



Impact analysis of COVID-19 on tourism using alternative indicators

Presented to

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A report submitted in partial fulfillment of
the requirements for EE406 Contemporary Economics Issues
Thammasat University
Semester 1/2021

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Introduction

As everyone knows, the COVID-19 pandemic in Thailand is part of the global coronavirus disease pandemic of 2019, which is caused by the coronavirus which causes severe acute respiratory syndrome. On January 13, 2020, Thailand became the first country outside of China to report a case. As of October 25, 2021, the country had recorded the cases, putting it fourth in Southeast Asia in terms of COVID-19 cases, behind Indonesia, the Philippines, and Malaysia. Thailand was somewhat successful in suppressing the pandemic for most of 2020, but since April 2021, it has been dealing with an unchecked resurgence outbreak. On March 22, 2020, an early wave of illnesses peaked, largely linked to nightclubs and a boxing match in Bangkok. Surveillance and contact tracing were initially used by the Thai government in response to the first outbreak. Beginning in mid-May, limitations were gradually eased. In July, the curfew was lifted, and universities reopened in August. The pandemic has wreaked havoc on the country's economy, which is highly reliant on tourism. Thailand's GDP is expected to contract by 6.7 percent in 2020, down from a previous prediction of a 2.5 percent gain, according to the International Monetary Fund. The government has borrowed money and launched a number of aid initiatives, including cash distributions to individuals affected and a 1.9 trillion baht stimulus plan, however only a small number of people have received it.

Dissatisfaction with the economic impact and government response impacting on the tourism authority in Thailand. Thus, this research focused on the effects from COVID-19 that affecting tourism revenue in 3 provinces in Thailand i.e. Bangkok, Phuket and Chonburi which are the provinces that respectively have the highest tourism revenue in Thailand referring to The Ministry of Tourism & sports in 2017-2018 when the Covid-19 pandemic has not occurred yet.

Time	Tourism revenue during October 2017- March 2018 (million THB)		
	Bangkok	Phuket	Chonburi
Jan-18	88,822.55	63,611.95	27,125.89
Mar-18	75,532.98	59,657.29	25,822.06
Feb-18	91,316.45	57,562.25	27,565.74
Oct-20	73,968.34	38,858.09	25,361.10

Dec-17	99,521.76	48,443.85	24,143.89
Nov-17	81,570.03	37,521.18	24,381.71

Source : https://www.mots.go.th/more_news_new.php?cid=411

Moreover, all data in this research were used to analyze the effects of COVID-19 on the tourism authority in Thailand, especially the three tourist provinces, as indicated above. The factors that are expected to affect the tourism authority in Thailand came from the other source of data which this paper tries to adapt through the case of three provinces in Thailand.

In addition, Bangkok, Phuket and Chonburi are all scenic towns that are the destination of many tourists including Thais and foreigners. In consequence, the epidemic has impacted the Tourism Authority of Thailand, particularly the three tourist cities in the provinces, which will have a staggeringly decreased inbound visitor income in 2020 and 2021 as a result of the suspension of international flights and Thailand's catastrophic epidemic scenario.

Therefore, this researches will inform the effect of the coronavirus pandemic on the three provinces in thailand (Bangkok, Phuket and Chonburi) which respectively have the highest tourism revenue referring to The Ministry of Tourism & sports in 2017-2018

Literature review

This research has focused on the impact of Covid-19 pandemic on the tourism in the 5 highest tourism revenue provinces referring to The Ministry of Tourism & Sports in 2017-2018 before the Covid-19 pandemic has occurred. There are many researches that related to this topic which can be separated in 2 categories;

1. Literature related to the research topic

- ❖ McKinsey (2021) Thailand's economy is reliant on international tourism, a once-flourishing sector that has been impacted by pandemic restrictions. But there have been continual government efforts to boost domestic travel, and measures to support returning international demand after Thailand began reopening to vaccinated international travelers from 63 countries on November 1, 2021. Even as the world addresses emerging variants of the

virus, Thailand's lessons can act as a guide for other tourism-dependent countries facing similar dilemmas as they prepare for the resurgence of international travel.

- ❖ Chavez et al. 2020; Network 2020; WHO 2020c, d. The cause of the increasing case was initiated by a tourist group in Bangkok. They came together in an air conditioned bus and spent their time together in many areas. Even though the ambient air temperature of Bang was high, the corona virus might be suffering from hot temperature, but in closed ventilation like air conditioner bus was stimulating factor of disease spreading. Based on the published papers about other coronaviruses, experts believed COVID-19 primarily spreads from person-to-person through close contact (approximately 2 m) by respiratory droplets
- ❖ Journal of public health (2020) The number of infected cases was distributed in tourist attractive provinces for example Bangkok (maximum case), Chonburi (Pattaya beach and other areas), Yala (connecting to Malaysia), Phuket.
- ❖ Chidchanok Anantamongkolkul (2020) A variety of industries have suffered from the recent COVID-19 epidemic. The tourism industry is no exception. Phuket has welcomed approximately 10 millions international tourists annually in recent years. Currently, the total number of international tourists in Phuket is much less than normal now at the end of the peak tourism season. For instance, on 28 March 2020, Phuket only received six international tourist arrivals while, at the same time, 8,000 tourists flew back to their home countries. Additionally, the statistics from the Phuket International Airport showed that 517 local Thais arrived in the city and 2,000 Thais left Phuket by planes.
- ❖ The World Health Organization (2021) The Phuket Sandbox initiative started today. The government has a contingency plan in place in case problems arise. If COVID-19 infections are reported in any of its three districts or if bed occupancy rises, authorities will reconsider the scheme and improvements will be made. 70 percent of people residing in Phuket have now received a first dose of COVID-19 vaccine and 56 percent have received both doses.
- ❖ Aucello (2020) In May 2020, the governor of Phuket closed the Phuket International Airport. This led to the decision by several airlines to ground

their fleets. For example, the Thai Airways International airline canceled their flights to many destinations. This is due to safety concerns and the decision is part of the plan to dampen the global outbreak.

- ❖ Mongkul Bangprapa and Chaiwat Satyaem, Bangkok post 2021 Tourism and Sports Minister Phiphat Ratchakitprakarn has confirmed Bangkok, Chon Buri, Phetchaburi, Prachuap Khiri Khan and Chiang Mai will begin implementing their tourism reopening plans on Oct 1 as planned.
- ❖ The World Health Organization (2021) More than 218,000 people on average per day have been vaccinated with either a first or second dose in the last 7 days.

2. Literature related to the methodology

- ❖ Rapid miner (2020) The end-to-end analysis used a machine learning model created in RapidMiner and discovered that some expected factors had a strong influence on life expectancy, including the global COVID pandemic causing economic turbulence, lowering GDP, and worsening unemployment, it's clear that the US needs to remain focused on, and continue to improve, the quality of care during and immediately after childbirth by ensuring that resources from the country's high health care expenditures are properly routed, thereby creating a healthy future for American mothers and their babies.
- ❖ Pristiyono, Mulkan Ritonga, Muhammad Ali Al Ihsan, Agus Anjar, Fauziah Hanum Rambe (2021) used the keyword 'COVID-19,' which is filtered by the keywords 'vaccine' and 'sinovac' in Indonesian tweets. The data crawling process is performed manually using the access token received from the Twitter API using the Rapid miner tools to extract the requested information and data. Data crawling continued with the Drone Emprit Academic Streaming Public Twitter Tool due to limited manual crawling resulting in 6000 tweets related to selected keywords on January 15-22, 2021
- ❖ Arminarahmah, A Daengs GS, G W Bhawika, M P Dewi and A Wanto (2021) view and map the spread of the Covid-19 virus in Asia based on Total Cases, Total Deaths, Total Cured and Active Cases from 49 Countries. The research data in this paper were obtained from the Worldometer website sourced from WHO, CDC, NHC and others. In this proposed paper, the algorithm used is X-Means Clustering with the help of Rapidminer.

Research Gap

According to the downside, since the topic is a new topic and situation. So, much study has not been done. Therefore, may cause defects and incompleteness in the way of execution and results. Moreover, since data and statistics for the research is hard to find and lack some parts from the new and uncertainty of the situation.

Data & research methodology

The data used in this research are the Covid-19 infected cases in three provinces that had highest tourism revenue respectively ie. Bangkok, Phuket and Chonburi in October 2017 - March 2018 (Before Covid-19) obtained from The Ministry of Health Thailand in and the Apple mobility index which we will consider in January 2020 - October 2021 period (monthly).

Table 1: Raw data in Bangkok

Month	LOG_infected cases_Bangkok	LOG_Apple mobility index_Bangkok
1-Jan-20	1.146128036	2.031748537
1-Feb-20	1.113943352	2.036385125
1-Mar-20	2.979092901	2.037868746
1-Apr-20	2.736396502	2.035444485
1-May-20	1.462397998	2.033197237
1-Jun-20	1.643452676	2.025519294
1-Jul-20	1.653212514	2.020518291
1-Aug-20	1.491361694	2.027810807
1-Sep-20	1.982271233	2.029328232
1-Oct-20	2.017033339	2.029719036
1-Nov-20	1.991226076	2.029896169
1-Dec-20	2.531478917	2.028065866
1-Jan-21	2.906335042	2.020890959

1-Feb-21	2.559906625	2.017384852
1-Mar-21	3.031408464	2.024982288
1-Apr-21	4.050882211	2.030132946
1-May-21	4.61436984	2.031514766
1-Jun-21	4.522848344	2.030045503
1-Jul-21	4.860972511	2.027486946
1-Aug-21	5.098782124	2.018750853
1-Sep-21	4.924723693	2.012928202
1-Oct-21	4.444341515	2.016137893

This study uses secondary data including infected covid case and Apple Mobility index (driving) based on January 2020 - October 2021 period in Bangkok.

Table 2: Raw data in Phuket

Month	LOG_infected cases_Phuket	LOG_Apple mobility index_Phuket
1-Jan-20	0.301029996	2.058535903
1-Feb-20	0	2.061178578
1-Mar-20	1.477121255	2.05972879
1-Apr-20	1.041392685	2.05428236
1-May-20	0.301029996	2.047985639
1-Jun-20	0	2.036559561
1-Jul-20	0	2.026748241
1-Aug-20	0	2.030493196
1-Sep-20	0	2.036580572
1-Oct-20	0	2.040358707
1-Nov-20	0.301029996	2.036845232
1-Dec-20	0.77815125	2.030640195
1-Jan-21	1.322219295	2.018632621
1-Feb-21	0	2.003809605
1-Mar-21	0	2.000566499
1-Apr-21	3.461048092	2.000988608
1-May-21	3.645225712	1.999631837

1-Jun-21	2.096910013	1.997613981
1-Jul-21	3.115277591	1.993800407
1-Aug-21	3.169968174	1.986590249
1-Sep-21	3.214578954	1.979510037
1-Oct-21	3.748575617	1.982209323

This study uses secondary data including infected covid case and Apple Mobility index (driving) based on January 2020 - October 2021 period in Phuket.

Table 3: Raw data in Chonburi

Month	LOG_infected cases_Phuket	LOG_Apple mobility index_Phuket
1-Jan-20	0.301029996	2.058535903
1-Feb-20	0	2.061178578
1-Mar-20	1.477121255	2.05972879
1-Apr-20	1.041392685	2.05428236
1-May-20	0.301029996	2.047985639
1-Jun-20	0	2.036559561
1-Jul-20	0	2.026748241
1-Aug-20	0	2.030493196
1-Sep-20	0	2.036580572
1-Oct-20	0	2.040358707
1-Nov-20	0.301029996	2.036845232
1-Dec-20	0.77815125	2.030640195
1-Jan-21	1.322219295	2.018632621
1-Feb-21	0	2.003809605
1-Mar-21	0	2.000566499
1-Apr-21	3.461048092	2.000988608
1-May-21	3.645225712	1.999631837
1-Jun-21	2.096910013	1.997613981

1-Jul-21	3.115277591	1.993800407
1-Aug-21	3.169968174	1.986590249
1-Sep-21	3.214578954	1.979510037
1-Oct-21	3.748575617	1.982209323

This study uses secondary data including infected covid case and Apple Mobility index (driving) based on January 2020 - October 2021 period in Chonburi.

Moreover, this research have used sentimental index obtained from twitter in three provinces which have highest tourism revenue respectively ie. Bangkok, Phuket and Chonburi in October 2017 - March 2018 (Before Covid-19) obtained from The Ministry of Health Thailand

Methodology

To fulfill the achievement of this research that aimed to understand the impact of Covid-19 on tourism in three provinces which have highest tourism revenue in October 2017 - March 2018 and acknowledge the situation and local people behavior in each province which the related organization can use this information to adapt for the policy and better service for the population in local three provinces. The methodology will be divided into 2 main parts which are the regression between the number of COVID19 infected cases and Apple Mobility Index using Excel and the sentimental index analysis using RapidMiner of three provinces ie. Bangkok, Phuket and Chonburi in Thailand.

i) The regression between the number of COVID19 infected cases and Apple Mobility Index using Excel of three provinces ie. Bangkok, Phuket and Chonburi in Thailand

Firstly, this research have conducted the regression using data from 3 provinces ie. Bangkok, Phuket and Chonburi to see the relationship between the infected covid cases and Apple Mobility index (driving) based on January 2020 - October 2021 and create graphs for alternatives indicators analysis using Excel that is the data analysis and documentation program. Moreover, the regression from Excel can show the statistically significant, the negative and positive coefficient, and R square to analyze the impact of Covid-19 on the three highest tourism revenue in October 2017 - March 2018 provinces.

ii) The sentimental index analysis using RapidMiner and twitter data of three provinces ie. Bangkok, Phuket and Chonburi in Thailand

This research calculated the sentimental index in three provinces for acknowledging the situation, behavior and trends of local people who are living in Bangkok, Phuket and Chonburi respectively using RapidMiner and twitter data related to three words which are “Covid”, “Tourism” and “Vaccine” as query for searching in RapidMiner that is the program that try to decipher the meaning of the tweet and attempt to assign a score to reflect the feelings of the individuals who wrote it which Positive scores indicate to a positive attitude in the message and may be deduced from the message's positive terms. And Negative score is vice versa.

Result and discussion

i) The regression between the number of COVID19 infected cases and Apple Mobility Index using Excel of three provinces ie. Bangkok, Phuket and Chonburi in Thailand

The three regressions show result in between the number of COVID19 infected cases and Apple Mobility Index using Excel of three provinces ie. Bangkok, Phuket and Chonburi had the highest tourism revenue in October 2017 - March 2018 in Thailand.

(The regression results between between the number of COVID19 infected cases and Apple Mobility Index using Excel of Bangkok, Table 1, Appendix 1)

Firstly, according to the regression results between between the number of COVID19 infected cases and Apple Mobility Index using Excel of Bangkok, the results show that the COVID19 infected cases is not statistically significant to the Bangkok Apple mobility index referring to P value which is more than 0.05 meaning that there is no significant linear correlation and no effect was observed between COVID19 infected cases and Apple Mobility Index in Bangkok.

(The regression results between between the number of COVID19 infected cases and Apple Mobility Index using Excel of Phuket, Table 2, Appendix 1)

Secondly, referring to the regression results between between the number of COVID19 infected cases and Apple Mobility Index using Excel in Phuket, the results show that the COVID19 infected cases is statistically significant to the Bangkok Apple mobility index referring to P value which is less than 0.05 meaning that there is

significant linear correlation and effect was observed between COVID19 infected cases and Apple Mobility Index in Phuket. There is the negative coefficient equal to -0.013 meaning that if the covid case in Phuket is decreasing around 1%, the apple mobility index will increase 1.3%. Specifically, from the regression result, the Phuket apple mobility index have the negative impact from the Covid-19 infected cases.

(The regression results between between the number of COVID19 infected cases and Apple Mobility Index using Excel of Chonburi, Table 3, Appendix 1)

Lastly, the regression results between between the number of COVID19 infected cases and Apple Mobility Index using Excel of Chonburi, the results show that the COVID19 infected cases is not statistically significant to the ChonburiApple mobility index referring to P value which is more than 0.05 meaning that there is no significant linear correlation and no effect was observed between COVID19 infected cases and Apple Mobility Index in Chonburi.

ii) The sentimental index analysis using RapidMiner of three provinces ie. Bangkok, Phuket and Chonburi in Thailand in “Covid”, “Tourism” and “Vaccine”

Referring to the sentimental index analysis using RapidMiner and twitter data related with the word “Covid” of Bangkok, Phuket and Chonburi. Moreover, the average sentimental index is the combination of positive and negative scores. If there are more of positive attitudes, average will be positive and if there are more of negative attitudes the average will be negative. According to the average sentimental index of Bangkok, Phuket and Chonburi the average sentimental index is negative which are -0.080, -0.081, -0.057 for Bangkok, Phuket and Chonburi (*Figure 1, 2, 3, Appendix 2*) respectively meaning that there are more negative attitudes on the messages in Twitter. For Example, “The Center for Covid-19 Situation Administration will extend quarantine for visitors arriving from overseas through sandbox and quarantine schemes from five to seven days, from this Thursday” posted by Kim Toan from Bangkok, “@ThaiNewsReports 12 more deaths than covid yet the country doesn't close down for #motorcycledeaths or accidents #pattaya #Thailand #jomtien #Phuket” posted by Jomtien Realty from Phuket and “@KenBrookes007 Oh, we were meant to go to Mercure Khao Lak for songkran 2020 but covid saw to K128 that posted” by Kim Toan alex Storrfield  in  from Chonburi.

Moreover, for knowing the situation and attitudes of the vaccination from local people, this research chose the word “Vaccine”. According to the average sentimental index from the word “Vaccine” in Bangkok, Phuket and Chonburi, (*Figure 4, 5, 6, Appendix 2*) there is the positive average sentimental index only in Phuket (0.036) which refer to the positive attitudes and negative sentiment index in Bangkok and Chonburi which refer to negative attitudes. For example, “ I don’t believe the two are linked. As I understand it, vaccine supply to low income countries isn’t hindered by rich countries procuring booster shots. Though I’m not sure what the roadblock is now, given supply constraints should no longer be in issue anywhere” the negative message posted from Matt Greenfield in Bangkok and “ Please read this is a new vaccine of Natural basic I hope this is the solution for all people. <https://t.co/1uRETeeChh>” the positive messages posted by Lothar Thiel. (O Jaguar) in Phuket.

Conclusion

From the regression between the number of COVID19 infected cases and Apple Mobility Index using Excel of three provinces ie. Bangkok, Phuket and Chonburi in Thailand. We can summarize that Phuket gained the most impact among three provinces that had the highest tourism revenue in October 2017 -March 2018 according to the indicator. There are many factors that cause this, since Phuket is one of the most popular destinations for tourists , second place after Bangkok. So, when the Covid cases have risen up, it means that people will travel less and spend their time at home. Moreover, the lockdown period is one of the causes of losing tourism revenue and tourists to Phuket. In addition, refer to the sentimental index, the Covid-19 still have effect to the negative attitudes of the local people in each provinces mostly in Phuket which maybe refer to the Phuket Sandbox and opening of the province for the tourism referring to the average sentimental index of the word “Sandbox” (***Figure 7** The sentimental index analysis using RapidMiner and twitter data related with the word “Sandbox” of Phuket, Thailand*) which the sample of text convey to many people who interested and excited for the opening of Phuket sandbox and have intention to travel there. Fortunately, the average sentimental index of the word “Vaccine” shows the positive attitudes of many people getting vaccination.

Policy recommendation

According to the policy recommendation, Firstly, this research will recommend that the related organization should use the RapidMiner instead of the satisfaction assessment towards their services to acknowledge the behavior, attitude and feelings of local people in the term of their services such as Vaccination services, lockdown, เวชชนะ, หมอพร้อม, เป้าตั้ง, Sandbox Government's system etc. to measure both the satisfaction and dissatisfaction of the people to improve and adapt the to their work to be more on point and efficiency. Moreover, since Phuket is one of the most gaining impact from the research, we suggested that the related organization should use the apple mobility index coupled with a RapidMiner to follow up on the tourism situation and find the way to boost tourism revenue and industry especially when the Covid-19 is disappear or weakened. The government should boost and impose the policy to support tourism coupled with the vaccine distribution to increase the confidentiality to people.

Besides, the related organization and government should aim to distribute the vaccine to every provinces in Thailand not only the highest revenue tourism country such as Bangkok, Phuket, Chonburi, Chiangmai etc. to improve the life of people in Thailand and stimulate the economics since the tourism revenue is the main revenue of Thailand economy.

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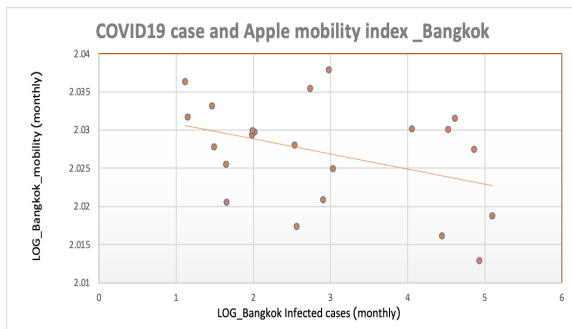
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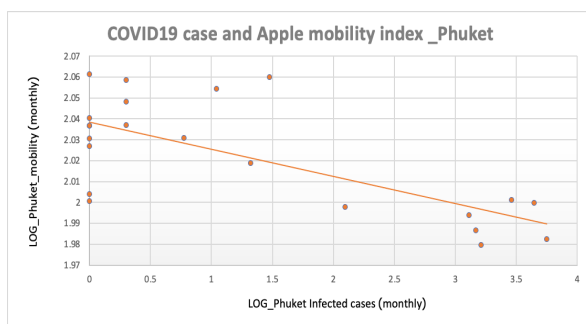
Appendix 1 Table

Table 1 regression results between the number of COVID19 infected cases and Apple Mobility Index using Excel of Bangkok



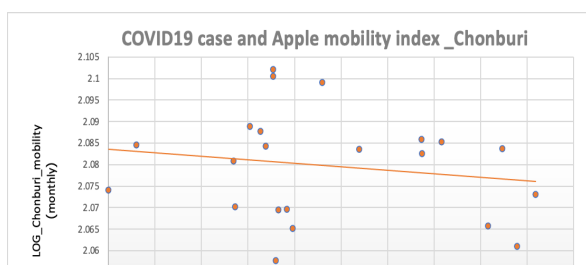
Regression Statistics							
Multiple R	0.398384536						
R Square	0.158710239						
Adjusted R S	0.11664575						
Standard Error	0.006365048						
Observation	22						
ANOVA							
	df	SS	MS	F	Significance F		
Regression	1	0.00015286	0.000153	3.77302199	0.0663	not sig	
Residual	20	0.000810277	4.05E-05				
Total	21	0.000963136					
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	
Intercept	2.032872918	0.003276602	620.421	2.5255E-44	2.026038	2.03970779	
X Variable 1	-0.001998777	0.00102901	-1.942427	0.06630027	-0.004145	0.0001477	

Table 2 regression results between the number of COVID19 infected cases and Apple Mobility Index using Excel of Phuket



SUMMARY OUTPUT							
Regression Statistics							
Multiple R	0.7087603						
R Square	0.5023411						
Adjusted R S	0.4774581						
Standard Error	0.0192795						
Observation	22						
ANOVA							
	df	SS	MS	F	Significance F		
Regression	1	0.0075039	0.0075039	20.188168	0.0002223	sig	
Residual	20	0.007434	0.0003717				
Total	21	0.0149379					
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	
Intercept	2.0385492	0.005524	369.03492	8.21E-40	2.0270264	2.0500721	
X Variable 1	-0.0130406	0.0029024	-4.4931246	0.0002223	-0.0190949	-0.0069864	

Table 3 regression results between the number of COVID19 infected cases and Apple Mobility Index using Excel of Phuket



Regression Statistics							
Multiple R	0.1676768						
R Square	0.0281155						
Adjusted R S	-0.0204787						
Standard Error	0.012514						
Observation	22						
ANOVA							
	df	SS	MS	F	Significance F		
Regression	1	9.061E-05	9.061E-05	0.578577	0.4557454		
Residual	20	0.003132	0.0001566				
Total	21	0.0032226					

Appendix 2 Figure

Figure 1 The sentimental index analysis using RapidMiner and twitter data related with the word “Covid” of Bangkok,Thailand

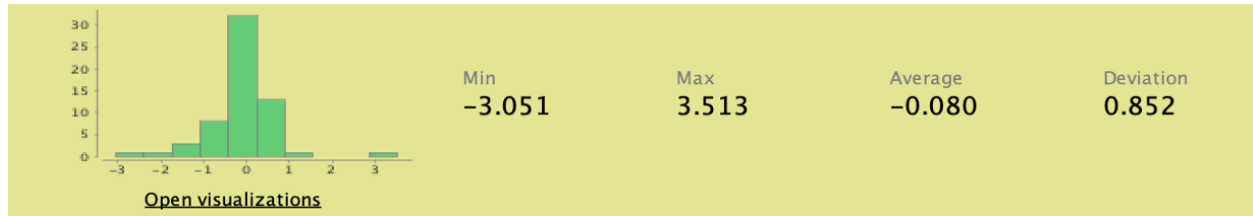


Figure 2 The sentimental index analysis using RapidMiner and twitter data related with the word “Covid” of Phuket,Thailand

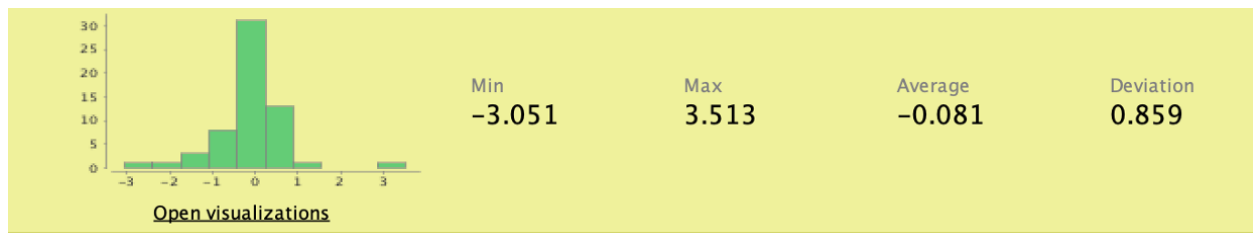


Figure 3 The sentimental index analysis using RapidMiner and twitter data related with the word “Covid” of Chonburi,Thailand

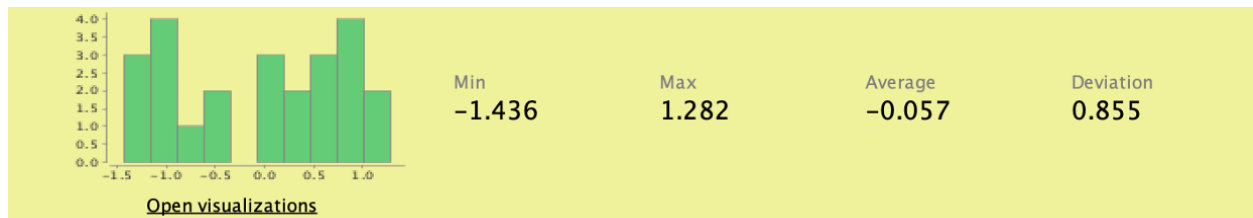


Figure 4 The sentimental index analysis using RapidMiner and twitter data related with the word “Vaccine” of Bangkok,Thailand

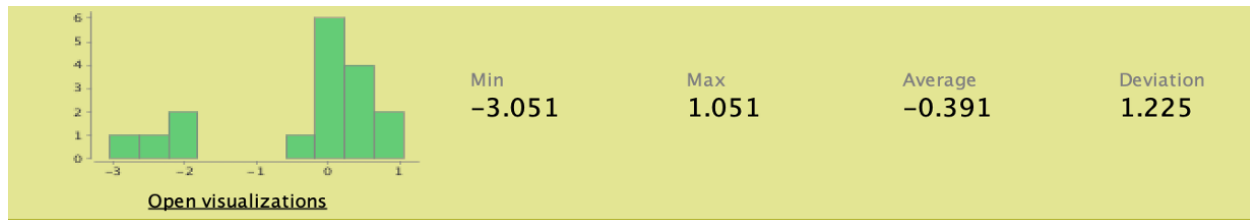


Figure 5 The sentimental index analysis using RapidMiner and twitter data related with the word “Vaccine” of Phuket ,Thailand

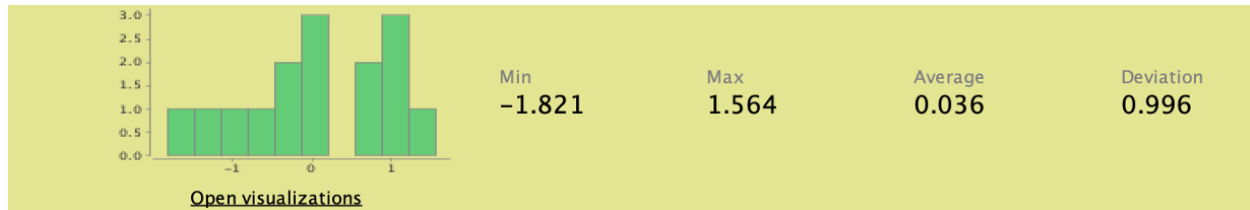


Figure 6 The sentimental index analysis using RapidMiner and twitter data related with the word “Vaccine” of Chonburi ,Thailand

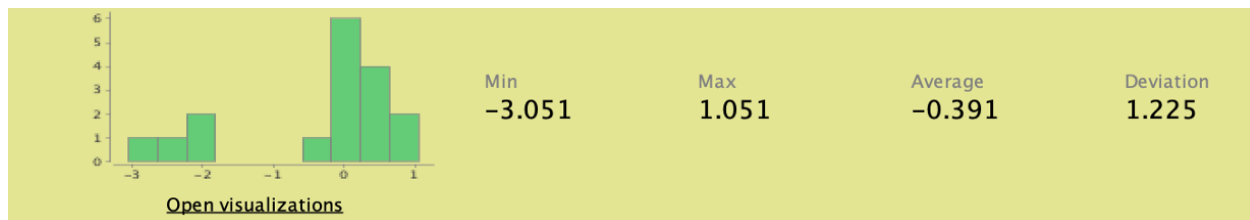


Figure 7 The sentimental index analysis using RapidMiner and twitter data related with the word “Sandbox” of Phuket, Thailand

