

Impact Analysis of COVID-19 using Alternative Indicators

EE406 1/2021 Assignment 4

Group C

INTRODUCTION to *COVID-19*

- Was found firstly in Thailand on 13 Jan 2020.
- Due to rapid spreading, in February, Thailand had announced how dangerous it is.
- This pandemic caused a huge impact on economic growth, poverty and middle-low income group.
- the number of domestic consumption, tourism and supply chain disruption has decreased.
- Moreover, the third wave of pandemic might not be alleviate until 2023.



SOURCE of DATA



Twitter



Apple Mobility Index



Google trends



Sentiment Index



Nighttime light

METHODOLOGIES: *Nighttime light, Apple Mobility Index, Sentiment Index*



Nighttime light index and Apple Mobility Index

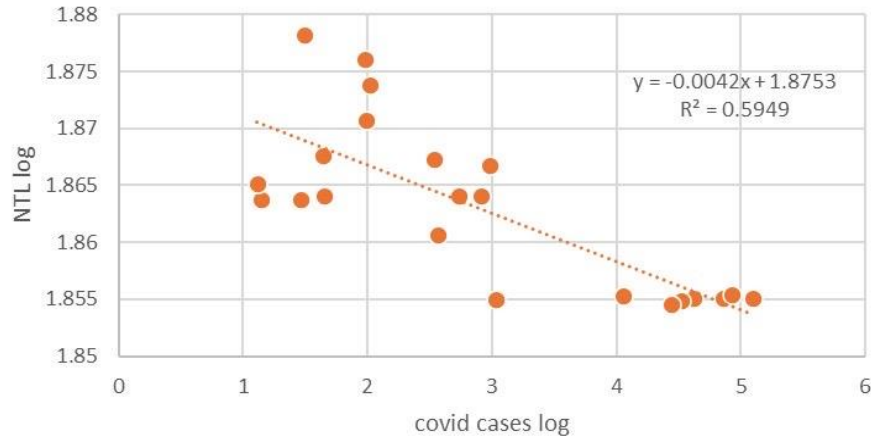
1. Retrieve data from Apple mobility and Nighttime light website
2. Retrieve data of Covid-19 cases
3. Select the range of data that will use to analyze. In this case is Jan 20 - Oct 21 for COVID-19 period.
4. Take log of all data to do regression analysis of both Covid-19 case with Apple mobility index and Covid-19 cases with Nighttime light of 4 provinces (Bangkok, Chonburi, Chiangmai and Phuket).
5. Analyze the outcome.

Sentiment Index

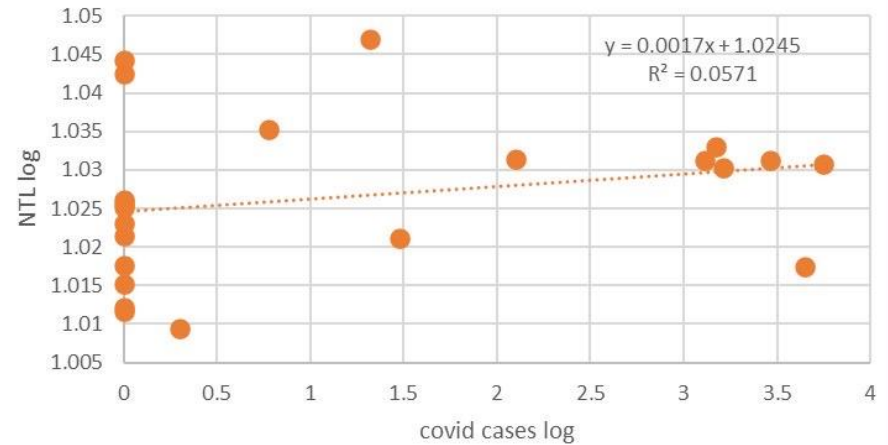
1. Retrieve data from twitter
2. Select criteria data ,and import into Rapidminer
3. Analyze the outcome

TASK 1: COVID-19 and Nighttime Light (January 2020 - October 2021)

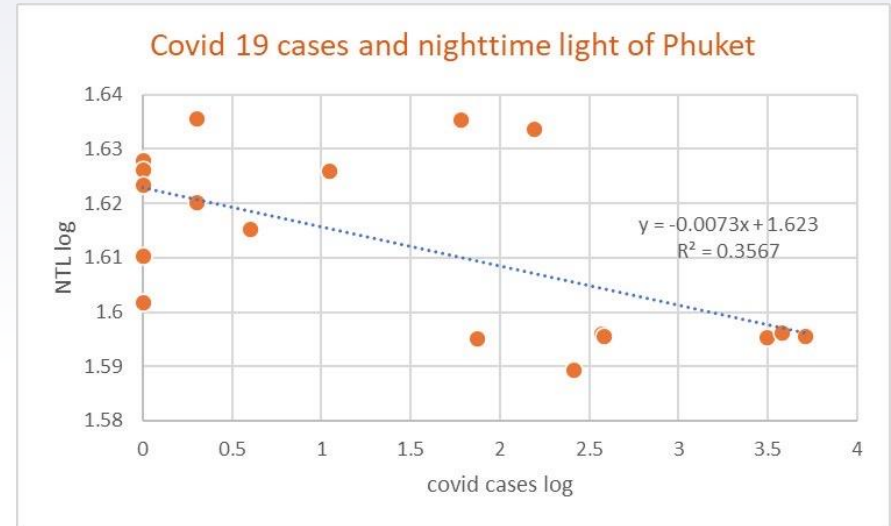
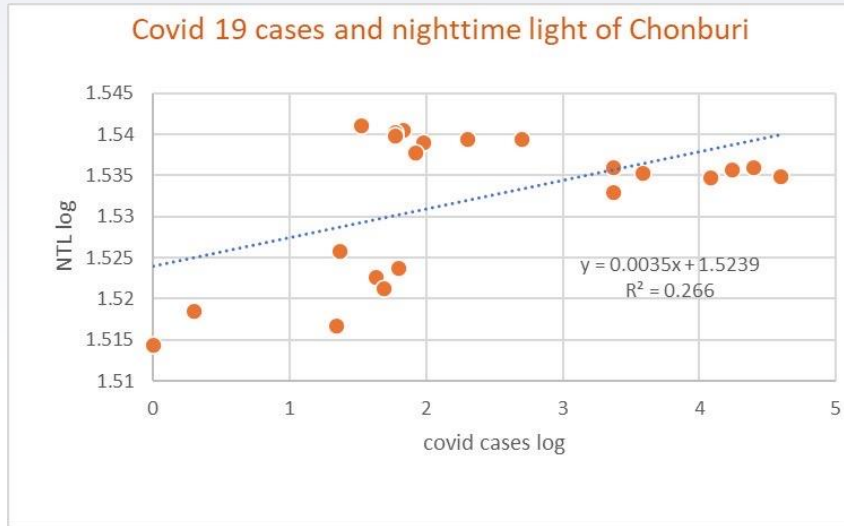
Covid 19 cases and nighttime light of BKK



Covid 19 cases and nighttime light of Chiangmai

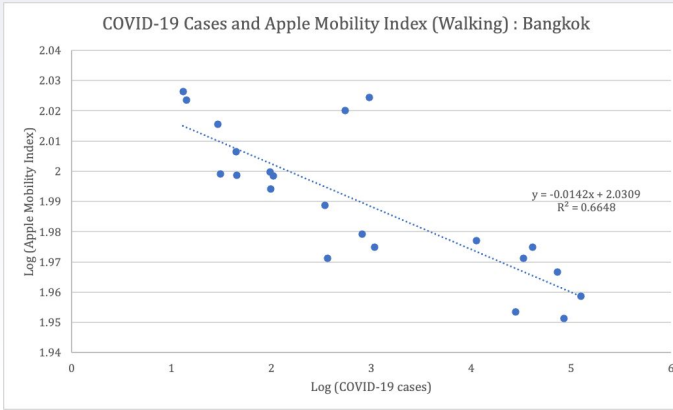
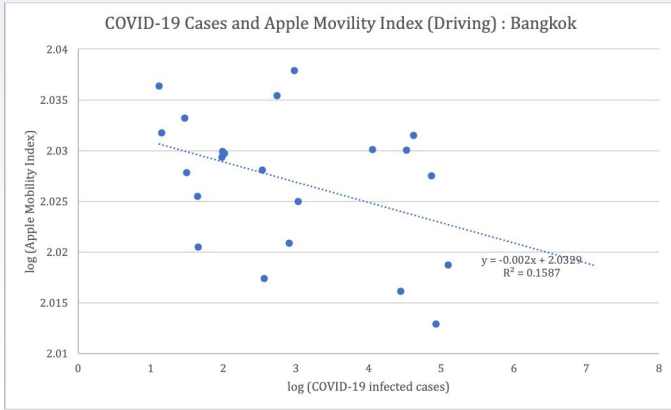


TASK 1: COVID-19 and Nighttime Light (January 2020 - October 2021)



- The R square is low which can be implied as Nighttime light cannot be used to predict the COVID19 cases or the result will not be accurate.

TASK 2: COVID-19 and Apple Mobility Index (January 2020 - October 2021)

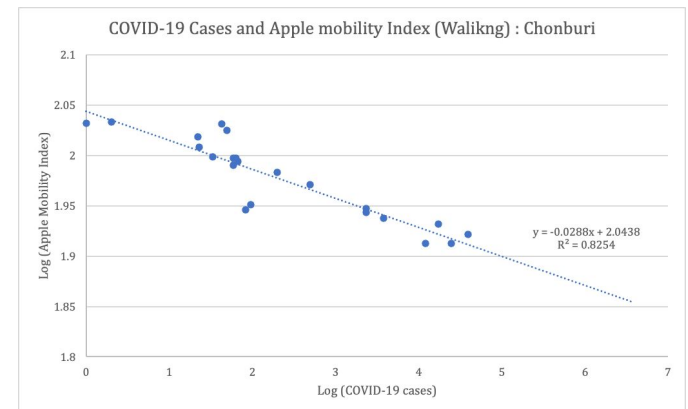
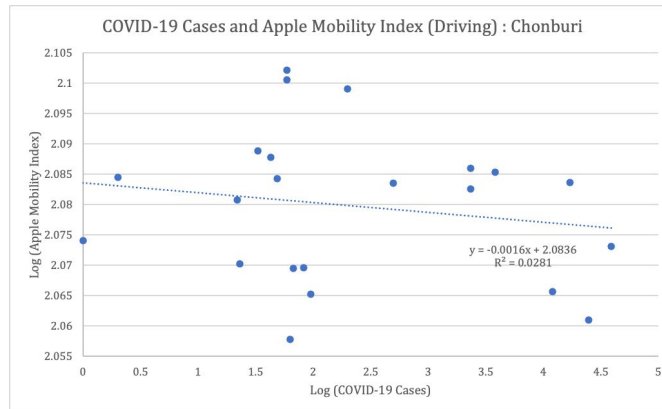


BANGKOK

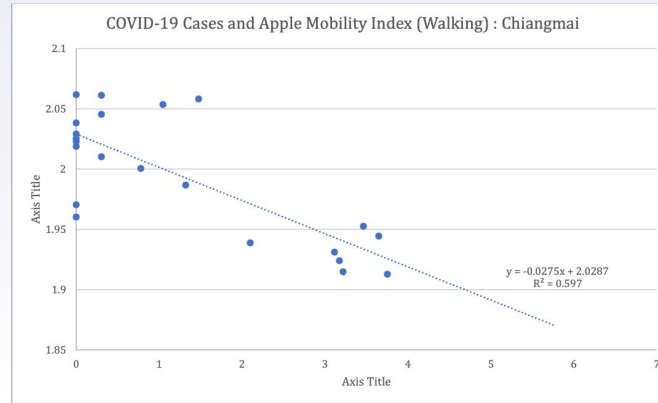
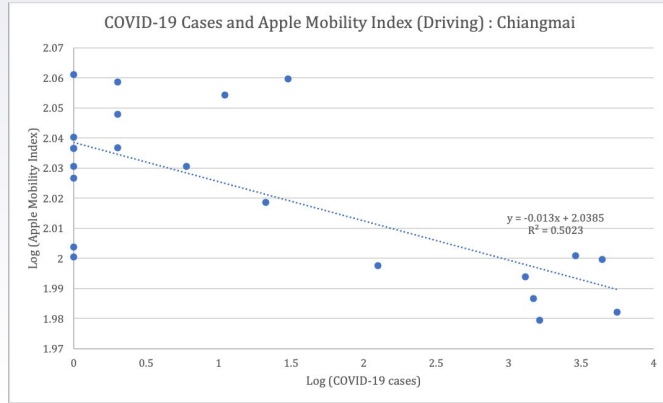
R-square of driving is not much compared to walking. Showed that it has less correlation between Apple mobility index and Covid-19 cases.

CHONBURI

R-square of driving is drastically lower than walking. Apple mobility index for walking has high correlation to the Covid-19 cases.



TASK 2: COVID-19 and Apple Mobility Index (January 2020 - October 2021)

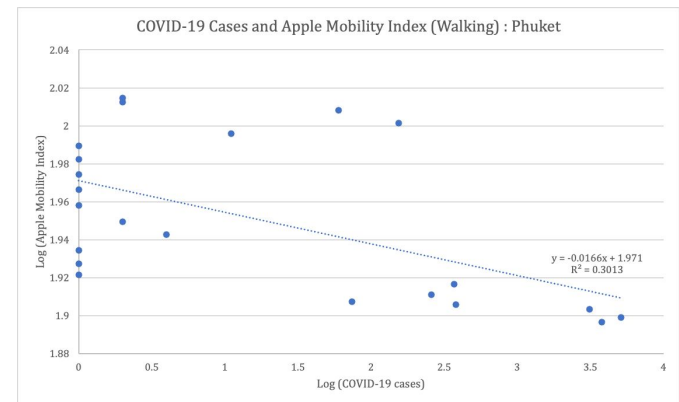
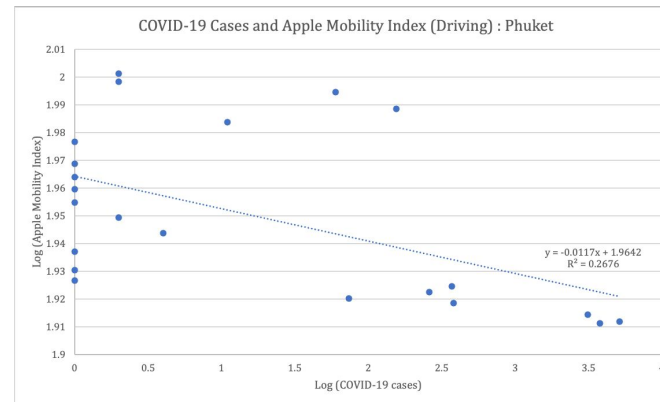


CHIANGMAI

Results of R-square for driving and walking are higher than 0.5. So they have correlation between the topics.

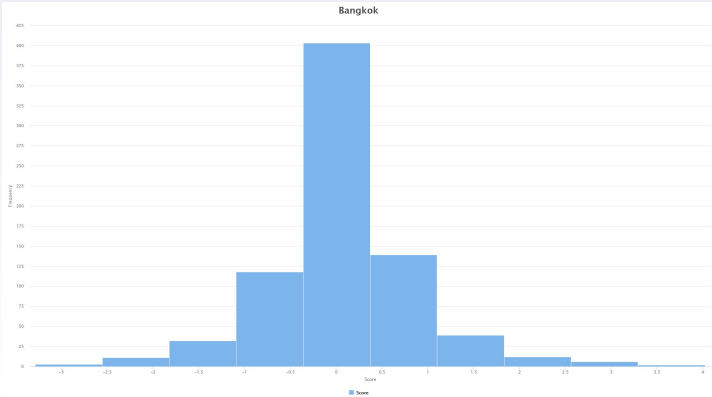
PHUKET

R-squares of both driving and walking for Phuket has very low results of over 0.2676 and 0.3013, show no correlation between the mobility index and Covid-19 cases.

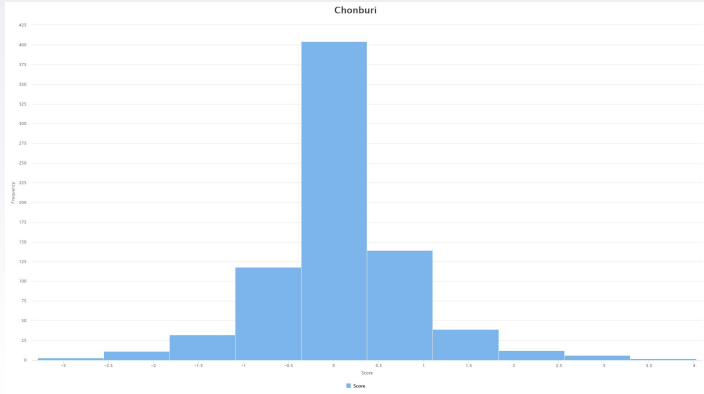


TASK 3: COVID-19 and Sentiment Index (Based on Twitter data)

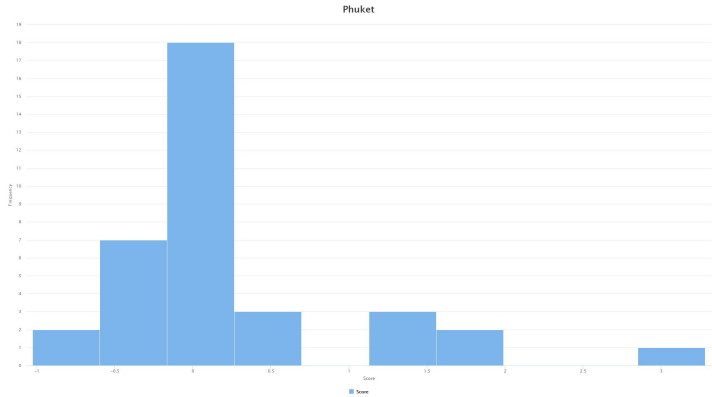
Bangkok



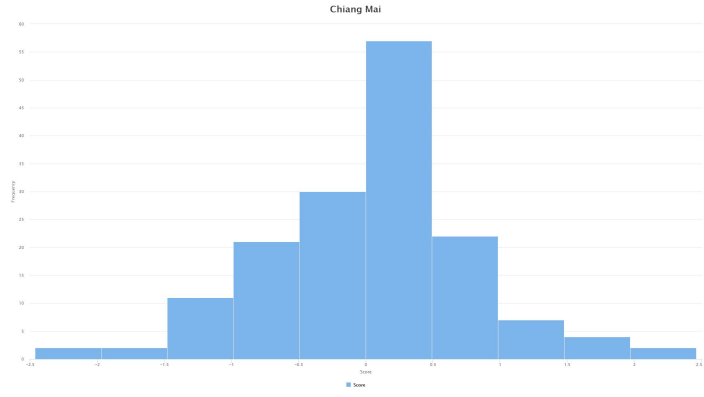
Chonburi



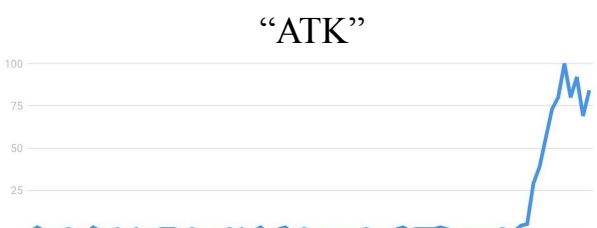
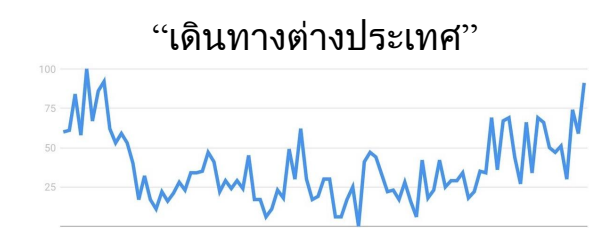
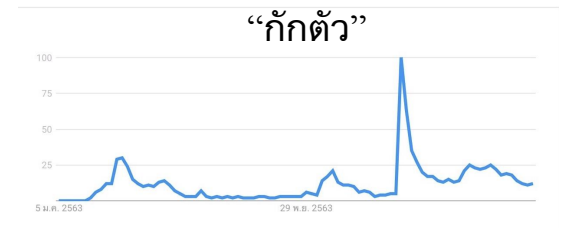
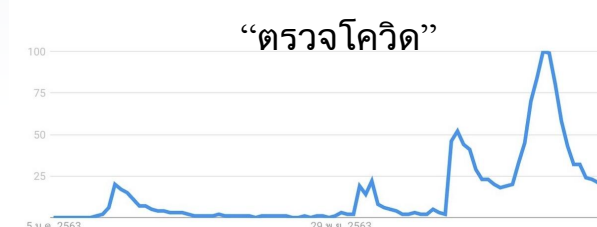
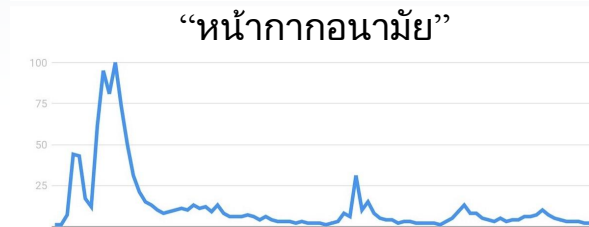
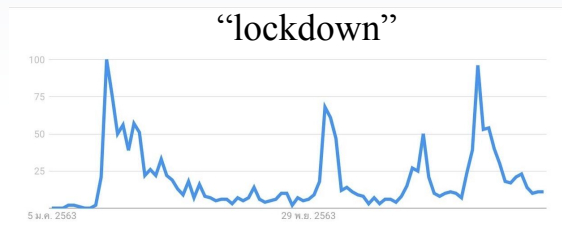
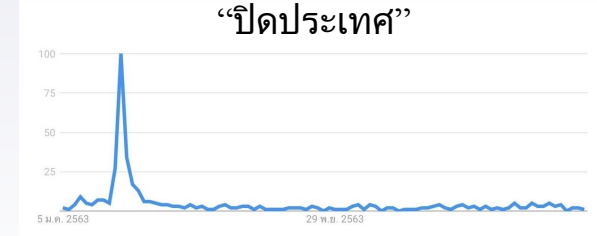
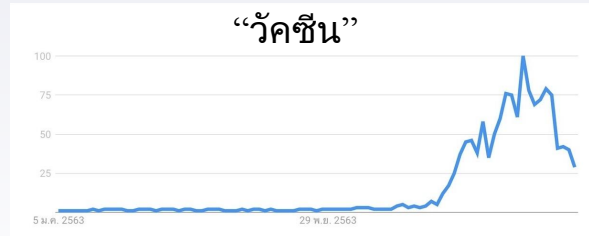
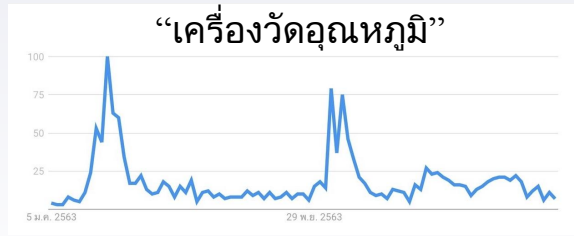
Phuket



Chiang Mai



TASK 4: Google Trends (January 2020 - October 2021)



TASK 5: *Result discussion*

Nighttime light index

- Low correlation between Nighttime light index and COVID-19 cases
- Cannot use to predict COVID-19

Apple Mobility Index

- Higher R-square in walking than driving
- Chonburi driving shown the least correlation and walking Chonburi has the highest correlation among the analysis.

Sentiment Index

- The results of those 4 provinces, including Bangkok, Chonburi, Phuket and Chiang Mai, appear to be nearby direction.
- The lessened restrictions of government's COVID-19 containment policies can currently reflect the positive attitude in those provinces.

“ Conclusively, COVID-19 has a definite impact on human behaviour ”

Policy *Recommendation*

- Share business trend analysis during and also after COVID-19 on Twitter.
- Keep updating International Tourism policy.
- Provide and promote more good news about COVID-19 through social platform, by KOL and micro influencer, to decrease panic and build a better society.
- Increase strict Infection Prevention and Control (IPC) for COVID-19 in Thailand, including having 2 doses of vaccine before entering any places.
- Subsidy and support Covid test such as ATK for free.

Thank you
Q&A

Appendices : Regression result Apple mobility index for Bangkok (Driving)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.39838454
R Square	0.15871024
Adjusted R Square	0.11664575
Standard Error	0.00636505
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.00015286	0.00015286	3.77302199	0.066300273
Residual	20	0.00081028	4.0514E-05		
Total	21	0.00096314			

	<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	2.03287292	0.0032766	620.42101	2.5255E-44	2.026038046	2.03970779	2.02603805	2.03970779
X Variable 1	-0.0019988	0.00102901	-1.9424268	0.06630027	-0.004145255	0.0001477	-0.0041453	0.0001477

Appendices : Regression result Apple mobility index for Bangkok (Walking)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.81537675
R Square	0.66483925
Adjusted R Square	0.64808121
Standard Error	0.01395878
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.00773015	0.00773015	39.6728579	3.78173E-06
Residual	20	0.00389695	0.00019485		
Total	21	0.0116271			

	<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	2.03094619	0.00718571	282.636999	1.7009E-37	2.015957074	2.04593531	2.01595707	2.04593531
X Variable 1	-0.0142139	0.00225666	-6.2986394	3.7817E-06	-0.018921166	-0.0095066	-0.0189212	-0.0095066

Appendices : Regression result Apple mobility index for Chonburi (Driving)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.16767677
R Square	0.0281155
Adjusted R Square	-0.0204787
Standard Error	0.01251401
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	9.0605E-05	9.0605E-05	0.57857699	0.4557454
Residual	20	0.00313201	0.0001566		
Total	21	0.00322262			

	<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	2.08358151	0.00566564	367.757582	8.7994E-40	2.0717632	2.09539983	2.0717632	2.09539983
X Variable 1	-0.0016236	0.00213449	-0.7606425	0.4557454	-0.006076	0.00282888	-0.006076	0.00282888

Appendices : Regression result Apple mobility index for Chonburi (Walking)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.9084911
R Square	0.82535608
Adjusted R Square	0.81662388
Standard Error	0.0173676
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.02851001	0.02851001	94.5187279	5.0713E-09
Residual	20	0.00603267	0.00030163		
Total	21	0.03454268			

	<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	2.04384645	0.00786307	259.929944	9.0771E-37	2.02744438	2.06024852	2.02744438	2.06024852
X Variable 1	-0.0288002	0.00296235	-9.7220743	5.0713E-09	-0.0349796	-0.0226208	-0.0349796	-0.0226208

Appendices : Regression result Apple mobility index for Chiangmai (Driving)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.70876025
R Square	0.50234109
Adjusted R Square	0.47745815
Standard Error	1.04784157
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	22.1660428	22.1660428	20.1881685	0.0002223
Residual	20	21.9594391	1.09797196		
Total	21	44.1254819			

	<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	79.1601001	17.3364973	4.56609536	0.00018757	42.9968003	115.3234	42.9968003	115.3234
X Variable 1	-38.521176	8.5733603	-4.4931246	0.0002223	-56.404892	-20.63746	-56.404892	-20.63746

Appendices : Regression result Apple mobility index for Chiangmai (Walking)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.77263532
R Square	0.59696535
Adjusted R Square	0.57681361
Standard Error	0.94297663
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	26.3413835	26.3413835	29.6235243	2.5058E-05
Residual	20	17.7840984	0.88920492		
Total	21	44.1254819			

	<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	44.4926207	7.9435849	5.60107574	1.755E-05	27.922593	61.0626485	27.922593	61.0626485
X Variable 1	-21.678646	3.98303202	-5.4427497	2.5058E-05	-29.987106	-13.370187	-29.987106	-13.370187

Appendices : Regression result Apple mobility index for Phuket (Driving)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.51730369
R Square	0.26760311
Adjusted R Square	0.23098327
Standard Error	1.18821132
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	10.3172044	10.3172044	7.30759828	0.01368012
Residual	20	28.2369226	1.41184613		
Total	21	38.554127			

	<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	45.9919472	16.5660299	2.77628058	0.0116518	11.4358143	80.5480802	11.4358143	80.5480802
X Variable 1	-22.962062	8.49422084	-2.703257	0.01368012	-40.680696	-5.2434276	-40.680696	-5.2434276

Appendices : Regression result Apple mobility index for Phuket (Walking)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.54888536
R Square	0.30127514
Adjusted R Square	0.2663389
Standard Error	1.16057587
Observations	22

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	11.6154001	11.6154001	8.62357018	0.0081585
Residual	20	26.9387269	1.34693634		
Total	21	38.554127			

	<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	36.5473612	12.0343205	3.0369277	0.00651074	11.4442086	61.6505138	11.4442086	61.6505138
X Variable 1	-18.112058	6.16771434	-2.9365916	0.0081585	-30.977685	-5.2464314	-30.977685	-5.2464314

Appendices : Regression result Nighttime light in Bangkok

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.771271							
R Square	0.594859							
Adjusted R Square	0.574602							
Standard Error	0.88038							
Observations	22							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	22.76028	22.76028	29.36548	2.64E-05			
Residual	20	15.50138	0.775069					
Total	21	38.26166						
	<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	264.0659	48.19522	5.479088	2.31E-05	163.5324	364.5994	163.5324	364.5994
X Variable 1	-140.185	25.86914	-5.41899	2.64E-05	-194.147	-86.2226	-194.147	-86.2226

Appendices : Regression result Nighttime light in Chonburi

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.515782							
R Square	0.266031							
Adjusted R Square	0.229333							
Standard Error	1.123122							
Observations	22							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	9.144058	9.144058	7.24912	0.014008			
Residual	20	25.22805	1.261402					
Total	21	34.37211						
	<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	-114.131	43.25997	-2.63825	0.015764	-204.369	-23.8919	-204.369	-23.8919
X Variable 1	76.02077	28.23512	2.692419	0.014008	17.12334	134.9182	17.12334	134.9182

Appendices : Regression result Nighttime light in Chiang Mai

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.238989							
R Square	0.057116							
Adjusted R Square	0.009971							
Standard Error	1.487224							
Observations	22							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	2.679653	2.679653	1.211507	0.284106			
Residual	20	44.23671	2.211835					
Total	21	46.91636						
	<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	-33.9022	31.88995	-1.0631	0.300405	-100.423	32.61905	-100.423	32.61905
X Variable 1	34.19214	31.06442	1.100685	0.284106	-30.6071	98.99139	-30.6071	98.99139

Appendices : Regression result Nighttime light in Phuket

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.597277							
R Square	0.35674							
Adjusted R Square	0.324577							
Standard Error	1.11356							
Observations	22							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	13.75379	13.75379	11.09162	0.003335			
Residual	20	24.80033	1.240017					
Total	21	38.55413						
	<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	80.57384	23.82976	3.381228	0.002967	30.86583	130.2818	30.86583	130.2818
X Variable 1	-49.1643	14.76223	-3.33041	0.003335	-79.9577	-18.3708	-79.9577	-18.3708