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**EE 406 Final report**



**Thailand PCI : Overall electricity consumption index and analysis of Covid19**

**From**

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**Presented to**

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**Introduction**

Firstly, considering the issue of household electric consumption in Thailand it has been considered as a vital consumption for the public. Moreover, it is a fixed cost that people who live in their residence must pay or it can be called an unavoidable cost. To explain, overall electricity cost depends on the household power energy usage which can be used for a variety of functions, including cooking, lighting, and electrical equipment usage. Then this report will draw some relation issues that COVID19 may have partial impacts to the change in electricity consumption behaviour of people. For reasoning, the usage fee of electricity consumption may increase according to the COVID19 pandemics because citizens tend to not be able to go outside due to the effect of pandemic and government lock down policy.

Equally important, in Thailand the electronic consumption is also growth related with the growth of economics as well. In 2017, Thailand's residential sector utilized 23.01 percent of the country's total power. As the economy grows, it continues to rise from 32,799.46 GWh in 2011 to 44,373.96 GWh in 2017 which represents an approximately 35.29% increase from the year 2011 to 2017. Electricity consumption increased around 5.2% per year from 2011 to 2017, and if we compared with other countries : China and Indonesia. Their power consumption on electricity also increased as well. As a result, Thailand must keep track of its household energy consumption. A survey of each household energy consumption is adopted regularly to detect the current usage and quantity demanded analysis which can be used further to determine the home sector's potential for energy savings. Then for overall Thailand's electrical market the state-owned Electricity Generating Authority of Thailand (EGAT) is responsible for generating, transmitting, and retailing electricity, and also generating capacity accounted for 33% of Thailand's total generating capacity as of the end of 2019 which dominates Thailand's energy market. As Transmission System Operator (TSO), EGAT is responsible for maintaining the transmission system's supply and demand balance, as well as controlling and administering all electricity generated in provincial areas by power plants connected to its high-voltage transmission lines and high-voltage substations. EGAT is the sole company that can buy and sell wholesale power to other companies.

Lastly, this paper will adopt several indicators including economics indicators which rely on the PCI (Private consumption index) on electricity consumption. Then the report will draw the relationship between this indicator with the google trends and COVID19 analysis with the regression interpretation. For the overall data, the paper randomly selects several keywords for running the regression analysis. To clarify, firstly we use ไฟบ้าน as a key word because it should be related with the main indicator due to its similarity of meaning. Then we also apply เปิดห้าง because in the COVID-19 we believe and relying on the information from other researches that if people stay in house due to lock down regulation the expense on electricity consumption will rise so many people should search this keyword for staying outside and save their energy or electricity consumption in their houses. For the third keyword, the word ค่าไฟ is being applied because every people might concern about the cost of electricity consumption so they might about this cost and its derivation. Next, we use ล้อคดาวน์ เดินทาง which it has some similarity aspects to our second keyword as in the COVID-19 period the majority might concern about their energy consumption in households so they prone to decide to save their energy usage by going outside for working and staying outside as well ,and people might need to consider for their traveling method related to the period of Covid-19. Moreover, during the lockdown period overall countries' energy consumption may decline because several industries or companies may close which lead to the reduction of overall electricity consumption usage. Then moving to the ไฟฟ้า keyword we believe that overall individuals will wonder about this word including types and cost which can link to next keyword (คำนวณค่าไฟ) because the majority of people may confuse about energy consumption cost calculation so they will attempt to save their energy usage as possible which may need some calculation methods to consider. Furthermore, in the period of the epidemics people might be substantially concerned about their energy consumption in households due to lock down situations which involve higher cost of electricity consumption. Then moving to the keywords from electricity appliances that we use include เครื่องใช้ไฟฟ้า พัดลม แอร์ (air conditioner) กระจก it is because I considered that in scope of Thailand people in every household requires the electricity appliance for households or family usage. Hence, we decide to put these keywords to be the alternative indicators.

## **Literature review**

Considering the literature review, in this paper it will provide some research related to the electricity consumption index with some information about COVID19. In this part, it will mainly introduce other researches by explaining the 3 main categories : research methods, sub-topics ,and datasets. Moreover, 15 researches will be applied in this part to strengthen this report by adopting several global articles for predicting and analyzing their methodology and datasets in various ways.

### **Literature related to datasets**

- Relying on the research from Mehmet Bulut which is Effects of New Normal Life on Electricity Consumption in Covid-19, it adopts the electricity demand units in GWh in Turkey as a dataset. Then after evaluating this research it lacks the explanation of household energy consumption details which may help to supplement the accuracy of research.
- A survey of the electricity consumption-growth literature from James E. Payne. Many theories related with the causal link between electricity consumption and economic growth with the inclusion of a review of the empirical literature. The data includes a chronological list of literature on the causal link between electricity consumption and economic development by nation, time range, and other related factors.
- The relationship between GDP and electricity consumption in 10 Asian countries from Sheng-Tang Chen, Hsiao-IKuo, Chi-ChungChen is being adopted. It uses both single data sets and panel data processes to evaluate the correlations between GDP and power consumption. The single data sets can indicate the directions of 10 Asian countries ,but the usage of Panel data will provide a deeper direction. There is a unidirectional short-run causation running from economic growth to electricity consumption and a bi-directional long-run causality running from electricity consumption to economic growth in the ten Asian nations.
- The article which called How did the German and other European electricity systems react to the COVID-19 pandemic is being selected from StephanieHalbrügge, PaulSchott,

Martin Weibelzahl Hans, UlrichBuhl Gilbert Fridgen, MichaelSchöpf as an authors. It aims to analyze the reaction of German and Europe electrical sectors toward the hitting of COVID-19. It presents data visualization and descriptive statistics on parameters for the transformation in the power grid ,and the research begins by focusing on Europe and describing the many external shocks that occurred during the COVID-19 epidemic. Then it also concentrates on Germany and examines the resulting endogenous consequences.

- The Global Changes in Electricity Consumption During COVID-19 article is being used. It believes that electricity usage can reveal how society will react in the future or other catastrophic events. It gathers information related to the change in electricity consumption of 58 regions globally from January to October 2020. Furthermore, it also provides time series data of the altering in the electricity consumption for improving the research efficiency and scale as well.

### **Literature related to methodology**

- The effects of the COVID-19 pandemic on the Brazilian electricity consumption patterns article is being used. Overall the study examines the impact of mobility-related physical distancing measures on energy consumption trends in the Brazilian energy system and its direction by Joinpoint software at the period of January to May 2020. This is because it indicates that the impact of COVID-19 tends to have partial impacts on electricity consumption patterns for people. Its methodology relies on statistical analysis methods which include the usage of the Joinpoint Regression Program, version 4.8.0.1. Data on daily energy use were aggregated into weeks which the temporal unit used was one week (7 days). Furthermore, the weekly percentage change or WPC was derived to perform the hypothesis testing for ensuring the validity of data by adopting confidence level ,and it is able to form a regression as well.
- The next paper adopts the impacts of the COVID-19 lockdown on energy consumption in a Canadian social housing building article. Overall, it attempts to evaluate the impacts

of COVID-19 during the lockdown period because people need to stay home during this period which may lead to the shifting in household electricity consumption in Canada. Moreover, the research attempts to answer two questions which are 1. Did the lockdown result in changes in overall energy consumption? 2. Did the lockdown result in changes in consumption patterns ? For the methodology, it aims to check for the shifting of energy consumption so it sets the control period to compare or assess with the COVID19 period. The control period spans from March 2019 to February 2020 which also enables us to observe the weather conditions as well. To explain, the weather conditions can lead to the shifting in people's consumption behaviour. Then it also obtains other time periods to be controlled (such as using all 4 years of data that preceded the lockdown or only using the spring seasons of previous years) as datasets. Furthermore, to answer these 2 questions above, the paper states the hypothesis that due to the lockdown it would lead to an increase in the household energy consumption ,but it may reduce peak demands energy consumption usage instead because if people go to work the energy consumption in certain periods may be significantly high. Hence, for a data-based comparison of energy-related behavior before and during the lock-down, various indications are required. This includes several formulas for calculating which afterward these results will be tested for validity by using P-value as main criteria.

- The article called Impact of homeowner's behaviours on residential energy consumption in Bangkok,Thailand is being adopted. This study looks at homeowners' energy-saving habits and attitudes in Bangkok, and analyzes the effect of household energy conservation. Field surveys are conducted in 400 Bangkok houses to examine socioeconomic characteristics, real saving behaviors, and electric devices usage. An in-depth examination of residents' saving behaviors impacted by age, gender, monthly income, and degree of energy-saving knowledge is undertaken in this study to acquire a better understanding of residents' energy-saving behaviors and their impact on household energy conservation. Furthermore, it also aims to estimate the energy-saving performance based on resident behaviors. Then after gathering the data or information, it comes up with the calculation on the household energy consumption. The study relies on the Latin Hypercube method for generating saving situations for energy calculation as well.

- For the next article that this research will clarify is Canadian Electricity Markets during the COVID-19 Pandemic (initial assessment), overall using accessible data, this study explores the impact of the coronavirus disease 2019 (COVID-19) pandemic on the electricity markets in a few Canadian regions. Next, focusing on its methodology it computes a fixed-effects regression that accounts for predicted trends in power demand and supply throughout each period with the temperature impacts. Moreover, to account for expected trends in power consumption at different temporal scales, the set of dummy variables is included for calculation and analyzing methods as well.
- The article which called Determinants of household electricity consumption in South Africa from Yuxiang Ye, Steven F. Koch, Jiangfeng Zhang is being used. To estimate the drivers of home energy consumption, this study integrates data from South Africa's latest Income and Expenditure Survey with data from the National Energy Regulator of South Africa. For the methodology, it assumes that the price of an item or service, as well as the consumer's income and tastes, all influence demand which it comes up with  $Y=f(p,I,F,D,H)$  equation. Moreover, the econometric model being used in this research for taking into account the presence of houses with no electricity consumption expenditure in the data. However, it merely considers households that are able to access electricity.

### **Literature related to sub-topics**

- Household electricity end-use consumption: results from econometric and engineering models from Bodil Merethe Larsen and Runa Nesbakken. In this research, it focuses on two main approaches. The engineering model, which has been used to generate the only recorded Norwegian end-use findings based on data from a Norwegian energy survey, is the first way. The second method is an econometric conditional demand model applied on data from the same survey. Then it will compare the numerical findings of the two models and provide some recommendations.

- Characterization of the household electricity consumption in the EU, potential energy savings and specific policy recommendations from Aníbalde Almeida, PaulaFonseca, Barbara Schlomann, Nicolai Feilberg are being used. It indicates that during the last ten years, household power usage in Europe rose by 2% every year. The power consumption is mostly driven by information technology and entertainment loads. The report offers policy suggestions for market transformation and behavioral improvements in equipment selection and operation.
- The determinants of household electricity consumption in Taiwan: Evidence from quantile regression from Wen-Hsiu Huang article is being adopted. The drivers of home energy use in Taiwan from 1981 to 2011 are investigated by using quantile regression. The impacts of demographic, socioeconomic, and household housing variables on household electricity consumption vary between quantiles and fluctuate over a period, according to our findings. Electricity consumption was greater in households with a higher income, a bigger family size, and more older members. Then the strategies for lowering electricity usage should target certain people who consume the most power. On the other hand, an interesting issue is being discovered that low-income and small-size homes may consume more power per capita.
- Relying on the adoption of The Impact of the COVID-19 Pandemic on Electricity Consumption and Economic Growth in Romania article, the impact of the COVID-19 epidemic on economic development and energy consumption is examined in this article, along with the hypothesis of the impact of this consumption on Romania's gross domestic product (GDP). It performed an analysis of the evolution of several indicators for 2007–2020, a comparison of their behavior during the financial crisis and COVID-19 crisis. Furthermore, it empirically explores the relationships between GDP and electricity consumption and other components by using time series on monthly electricity consumption and quarterly GDP with the multi-linear regression model as well.
  - Lastly, COVID-19 and household energy implications: what are the main impacts on energy use article is selected. The effects of COVID-19 on home energy usage are investigated in this study. Some of these effects are linked to longer-term changes in energy consumption, while others may just be transient or

changing in a temporal period. The samples collect from 352 households and focus on primary energy usage in three periods: before the pandemic , during the COVID-19 epidemic and lockdown, and after the lockdown. Moreover, home energy usage is divided into several categories: transportation, cooking, entertainment, heating and cooling, lighting, etc. Lastly, this research will further contribute to larger-scale research on analyzing home energy use/demand during health emergencies and crises, such as a pandemic as well.

### **Research Gap**

Compared to other research that we conducted, this study will primarily focus on the keywords from Google trends related to electricity consumption and Covid-19. In overall example research, many researchers do not take into account purely on the effect of Covid-19 on households electricity consumption. Hence, it may lack these related datasets and variables that could affect this issue. However, in terms of my research it may not be able to adopt several calculation methods because of the lack of some datasets. This is because in this paper it will focus mainly on the linkage or connection between the set of alternative indicators with the primary indicator. Lastly, since we aim to focus on the impact of COVID-19 on energy consumption, the time period may not be long enough.

### **Data and Research methods**

#### **Overall data**

The paper will utilize the data and information of the Private consumption index from BOT in the category of Household electricity consumption Index. This index will be used as a main indicator, and it will be used to link with keywords data from google trends with the period range from 2015 to 2021. This is because in this range period it will be able to draw the relationship between both variables to analyze their connectivity, and it can be used to interpret and analyze the impact of Covid-19 on Household electricity consumption as well. Moreover, if we consider the electricity consumption in households, it is increasing over a period significantly which may imply that people become careful about electricity consumption, and we also observe that the electricity usage in households reaches a peak during the summer period. Next, considering the overall keywords in our dataset the paper adopts 10 main keywords to look for the connectivity of data by looking at their R-squared. Firstly, we use ไฟบ้าน as a key word because it should be related with the main indicator due to its similarity of meaning. Then we also apply เปิดห้าง because in the COVID-19 we believe and relying on the information from other researches that if people stay in house due to lock down regulation the expense on electricity consumption will rise so many people should search this keyword for staying outside and save their energy or electricity consumption in their houses. For the third keyword, the word ค่าไฟ is being applied because every people might concern about the cost of electricity consumption so they might about this cost and its derivation. Next, we use ล็อคดาวน์ which it has some similarity aspects to our second keyword as in the COVID-19 period the majority might concern about their energy consumption in households so they prone to decide to save their energy usage by going outside for working and staying outside as well. Moreover, during the lockdown period overall countries' energy consumption may decline because several industries or companies may close which lead to the reduction of overall electricity consumption usage. Then moving to the ไฟฟ้า keyword we believe that overall individuals will wonder about this word including types and cost which can link to next keyword (คำนวณค่าไฟ) because the majority of people may confuse about energy consumption cost calculation so they will attempt to save their energy usage as possible which may need some calculation methods to consider. Furthermore, in the period of the epidemics people might be substantially concerned about their energy consumption in households due to lock down situations which involve higher cost of electricity consumption. Then moving to the keywords from electricity appliances that we use include เครื่องใช้ไฟฟ้า พัดลม แอร์ กระจก it is because I considered that in scope of Thailand people in every household requires

the electricity appliance for households or family usage. Hence, we decide to put these keywords to be the alternative indicators.

### **Methodology**

Next, considering the research method or working process firstly after obtaining the keywords its data in terms of statistics data from January 2015 to October 2021 is being collected. Secondly, after gathering the data we need to use it to compare the connectivity of the primary data which is household electricity consumption PCI. In this method, we need to compute mean and standard deviation of each data set strictly for making our data become normalized because to create effectiveness of primary data and overall keywords comparison the data sets must be normalized by using excel as a tool. Thirdly, after normalization of data we will compute the data analysis order in excel for computing the regression. However, the running process must be performed separately. To explain, we need to match and compute each normalized data keywords with the households PCI separately or individually to obtain each connectivity relation. Then after computing each regression data set the summary outputs will obtain several numerical results including r-square, hypothesis testing, sample, and adjusted r-squared. Then after running a pair of both primary and alternatives indicators datasets. The usage of Stata will be used as well because the excel has limitations on running several indicators simultaneously so Stata will be the choice for coming with a set of regression numerical results. Moreover, after running Stata we will obtain the OLS or ordinary least squares which will be able to assess the significance of each data and be able to interpret the correlation of our conventional data with the primary data as well. To conclude, the regression outputs will be explained in the part of results along with overall numerical data from summary outputs as well.

## Result analysis and discussion

For the result analysis part, it primarily relies on the summary outputs that are performed through the Stata program and the usage of excel for normalizing each alternative indicator. Moreover, the graph derivation from excel will be interpreted as well. Considering the OLS result, the table will be portrayed in the appendix part. Firstly, we use 5 sets of alternative indicators which are announced in the OLS because after running separately 13 datasets in the excels, the keywords or alternative indicators results are not significant and not correlated based on the level of T-stat and R-squared. Hence, we select 5 keywords which are more correlated to run in the Stata program. The keywords that includes in the Stata are normalized data of ไฟบ้าน เปิดห้าง พัดลม television ขนส่ง along with the one conventional data which is normalized data of PCI(Private consumption index) of households electricity consumption. When considering the results in summary outputs, we found out that 2 of 5 alternative indicators are significance which are พัดลม and ขนส่ง with the T-value of 8.49 and 4.70 respectively. This means that พัดลม and ขนส่ง is related or having several impacts on the households electricity consumption ,and it means that the hypothesis by using these alternative data for explaining or analyzing the impacts towards the electricity consumption PCI is valid. Next, considering the issues related to electricity usage on Covid-19 after running separately data analysis in excel we found out that the keywords including lock down ล็อคดาวน์ โควิด เปิดห้าง may not directly correlate with the PCI of electricity consumption in Thailand. However, it might not be totally not related because it might have an error in terms of the comparison of time period. To clarify, the Covid-19 occurred in 2019 to present which our period that we collect PCI data is from 2015 to 2021. Hence, it might have the mismatch in time period as well.

Moreover, we also come up with the graph from google trends which compare between 2 electricity appliances keywords including แอร์ & พัดลม. It shows that overall trend is similar in every consecutive period which may able to indirectly interpreted for overall household electricity consumption due to the significance of พัดลม from the OLS. Next, we also use normalized data in excel performing graphs to look for some variable trends as well. Lastly, we

come up with the R-squared of 76.39% from these 5 datasets. This can be interpreted as 76.39% of x or the set of the alternative indicators can be explained approximately 76.39% on Y or PCI of electricity consumption in Thailand which quite fit in the regression model.

For the advantages of these methods, I believe that we can identify the people's behaviors or point of their interest by analyzing the overall electricity consumption in our country. Moreover, in terms of government they might be able to capture the citizens interest over a period as well. Moreover, even some alternative indicators cannot be explained and not perfectly related to the ordinary data, focusing on its trend it may be indirectly involved as well. For the limitation, I considered that the datasets should be extended including the sample of keywords. Moreover, we cannot directly interpret the data of COVID-19 keywords to match with the household consumption of electricity which we already indicate that it might occur because of the differential in data available. Lastly, we consider that another limitation is that the result of some alternative indicators in OLS are not significant.

### **Conclusion and policy recommendation**

For the conclusion, overall the research primarily relies on the methods of regression or performing OLS ordinary least squares to interpret the significance and validity of the alternative indicators, and to ensure the presence of the hypothesis as well. Moreover, the research scope on keywords related to electricity from google trends in Thailand from 2015 to 2021. Then we also provide 15 researches which relate to the electricity usage in many countries which enable us to indicate the research gap. The research gap related to the calculation method that this paper may not be able to calculate because of the availability of datasets. Moving to the research methods key finding, this paper attempts to indicate the connection between each datasets and trends by using google trends, excel, and Stata program. These programs are being used to obtain the datasets results.

For the policy recommendations, this paper came up with three main suggestions. Firstly, the government may come up with the promotion of google trends. This is because the government aims to analyze the impact of these keywords on the information of electricity consumption PCI on the BOT. They might focus on choosing this platform to satisfy their needs, in which the government will be able to capture citizens' points of interest in each period. Next, for the second suggestion, the government should adapt these datasets for developing the saving of electricity or energy consumption. To explain, the government may come up with a policy for focusing on the installation of the technology or look for the adoption of new technology for reducing the cost of energy usage in each household. Moreover, they might improve Research and Development for making the electricity consumption become more efficient. To strengthen the suggestion, from the google trend of electricity in Thailand it has increased significantly over the period which means that citizens primarily focus on these issues for every generation. Lastly, I suggest that the government should support the poor or provide subsidies. To explain, especially in Covid-19 citizens might be confronted with the increase in the households electricity cost because during the lockdown many people need to work from home, and their family may need to perform the studying via online session. Moreover, staying home during the lockdown period, the increase in the usage of electricity appliances is unavoidable. Hence, the government should provide subsidies to each household.

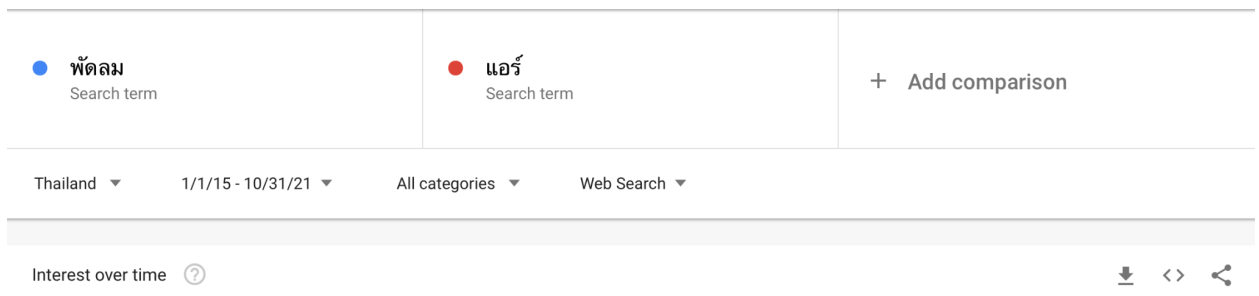
Moving the future improvement for this research, I considered we need to solve some limitations first. To explain, we may need to rely on some calculations which analyze further

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impacts of Covid-19. Moreover, in terms of Covid-19 impacts we consider that analysis in a similar period may become more efficient ,and other approaches with other alternative indicators sets are required for making the paper become more efficient and accurate. Then for further improvement I considered the google mobility index may be somehow related to the usage of electricity and Covid-19. Hence, this index may need to be exposed or take into account to strengthen the findings and results in the paper.

## Appendix

### Google trend graph between พัฒน์ แอร์ keywords





The regression equation from excel of 5 alternative indicators separately which will being used in Stata program

The summary output of ไฟบ้าน

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.59255822							
R Square	0.35112525							
Adjusted R S	0.34301432							
Standard Err	0.81054653							
Observations	82							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	28.4411452	28.4411452	43.2903575	4.5024E-09			
Residual	80	52.5588548	0.65698568					
Total	81	81						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-1.207E-15	0.08950989	-1.348E-14	1	-0.1781304	0.17813036	-0.1781304	0.17813036
Normalize of	0.59255822	0.09006073	6.57954083	4.5024E-09	0.41333167	0.77178478	0.41333167	0.77178478

The summary output of ไฟบ้าน

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.59255822							
R Square	0.35112525							
Adjusted R S	0.34301432							
Standard Err	0.81054653							
Observations	82							
<i>ANOVA</i>								

### The summary output of พัฒน

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.82400662							
R Square	0.67898691							
Adjusted R S	0.67497425							
Standard Err	0.5701103							
Observations	82							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	54.99794	54.99794	169.211024	1.9568E-21			
Residual	80	26.00206	0.32502575					
Total	81	81						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-1.139E-15	0.06295815	-1.81E-14	1	-0.1252907	0.12529071	-0.1252907	0.12529071
normal	0.82400662	0.06334559	13.0081138	1.9568E-21	0.69794488	0.95006836	0.69794488	0.95006836

### The summary output of ขนส่ง

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.71941387							
R Square	0.66755632							
Adjusted R S	0.65257705							
Standard Err	0.69890931							
Observations	82							
<i>ANOVA</i>								

### The summary output of television

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.26931646							
R Square	0.07253136							
Adjusted R S	0.060938							
Standard Err	0.96905211							
Observations	82							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	5.87503996	5.87503996	6.25628548	0.01441651			
Residual	80	75.12496	0.939062					
Total	81	81						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-1.155E-15	0.1070139	-1.079E-14	1	-0.2129645	0.21296446	-0.2129645	0.21296446
normal telev	-0.2693165	0.10767246	-2.5012568	0.01441651	-0.4835915	-0.0550414	-0.4835915	-0.0550414

### The OLS from Stata

Source	SS	df	MS	Number of obs	=	82
Model	61.8797421	4	15.4699355	F(4, 77)	=	62.30
Residual	19.1202566	77	.248315021	Prob > F	=	0.0000
Total	80.9999987	81	.999999984	R-squared	=	0.7639
				Adj R-squared	=	0.7517
				Root MSE	=	.49831
normalizhh~a	Coefficient	Std. err.	t	P> t	[95% conf. interval]	

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- panelJeanRouleauLouisGosselin, A. links open overlay, JeanRouleau, LouisGosselin, Highlights•Energy use in a residential building was compared before and during COVID lockdown. •At the beginning of the lockdown, & AbstractThe COVID-19 pandemic hit societies in full force in 2020 and compelled people all around the world to change their lifestyle. The time spent at home significantly surged during the pandemic and this change in occupancy can have a direct impact on. (2021, February 12). *Impacts of the COVID-19 lockdown on energy consumption in a Canadian social housing building*. Applied Energy. Retrieved December 17, 2021, from <https://reader.elsevier.com/reader/sd/pii/S0306261921001124?token=48BAB51199637939D31F4D3EA71810D896615BB8F5C8F45FD00C1F6AFD5BA65DADBBC3468B7D25DC721C748E8866D25C&originRegion=eu-west-1&originCreation=20211130184243>
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