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# The Impact of Covid-19 on the Aviation Industry: A Post Covid Econometric Analysis

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A newly discovered COVID-19 disease, notoriously known as Coronavirus, caused by the novel Corona Virus has shaken the world. It is no surprise that the aviation industry has been hit hardest by the Corona Virus. The current research makes an effort to identify the post effect of Covid-19 on the aviation industry in Belgium, Albania, Austria, Finland, Germany, Italy, Spain, France, Turkey and United Kingdom. The study explained the magnitude or impact of Covid cases and Covid deaths on Airline traffic, Freight traffic and Passenger traffic. To meet the objectives of the current study the two models have been tested separately. In the first model, we tested the impact of Covid cases on the study variables Airline Traffic, Freight Traffic and Passenger Traffic. In second model, we tested the impact of Covid deaths on the study variables Airline Traffic, Freight Traffic and Passenger Traffic. The study also applied the Augmented Dicker's fully test to measure the stationarity of data. Results of the panel data showed that Covid cases as well as Covid deaths posed a significant declining impact on Air traffic, Freight traffic and Passenger traffic. Furthermore, VAR, Impulse Response Function (IRF) and Variance Decomposition has been applied for describing shocks, quantifying shocks and explaining intra and inter dependencies between the study variables in detail.

**Keywords**: *Covid-19; Airline Industry; Panel Analysis; Passenger.*

## INTRODUCTION

A newly discovered COVID-19 disease, notoriously known as coronavirus, caused by the novel coronavirus has shaken the world. Numerous people have caught the illness exhibiting trivial to moderate respiratory ailments and many might recover without any special treatment. People who already have some health problems like chronic respiratory disease, cardiovascular disease, cancer, and diabetes or are older, are expected to cultivate a serious illness. The only way to slow down the transmission of this virus is to be well informed about its symptoms and how they expand. Using alcohol-based hand sanitizer frequently, washing your hands for at least 20 seconds and not touching your face can save you are others from this infectious disease. The coronavirus develops mainly through a person's droplets of saliva or when an ill person sneezes or coughs. Respiratory etiquette (like coughing into a flexed elbow) must be practiced. At the moment there is no cure or particular shot available for coronavirus, having said that, various clinical trials are happening for potential treatments.

Different people are getting infected in diverse ways from coronavirus. People who have been infected have minor to modest symptoms and improve without necessary special treatment. People whose life is at higher risk of getting infected by this disease are the ones who already have some serious health problem and those who are over 60 years of age. Dry cough, temperature, and fatigue are some common symptoms along with breathing issues, aching throat, pain in the whole body and along with it a few patient complain about motion sickness or a runny nose and diarrhea. Health experts advise that people who are in good health with slight symptoms should distance themselves from others and communicate with their doctor for assistance on testing and medical care.

## CORONAVIRUS AND THE AVIATION INDUSTRY

It is no astonishment that the aviation industry has been hit hardest by the coronavirus infection but the haste and gravity of the plunge which air companies have taken is nonetheless breath-taking. Alex who is airline boss stated in a memo to his employees on 13th March 2020 titled "The Survival of British Airways", that

> "This disaster of the world is not the ones we have known, all of the industry should get through this situation which can last 1 or 2 quarters. Any longer, the prospect of the airline could be transformed for good. The instant pain is obvious. American and European air companies' stock prices have dropped quicker even than the world's corona-hit share markets" (see chart 1).

In addition to it, the International Air Transport Association (IATA) on 5th March 2020, estimated a potential hit to global revenues of $113bn this year. That is 1/5 of former years generally proceeds and 4 times greater than the International Air Transport Association

projected in February when Covid-19 was supposed to be a Chinese worry rather than a worldwide one. Ever since, the International Air Transport Association's amendments have got worse. Profitable transatlantic routes, which made air company about $20bn in sales in previous years, have been hit by Head of state Donald Trump's 30-day prohibition on utmost airlifts to the U.S. from Europe. Delta, an American air company, stated it might have to trim intercontinental programs by 40%, up from a 25% decline before the prohibition. Lufthansa, Europe's largest airlift, had already changed trips partially for April. As further countries carry out travel constraints, the German air company possibly will thin programs by 90%, calculated by a specialists at Bernstein, a research firm. Estimates also show that others that work for smallish local markets and depend on international interconnections might need to shut down completely.

Numerous air company chiefs adhere to the faith that international travel figures will follow the same route as in the wake of prior troubles, such as the terrorist assaults of 11th Sep 2001 or the worldwide financial crisis of 2007-09. After a few months of frenzy, travel configurations then returned to standard and the progressions carry on. A lot has happened in China this year. Chinese air travel was smashed hard at first. According to OAG, in the middle of February about 70% of flights were stranded. Nowadays infections are calming in the country and travellers are getting back in the air, attracted by large discounts. The most recent statistics put forward that the capability is now down by 43% compared to previous years.

Some airlines, however, work for a massive national market like China's. The EU's air travel market that apparently looks huge, is also breaking; Denmark and Poland have already banned most non-natives from arriving. Cathay Pacific, based in Hong Kong, has also trimmed capability by 65% in March and April and expects more cuts in May. The Korean Air Company has cut 80% of its program.

Chinese air companies also rely on substantial state support. Some of the big ones are government-owned (China Eastern and China Southern) or could be (there was conjecture last month that struggling Hainan Airways' holding company) publicly owned. Beijing has already assured bail-outs to make up for their damages, expected to be about $3bn in February alone. Lufthansa is asking European states for financial support that may want relaxing European Union state-fund rules. Mr. Trump's ambiguous talk of support to stricken industries, including air companies, remains just that for now.

At present many airline companies are very much trying to save cash. Moreover, cutting flights, many are asking the workforce to take unpaid leave. The air company Norwegian Air Shuttle, is obligated near to the ground-cost air company in the middle of rearrangement, has for the time being stood down half of its 11,000 employees. Scandinavia's SAS is putting off 10,000 staffs, 90 percent of its workforce, as it calls off most of its flights. KLM, the Dutch airline, said it would lop 2,000 occupations in the upcoming months. Lufthansa has on hold its dividend for 2019, it may sell their few airplanes. The sudden reduction in the price of fuel should help,

but a lot of carriers will only feel the advantage later, having earlier been protected in buying at greater prices to evade against the jeopardy of high-priced oil (Douglas, 2020).

States are proposing some aid. To support Norwegian Air, its government has distrait air travel taxes. In an exertion to stop useless ghost airlifts with no rail user, which some airlines have been flying to realm valued take-off and landing slots at demanding airports, supervisory bodies around the globe have for the time being put aside rules that call for slots to be used at a minimum of 80 percent of the time. Sufficiency of air companies is also climbing back resource expenditure by the bow to the buying of a new airplanes. Airbus, Europe's aerospace giant, has decided to postponement some deliveries to Chinese Air Company, Cathay is talking over rescheduling with both Airbus and its U.S. competitor, Boeing. Air companies are also requesting leasing companies, which have developed rapidly over the past decades and this day and age possess around 50 percent of the global fleet, to show moderation overpayments.

Only a few air companies will survive the pandemic, Europe has by this time seen one fatality. Flybe, a British air company with fundamental financial-health problems, professed economic failure on March 5th. Norwegian's stock price, which had lost 80 percent of its price in the middle of 2016 and 2019, has now hit another 4-5 since February. In Europe's disjointed air travel market, a third of carriers, mostly small basic ones, whichever lost money or hardly ruined even in 2019 stated by, Citigroup, a bank. The boss of Lufthansa, Carsten Spohr forecasts "various insolvencies". Air companies that do make it will appreciate less jam-packed skies—and more set a price power. A abolish in Europe, long overwhelmed by overloading, would value companies with solid balance-sheets, these comprise despite Mr. Cruz's warnings— BA's parent, IAG and EasyJet, Ryanair. The *Financial Times* on March 13$^{th}$ stated that two non-executive board participants at IAG have loaded up on the group's low-cost stock, suggestive of a little confidence in its forecasts. Weakened carriers like Norwegian Air, and perhaps even more well-known liveries, may become an acquirement bull's eye.

All this will come true if regaining is instant, but if the pandemic lasts longer then there will be a less assured tourism pattern mutate to regular. In a disturbing indication, the chief of one big leasing company states that even companies with seemingly vigorous balance-sheets have requested him to go informal on rent, signifying at least some are anxious about continued existence.

If further air companies flinch to flop, that would have a contagious effect all through the broader air travel industry. Before Mr. Trump's ban, U.S. airport operatives were anticipating to lose in any case $3.7bn between them this year. Fragile airports possibly will originate under pressure and may not continue, making some states less easily reached even if the state of affairs eventually mends. Airbus and Boeing are manufacturing lease planes and look probable to change of mind tactics for building up production of contracted-body airliners; decreasing profits will weigh upon struggles to invest in new climate-pleasanter replicas, even leasing companies, which have an abundance of capital and could repurchase planes from distressed

air companies and then lease them back, could be upset if extensive insolvencies flood the market with the second-hand airplanes, depressing leasing rates (Douglas, 2020).

Maybe the ultimate uncertainty worries are ever-changing approaches to business and free time travel. If businesses become aware that they can function with fewer officials flying around the world, and vacationers get a sense of taste for "staycations" or trains, intensified by "flight shame" over aircraft's carbon releases, the industry may fight to keep doubling traveller capacities every 15 years, as it has done for the past three decades. Covid-19 is already showing to a certain extent to loose speed parachute, it may capture impetus more intensely still.

The worldwide airline industry faces losing more than $250bn in profits, according to the newest prediction from a skilled body that has been enforced to tear its position again as Covid-19 spread. The hit would sum to more than a 40 % drop in profits from 2019, IATA, the industry trade body informed. It is up from a forecast of $113bn made a few days back and an early prediction of $30bn at the start of the emergency. IATA's chief economist Brian Pearce stated that the shrill rise in the anticipated blow stopped from the destructive delay of travel constraints in current days. The prohibitions now cover approximately 98% of customer revenues. Sizes were anticipated to be 90% down in Europe alone, and a numberof airlines in the area are in danger of collapse. The caution comes as Ryanair, Europe's leading low-cost carrier, grounded its whole task force and as states around the globe think through relief packages for the air travel industry. The United Kingdom is anticipated to reveal its package soon (IATA, 2020).

IATA's director-general, Alexandre de Juniac, reported that speed was authoritative if states wished to avoid high-profile failures, which would influence the world economy. Government enthusiasm to act was wanted, but approximately half the globe's airlines were at threat of bankruptcy as cash resources were being reduced, he said that they obviously want huge action very fast, as we are part of an industry which is very important to the world economy. Mr Pearce said that the industry also copes with a slower retrieval than had been practiced in prior pandemics, he also confesses that this pandemic is not that world has seen before and if it ends with a deep global recession, which is now anticipated, it will probably also delay recovery and will be a much steadier slope. Using the experience of pandemics, recovery is predicted to arise by the third quarter. Nevertheless, by the fourth quarter of this year, the industry will see some 10 % under what was previously estimated.

On a positive note, IATA reported there were initial marks of retrieval in national air travel in China. Mr de Juniac said that traffic is approaching back gradually and the load feature for the local market is around 60%, so things are refining but gradually (IATA, 2020). The economic influence on carriers has been huge. Approximately 40% of flights influenced by the European travel prohibitions is based on the United States, such as United Airlines and Delta, with billions in lost profits already projected for this year.

A lot of air companies across the globe face the risk of bankruptcy in the upcoming months if these decreasing trends endure. To windbreak against these domino effects of the epidemic, United States carriers are demanding aloft of $60 billion in bailouts and direct support from the regime. Coronavirus is flinging the whole thing up in the air involving the destiny of airline companies. It is unknown when these severe travel limitations may be lifted, but one can only assurance that these carriers do not have to carry on to survive the storm much longer.

## SCENARIO 1: LIMITED SPREAD

This situation contains markets with over 100 established cases of Covid-19 (as of 2 March 2020) that have qualified a sharp recession followed by a V-shaped retrieval profile, estimations fall in end-user sureness in other markets (North America, Asia Pacific, and Europe). Internationally, the fall in demand explains an 11 %, international passenger revenue loss equal to $63 billion, China would account for roughly $22 billion of this total, and markets linked with Asia (as well as China) would account for $47 billion of this total.

## SCENARIO 2: EXTENSIVE SPREAD

This situation put on a similar practice as the first, but to all markets that at present have 10 or more established coronavirus cases (as of 2 March 2020), the consequence is a 19% loss in international passenger revenues, which equates to $113 billion. Fiscally, that would be on a scale the same to what the industry experienced in the Worldwide Financial Crisis.

## EXTRAORDINARY CIRCUMSTANCES

The UN intercontinental domestic air travel business exclaims on governments to make sure that shipment operation is not disturbed to sustain the ease of use of essential medication and gear, for instance masks and ventilators that will assist to fight coronavirus. International Air Company's organisation IATA, has predicted that the air travel industry will want up to $200 billion of national support, a heaping force on governments in front of demands from all areas and immediate failing in communal finances as economies crash. In the opinion of Carsten Spohr, the blow-out of Covid-19 has positioned the whole economy of the world and business in a unique state of circumstance. In a statement, Chief Executive officer of Lufthansa, Germany said that right now, no one can predict the magnitudes. Lufthansa, which has inactive 700 of its 763 airplanes, has previously had meetings with the German government on liquidity, comprising through extraordinary finances from the state development bank KfW. The airline representative said that the longer this predicament goes on, the more to be expected that the future of air travel cannot be definite without government aid. He said that they had prearranged this year to be given a new airplane every 10 days but now they don't want any. The representative forecasted that the industry would arise into "not the same world" after the disaster, saying the requirement for air company partnerships would simply become more persistent.

In Australia, a Qantas representative said that they will cancel all intercontinental air travel and 2/3 of its 30,000 staff will be required to take a salaried or unpaid leave of absence. The government is prohibiting the entrance of non-native and non-inhabitants coming Friday. The leading United States air companies are all radically decreasing journeys, have stationed 100 of its airplanes, cutting commercial salaries and further costs, and boosting workers to take volunteer early retirements or unpaid leaves of absences. Although asking for government funds, they have snubbed blame that they compensated stakeholders with too many dividends and share buybacks in good times, parting it with a smaller amount of money to manage the predicament. U.S. Air companies senior vice president global government affairs told workers in a memo, that this is not a conventional rainy day. These are an astonishing state of affairs, and further support is essential to guard occupations and make sure that flying can carry on to depend on our industry after the emergency ends.

## GOVERNMENT RELIEF

Countries that have been affected by this pandemic have started to make plans to tackle this situation. Sources from India have told Reuters that their government was planning a relief package of $ 1.6 billion to aid providers victimised by Covid-19. An Indian airline known as Spice Jet (SPJT.NS) stated that it was suspending the mainstream of its international operations from March 21 to April 30, while competitor Indigo (INGL.NS) requested employees, to take a remuneration cut of up to 20%. The Ministry of Taiwan's transport has stated that it was inviting its air companies in funds requirement and fiscal policies with a vision to give them help, such as providing operational endowment and rolling over loans. The first portion of an NZ$600 million ($344million) air transport aid package is outlined by New Zealand, as it declared to close its borders for non-native and non-residents ($1 = 1.7440 New Zealand dollars).

This research is used to identify the pre and post effect of Covid-19 on the aviation industry and find out the magnitude or impact due to passengers.

## MODEL, METHODOLOGY, DATA AND VARIABLES

### STUDY VARIABLES

The present study utilises the mix of variables to perform experimental investigation. To meet the objectives of the current study the two models have been tested separately. In the first model, the dependent variables of the study include Passenger Traffic, Airline Traffic and Freight Traffic. The independent variable includes Covid cases. In the second model, the dependent variables of the study include Passenger Traffic, Airline Traffic and Freight Traffic, and the independent variable includes Covid deaths. A detailed construction of variables is described below.

| | |
|---|---|
| **Covid Cases** | Total number of Covid cases being reported |
| **Covid Deaths** | Total number of deaths reported |
| **Passenger Traffic** | Total number of passengers travelling |
| **Airline Traffic** | Total number of flights in operations |
| **Freight Traffic** | Total Kg of freight transported through air |

## DATA SOURCES/SAMPLING

The time series data set for empirical analysis was collected from World Development Indicators (WDI) at monthly frequencies specified as Post Covid scenario Jan 1, 2020 to May 31, 2020.The secondary data has been collected through confidential sources from Belgium, Albania, Austria, Finland, Germany, Italy, Spain, France, Turkey and United Kingdom.

## STATISTICAL TECHNIQUES

The Augmented Dickers–Fuller test was applied to explore Unit Root properties of data. Multiple Panel data analysis was used to predict the change in dependent variable by independent variables. Later VAR (Majkrzak, 2006), Impulse response function (IRF) and variance decomposition were applied for describing shocks, quantifying shocks and explaining intra and inter dependencies respectively by using Eviews 10.

## TESTS FOR STATIONARITY

Unit root test was performed to identify the trends, intercepts and stationarity of the data. For the purpose of current research, ADF (Dickey and Fuller 1981) with a constant trend and intercept was applied to make data stationary of study variables in order to examine the integrational properties of the data series (Jawad et al, 2018).

## VECTOR AUTO REGRESSION OF COVID CASES

**CC** = C(1,1)*CC(-1) + C(1,2)*CC(-2) + C(1,3)*AT(-1) + C(1,4)*AT(-2) + C(1,5)*FT(-1) + C(1,6)*FT(-2) + C(1,7)*PT(-1) + C(1,8)*PT(-2) + C(1,9)

**AT =** C(2,1)*CC(-1) + C(2,2)*CC(-2) + C(2,3)*AT(-1) + C(2,4)*AT(-2) + C(2,5)*FT(-1) + C(2,6)*FT(-2) + C(2,7)*PT(-1) + C(2,8)*PT(-2) + C(2,9)

**FT** = C(3,1)*CC(-1) + C(3,2)*CC(-2) + C(3,3)*AT(-1) + C(3,4)*AT(-2) + C(3,5)*FT(-1) + C(3,6)*FT(-2) + C(3,7)*PT(-1) + C(3,8)*PT(-2) + C(3,9)

**PT** = C(4,1)*CC(-1) + C(4,2)*CC(-2) + C(4,3)*AT(-1) + C(4,4)*AT(-2) + C(4,5)*FT(-1) + C(4,6)*FT(-2) + C(4,7)*PT(-1) + C(4,8)*PT(-2) + C(4,9)

## VECTOR AUTO REGRESSION OF COVID DEATH

**CD** = C(1,1)*CD(-1) + C(1,2)*CD(-2) + C(1,3)*AT(-1) + C(1,4)*AT(-2) + C(1,5)*FT(-1) + C(1,6)*FT(-2) + C(1,7)*PT(-1) + C(1,8)*PT(-2) + C(1,9)

**AT** = C(2,1)*CD(-1) + C(2,2)*CD(-2) + C(2,3)*AT(-1) + C(2,4)*AT(-2) + C(2,5)*FT(-1) + C(2,6)*FT(-2) + C(2,7)*PT(-1) + C(2,8)*PT(-2) + C(2,9)

**FT** = C(3,1)*CD(-1) + C(3,2)*CD(-2) + C(3,3)*AT(-1) + C(3,4)*AT(-2) + C(3,5)*FT(-1) + C(3,6)*FT(-2) + C(3,7)*PT(-1) + C(3,8)*PT(-2) + C(3,9)

**PT** = C(4,1)*CD(-1) + C(4,2)*CD(-2) + C(4,3)*AT(-1) + C(4,4)*AT(-2) + C(4,5)*FT(-1) + C(4,6)*FT(-2) + C(4,7)*PT(-1) + C(4,8)*PT(-2) + C(4,9)

## GENERALISED IMPULSE RESPONSE ANALYSIS

First differences of the logged variables in the unrestricted VARs were used to estimate the generalised IRFs and the generalised forecast error VDCs. Where C * (L)=C(L)A0 −1 denoted the impulse response function of Xt to structural shocks to ɛt.

Xt = C ∗ (L)$\boldsymbol{\varepsilon}$t

C ∗ (L) = C (L)Ao−1

## RESULTS AND ANALYSIS

### 1. Panel Unit Root Test

| | Varia | I(0) | P(0) | I(1) | P(1) | Remarks |
|---|---|---|---|---|---|---|
| | | t-Stats | P-value | t-Stats | P-value | |
| International Airline | PT | -33.0917 | 0.0000 | | | Stationarized at Level |
| | AT | -40.8018 | 0.0000 | | | Stationarized at Level |
| | FT | -19.1363 | 0.0000 | | | Stationarized at Level |
| | Cases | -1.85807 | 0.0316 | | | Stationarized at Level |
| | Deaths | -1.95629 | 0.0252 | | | Stationarized at Level |

**Note:** PT shows Passenger traffic, AT shows Airline traffic, FT stands for Freight traffic, Cases shows Covid cases and Deaths shows Covid deaths

The table above demonstrates the results of Panel Unit Root test for the study variables and shows that all the variables stationarized at level.

## 2. PANEL ARDL

### 2.1 Panel ARDL (1, 1, 1, 1, 1, 1, 1, 1) Long Run results for Covid Cases

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| **Long Run Equation** | | | | |
| Covid Cases | 24452.24 | 0.434 | 2.177184 | **0.03045*** |
| **Dependent Variables: Airline Traffic** | | | | |
| Covid Cases | 24271.22 | 0.234 | 1.570881 | **0.04844*** |
| **Dependent Variables: Freight Traffic** | | | | |
| Covid Cases | -81664.60 | 0.030 | -0.121639 | **0.0154*** |
| **Dependent Variables: Passenger Traffic** | | | | |

**P<0.01and *P<0.05

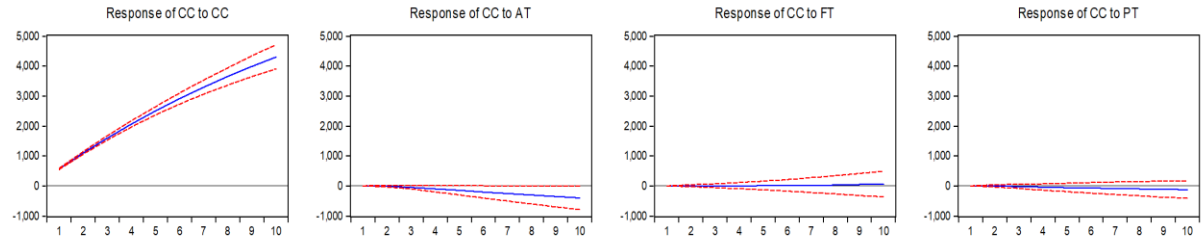
The long-run estimates of the study model are reported in the table above. The estimated coefficient of the long-run relationship evidenced positive and significant impact of Covid cases on Airline traffic comprehensively. The findings further reported the significant positive impact of Covid cases on Freight traffic however, a drastic negative highly significant impact of Covid Cases has been recorded on the Passenger traffic. In a nutshell, overall airline traffic has been effected by the increased Covid cases, with a great magnitude of decrease witnessed in Passenger traffic as compared to Freight traffic.

## 2.2 VECTOR AUTO REGRESSION MODEL FOR COVID CASES

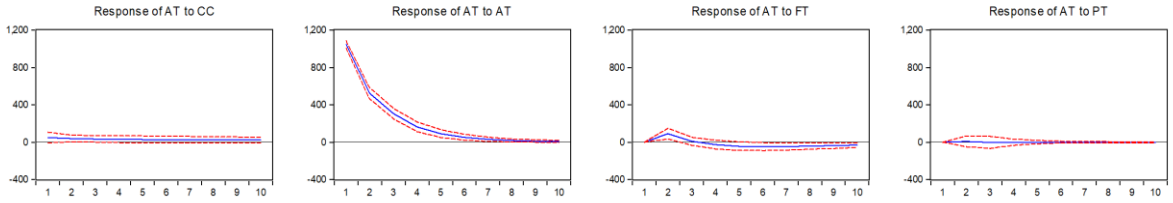
| | CC | AT | FT | PT |
|---|---|---|---|---|
| **CC(-1)** | 1.937715 | 0.025204 | -0.834027 | -5.10E-05 |
| | (0.01049) | (0.01935) | (1.73314) | (4.1E-05) |
| | [ 184.801] | [ 1.30239] | [-0.48122] | [-1.23502] |
| **CC(-2)** | -0.937596 | -0.025027 | 0.879876 | 5.37E-05 |
| | (0.01060) | (0.01956) | (1.75147) | (4.2E-05) |
| | [-88.4838] | [-1.27971] | [ 0.50237] | [ 1.28694] |
| **AT(-1)** | -0.008867 | 0.482623 | -3.292092 | -1.68E-06 |
| | (0.01490) | (0.02749) | (2.46235) | (5.9E-05) |
| | [-0.59525] | [ 17.5535] | [-1.33697] | [-0.02868] |
| **AT(-2)** | -0.021759 | 0.061367 | -6.396924 | -2.97E-05 |
| | (0.01489) | (0.02748) | (2.46124) | (5.9E-05) |
| | [-1.46129] | [ 2.23301] | [-2.59907] | [-0.50679] |
| **FT(-1)** | 5.02E-06 | 0.000983 | 0.901583 | -3.24E-08 |
| | (0.00017) | (0.00031) | (0.02754) | (6.6E-07) |
| | [ 0.03014] | [ 3.19749] | [ 32.7425] | [-0.04937] |
| **FT(-2)** | 2.36E-05 | -0.001256 | -0.060365 | -1.17E-08 |
| | (0.00017) | (0.00031) | (0.02771) | (6.6E-07) |
| | [ 0.14062] | [-4.06140] | [-2.17872] | [-0.01777] |
| **PT(-1)** | -1.191298 | 3.526998 | -365.9960 | -0.005727 |
| | (6.90804) | (12.7496) | (1141.84) | (0.02721) |
| | [-0.17245] | [ 0.27664] | [-0.32053] | [-0.21045] |
| **PT(-2)** | -7.087424 | -2.452852 | -198.8825 | -0.006105 |
| | (6.90387) | (12.7419) | (1141.15) | (0.02719) |
| | [-1.02659] | [-0.19250] | [-0.17428] | [-0.22452] |
| **C** | 216.4624 | 2275.329 | 59480.02 | 0.903505 |
| | (73.2343) | (135.163) | (12105.0) | (0.28846) |
| | [ 2.95575] | [ 16.8340] | [ 4.91368] | [ 3.13212] |

Source: Author's calculations

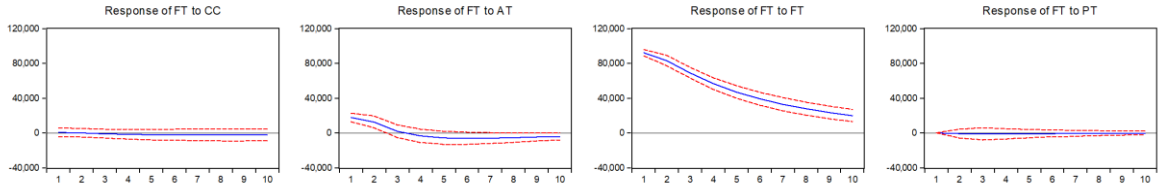
## 2.3 IMPULSE RESPONSE FUNCTION



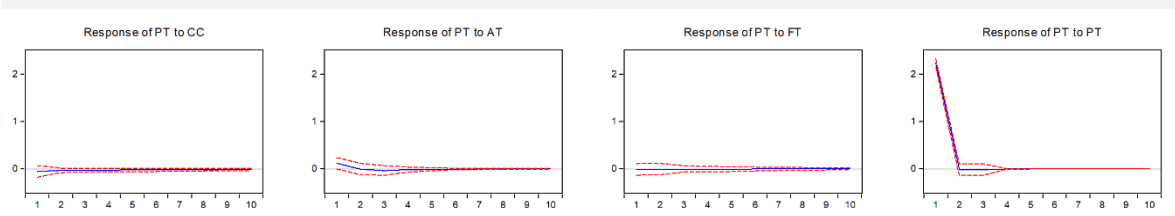

**Covid Cases (CC):** The results showed that Covid cases shock start its effect on Covid cases and shock reported an inclining trend until the last month and didn't get stable. Covid cases shock also affected Airline traffic and kept declining but did not become stable. Covid cases shock also affected Freight traffic and reported a somewhat near to constant trend until the last period. Covid cases shock also affected Passenger traffic and kept declining continuously until the last month.




**Airline traffic (AT):** The results showed that Airline traffic shock start its effect on Covid cases and shock reported a somewhat constant trend until the last month. Airline traffic shock also affected Airline traffic, kept declining, and becomes stabilized in a couple of the last few months. Airline traffic shock also affected Freight traffic and reported an inclining trend and somewhat becomes stabilized in the last period. Airline traffic shock also affected Passenger traffic and initially it showed a fluctuating trend and later becomes constant.




**Freight traffic**: The results showed that Freight traffic shock start its effect on Covid cases and shock reported a somewhat constant trend until the last month. Freight traffic shock also affected Airline traffic and kept declining continuously until the last months. Freight traffic shock also affected Freight traffic and reported a declining trend until the last period. Freight traffic shock also affected Passenger traffic and it showed a constant trend.




**Passenger traffic**: The results showed that Passenger traffic shock start its effect on Covid cases and shock reported a somewhat constant trend until the last month. Passenger traffic shock also affected Airline traffic, kept declining and then was constant until the last months. Passenger traffic shock also affected Freight traffic and reported a constant trend until the last period. Passenger traffic shock also affected Passenger traffic and it showed a declining trend.

## 2.4 VARIANCE DECOMPOSITION

**VARIANCE DECOMPOSITION OF CC**

| Period | S.E. | CC | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 568.2924 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 1238.895 | 99.99383 | 0.005690 | 1.46E-05 | 0.000462 |
| 3 | 2023.636 | 99.93519 | 0.053624 | 0.000193 | 0.010997 |
| 4 | 2893.682 | 99.84496 | 0.131664 | 0.000417 | 0.022959 |
| 5 | 3829.124 | 99.74348 | 0.222315 | 0.000848 | 0.033352 |
| 6 | 4815.334 | 99.64174 | 0.314647 | 0.001641 | 0.041973 |
| 7 | 5841.084 | 99.54481 | 0.403167 | 0.002925 | 0.049094 |
| 8 | 6897.506 | 99.45469 | 0.485517 | 0.004773 | 0.055024 |
| 9 | 7977.454 | 99.37179 | 0.560985 | 0.007207 | 0.060016 |
| 10 | 9075.088 | 99.29587 | 0.629660 | 0.010206 | 0.064265 |

Source: Author's calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of Covid cases results showed that during the first month 100% variation in Covid cases is due to itself, which decreased to 99.9% in the second month. Furthermore, Covid cases itself variation contribution decreased continuously until the last period and was equal to 99.2%.

**VARIANCE DECOMPOSITION OF AT**

| Period | S.E. | CC | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 1048.853 | 0.217417 | 99.78258 | 0.000000 | 0.000000 |
| 2 | 1176.398 | 0.278975 | 99.12274 | 0.593794 | 0.004488 |
| 3 | 1216.171 | 0.340218 | 99.09326 | 0.561868 | 0.004654 |
| 4 | 1227.981 | 0.396508 | 99.00188 | 0.596921 | 0.004695 |
| 5 | 1232.483 | 0.447598 | 98.83249 | 0.715208 | 0.004700 |
| 6 | 1234.777 | 0.494068 | 98.64141 | 0.859834 | 0.004691 |
| 7 | 1236.266 | 0.536614 | 98.46375 | 0.994953 | 0.004683 |
| 8 | 1237.352 | 0.575730 | 98.31300 | 1.106589 | 0.004677 |
| 9 | 1238.179 | 0.611737 | 98.19050 | 1.193094 | 0.004673 |
| 10 | 1238.819 | 0.644860 | 98.09276 | 1.257712 | 0.004672 |

Source: Author's calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of Airline traffic results showed that during the first month 99.7% variation in Airline traffic is due to itself, which decreased to 98.1% in the second month. Furthermore, Airline traffic itself variation contribution decreased continuously until the last period and was equal to 99.09%.

**VARIANCE DECOMPOSITION OF FT**

| Period | S.E. | CC | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 93933.73 | 0.004094 | 3.567631 | 96.42827 | 0.000000 |
| 2 | 126083.8 | 0.002306 | 2.963505 | 97.02998 | 0.004207 |
| 3 | 143804.4 | 0.006030 | 2.293127 | 97.69064 | 0.010207 |
| 4 | 154623.1 | 0.015254 | 2.034185 | 97.93710 | 0.013461 |
| 5 | 161710.8 | 0.028671 | 1.983998 | 97.97233 | 0.015001 |
| 6 | 166533.1 | 0.044877 | 2.011177 | 97.92818 | 0.015767 |
| 7 | 169886.3 | 0.062677 | 2.057223 | 97.86395 | 0.016154 |
| 8 | 172248.2 | 0.081090 | 2.100430 | 97.80213 | 0.016348 |
| 9 | 173925.3 | 0.099331 | 2.134801 | 97.74943 | 0.016437 |
| 10 | 175122.2 | 0.116796 | 2.160176 | 97.70656 | 0.016471 |

Source: Author's calculation

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of freight traffic results showed that during the first month 96.4% variation in freight traffic is due to itself, which increased to 97.02% in the second month. Furthermore, freight traffic itself variation contribution increased continuously until the last period and was equal to 97.7%.

**VARIANCE DECOMPOSITION OF PT**

| Period | S.E. | CD | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 93887.09 | 0.002830 | 3.600170 | 96.39700 | 0.000000 |
| 2 | 125969.2 | 0.020481 | 3.005021 | 96.96928 | 0.005215 |
| 3 | 143602.1 | 0.051139 | 2.330011 | 97.60581 | 0.013035 |
| 4 | 154333.1 | 0.088983 | 2.063719 | 97.83009 | 0.017213 |
| 5 | 161340.4 | 0.128872 | 2.006755 | 97.84514 | 0.019234 |
| 6 | 166091.4 | 0.166976 | 2.028814 | 97.78394 | 0.020268 |
| 7 | 169382.2 | 0.200871 | 2.071445 | 97.70686 | 0.020821 |
| 8 | 171689.8 | 0.229320 | 2.112698 | 97.63685 | 0.021127 |
| 9 | 173319.5 | 0.251977 | 2.146276 | 97.58044 | 0.021302 |
| 10 | 174475.3 | 0.269108 | 2.171729 | 97.53776 | 0.021406 |

Source: Author's calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of Passenger traffic results showed that during the first month 0.00% variation in Passenger traffic is due to itself, which increased to 0.5% in the second month. Furthermore, Passenger traffic itself variation contribution increased continuously until the last period and was equal to 2.1%.

## 3. PANEL ARDL FOR COVID DEATHS

### 3.1 Panel ARDL (1, 1, 1, 1, 1, 1, 1, 1) Long Run results for Covid Deaths

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| **Long Run Equation** | | | | |
| Covid Deaths | 738991.8 | 0.471 | 2.416794 | **0.000**** |
| **Dependent Variables: Airline Traffic** | | | | |
| Covid Deaths | 5960.103 | 0.372 | 1.931752 | **0.0258*** |
| **Dependent Variables: Freight Traffic** | | | | |
| Covid Deaths | -30788.96 | 0.012 | -0.0547359 | **0.0110*** |
| **Dependent Variables: Passenger Traffic** | | | | |

**P<0.01and *P<0.05

The long-run estimates of the study model are reported in the table above. The estimated coefficient of the long-run relationship evidenced a positive and significant impact of Covid deaths on Airline traffic comprehensively. The findings further reported the significant positive impact of Covid deaths on Freight traffic however, a drastic negative highly significant impact of Covid deaths has been recorded on the Passenger traffic. In a nutshell, the overall Airline

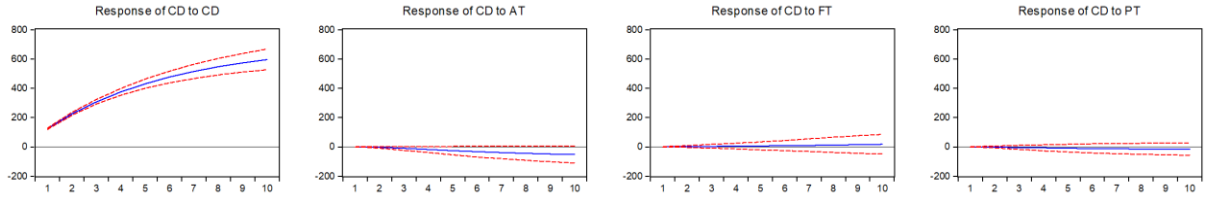
traffic has been affected by the increased Covid deaths with a great magnitude of decrease witnessed in passenger traffic as compared to freight traffic.

### 3.2 VECTOR AUTO REGRESSION (VAR) COVID DEATHS

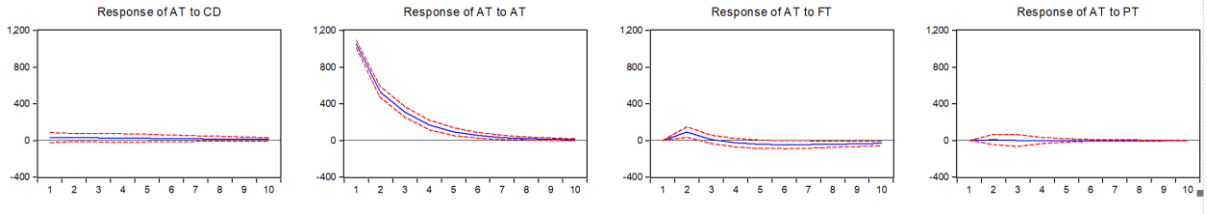
| | CD | AT | FT | PT |
|---|---|---|---|---|
| **CD(-1)** | 1.818170 | 0.133341 | -9.715556 | -0.000531 |
| | (0.01626) | (0.13853) | (12.3919) | (0.00030) |
| | [ 111.794] | [ 0.96254] | [-0.78403] | [-1.79813] |
| **CD(-2)** | -0.816609 | -0.133831 | 10.22764 | 0.000553 |
| | (0.01646) | (0.14021) | (12.5420) | (0.00030) |
| | [-49.6099] | [-0.95452] | [ 0.81547] | [ 1.84885] |
| **AT(-1)** | -0.003975 | 0.484081 | -3.203995 | 2.55E-06 |
| | (0.00323) | (0.02749) | (2.45929) | (5.9E-05) |
| | [-1.23155] | [ 17.6077] | [-1.30281] | [ 0.04353] |
| **AT(-2)** | -0.001491 | 0.063140 | -6.392836 | -2.96E-05 |
| | (0.00323) | (0.02750) | (2.45963) | (5.9E-05) |
| | [-0.46186] | [ 2.29628] | [-2.59910] | [-0.50455] |
| **FT(-1)** | 1.15E-05 | 0.000986 | 0.900431 | -6.89E-08 |
| | (3.6E-05) | (0.00031) | (0.02754) | (6.6E-07) |
| | [ 0.31835] | [ 3.20307] | [ 32.6971] | [-0.10493] |
| **FT(-2)** | -2.54E-06 | -0.001258 | -0.060689 | -1.27E-08 |
| | (3.6E-05) | (0.00031) | (0.02770) | (6.6E-07) |
| | [-0.06993] | [-4.06130] | [-2.19070] | [-0.01916] |
| **PT(-1)** | -0.791059 | 4.072304 | -407.1116 | -0.005855 |
| | (1.49768) | (12.7569) | (1141.14) | (0.02720) |
| | [-0.52819] | [ 0.31922] | [-0.35676] | [-0.21525] |
| **PT(-2)** | -0.803806 | -1.928596 | -240.8592 | -0.006277 |
| | (1.49682) | (12.7496) | (1140.48) | (0.02719) |
| | [-0.53701] | [-0.15127] | [-0.21119] | [-0.23089] |
| **C** | 40.81342 | 2278.235 | 59047.15 | 0.911505 |
| | (15.9216) | (135.617) | (12131.3) | (0.28918) |
| | [ 2.56339] | [ 16.7990] | [ 4.86732] | [ 3.15199] |

Source: Author's calculation

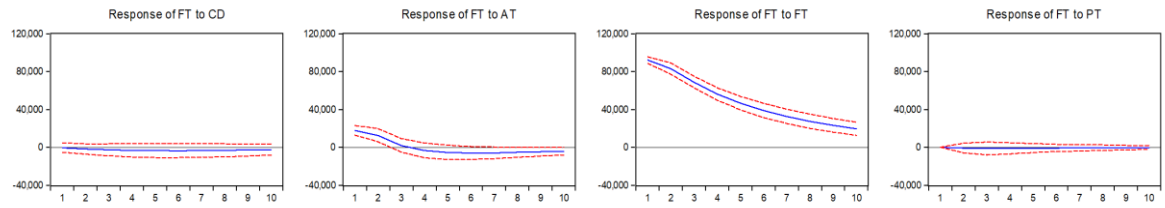
### 3.3 IMPULSE RESPONSE FUNCTION FOR COVID DEATHS



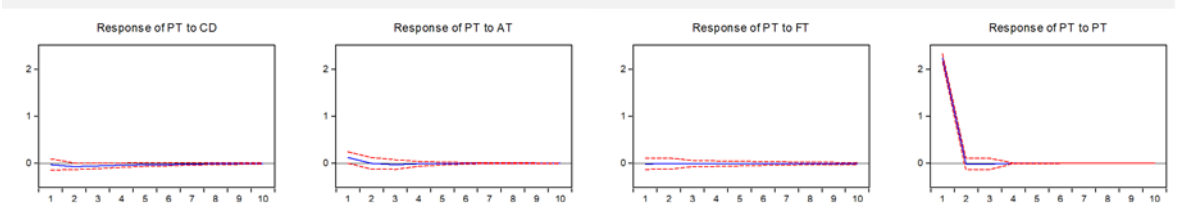

**Covid Deaths (CD):** The results showed that Covid deaths shock starts its effect on Covid deaths and shock reported an inclining trend until the last month and didn't get stable. Covid deaths shock also affected Airline traffic and kept declining but did not become stable. Covid death shock also affected Freight traffic and reported a slight increase until the last period. Covid deaths shock also affected Passenger traffic and reported a slight declining trend until last month.




**Airline traffic (AT):** Airline traffic shock also affected covid deaths and reported a slight declining trend and later constant until last month The results showed that Airline traffic shock starts its effect on Airline traffic and shock reported a declining trend until the last month and became stabilised in last month. Airline traffic shock also affected Freight traffic and kept inclining initially but later it continuously declined until the last month. Airline traffic shock also affected Passenger traffic and reported a constant trend until the last period.




**Freight traffic:** The results showed that freight traffic shock starts its effect on Covid deaths and shock reported a declining trend until the last month and almost a near stabilization in the last month. Freight traffic shock also affected Airline traffic and kept declining but did not become stable. Freight traffic shock also affected Freight traffic and reported a continuous declining trend until the last period. Freight traffic also affected Passenger traffic and reported a somewhat constant trend until the last month




**Passenger traffic:** The result showed that Passenger traffic shock starts its effect on Covid deaths and shock reported a stabilised trend in the last month. Passenger traffic shock also affected Airline traffic and slightly declined in initial years and become stabilized in the last years. Passenger traffic shock also affected Freight traffic and reported a continuous stabilised trend until the last period. Passenger traffic also affected Passenger traffic and reported a somewhat constant trend till last month

### 3.4 VARIANCE DECOMPOSITION OF COVID DEATH

| Period | S.E. | CD | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 123.2211 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 255.6369 | 99.96821 | 0.025252 | 0.001753 | 0.004781 |
| 3 | 399.2399 | 99.89115 | 0.086815 | 0.004096 | 0.017936 |
| 4 | 547.5485 | 99.80009 | 0.163531 | 0.006895 | 0.029483 |
| 5 | 696.7662 | 99.70818 | 0.242748 | 0.010527 | 0.038546 |
| 6 | 844.6401 | 99.62090 | 0.318277 | 0.015200 | 0.045618 |
| 7 | 989.8466 | 99.54028 | 0.387548 | 0.020966 | 0.051208 |
| 8 | 1131.643 | 99.46670 | 0.449836 | 0.027768 | 0.055698 |
| 9 | 1269.658 | 99.39986 | 0.505302 | 0.035479 | 0.059361 |
| 10 | 1403.757 | 99.33919 | 0.554485 | 0.043934 | 0.062391 |

Source: Authors calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of Covid deaths results showed that during the first month 100% variation in Covid deaths is due to itself, which decreased to 99.9% in the second month. Furthermore, Covid deaths itself variation contribution decreased continuously until the last period and was equal to 99.3%.

**VARIANCE DECOMPOSITION OF AT**

| Period | S.E. | CD | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 1049.573 | 0.081918 | 99.91808 | 0.000000 | 0.000000 |
| 2 | 1177.909 | 0.131516 | 99.26767 | 0.594850 | 0.005968 |
| 3 | 1218.426 | 0.178296 | 99.25333 | 0.562721 | 0.005658 |
| 4 | 1230.538 | 0.219857 | 99.17902 | 0.595552 | 0.005572 |
| 5 | 1235.111 | 0.254297 | 99.02940 | 0.710771 | 0.005532 |
| 6 | 1237.362 | 0.281777 | 98.86008 | 0.852630 | 0.005514 |
| 7 | 1238.753 | 0.303245 | 98.70561 | 0.985640 | 0.005506 |
| 8 | 1239.714 | 0.319809 | 98.57888 | 1.095809 | 0.005504 |
| 9 | 1240.404 | 0.332483 | 98.48063 | 1.181381 | 0.005503 |
| 10 | 1240.903 | 0.342121 | 98.40689 | 1.245488 | 0.005502 |

Source: Authors calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of Airline traffic results showed that during the first month 99.9% variation in Airline traffic is due to itself, which decreased to 99.2% in the second month. Furthermore, Airline traffic itself variation contribution decreased continuously until the last period and was equal to 98.4%.

**VARIANCE DECOMPOSITION OF FT**

| Period | S.E. | CD | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 93887.09 | 0.002830 | 3.600170 | 96.39700 | 0.000000 |
| 2 | 125969.2 | 0.020481 | 3.005021 | 96.96928 | 0.005215 |
| 3 | 143602.1 | 0.051139 | 2.330011 | 97.60581 | 0.013035 |
| 4 | 154333.1 | 0.088983 | 2.063719 | 97.83009 | 0.017213 |
| 5 | 161340.4 | 0.128872 | 2.006755 | 97.84514 | 0.019234 |
| 6 | 166091.4 | 0.166976 | 2.028814 | 97.78394 | 0.020268 |
| 7 | 169382.2 | 0.200871 | 2.071445 | 97.70686 | 0.020821 |
| 8 | 171689.8 | 0.229320 | 2.112698 | 97.63685 | 0.021127 |
| 9 | 173319.5 | 0.251977 | 2.146276 | 97.58044 | 0.021302 |
| 10 | 174475.3 | 0.269108 | 2.171729 | 97.53776 | 0.021406 |

Source: Authors calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of freight traffic results showed that during the first month 96.3% variation in Airline traffic is due to itself, which increased to 96.9% in the second month. Furthermore, Airline traffic itself variation contribution increased continuously until the last period and was equal to 97.5%.

| Period | S.E. | CD | AT | FT | PT |
|---|---|---|---|---|---|
| 1 | 2.238057 | 0.014537 | 0.299276 | 0.002930 | 99.68326 |
| 2 | 2.239053 | 0.099268 | 0.299021 | 0.003714 | 99.59800 |
| 3 | 2.239875 | 0.150971 | 0.316035 | 0.004718 | 99.52828 |
| 4 | 2.240260 | 0.181043 | 0.318459 | 0.006335 | 99.49416 |
| 5 | 2.240464 | 0.198156 | 0.318791 | 0.006989 | 99.47606 |
| 6 | 2.240572 | 0.207402 | 0.318769 | 0.007311 | 99.46652 |
| 7 | 2.240626 | 0.212027 | 0.318770 | 0.007494 | 99.46171 |
| 8 | 2.240651 | 0.214065 | 0.318805 | 0.007614 | 99.45952 |
| 9 | 2.240660 | 0.214770 | 0.318846 | 0.007701 | 99.45868 |
| 10 | 2.240663 | 0.214902 | 0.318876 | 0.007766 | 99.45846 |

Source: Authors calculations

The variance decomposition explains contribution by each variable to the other variables in auto regression. Variance decomposition of Passenger traffic results showed that during the first month 96.6% variation in passenger traffic is due to itself, which decreased to 96.5% in the second month. Furthermore, Airline traffic itself variation contribution increased continuously until the last period and was equal to 99.4%

## CONCLUSION

Hence, the objective of the current research was to investigate the impact of Covid cases and Covid deaths on the airline industry in Belgium, Albania, Austria, Finland, Germany, Italy, Spain, France, Turkey and United Kingdom during the Post Covid period. Findings of the Augmented Dicker's Fully test showed that all variables stationarized at level. Results of Panel ARDL showed that Covid cases as well as Covid deaths had a significant and drastic impact on the Air traffic, Freight traffic and Passenger traffic. Furthermore, the study also explained in detail the shock, aftereffects, magnitude, and intra and inter dependence between the study variables in detail. The findings of the study comprehensively evidenced that Covid 19 has harshly affected the aviation industry across the globe creating huge losses for the industry and bringing them to the verge of bankruptcy. At the moment, the aviation industry is struggling for their survival instead of revival. The findings of the present research will help the strategist to develop a contingency plan to overcome and minimise the losses created due the pandemic and fight their battle for survival.

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