Final Paper

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Introduction

At the start of 2020, the Thai economy was hit hard by the global COVID-19 pandemic, which had an impact on people's daily lives and slowed economic activity. The supply of goods and consumer revenues have been reduced, and several enterprises have stopped production. This time, more than any time, commercial international air transportation has been impacted. In 2020, the total number of passenger passenger seats in the world decreased by 50%, with international passenger seats falling by 55–64 percent and domestic passenger seats falling by 18–23 percent. The overall number of passenger seats in Asia Pacific fell by 45 percent, with international passenger seats falling by 71.9–77.5 percent (decreased the most compared to other regions) and domestic passenger seats falling by 12.9–16.2%. The Thai Ministry of Public Health reported in January 2020 that the first COVID- 19 infected persons had been found, and the number of infected people continued to rise, as a result, the overall number of passengers in Thailand began to decline in February. Following that, the government issued the Emergency Decree on Public Administration in Emergency Situations, which restricts cross-provincial travel for domestic passengers and the Civil Aviation Authority of Thailand issued a temporary measure restricting flying into Thailand, resulting in the cancellation of most Thai airlines' flights.

Table showing the statistics of Thailand's air transport in 2020

Air Transport	Passenger		Flight		Freight	
	Million People	%	Number	%	Ton	%
Total	58.25	-64.7%	500,435	-53.1%	954,377	-36.0%
International	16.25	-81.7%	133,940	-73.9%	922,163	-34.7%
Domestic	81.70	-44.9%	366,495	-33.8%	32,214	-58.6%

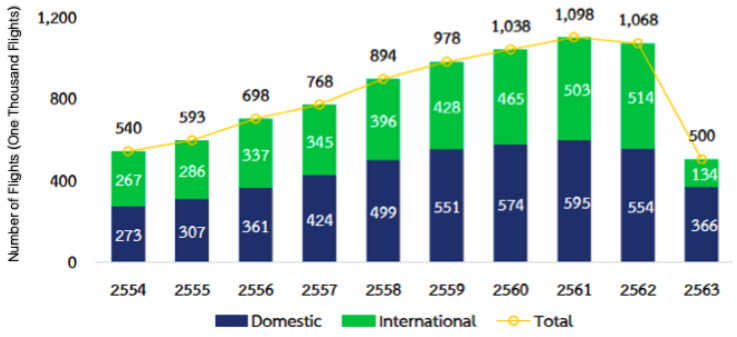
Note: % means the change rates compared to 2019

Sources: Airports of Thailand Public Company (Limited), Department of Airports, U-Tapao Airport Authority and Bangkok Airways Public Company (Limited)

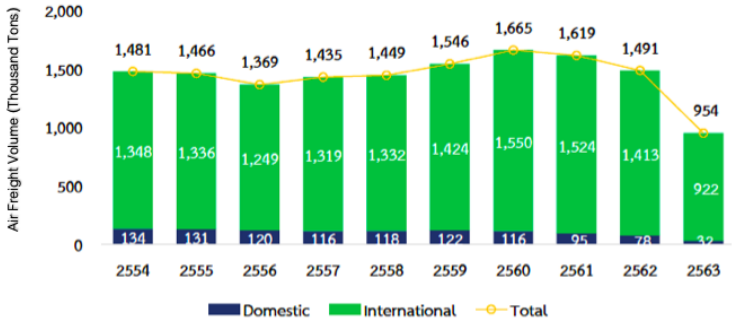
In Thailand's case, in the last ten years, Thailand's air transport has been the most badly impacted. In 2020, there were 64.7 percent fewer passengers than the previous year, with international passengers falling by 81.7 percent and domestic passengers falling by 44.9 percent. The total number of flights fell by 53.1 percent, with international flights dropping by 73.9

percent and domestic flights falling by 33.8 percent. According to these, international and domestic travel restrictions have resulted in these reductions. Air freight was also impacted because Thailand's air freight is a sort of transport that is operated alongside passenger aircraft. In other words, compared to last year, when international air freight reduced by 34.7 percent and domestic air freight decreased by 58.6 percent, the overall volume of air freight decreased by 36 percent. To see clearly picture of the situation in Thailand's aviation, according to the statistical number for the number of overall passengers in ten years (2011-2020), it was discovered that the number of overall passengers in normal situations increased at a compound annual growth rate of 10.58 percent per year, with the number of international passengers increasing at a 9.74 percent per year and the number of domestic passengers increasing at 11.63 percent per year. However, the COVID-19 pandemic broke out in 2020, causing impacts on the aviation industry in Thailand with the number of overall passengers declining the greatest in Thailand's aviation industries in 10 years due to a halt in air transportation. Moreover, if we are viewing in term of volume of overall air freight, due to the COVID-19 pandemic in 2020, imposed restrictions on international and domestic travel, this resulted in only 500,435 flights in 2020, a 53.1 percent decrease from the previous year, with 133,940 international flights down 73.9percent and 366,495 domestic flights down 33.8 percent.

Statistics Regarding Number of Overall Flights in 10 Years (2011-2020)



Statistics Regarding Volume of Overall Air Freight in 10 Years (2011-2020)



Hence, the objective of this paper is to find the factors that affect Thailand's Aviation including both passenger transportation and air freight transportation. Moreover, this paper aims to suggest policy recommendations to support the improvement of Thailand Aviation industries.

Literature Reviews

This paper will focus on the factors that affect Thailand's air transportation, which have been hit the most in the past 10 years by COVID19 pandemic. Moreover, there are many related researches to the factors that impact the Thai aviation industry which can be separated into 3 main categories.

1. Literature that related to the factors that impact Thai aviation industry
    - State of Thai aviation industry by the civil aviation authority of Thailand (2019) stated the factors affecting the growth of Thai Aviation industry and forecasted Thailand's air transport trend through the official collecting data of Thai aviation industry. Therefore, the factors are the restriction of global air transport policy, global economic drop, Thai economic drop, Decline of tourism, Decline in investment, and government intervention policy.
    - The impact of the COVID19 pandemic on the air transport industry with a particular focus on Thailand by Salitorn Thongmeensuk (2020) focuses on the factor affecting demand and supply for air transportation in Thailand and structural perspectives of the aviation industry by using data from Thailand Development research institute (TDRI). To mitigate the impacts of the COVID 19 outbreak, the government must provide some sector specific mechanism to ensure that both passengers and airline would survive.
    - ERIA Paper series No.401 (2021) provides an in-depth description of the coronavirus disease (COVID-19) pandemic and its interactions with air transportation in the Association of Southeast Asian Nations (ASEAN)+5 region, using a gravity regression model. As the pandemic evolved, most countries have significantly reduced the number of flight connections, especially international flights which reduced connectivity, based on the regression analysis to have a significantly negative impact on trade merchandise that is essential to consumers and businesses.
    - The impact of COVID19 on the aviation industry in Thailand by Iratracha Amornpipat (2020) provides the year in review of 2020 Thai aviation industry by using data from UNWTO and recommendation for aviation measures. Thailand has had to deal with conditions that have tightened the liquidity, creating an

unsettled situation in the global economic foreign exchange market, Airlines Aircraft largely grounded, running out of cash fast,, and economies at a standstill need to open up economy while mitigating risk passengers currently unable to travel due to government restrictions.

- The impact of COVID 19 on global aviation industry by Vichai Premmanisakul (2021) this paper discussed and examined the challenges faced by the aviation industry due to Covid19 along with measures undertaken to minimize the negative impact by gathered data and figures from a wide range of academic resources such as Google Scholar and credible websites and resources such as OECD, ICAO and Deloitte. The airline business had very different abilities for withstanding such shocks and heterogeneous predictions for the future of the aviation industry. Bankruptcies hurt the competitive environment, which also reflects on the fare of air travel.

2. Literature that related to the factors that impact both passenger and airline decision choice or perception
    - Factors affecting airline's passengers choice by Business Excellence and Logistics Research Centre,School of Management, Mae Fah Luang University and Technopreneurship & Innovation Management, Graduate School, Chulalongkorn University (2020) identify the airline's attractive attribution for the passenger perception under COVID19 pandemic through online collective method via google form. The results show the importance of the airline's attractive attribution with the finding of the importance of preventive measures of infectious diseases along with 9 significant contributions with 36 sub-attributes.
    - The factors affecting to passengers on selecting Thai airways by Arpatsarapon Pinitnuk and Benjapol Worasuwanarak (2019) indicated the factors affecting passengers on selecting Thai airways through the collected data from passengers who traveled by Thai airways in international routes by Thai Airway Reviews by SkyTrax website. The factors that affect selecting Thai airways are the old of the aircraft and technology and system compartment, and the safety protocol on Covid 19.

- TDRI quarterly review VOL.35 No.3(2020) paper is aimed at examining the impacts of COVID-19 on Thailand's air transport industry under current legal arrangements and providing policy recommendations for the airlines so that they can survive this unprecedented crisis. The volume of domestic passengers declined after the declaration of the Emergency Decree on Public Administration in Emergency Situation. So, passenger demand had fallen sharply by 90.2 percent and the number of both international and domestic passengers had drastically decreased by about 99 percent in both the domestic and international flight markets due to the imposition of a temporary ban on all international flights.
- Commercial airline protocol during COVID19 pandemic by Krit Pongpirul (2020) indicates the exploration of the implementation feasibility of Thai Airways International protocol from the perspectives of passengers and aircrews through an online questionnaire survey of passengers and aircrews, then use descriptive statistics method for data analysis. Several preventive measures for in-flight transmission have relied on past experiences and raised financial and feasibility concerns to the airline industry and the implementation feasibility of commercial airline infection control protocol, especially from the perspectives of passengers and aircrews, has been lacking.
- Coping and the needs of airline customer service agent during Covid 19 pandemic spread by Nutchirathron Naulsom (2021) ,in this research, it aim to study work stress of airline customer service agent, explore the needs of airline customer service agent by obtained data from questionnaire and use descriptive statistics to analyse. The result found that airline customer service had the highest stresses for every factor during COVID 19 pandemic and needed a clear role in work and expected more on career advancement.

3. Other literature related
    - COVID-19 pandemic– a testing time for tourism and hospitality in Thailand by Sanhakot Vithayaporn (2021). This paper highlighted that the tourism and hospitality sectors in Thailand and also the aviation industry that have experienced devastating situations and airline companies, due to the suspension of all flights and the temporary closure of international airports to prevent the spread

of the COVID-19 pandemic by carried out a study of peer-reviewed articles on the current situation from relevant journals, such as Tourism Management, based on a total of 50 identified primary studies.

- Commercial airline protocol during COVID 19 pandemic: An experience of Thai Airways International by Krit Pongpirul (2020) indicates the exploration of the implementation feasibility of Thai Airways International protocol from the perspectives of passengers and aircrews through online questionnaires. Some regulations might not have adequate detail so the inputs from the real experiences are essential. Passengers of the repatriation flights in this study not only agreed with the temperature check but also remained aware that they were approached for a body temperature check.
- Covid 19 and airline performance in the asia pacific region by James Peoples (2020) by using apply the output orientation based on the standard Data Envelopment Analysis (DEA) model as introduced by Charnes to investigate the impacts of COVID-19 pandemic on technical efficiency and productivity of airlines indicate that current environment emphasizes physical distancing, airline companies struggle to operate a profitable business. These challenges faced by airline companies not only influence their industry, but also have wide ranging implications for the global economy.
- Will COVID19 threaten the survival of the airline industry by Xiao Xuan (2021) by using VAR to analyze the pandemic impact and forecasting. The model provides more accurate forecast results as compared to the simple and general linear statistical model. If the circumstances at the destination are not good, even if the requirements for self-isolation are eased, it was found to have a negative influence on the prospects of recovering aviation demand. This indicates that an unconditional lifting of self-isolation requirements while the circumstances at the destination remain bad could have a negative effect on the recovery of aviation demand.
- Impact of COVID 19 on carec aviation and tourism (2021) provide a quick initial assessment of the impact of the coronavirus disease on the aviation and tourism sectors of the Central Asia Regional Economic Cooperation (CAREC) and

provide recommendations for the recovery of air travel and tourism through online survey and conference to all member countries. The coronavirus disease has had a devastating impact on global aviation. In Central Asia, virtually all domestic and international air travel were suspended in an attempt to contain the spread of COVID-19. This crisis provides an opportunity to reset the aviation industry in Central Asia Regional Cooperation (CAREC) countries through reforms, new strategies, and restructurings.

Research Gap

With the COVID 19 situation, the collecting of data is limited because the collected data cannot collect by face to face approach. So, the data has to be collected online through survey or google form. According to this, the sample of the passengers is limited due to the difficulty in conducting an online survey. Moreover, the collected data cannot control the socio-demographic characteristics of the respondents. In addition, some data contain just all respondents from Thailand, therefore, the finding may not be applicable to other areas. Similar studies could be done with the respondents from different countries and cultural backgrounds and analyze the comparative result. Furthermore, some research literature focused on the importance level that passengers attach to airlines attributes in general rather than on a particular type of flight or travel motivation. Lastly, the response rates of the voluntary questionnaire survey were low and self reported data relying on passenger perception might not be accurate to be used as a reference for real practice.

Data & Research methods

For the data collection, we gathered data from the Bank of Thailand and used private consumption index (PCI) as a conventional indicator while also gathering data from google trend and use as alternative indicator. In this paper, we try to use the google trend which is an alternative indicator to explain the trend and relationship of the conventional indicator which is private consumption index (PCI). Then, we will try to use alternative indicators to explain the effect of the COVID 19 pandemic on Thailand’s aviation industry.

Table 1: Sources of data

Data	Sources	Unit
Private Consumption Index: Sales of passenger transport index	Bank of Thailand (BOT)	Standardized Index
Keyword search	Google Trend	Number of search

For the research methodology, firstly, we have to gather data of private consumption index (PCI) or the conventional indicator from the Bank of Thailand (BOT website) and then export it to Microsoft Excel to organize and standardize data. On the other hand, we also need to find the related keywords to the aviation industry in google trends and use them as alternative indicators, then export it to Microsoft Excel to normalize data. Next, we visualized the data into the graphical illustration to see the trend and pattern of conventional data and alternative data. Moreover, we will use the Stata program for the deeper analysis and use it to run the regression to explain how the data are related or closely related. In the Stata method, it will be used the OLS regression or Ordinary Least Squares regression or also known as linear regression to see the relationship between dependent variables (Conventional Indicator) and independent variables (Alternative Indicator). The more explanatory variables of the model, the OLS function will be:

$$\mathbf{Y_i = \underline{\alpha} + \beta I\ X_1 + \beta_2\ X_2 + \beta_3\ X_3 + ... + \beta_n\ X_n + U_i}$$

Where Y_i = Dependent variable

$\underline{\alpha}$ = Intercept in the regression model

$\boldsymbol{\beta}$ = Coefficient of each independent variables

X_i = Independent variables

U_i = Error term of the regression model

The keywords in google trend or the alternative indicator to run the OLS regression would be related to aviation and other elements that related to travel by air transportation. After we put the conventional indicator and alternative indicator into the Stata program, the OLD regression function will be:

$$Y_i = \underline{\alpha} + \beta I\, X_1 + \beta_2\, X_2 + \beta_3\, X_3 + \beta_4\, X_4 + U_i$$

Where Y_i = Conventional data "Sales of passenger transport index"

$\underline{\alpha}$ = Intercept in the regression model

β = Coefficient of each independent variables

X_1 = Alternative data from Google trend keyword search on " Airline "

X_2 = Alternative data from Google trend keyword search on " Passport "

X_3 = Alternative data from Google trend keyword search on " Flights "

X_4 = Alternative data from Google trend keyword search on " Airflight "

U_i = Error term of the regression model

Result analysis and discussion

According to the figure…, after running the OLS regression from the monthly from 1 January 2019 to December 2020 in the Stata program, the relationship between dependent variable which is private consumption index (Sales of passenger transport) and independent variables which is google trend keywords tend to be highly correlated, according to the figure 6: the OLS result. On the other hand, the independent variable or the keyword from the google trends include: Airline, Passport, Flights, and Airflight, the criteria to pick the keywords from google trend based on the literature review and aviation related word. According to the literature reviews, it found that the key change of people's behavior toward the aviation industry was change by the COVID 19 pandemic which has a big impact on the consumer or passenger as well as airline provider or producer, but the adverse degree of impact depends on the period of time as well. In this paper, most of the sample size for sample observation varies and is done through online questionnaires due to COVID 19 pandemic.

Moving on to the specific variables, the R-squares in the result indicate the highly related between conventional and alternative indicators, is around 0.9724 or 97.24 percents, and the adjusted R-squared is 0.9666 or 96.99 percents. According to these results, the result is quite clear and can be said that the correlation between the sales of passenger transport index and google trend selected keywords are highly related and in the same direction. Moreover, after we

get the result of the t-statistical test, it can be concluded that most of the independent variables are significant. To clarify, the keywords on Google trend on “ Airline”, “ Passport”, “Flights”, and “Airflight” have an t- statistical value of 5.87, 5.60, - 2.02, and - 1.79 respectively. According to these, all of the independent variables except airflight are highly significant while the “Airflight” variable are almost significant.

After the result from both dependent and independent variables, we can conclude that they are highly related and significant which can imply that the use of alternative indicators or Google trend can be used to predict and explain the trend of conventional indicator. Moreover, in this paper, the scatter graph results of both Conventional and Alternative indicative are also provided to see the clear picture of the trend and direction between these two indicators. According to figures 1 to 5, we can see that, in the beginning of 2020 or in January 2020, there is a dramatic drop in number in both Conventional and Alternative variables. These is because, in the January 2020, there have been reported first case of COVID in Thailand country by ministry of public health from Chinese tourist which was the first source of pandemic and it was reported that the virus have widely spread in the country cause the infected cases to rise dramatically. After that period, the infected cases rose every month which forced the Thai government to shutdown the public places such as markets and malls, were ordered to close, the bans of travel at province level, and followed by shutdown both international and domestic travel that highly affected the aviation industry which we can see clearly drop of the number in both conventional and alternative result that related to the pandemic situation.

On the discussion part, in my point of view, the sales of transport in Thailand depend on the situation at that time. In the normal situation, before the pandemic in January 2020, we can see the gradual increase in sales of transports index. In the normal situation, people have not faced the restriction or bans of traveling that make them able to travel anywhere and the google trend keyword search is also gradually increasing as well, according to figures 1 to 5. However, after the COVID 19 pandemic occurred, it changed people's behavior, because of the high rate of wide spread of the virus, to be more secure and prevent going to the intended population area which caused a sharp drop in the economy as well as the aviation industry as well. Moreover, the government restriction and bans of travel are the major factor that cause the aviation industry to have a dramatic drop in revenue and passengers which make them faced the hardest time for their business and have to stay alive until the government can find a way to mitigate the COVID

cases in the country. Therefore, from the google trend keywords, these can conclude that it has the same direction and similar pattern ,and also can explain and predict the conventional indicator effectively.

The limitations of this paper was that the data gathered from alternative sources because google trends provide only the statistics of keyword searches, only keyword searches may not be enough to use to predict and forecast in the real practical data. Moreover, the updated data and the accuracy of both indicators are different. The PCI data from the BOT website is updated to the present and can be a good indicator to use to predict and forecast the trend of the data. On the other hand, the alternative data have some missing data in some period of time and some of the keywords are not significant enough to explain the convention data or have direct impact on the topic. Furthermore, the respondents of the experiment in many sources of data are questionnaires through online platforms which can be biased and not accurately as direct observation or face to face survey. In conclusion, it would be more accurate to predict data if we have more alternative indicators that can explain the main data and relate to the topic.

Conclusion

After the analysis of the result from both conventional data and alternative data, we can see that the impact of COVID 19 pandemic has not only affected some specific industries but it affected the whole economy. In this paper, we try to analyze and explain the aviation industry sector which has been hit very hard. The reason for the shape drop in air transportation and passengers is the widespread virus that forced the government to shut down the country and many businesses and also bans the travel across international and domestic. According to the results from many sources of data and paper results, we can definitely indicate that COVID 19 pandemic is the main factor of causing change in people’s behavior and spending which highly affected the aviation industry. Moreover, government restriction and regulation are also the factors that caused the hard drop in the aviation industry because many restrictions limit people's travel freedom and cause people to stay at home instead of going anywhere.

From the OLS regression, we can see the similar trend between the PCI index which is conventional indicator and google trend keyword search which is alternative indicator that mean the effect of COVID 19 to the aviation industry can be explained through the OLS regression

method and also the data from google trend can explain and predict the trend of the primary data effectively.

On the other hand, there are some additional variables that are not significant because some data are not always updated or correct. However, we can still conclude that, in this paper, we can explain and predict the trend of the primary indicator by the use of the alternative data and also have similar trends which make us see the more clearly picture of how COVID 19 affects the aviation industry.

Policy recommendations

The outbreak of Coronavirus pandemic has a devastating effect on Thailand, not only the aviation industry, but also the whole economy as well. However, Thai's aviation industry has the worst impact as both domestic and international flights have been postponed and diminished altogether. As a consequence of the significant decrease in demand, a majority of air carriers are encountering a substantial fall in their revenue and facing a myriad of legal issues as a result of financial disruption. At the same time, during the financial crisis, the aircraft industry may not be able to fulfill rental and maintenance reserve obligations. Hence, the government policy makers are challenged to support and create policy to support the aviation industry and mitigate impact of the COVID 19. The aviation industry in one of the industry that is the main engine of growth to the Thai economy as it bring the foreigner to the country which create positive spillover effect to other industry such as tourism, services, and etc.

Currently, the government implemented the mechanism which includes reduced parking fee, lower air navigation charges for both domestic and international flights, discounted arrival and departure fees, discounted jet fuel excise for domestic flights. Moreover, the government also implemented an assistance package such as loan payment holidays and dedicated advances. To further support the aviation industry, the government has numerous options to consider. In my opinion, I recommend the policies include the direct grant of financial support to air carriers to compensate for the drop of revenues and improve liquidity caused by movement restriction measures imposed owing to the COVID19. Moreover, for corporations, the extension of the scope of eligibility of corporate bonds to provide access for a broader range of corporations and opportunity to gain financial support. The temporary waives of ticket taxes and other types of tax

charges by the government to reduce cost of passenger spending which can increase the number passengers traveling both domestic and internationally due to lower ticket cost.

Furthermore, as COVID19 outbreak, the passengers are highly concerned about safety and hygiene. According to these, the airline has to perform safety monitoring, effective hygiene system and preventive measures. All of these cause the higher cost of production to the airline as they need to pay more for the safety and hygiene of the passengers. So, the government and the ministry of public health should work together to reduce the burden for the airline such as providing the support of staff that can reduce the burden of the airline and provide the effective measures for the airline to follow to regain passenger trust and increase passengers' safety.

Suggest the future improvement for this research

1. To improve the accuracy of the data, we should find other sources of data that are reliable and related to the topic because only 1 alternative data alone cannot predict the primary data accurately. So the more sources of data and index can improve the accuracy of the analysis
2. For the regression method or OLS regression, some of the variables are not significant enough to explain the primary indicators. So, we should find more of the variable of the alternative indicator that is significant to the main index and can explain data more accurately. Therefore, more variables can improve the accuracy and explainability of the alternative indicator to the conventional indicator.
3. Due to the limitation of the situation because of the COVID 19 pandemic, the data that gather from the online questionnaire or survey may not be accurate and can be biased. So to improve the quality of data, we should find a way to directly ask the respondent for the result and also safe and reliable for the respondents to do the research.
4. This paper is not concerned about the other transportation industry rather than the aviation industry that also got the huge impact from the COVID19 pandemic. To make the paper more diversify of categories of transportation, we should add more and analyze other transportation as well,

Appendix

Figure 1: Conventional Graph result

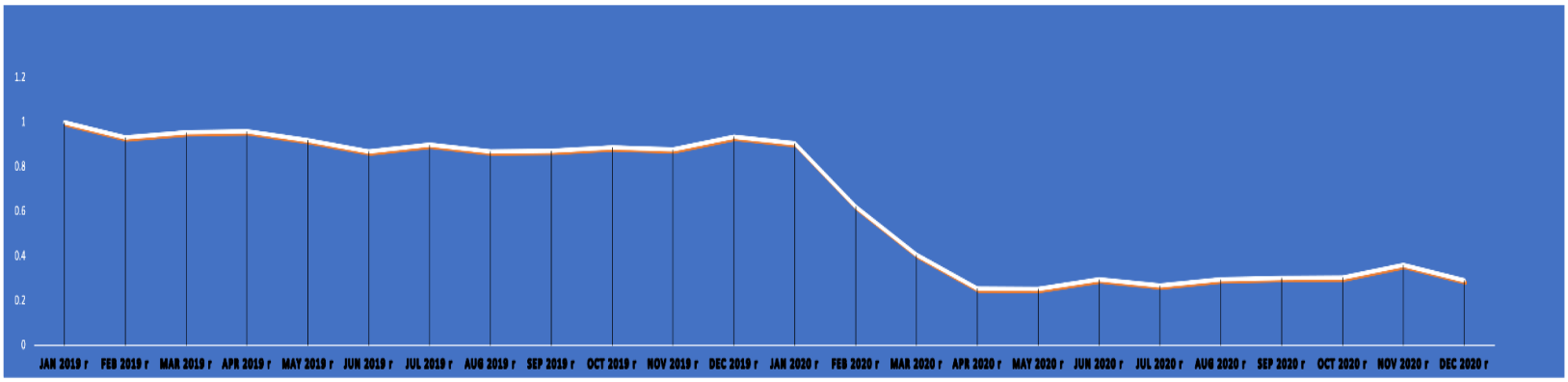


Figure 2: Alternative Graph result (Airline)

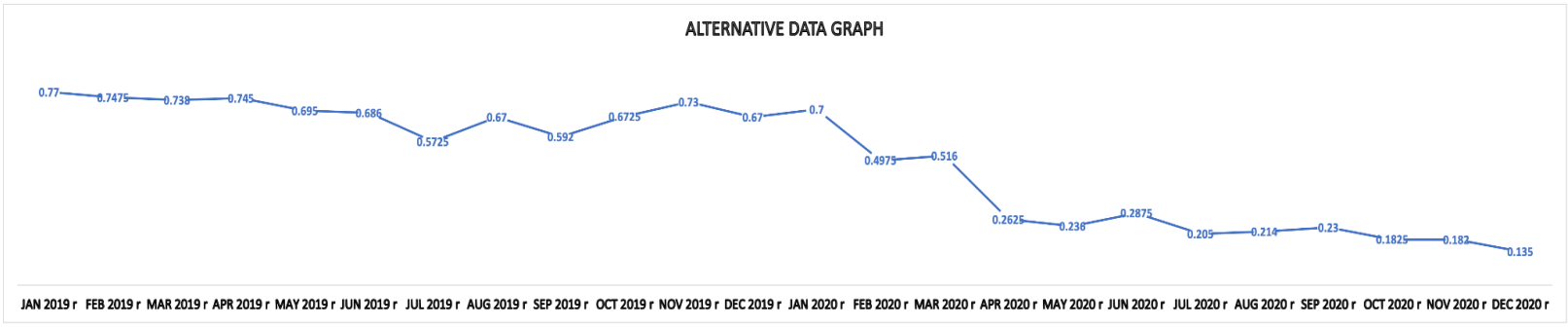


Figure 3: Alternative Graph result (Passport)

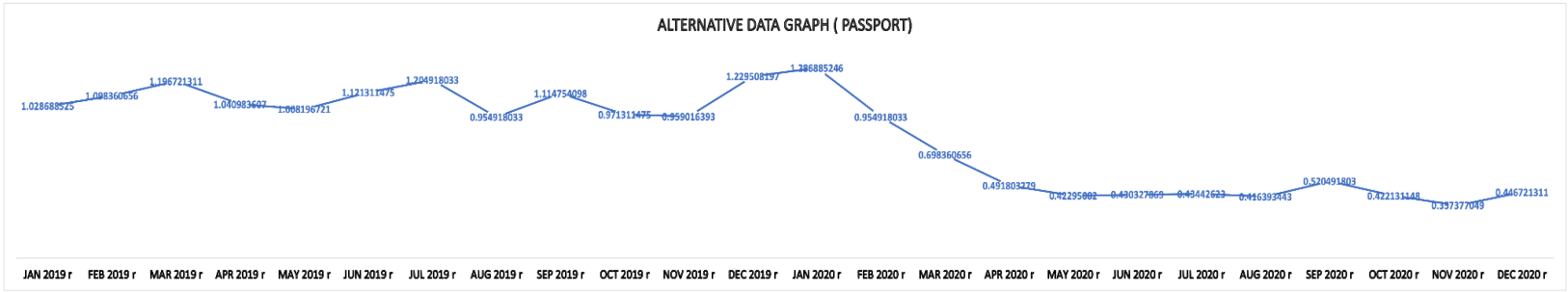


Figure 4: Alternative Graph result (Flights)

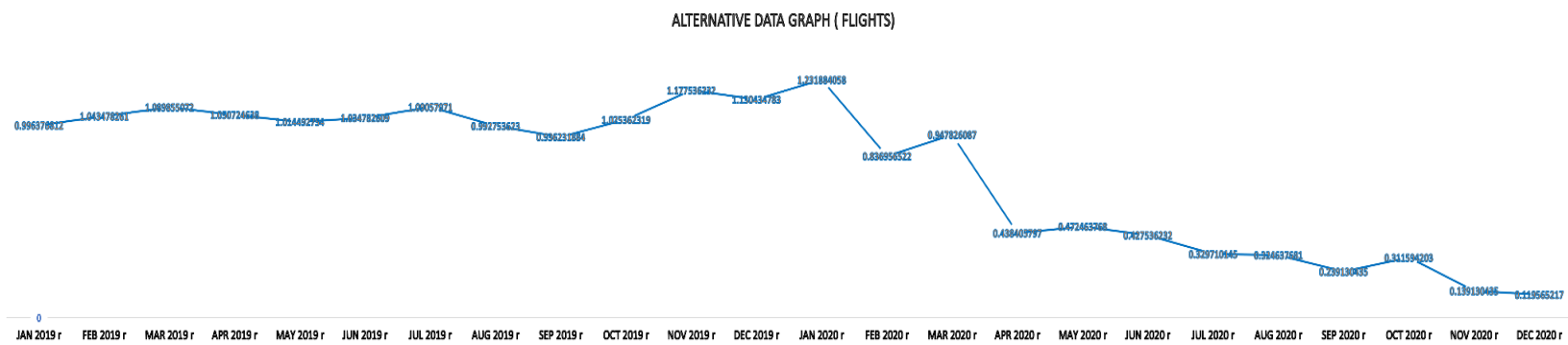


Figure 5: Alternative Graph refult (Air Flight)

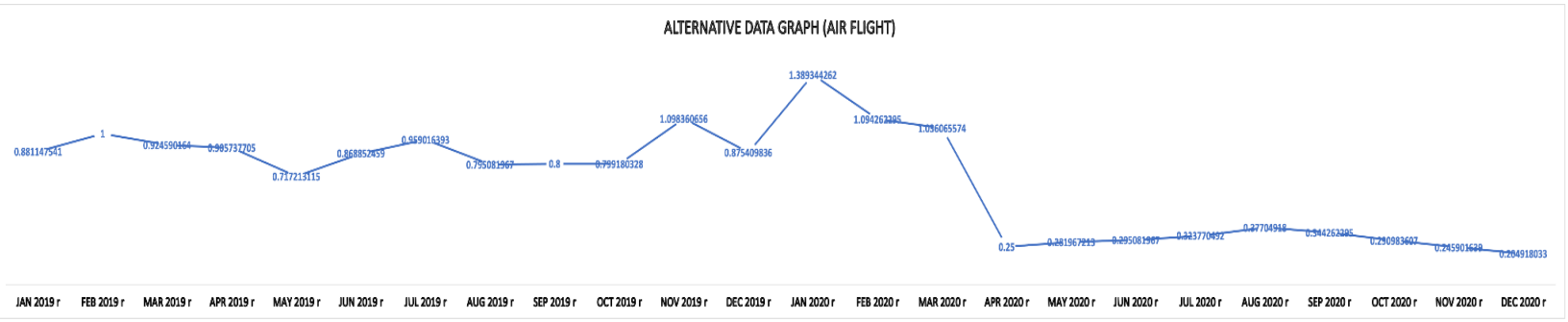


Figure 6: The OLS regression result

Source	SS	df	MS	Number of obs	=	24
				F(4, 19)	=	167.57
Model	2.08702327	4	.521755818	Prob > F	=	0.0000
Residual	.059158607	19	.003113611	R-squared	=	0.9724
				Adj R-squared	=	0.9666
Total	2.14618188	23	.093312256	Root MSE	=	.0558

salesofpass~i	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
airlinethai~d	1.156132	.1969897	5.87	0.000	.743828	1.568436
passporttha~d	.6063248	.1082806	5.60	0.000	.3796909	.8329587
flightsthai~d	-.3141589	.1553728	-2.02	0.057	-.639358	.0110402
airflightth~d	-.1592968	.0889855	-1.79	0.089	-.3455455	.026952
_cons	-.0755813	.0332686	-2.27	0.035	-.1452132	-.0059494

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