, which is the combined time series and cross-section error component.

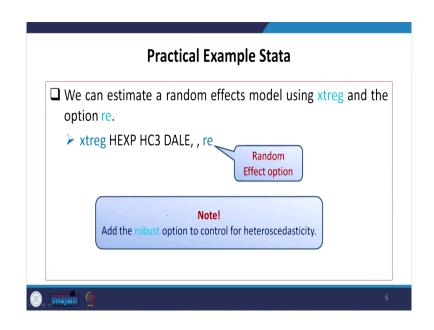
Because of the composite error term, the random effect model is also, known as the error component model. This is also, known as the error component model. In short, it is called ECM, alright. And the alpha i are assumed as independent of their term and the X it which are also, independent of each other. For all i as well as all t component this assumption is not necessary for the fixed-effect model. so, this is how it is different as compared to the fixed-effect model.

so, the covariance of alpha i t and alpha i is equal to alpha i_t, and the covariance of epsilon i t and the epsilon s the is nothing but equal to 0 and we indicate that the individual difference arises from a common intercept that is alpha naught is same for all cross-sections, cross-section units and also, over time. And the alpha varies cross-sectionally, but not by time or time-invariant.

so, the covariance after composing both this term error with its time component error with its cross-section component. so, the covariance of vit and v j s is equal to v i t and v j s should equal to the expected value. Basically, when we find out the covariance, we take the expected value of these two are actually equal to 0 or is equal to 0. so, the random effect model is estimated by a generalized least square technique in sort called GLS.

When variance structure is actually known that is one of the important aspects. When the distribution is known, then we explain it through the GLS model and by feasible generalized least square technique as well inside that is called an FGLS when the variance is known to not know. so, there are two approaches one is when variance is known and when variance is not known and accordingly GLS or FGLS models are actually used. We are also, going to show you practical explanations using the given dataset.

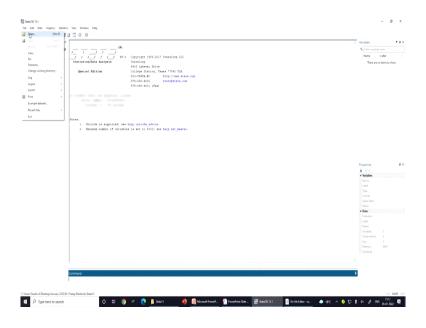
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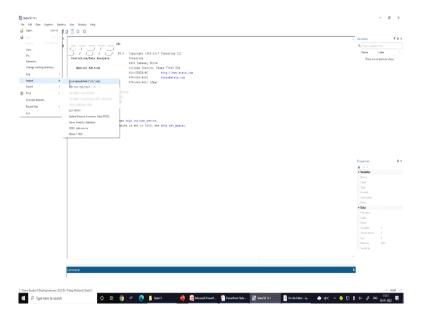
We will first estimate the random effect model using the command xtreg command xtreg with the options we will give it as re random effect and then we will find out whether that actually fits or not,

so, we will go to the practical session, alright. Now here is our Stata.

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And we will all so, use the same w h o data, which we already experimented in the previous lecture.

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Now we are all so, giving you the details.

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so, this is our result and now, you can see the model is actually significant and the implications impact of each of the components is defined and its level of significance are, also, defined you can easily read between the line. And these are positively linked to the dependent variable, so, and I am not explaining much I have already explained earlier in our previous lecture.

Now, another aspect is that you can also, add the robust option to control for the heteroscedasticity. If there is any, technique wanted to go for to check this heteroscedasticity better to run with the robust option.

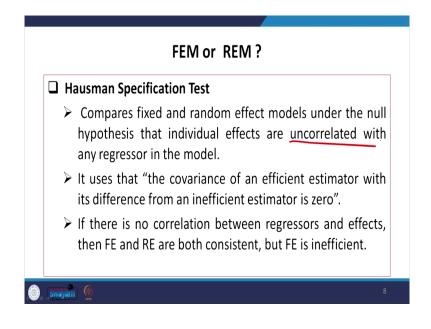
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This is the one we have already derived on your screen and I have already explained this and similarly all those variables, and interpretations also, we have attached here for your reference; similar approaches we did it in our previous lecture.

Another aspect is that the difference across units is actually uncorrelated with the regress so, rs. That is also, important. so, the this is mentioned here on the screen, you can see that this is assumed to be 0 as per the random effect model,

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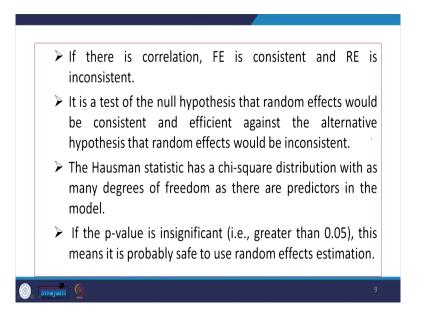


so, the rest interpretations are perfectly fine and you can easily do it. Now we are going to clarify whether our data is going to be interpreted with a fixed-effect model or a random effect model, or we cannot just take randomly with any of the models.

so, we need to specify with a test called Hausman; Hausman Specification Test. This compares fix effect and random effect models under the null hypothesis that individual effects are actually uncorrelated with any regression in the model, so, that is it it's very clearly spelled and we already said, they know individual effects are uncorrelated with the regress so, r. It uses that the covariance of an efficient estimator with its difference from an inefficient estimator should be 0.

If there is no correlation between regress so, rs and effects then fixed effect and random effect are both consistent, but the fixed effect is in fact inefficient.

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If there is a correlation, then FE is consistent. Therefore, RE is not suggested to be applied. It is a test of the null hypothesis the random effects would be consistent and efficient against the alternative hypothesis, that random effects would be inconsistent the Hausman Test has a specific chi-square distribution with as many degrees of freedom, and as there are predictors in the model.

If the p-value is insignificant; that means, the assumption is not rejected. If insignificant; means, if it is greater than 0.5 as per the standard practice of 0.05 this means it is probably

safe to use the random-effects model. so, since the assumption is that coefficients are not systematically distributed differences in coefficients are not systematic.

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so, now it is not rejected. if it is since the assumption is that it is not systematic; that means, it may follow randomness in the relationship with correlation covariance is going to be 0.

Now, this is not rejecting; that means, it is it in this case in our result also, we can check these are the command you can easily see I will also, operate with it, we will first go by the xtreg with fixed effect, then we will estimate and store that fixed effect result. We will store it then we will go for the random effect model, then also, we will store then we will check Hausman Test.

this is how it is followed you can have a check it is here. Now we have this first we will run with once again with a fixed effect with the same data set.

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Then we will we can this is the fixed effect result and we have already interpreted this, and earlier and you can check you can store this fixed effect result estimate store fixed with the name fix we have given. Then we will run the random effect model and we also, store it store with the name random and we have stored it then we have run the Hausman Test.

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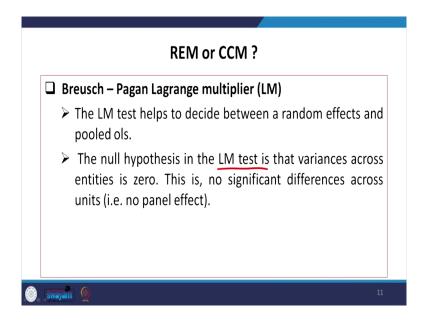
Hausman Test is the most suggested instrument to check the difference,

Now, you can see that your hypothesis is that it should not be systematic, the difference in coefficients is not systematic, so, systematic means it follows a certain order, not systematic means it is having certain randomness, alright.

Now it is saying that the randomness is this not in fact violate rejected. Because of the p values, you can see the p-value is of value 0.3061; that means, it is greater than that of 0.05. it is not rejecting this model is not rejecting the null hypothesis; that means, it says that it is in fact nonsystematic.

The covariances are expected to be 0 therefore, it is suggested to go for a random effect model, instead of a fixed effect. Had it been the fact that it is this p-value is significant it is always suggested to go for your, always suggested to go for a fixed-effect model, alright. Now we can see here and these are all presented on your screen even though I have clarified using this screen,

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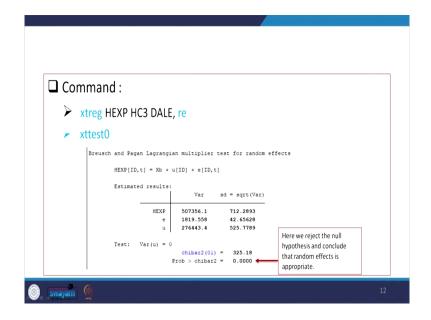
so, let us move to another comparison, the constant common model as compared to the random effect model.

one of the tests that are important in this case which is frequently used by the researcher is called the Breusch-Pagan Lagrange multiplier, in short, it is called the LM test, LM test helps to decide between a random effect and a pooled OLS. so, pooled ols which we have already said for CCM Constant Common Multiplayer or model. In that case, we have a comparison in

this particular segment that is the null hypothesis, in the LM test is that likewise, we did for the Hausman test here also, certain there are certain null hypotheses.

This suggests that variance across entities is 0. Variances across entities are 0, this is a no significant differences across units, so, across units, there are no significant differences; that means, there is no panel effect, alright. That is the assumption if it is violated then accordingly, we can take the decision.

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Here is the command like you will you have to go with the xtreg, then random effect then the next text is xttest0. Here this gives you the idea that here the level is significant p-value is significant, this suggests that we reject the null hypothesis and conclude that random effects are in fact appropriate.

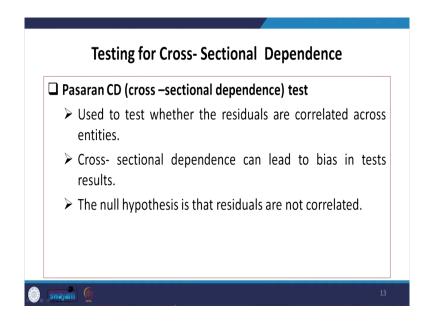
Based on a likewise assumption it suggests that the variance across entities is 0 and no significant difference across units, but here you are saying it is rejecting that one, and accordingly we take the decision. This is what you can also, check it we have kept everything over here, so, this is the one we have run it on your screen and you can just have a lot, alright and here is the level of significance and since it is significant.

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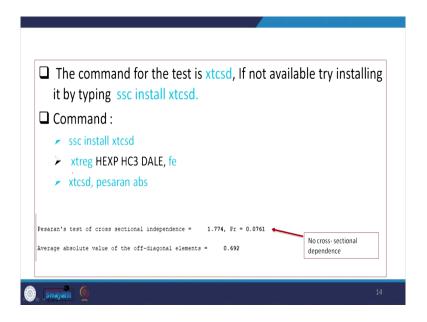
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so, we suggest that you should go for a random effect model instead of C M 1, alright.

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Then it comes to understanding whether they occur in a cross-sectional dependence. It might be the case that the cross-sectional units are also, dependent on each other. so, for that Pasaran CD or cross-sectional dependence test C D in short. This test is used whether the residuals are actually correlated across entities. The residuals we have are actually expected to be correlated, then cross-sectional dependence can lead to bias in test results. so, the null hypothesis suggests, that residuals are not correlated. (Refer Slide Time: 18:44)



if they are correlated then we have to make the decision accordingly. Like here our, p-value the probability value for it actually, suggests that it is having a value of 0.0761. Now we can see that there is no cross-sectional dependence. Because of its level of significance and the command for this test is xtcsd, alright if not available, then we need to actually install it by typing ssc install xcsd. so, that you can do it on your own it is on the screen xtcsd.

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	IIC3 135.8857 20.52200 4.76 0.000 79.99140 191.7859	PUETHE	PUETHE
	DLE 18.04506 6.044045 2.90 0.003 6.119754 29.95030 cons -1260.687 305.9721 -6.12 0.000 -1860.391 -640.9924	GDPC	COPC
		LCOMP	LCOMP
	algma_u 525.72889	LDALE	LDALE
	signa + 42.656376	LHEIP	LHDP
	the .99346101 (fraction of variance due to u_1)	LHC	LHC
		LPOPDEN	LPOPDEN
	. #16#10		HENUMBER
		Properties	
	Breuech and Papan Lagrangian multiplier test for random effecta	* Variables	
	HEM(10, t) = X0 + u(10) + e(10, t)	Narra	
	MEXF(10,1] = AB + U(10) + #(10,1)	Label	
	Estimated (esuits:	Tax.	
	Var e6 = agrt(Var)	Format	
		Value label	
	HESP 507354-1 712-2983	Notec	
	e 1019.559 42.45428 u 276443.4 525.7789	* Data	
	0 276463.4 525.7789	Label	
	Test: Var(u) = 0	Label	
	chiber2(0) = 325.18	Verables	
	Prob > chiber2 = 0.0000		
			31,266
	- end of do-file	Memory	644
	#73 of 90*11#	Sorted by	ALLY OIL
		1	
	Command		
	install store		

(Refer Slide Time: 19:44)

	3 1 0 0		
ev T#X	R-eqi (be per group)	Variables	1
l iter commands here	ar.sg: cos per group: within = 0.2455 #in = 5	A litervasabi	
Command _rc	between = 0.4972 avg = 5.0	Nove	Label
import excel "C/User/Sta	overall = 0.4862 max = 5	10	0
do 'C/Usen/S70010-1/A	Wald ch12(2) • 69.69	Country	Country
do "C//Jser/S7J010-1/A do "C//Jser/S7J010-1/A	#aio Coli(2) = \$9.59 Coll(0,1,X) = 0 (assumed) Frob - 0.5000	COMP YEAR	COMP VEAR
do "C/User/STUDIO-11A		HEXP	HEIP
le "C//ben/S7000-1A.		HCI	HCI
lo "C//User/S70010-11A	HEXP Coef. Std. Exr. z P-(z) [954 Conf. Interval]	DALE	DALE
lo "C/User/S70010-1/A	IIC3 135.0457 20.52208 4.76 0.000 79.59348 191.7599	SMALL	SMALL
le "C/User/S70010-11A	DALE 18.04306 6.044045 2.98 0.003 6.139254 29.45038	GN	GINI
install stood 199	_ccns +1260.687 305.9721 +4.12 0.000 -1960.391 +660.9924	TROPICS	TROPICS
		POPDEN	POPDEN
	n 1gma, u 535.72889 n 1gma, e 42.656276	PUETHE	PUETHE
	Tho	GDPC	GDIPC LCOMP
		LOALE	LOALE
		LHEIP	LHDP
	. stlest0	LHC	LHC
	Breusch and Pagan Lagrangian multiplier test for random effects	LPOPDEN	LPOPDEN
		WENUMBER	THRIVUMBER
	$REXP(1D, \tau) = XB + u(1D) + v(1D, \tau)$	Properties	
	Estimated results:	8.11	
	Var ad = agrs(Var)	* Variables	
		Norre Label	
	HEEP 507356-1 712-2093 e 1019-558 42-45428	3,94	
	226443.4 525.7799	Format	
		Value label	
	Test: Var(u) = 0	Noter	
	ch(her2(0)) = 335.10 Frob > ch(her2 = 0.0000	* Data	
	I.C. COTALE - CARA	Label	
		Notes	
	end of do-file	Variables	
	. Install stord	Observations	165
	. Instal a scenario instali is unreconized	Sat	31,266
	r (1999)	Memory Sorted by	64M ID YEAR
			0.1047
	Connand	1	
	dec [natal1 stord		

you need to install it and we can take the help of this,

ssc install xtcsd ssc, alright.

(Refer Slide Time: 20:02)

ev T#X		 Variables 	τ.
Filter commands here	Wall chil (#) 69.69 corr(u_1, X) = 0 (assumed) Prob > chil = 0.0000	A Litervarab	
Command Jrc	COLUMN TO A CONTRACT AND A CONTRACT A CONTRACTACT A CONTRACTACT A CONTRACTACT A CONTRACTACT A CONTRACTACTACTACTACTACTACTACTACTACTACTACTACTA	Nove	Label
import excel "C//User/Sta		0	0
do "C/Usen/STUDIO-IVA	HEXP Coef. Std. Err. z P>(z) (95% Conf. Interval)	Country	Country
de "C//Jser/S7J010~17A	813 135.8457 20.53200 4.76 0.000 79.89148 191.7999	C06.09	COMP
do "C/User/S70010~1/A	10.3 10.0150 (0.0100 k.16 0.000 k.16 1.000 k.175 1.000 k.1757 1.0000 k.1757 1.0000 k.1757 1.000 k.1757 1.000 k.1757 1.000	YEAR	VEAR
de "C/User/S70010-11A de "C/User/S70010-11A	0008 -1260.687 305.9721 -4.12 0.000 -1960.381 -660.9924	HEXP HC3	HEXP HC3
de "C//Jser/S70010~11A		DALE	DALE
de 'C/User/STUDIO-11A	signa_u 525.77889	SMALL	SWALL
de "C/(2Her/S70010-17A	sigma_e 42.656776 tho .99366101 (fraction of variance due to u i)	GN	GINI
initial stool 199	(no	TROPICS	TROPICS
os instal stord		POPDEN	POPDEN
	. xttest0	PUETHE	PUETHE
		GDPC	GDPC
	Breusch and Fagan Lagrangian multiplier test for random effecta	LCOMP	LCOMP
	$HEXF(10, 1) = X0_0 + u(10)_0 + e(10, 1)_0$	LDALE	LOALE
	when Frank	UHD/P	LHD/P
	Estimated results:	LHC	LHC
	Var #6 = sqtt(Var)	LPOPDEN	LPOPDEN
	IESEF 507356.1 712.2093	WENDWEEK	THENUMBER
	+ 1013-539 47 4522	Properties	
	275443.4 525.7785	8.11	
		* Variables	
	Test: Var(u) = 0	Label	
	chiber2(0) = 325.10 Frob > chiber2 = 0.0000	1.04	
	FLO / CLIMES - 0.0000	Format	
		Value label	
	end of do-file	Notes	
		* Data	
	. Install stead command install is unrecognized	Label	
	COMMON DEWEAR IS WITH OUR LEVEL	Label	
	. sec install stord		165
	checking stass consistency and verifying not already installed	Sa	31,266
	inetalling into c:\edo\plum\ instellation complete.	Memory	64M
	TURNET BALTON CONFILMENT	Sorted by	ALIY OI
	A second s		
	Command		
	р 		

it is, verifying not already installed so, now installation is complete. Now you can take the command and accordingly we can take the decision of running it.

(Refer Slide Time: 20:28)

r commandi hars part and "CUber/Stat. (CUber/ST000-14 "CUber/ST000-14 "CUber/ST000-14 "CUber/ST000-14 "CUber/ST000-14 "CUber/ST000-14 "CUber/ST000-14	- an install stand (notice) tool contents of workford out along (model.ed.). (notice) tool contents	Eriter variables have Narve Label D O Country Country
pot excit "C/User/Stat. "C/User/ST000-19A "C/User/ST000-19A "C/User/ST000-19A "C/User/ST000-19A "C/User/ST000-19A "C/User/ST000-19A	ndersky metad konsinenzy od verfisjog ne klendy installad Installate inter Cherginal Installation complete.	10 ID Country Country
(1/Jseri S7000 - 1/A., 'C/Jseri S7000 - 1/A.,	inexelleng uns d'indelglaut inexellentos complete.	Country Country
"C/User/S7000-19 "C/User/S7000-19 "C/User/S7000-19 "C/User/S7000-19 "C/User/S7000-19 "C/User/S7000-19		
"C/Iberi/STUDIO-IVA "C/Iberi/STUDIO-IVA "C/Iberi/STUDIO-IVA "C/Iberi/STUDIO-IVA "C/Iberi/STUDIO-IVA	. do 'C:\Deers(ST0D10-1\AppDets(Loos)\Yemp\ST0150_000000.tmp'	
"C/User/STUDIO-ITA "C/User/STUDIO-ITA "C/User/STUDIO-ITA "C/User/STUDIO-ITA	. do "C:\Users\STUDIO-1\AppDatA\Loos1\Temp\STDI570_G00000.tmp"	COMP COMP
"C/User/S7000-11A "C/User/S7000-11A "C/User/S7000-11A		YEAR YEAR
"C/User/S70010-11A "C/User/S70010-11A	streg HEAP HCS DALE, fe	HEXP HEXP
"C/Usen/S70010-1/A.,		HO HO
	Fixed-effects (within) regression Number of obs = 165	DALE DALE
"C///JHN/S70010-11A	Group variable: ID Humber of groups = 33	SMALL SMALL GINI GINI
talisted 199	R-sq: Obs per group:	TROPICS TROPICS
install stood	x.5g; uos per group: vithin = 0.2456 min = 5	POPOEN POPDEN
"C///ser/S7000-1/A	Between 60.4867 avg = 3.0	PUETHE PUETHE
	overall = 0.4956 BAX = 5	GDPC GDPC
		LCOMP LCOMP
	T(2,130) = 21.16 corr(u_1, 30) = -0.0000	LDALE LDALE
	control 1: You =	LHD/P LHD/P
		LHC LHC
	HEXP Coef. Std. Err. t Poits (954 Conf. Interval)	LPOPDEN LPOPDEN
		WBNUMBER WBNUMBER
	IC3 168-7513 36-11173 4.67 0.000 97:3003 240:194 DALE 21.00715 7.107159 2.96 0.004 6.946406 35.06782	Properties
	cons -1631.496 406.6675 -6.01 0.080 -2436.039 -826.9534	A
		 Variables
	signs_u 534.7844	Label
	aigma e 42.656276 tho .99412290 (fraction of variance due to u i)	1.04
		Format
	T test that all u_1=0: T(32, 138) = 713.25 Prob > T = 0.0000	Value label
		Notes
	. xtead, peasran abs	* Data
		Literame
	Pessran's test of cross sectional independence = 1.774, Fr = 0.0741	Notes
		Variables 37
	Average absolute value of the off-disponal elements = 0.692	Obsenations 185
	D.	Sax 31,260
	end of de-file	Memory 64M
		Sorted by O YEAR
		—
	Evenue -	
	Command	•

this is the both of these we are actually running it and we found that this is actually significant and there is no cross-sectional dependence, alright.

(Refer Slide Time: 20:41)

coe	al correlation causes the standard errors of the fficients to be smaller than they actually are and higher R-
•	ared. erial command available to test serial correlation.
	II Program
	earch xtserial
▶ r	net sj 3-2 st0039 (or click on st0039)
≥ r	net install st0039

And now this is done. Then another possible aspect is to also, check the serial correlation, because of the time component.

so, serial correlation causes the standard errors of the coefficients to be smaller, than they actually are and a higher R square is possible, we need to check. so, xtserial command is

available to test serial correlation. so, xtserial we need to search this xtserial then net sj 3-2 1and its that based on this string value of it and accordingly string since it is the variable correlation string. so, accordingly, we can do it.

(Refer to Slide Time: 21:24)

nmand (tserial HEXP F	102		
		4	
	st for autocorrelation in panel of order autocorrelation 32) = 29.524	lata	
Pr	ob > F = 0.0000	1	
	There is serial correlation		

I am just going to show it over here like this. These are the command,

basically, what I am saying we need to install the program. We need to search for xtserial then net sj 3 hyphen 2 st 0039, then we need to install that particular st 0039 on our system. then only it will work.

(Refer to Slide Time: 21:51)

7.8 ×			
	7(199):	Variables	
er commands hava		A litervariab	
ommand rc	. sao install wtosd checking stosd consistency and verifying not already installed	Nave	Label
port excel "C/User/Stu-	Consisting acoust concept and version of internet internet. (0	0
C:/Uses/S70010-1/A	installation complete.	Country	Country
"C/UHH/S70010-11A		COMP	COMP
"C/User/S70010-1%A	. do "C'UBera/STUDIO-1/Applata/Local/Temp/STD15f0_000000.tmp"	YEAR	YEAR
'C/User/S70010-11A	. NITES HEAD BCA DALE, IS	HEIP	HEXP
C/User/S70010-17A		HCI	HCI
'C/User/S7000-11A 'C/User/S7000-11A	Fixed-effects (within) regression Number of obs = 165	DIALE SMALL	DALE SMALL
C/0ser/S1000~1A C/0ser/S1000-1A	Group variable: ID Number of groups = 33	GNI	GINI
distad 199	R-sq: Obs per group:	TROPICS	TROPICS
install stood	uthin = 0.2456 an = 5	POPDEN	POPDEN
C/User/S7UDIO-11A.	between = 0.4867 avg = 5.0	PUETHE	PLETHE
	overall = 0.4555 max = 5	GDPC	COPC
	7(2,130) = 21,16	LCOMP	LCOMP
	$\Gamma(7, 150) = 21.16$ O(Tr(1, 1, 30) = -0.3967 $Fr(b > 7 = 0.0560$	LOALE	LOALE
		LHEIP	LHDP
		LHC	LHC
	HEXP Coef. Std. Err. t Po(t) [[934 Conf. Interval]	LPOPDEN	LPOPDEN
	BC3 146-7513 36-11173 4.67 0.000 97-3053 240.194		INTRO AND
	DLT 21.0715 7.107159 2.46 0.004 6.44646 35.00782	Properties	
	_cccs = -1631.496 406.6673 -4.01 0.000 -2436.039 -926.9534	· Variables	
		Name	
	ations.u 534.7844 atoms e 43.65576	Label	
	tho .9912290 (fraction of variance due to u.1)	3,94	
		Format	
	F test that all u_1=0: F(32, 130) = 713.25 Ftc0 > F = 0.0000	Value label	
	stord, peasen she	Notes	
	. Access, person or more	Liename	
		Label	
	Pessran's test of cross sectional independence = 1.774, Fr = 0.0761	Notes	
	Average absolute value of the off-dispond elements = 0.692	Variables	
	VAALADA WEGOTICA AWTAM OF ING OLT-OTADOUT WEGAWAOTA . N'PAN	Observations	
		Sax Memory	31,20£ 64M
	end of do-file		SALV OL
	Command		
	search staerial	-	
udio Al Desktog/January 2022/D			

(Refer Slide Time: 21:58)

v T # 2	1(199):	 Variables 	
Iter commands have	. seo install stood	🔦 filter variabl	
Command rc	. make immediate account of the second s	Nove	Label
mport excel "C//User/Sta	Installing Into d/kds/plust	10	0
lo "C/Usen/S7UDIO-IIA	installation complete.	Country	Country
le "C/Usen/S70010-11A		COMP	COMP
lo "C/User/S70010~1/A	. do "C:\Dsers\STUDIo-1\AppGata\LocalYemp\STD1540_d00000.tmp"	YEAR	VEAR
le "C/Usen/STUDIO-11A	streg HEOP HC3 DALE, fe	HEIP	HEXP
е "Слини/S70010-11А.,	- score more more the	HCI	HCI
e "C//User/S7U010 - II.A	Fixed-effects (within) regression Number of obs = 145	DALE	DALE
o 'C//Usen/STUDIO-11A	Group variable: ID Number of groups = 33	SMALL	SMALL
e "C//Juer/STUDIO-11A		GN	GINI
stall stead 199 scientall stead	R-sq: Obs per group: within = 0.2456 min = 5	TROPICS POPDEN	TROPICS POPDEN
c mitall stood s "C//Josen/STUDIO=11A	uitain = 0.2455 Bill = 5 between = 0.4457 Bill = 5	POPOEN	PUETHE
arch stopial	overall = 0.4856 nax = 5	GDPC	COPC
		LCOMP	LCOMP
	F(2,130) = 21.16	LOALE	LOALE
	corr(u_1, 30) = -0.3807 Prob > F = 0.0000	LHDP	LHDP
		LHC	LHC
	HEXP Coef. Std. Err. t Polt[] [954 Conf. Interval]	LPOPDEN	LPOPDEN
		WENUMBER	THENUNBER
	163 146.7513 36.11173 4.67 0.000 97.30853 240.194	Properties	
	DALE 21.00315 7.103159 2.46 0.004 6.44646 33.04382 cons -1631.446 406.4675 -4.01 0.000 -2436.039 -826.4534	8.11	
		 Variables 	
	stgma u 554.2844	Norra	
	signa e 42.656276	Label	
	tho .99412290 (fraction of variance due to u_1)	194	
	T test that all u 1=0; F(32, 130) = 713.25 F(cb > T = 0.0000	Format Value label	
	F test that all u_1=0: F(32, 130) = 713.25 Frob > F = 0.0000	Notes	
	. stood, pessren ake	+ Data	
		Label	
	Pessean's test of cross sectional independence = 1.274, Pr = 0.0741	Noter	
	Average shadute value of the off-disponal elements = 0.699	Variables	
	ALLER MONTON LETTE OF THE OFFICE STREETLE - OFFICE	Observations	165
		Sax Memory	31.20£ 64M
	end of do-file	Sorted by	ALLY OL
		South B	
	. essrók gtarial	¥	
	Command		

(Refer Slide Time: 22:00)

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veurch stoefal 🛛 🗙	
earch for steerial (manual: [#] search)	
march of official help files, FAQs, Examples, 5Js, and STBs	
50 Terting for participant Amenandmentity and accounted and 	
1-1-2 #0019 Fering for serial correlation in linear panel-data models (Delp arterial of Inselled)	
eb resources from Stata and other users	
untacting http://www.stata.com)	
peckages found (State Journal and STB listed first)	
1555 from http://www.etata-pointal.com/refuers/aj20-1 5220-1 at0552. Johnama (2015) test for areial / Johnana (2015) test for serial dorelation in / point-data models / by Rem Johnana, University of Cambridge, / Cambridge, UV / Universe Veranda, Universite de Mamer, Namer, / Delpins / Jopenni 1356545.ac.id., verandisamat.de /	
10039 from http://www.etsia-formal.com/esfwest/sj-2 3072 attobut. Testing for setial correlation in linear / Testing for serial correlation to linear pear-locks model of Vg Parid M. Doubler, Deals Corporation / Support: dirakterBeats.com / After Lansallation, type holy starenial	
terial from http://www.etata.com/seris/ddrubber sterial tetus for prial corristion in linear panel-date models / sterial superments a test for erial correlation in the iddreptrettC / errors of a linear panel-date model discoursed by Modelidge (2001). / Drubber (2001) presents stabilities refines that that sets has good size /	
har from NULLIFORNOV do Andréa Marine Son est for activities / abar 2000/ models optimus Articles Son est for activities / abar performs the Archino-Bond (1991) test for / actionrelation. The test as enginable properties for a / performance interes devenues Motor of Bonarte dynamic peel / data estimator, but is quite general in its	
teerialpm from http://fmww.bc.edu/ReFEc/bocode/x	CP NM C

now this is being searched and we will xt and next one xt 0039.

(Refer Slide Time: 22:12)

 	xa(e/a)]-]				R.	loo see - Jump to
Deckop #10339 from http://www.etata-journal.com/esf	were/#51-2				Deleg: A	to sw = _lump to
parkage #10339 from http://www.stata-journal.com/sof	wate/#5]-2					
TITUE	wate/#51-2					
5J3-2 st0039. Testing for serial correlation	n linear					
DESCRIPTION/AUTHOR(S) Testing for social correlation in linear panel by David M. Drukker. State Corporation Support: dorukterBatal.com After installation, typ help staarial	data modela					
INSTALLATION FILES #10039/#testial.ado #10039/#testial.blp	click here to install)					
ANCILLARY FILES st0035/stserial.do	click here to get)					
P Type here to search O	12 🌀 🛷 🜔 📘 9445	🏨 👼 Monself Fa. 🛛	👔 Do-file Editor 💌 Verwer - net sj	● 18°C ∧ ● 17 🚦		C#_NIM 1927 ∎

this is to we need to install it.

(Refer Slide Time: 22:16)

Lat Maany Help (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	R
e nozel at0002.pkg X	
kage installation	
KAGB INSTALLER	
<pre>imp: nam: st009.pkg from: http://www.stata-yowrad.com/esftware/s31-2/</pre>	
ržiną addžib consistency und vezifying not alzeady installed taliną uto vriubilgiust taliatino complet.	
ick have to return to the previous atreen)	

And once it is installed, yes now it is complete we can run that command.

The command is to understand the serial correlation. so, that is basically, ssc install we did it then xtrag.

(Refer Slide Time: 22:36)

ev 14:	seo install store	 Variables 	
Liber commands here	checking stamm consistency and verifying not already installed	A Litter verabl	
Command Jrc	ineraling into coludo/plue/	Name	Label
import excel "C/Uber/Sta.	installation complete.	0	0
de 'C//Jser/S70010-1/A	. do "C:\Deers\STUDIO-1\AppGuta\Loca\\Temp\STD15f0 00000.tmp"	Country	Country
de "C//JHHV/S70010-11A		COMP	COMP
do "C/User/S70010-11A	. xtreg HEXF EC3 DALE, fo	YEAR	YEAR
do "C/User/STUDIO-1/A		HEXP	HEIP
do "C//Jser/S70010~11A	Fixed-effects (vithin) regression Humber of obs = 145	HG	HC3
do "C//Jsen/S7U010-11A	Group variable: ID Number of groups = 33	DALE	DALE
do "C/User/STUDIO-11A	R-agi Obs per group:	SMALL	SMALL
do "C//Jver/S70010-1/A	within = 0.2456 min = 5	GN	GINE
install stool 199	between = 0.4967 avg = 5.0	TROPICS	TROPICS
ssc install stead	overall = 0.4956 max = 5	POPDEN	POPDEN
de "C/User/STUDIO-IIA		PUETHE	PUETHE
search storial	T(2,130) = 21.16 corr(u,1,32) = -0.3907 Frob > F = 0.0000	GDPC	GDPC
	corr(u_i, Xb) = -0.3987 Prob > F = 0.0000	LCOMP	LCOMP
		LDALE	LOALE
	HEXP Coef. Std. Err. t P>(t) [958 Conf. Interval]	LHEP	LHEP
		LHC	LHC
	EC3 160.7513 36.11173 4.67 0.000 97.30033 240.194	LPOPDEN	LPOPDEN
	DLE 21.00715 7.107159 2.96 0.004 6.946496 35.06782	WENUMBER	118112488
	_cons -1431.486 406.4675 -4.01 0.000 -2436.039 -426.4534	Properties	
	ajona u 554,2844	A	
	signa.e 42.656276	< Variables	
	tho .99412290 (frection of variance due to u_1)	Name	
		Label	
	F test that all u_1=0: F(32, 130) = 713.25 Frob > F = 0.0000	Tormat	
	. RCod, pessran abs	Value label	
	. scoret bener an ann	Notes	
		+ Data	
	Pessgan's test of cross sectional independence = 1.774, Pr = 0.0741	Liename	
		Label	
	Average absolute value of the off-diagonal elements = 0.692	Notes	
		Variables	
	end of do-file	Observations	165
		Sax Memory	51.20k
	. search reserval	Sorted by	
		- Acres 14	
		v	
	Command		
	Contano area lastali kteet3		
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(Refer Slide Time: 22:38)

м тах	checking stosd consistency and verifying not already installed	× Variables	,
iter commands have	installing into ci/ado/plus/	A Litervarab	
Command rc	instellation complete.	Name	Label
import excel "C/User/Sta	. do. "C:\Deers\STUDIO-1\AppButs\Locs\\Temp\STDI5f0.00000.tmp"	0	0
do 'C/User/STUDIO-IIA		Country	Country
le "C/User/S70010-1/A	. xtreg HEXP BC3 DALE, fe	C0849	COMP
lo "C/User/S70010-11A		YEAR	VEAR
lo "C:/Usen/S70010~11A	Fixed-effects (within) regression Number of obs = 145 Group variable: ID Number of groups = 33	HEIP	HEXP
e "C//0sen/S70010-19,A	ntonb Astrectsi the homeset of diorbs - Yr	HCI	HC3
e "C//Jsen/S7U010~1%	R-aq: Obs per group:	DIALE	DALE
*C/Usen/S70010-11A	vichin = 0.2456 min = 5	SMALL	SMALL
C/User/S70010-11A	between = 0.4967 avg = 5.0	GN	GINI
tall stool 199	overall = 0.4856 max = 5	TROPICS	TROPICS
cirotall stead	7(2,130) = 21.36	POPDEN	POPDEN
e "C/User/S70010-11A arch starial	r(x,130) = x1.16 corr(u,1,35) = -0.3967 Frob F = 0.0000	PUETHE GDPC	PUETHE
install intest3		LCOMP	LCOMP
C PROFEERINGES		LOALE	LOALE
	HEXP Coef. Std. Err. t Po(t) [554 Conf. Interval]	LHEIP	LHEP
	RC3 166.7513 36.11173 4.67 0.000 97.30033 240.134	UHC	LHC
	NC3 146-7513 36.11173 4.67 0.000 97.30853 240.194 DOLT 21.03157 7.107159 2.96 0.024 6.94645 35.04782	LPOPDEN	LPOPDEN
	008 -1631.496 405.6675 -4.01 0.000 -2436.039 -826.8534	WENUMBER	HENUMBER
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	tho -99412290 (fraction of variance due to u_1)		
	F test that all u_1=0: F(32, 138) = 713.25 Frob > F = 0.0000	Label	
		5,94	
	. xtced, pesaran abe	Format	
		Value label	
	Pessran's test of cross sectional independence = 1.774, Fr = 0.0761	+ Data	
	anantau a caur or cross secritors fundamentes - 11148 ar - annuar	Liecame	
	Average absolute value of the off-disponal elements = 0.682	Label	
		Notec	
		Variables	
	end of do-file	Observations	165
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	. eso install sttest3	Sorted by	ID YEAR
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	Command		
g host			0 CP N

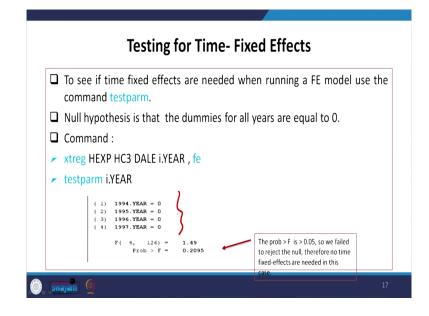
we need to compare this three.

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tw.	τ×	. search stae	rial						 Variables 	,
	0								A Liber variable	les have
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do "C/User/STUDIO-1/		. streg litty	BC3 DALE, fe						YEAR	VEAR
lo "C!/Usen/S70010~1/		Timed-effects	(vithin) reg	rression		Number o	t cha -	165	HEUP	HEXP
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terch staterial						1(2,130)		21.16	GDPC	GOPC
sciental strend		corr(u_1, XD)	 -0.3901 			BLOD > 1		0.0000	LCOMP	LCOMP
rowg HEXP HC3 DALE, N									LDALE	LOALE
tetl		REXP	Coef.	Std. Err.	e	P>151	1954 Conf.	Interval]	LHEIP	LHDP
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		00.0		405.6675		0.000	-2436.039			interventer.
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		sigma_e rho	42.655276	(frection					Name	
		rno		(11952300	of verie	nce die to	2.0		Label	
		7 test that a	11 u_1=0: F13	12, 130) = 71	3.25		Prob >	7 = 0.0000	1 ₀₁	
									Format	
		sttest3							Value label Natur	
		. xttest)							+ Data	
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		in fixed effe	rt regression	model					Label	
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		80: signa(1)*	2 - 41gba*2 f	for all 1					Variables	
		ch12 (33) =	1.1e+07						Observations	
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									Sorted by	ID YEAR
									×	
		Command							4	

now we have got the result on your screen you can see that these 3 steps you have to follow and everything is on your screen. Even we have also, kept all those things systematically now, xtserial the 2 variable we have taken, and now basically, this is also, called as Wooldridge test for autocorrelation in panel data, autocorrelation in panel data And the hypothesis is that there is no first-order autocorrelation and since it is significant; that means, there is a serial correlation, and a first-order serial correlation exists in the data.

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so, now this is the one to see if time-fixed effects are needed when running a, fixed effect model, we need to use the command testparm. based on that serial correlation we can identify whether there exists serial correlation or not. The next one is to understand whether it has a certain time fixed effect or not. the command standard command we take is called testparm. the null hypothesis in this context is that the dummies for all years are equal to 0, the dummies that are taken for all the years of the dummy are actually equal to 0. so, the command is in fact we have taken here as i dot is the dummy. For a year all the year's dummies are equal to 0.

so, testparm i dot year we have taken and based on that we can see that the probability value p-value is greater than point 0.05, we will also, see that. so, in this case, we know we fail to reject the null hypothesis. Therefore, no time fixed effect is needed in this case, you can also, check it with the data this is presented in our do file as well.

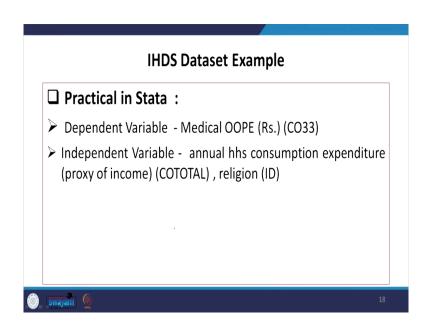
here is the do-file you can draw the do file, to understand the time fixed effect.

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ev Tax		 Variables
Eiter commands have 0	Timed-effects (within) regression Number of obs = 165 Group variable: ID Number of groups = 33	🔧 Eitter variables beer
Command rc	oracle astraction in the interest of diodia - 12	Name Label
import excel "C/User/Stu	R-sqi Obs per groupi	10 10
do "C?/Usen/STUDIO~I/A	within = 0.2796 min = 5	Country Country
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do "C/User/S70010-11A	overall = 0.4937 nax = 5	YEAR YEAR
do "C!/Usen/S70010-11A	7(6,126) = 0.15	HEP HEP
do "C//Jser/S70010-1/A	corr(u_1, Xb) = 0.3017 Prob > F = 0.0000	HO HO
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do "C//Isen/STUDIO - II.A., do "C//Isen/STUDIO - II.A.,		SMALL SMALL GN GN
ee Crisensistero PA	HEXP Coef. Std. Err. t Po(t) [954 Conf. Interval]	TROPICS TROPICS
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us install streat	YTAR	LCOMP LCOMP
NTHEY HEAP HE3 DALE, 14	1594 -1.950019 11.34773 -0.17 0.844 -24.44643 20.54639 1595 8.561033 13.43488 0.42 0.533 -10.54785 35.66592	LDALE LDALE
ited	1955 8.54603 13.48880 0.62 0.533 -16.54785 35.48992 1656 34.0254 16.22159 1.40 0.140 -0.366134 57.01644	LHEIP LHEIP
do "C/User/STUDIO-11A	1997 36, 19734 20, 36468 1, 76 0, 081 -4, 529452 76, 90413	LHC LHC
		LPOPDEN LPOPDEN
	_cons -716.3045 607.2339 -1.10 0.240 -1918.002 485.3933	WENUMBER WENUMBER
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	Tho .99301403 (fraction of variance due to u_1)	* Variables
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	F(-4, -124) = -1.49	Variables 37
	Prob > F = 0.2005	Obsenshors 185
		5av 31.204
	end of do-file	Memory 64M
	422 of 00-174	Sorted by O YEAR
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on) Studio Al Desktog (January 2022)	h. Protog Migherth (Statal S	CP NM

And so, we find that we can see in the result that it is not significant. so, there is no time-fixed effect, in the model, alright. And time-fixed effects are needed in this case.

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Therefore, we can ignore that and it is not necessary to run further.

After saying all those basic or important steps in the random effect model. we have guided the, with guided with the help of the W H O balanced data example data set. You can al so,

run on your own through the IHDS dataset example data set, we have already uploaded to your screen.

And that is given with the name practical in Stata. The dependent variable is medical out-of-pocket expenditure and which is in rupees and the independent variables are given as annual household consumption expenditure, which is a proxy of income and then religion etcetera, religion is the ID variable.

You can just check this I am not experimenting we have already given everything on your folder and for your EG operation, we are keeping this data set for you to understand random effect health care random effect panel data in health care.

so, these are all here for you we lo forward to your participation in the next class.

Thank you.