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Short and Long run dynamics of domestic air travel for Auckland Region 2008-2019

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"Dinámicas de corto y largo plazo para el tráfico aéreo doméstico en la región de Auckland 2008-2019"

Resumen

Entender las variables que afectan las operaciones de las aerolíneas es crucial en un sector tan competitivo como el transporte aéreo. El presente trabajo intentará dilucidar cuáles son los determinantes de la demanda para el sector de cabotaje para la región de Auckland utilizando factores relacionados al servicio y a las características geo-económicas. Un modelo de correción de errores es desarrollado para estimar las elasticidades del ingreso y el precio para este segmento particular del mercado, así como también un posible efecto sustitución con otros medios de transporte y el efecto de la calidad del servicio ofrecido. Los resultados indican que una rebaja de precios no sería realmente efectiva en el corto ni en el largo plazo ya que el crecimiento de la demanda se explica principalmente por el efecto ingreso.

Palabras clave: tráfico aéreo, Nueva Zelanda, elasticidad de demanda, efecto ingreso, efecto precio

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Abstract

Understanding the variables that affect airline operations is crucial in a competitive sector as air transport. The present work will try to shed some light into the determinants of the demand for domestic air travel for Auckland Region using service-related and geo-economic factors. An Error Correction Model will be developed in order to estimate the income and price elasticities of this particular segment of the market, as well as the substitution effect with other means of transport and the quality of the service provided. It is found that lowering the price is not truly effective to stimulate demand in the short nor in the long run as the main driver of the growth of domestic demand is the income effect.

Keywords: air traffic, New Zealand, demand elasticity, income effect, price effect

Códigos JEL: L93, N77, R41

Contents

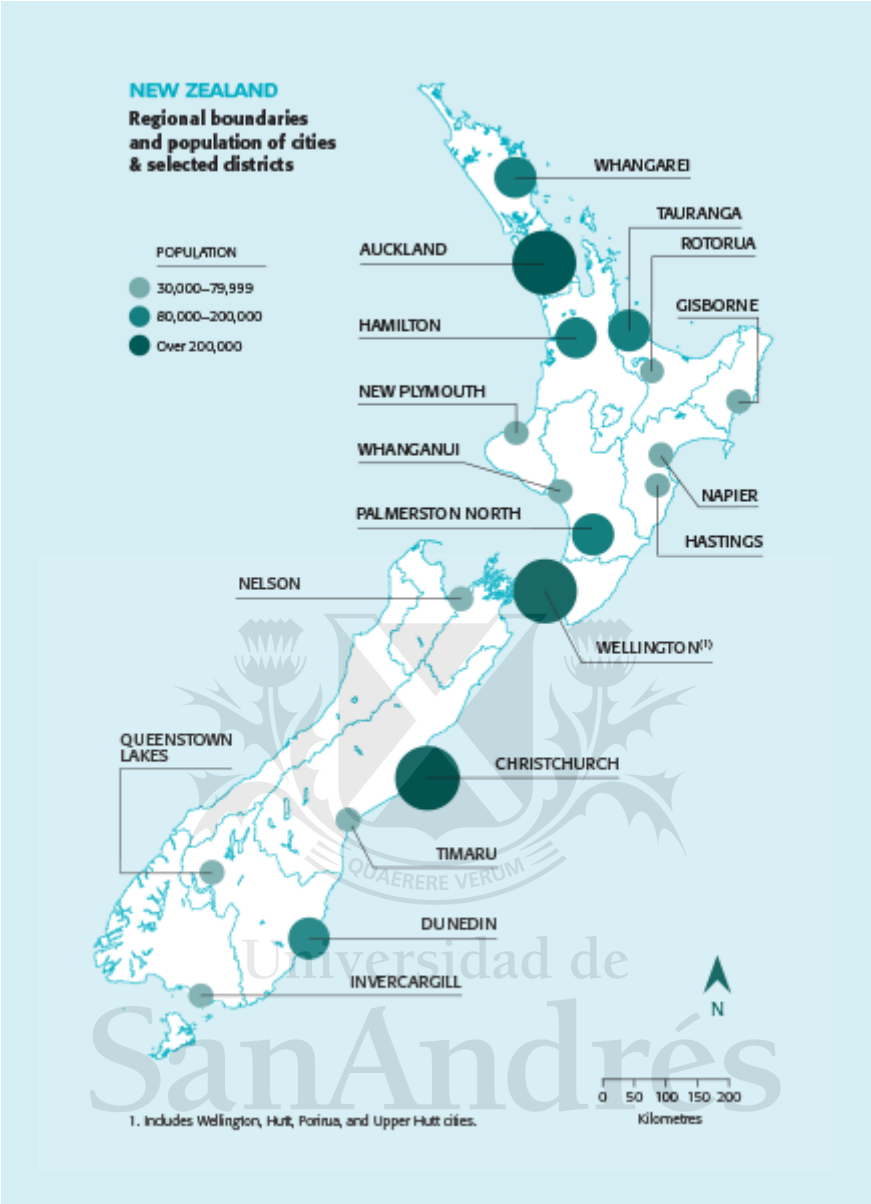
1 Introduction

Aviation transport has been significantly growing over the years as technological change, market liberalization, the emergence of Low Cost Carriers (LCCs) and economic growth have allowed more people to access this mean of transport. Air traffic is a great enabler of economic growth as it has a positive effect in trade and tourism and it helps to create employment.

New Zealand is in the top 15 of air travellers per capita in 2019 according to Airbus(2021). This can be explained mainly by 4 factors. First, New Zealand has a developed economy with a high level of income per capita. As it will be shown further ahead in this paper, Income is the main determinant of air travel. Second, the aviation sector, as much of its economy, is not heavily regulated allowing for competition which results in a better product for the consumer. In third place, its geography and population distribution makes New Zealand a perfect place for aviation to thrive. Lastly, there are no means of transport in New Zealand that can compete to air travel.

New Zealand's geography helps greatly to the development of the aviation sector, both for international and domestic travel. For international air travel, New Zealand's isolation makes it the only feasible option when travelling abroad. The closest country to New Zealand is Australia at 2000km of distance (distance between Auckland and Sidney). For domestic travel, New Zealand's geography and demographic distribution contribute to making air travel the best mean of transport. A map showing the population distribution in the country is shown in Figure 1. As it can be seen, the country consists mainly of two large islands, called 'North' and 'South' island interconnected by air or by a taking a 4h ferry crossing the Cook Strait between Wellington (North Island) and Picton (South Island). This makes air travel a highly competitive sector as it can reduce significantly the time of travel between cities. For example, if we take the case of the two biggest cities in each island, Auckland and Christchurch, by taking an airplane the amount of time spent travelling can be reduced from 16hs to 1h20m.

Figure 1: New Zealand population density Map



Source: https://newzealandlopesj.weebly.com/people–population.html

In New Zealand, air travel faces virtually no inter-modal competition, as privately owned cars are the most used mean of transport in the country (Humphris,2016). However, car is not as competitive and attractive as air travel, specially in longer distances. Additionally, and contrary to what happens in places like Europe where trains are passenger-oriented, in New Zealand the train system operates under a completely different logic. There are no trains in the country used for inter-urban passenger transport as railways are mainly used to freight hence making aviation an even stronger option

(Atkinson,2016).

The focus of this research is to understand the domestic demand for Auckland region as no papers addressing this topic could be found. Many papers study international travel, domestic tourism and even more so the duopolical market structure that defines New Zealand domestic aviation market. However, by not studying this particular market aviation sector may be at risk of miscalculating their actions.

The aviation sector is in constant pressure as competition has raised the bar for airlines and any efficiency gain is crucial to keep up with the market trends. Companies plan several years ahead and it is of upmost importance to understand what variables are affecting the demand for the service they offer and how can any change affect the operation and the income flow. For example, over estimating the demand will lead to a lower load factor and a lower revenue per seat offered, making the company struggle financially as many of this sector's cost are semi-fixed. Given this situation it is important to understand which forces are determining the behaviour of the demand and what tools are available for the companies to boost the demand, if any.

The rest of this work is structured in the following way. In Section 2 the main determinants of air travel demand will be explained, addressing economic and non-economic factors. In Section 3, different papers that focus on estimating different elasticities for air travel around the world will be analysed. In Section 4, the methodology used in this paper will be explained followed by Section 5 where data and results are presented. Lastly, in Section 6 there will be some concluding remarks and possibles ways to extend this investigation

2 Air Transport Demand Determinants

The literature revolves around several determinants for air travel demand. Graham(2000) defines the determinants as the factors that allow people to travel and motivators as reasons why people are willing to travel. Understanding both is crucial to measure the limits of the aviation industry growth and how these two set of variables interact. This is not only important for the airlines but also for policy makers who need to understand the consequences of any given measure or policy in the aviation market (Dargan & Hanly, 2000).

The list of determinants mentioned in the literature ranges from economic factors, such as Income or airline fares, to geographical factors or availability of different means of transport. Additionally, the market structure has a significant impact as it determines how airlines and other agents behave and under which laws the different players operate. We can potentially narrow the determinants of the demand into three big groups:

- Economic factors
- Market structure
- Geographic and socio-demographic factors

It is important to understand which role every agent has in the market. For example, a government can announce a new agreement that facilitates/disrupts the air traffic having a large impact on how the market is determined, without any other player interfering directly in that decision. On the other hand, airlines may only have an impact in some of the determinants, such as price, seats offered and schedule, but has no power to dictate the rules under which the market will develop or the geography of a given country. Jorge-Calderon (1997) addresses the former as service-related factors and the ones that cannot be affected by the airlines as geo-economic factors.

2.1 Economic factors

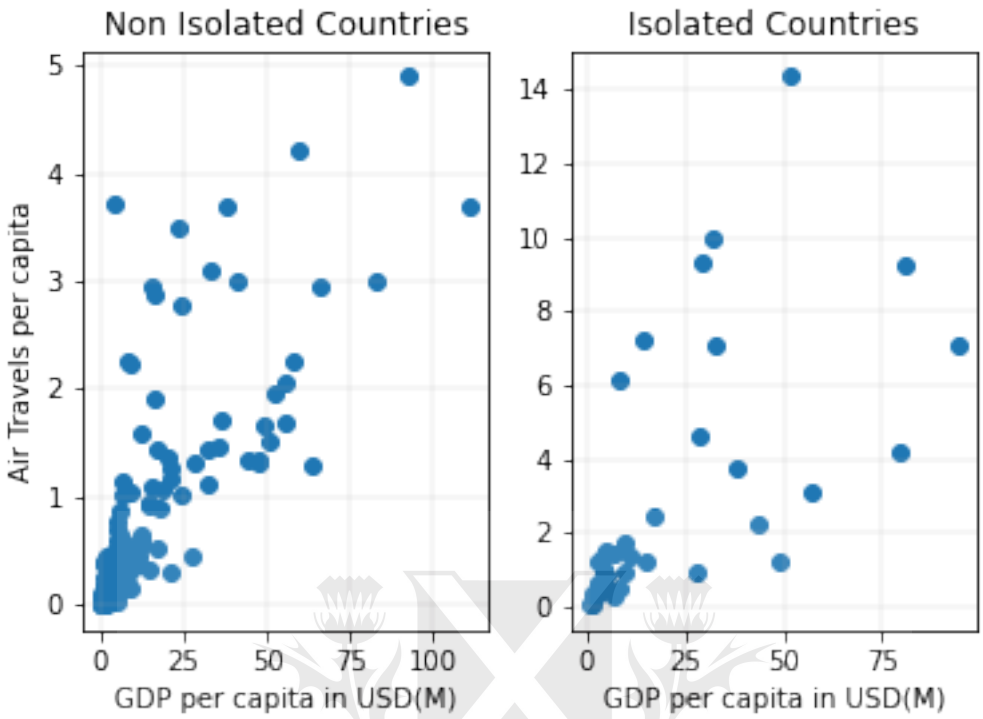
In this subsection different economic factors behind the demand for air travel will be addressed. There are many variables that are used in the literature to explain the drivers behind the air transport demand such as income, airline fares, trade, exchange rate, jet fuel price, population and immigration among others. The two main economic factors behind the demand for air travel will be explained in detail in this section; income and airline fares.

Income has been appointed as the key component fueling the demand for air travel. This can be measured as disposable income, consumer expenditure, Gross Domestic Product, Gross Domestic Product per capita and even as a stock variable like total wealth or assets. At least one of these variables are present in the majority of the studies that forecast air travel demand (this will be analysed in Chapter 3). Income is the main input used by the International Air Transport Association (IATA) (IATA, 2016), and the 3 most important aircraft manufacturers in the world (Boeing,2016; Airbus,2021; Embraer, 2020) while forecasting the growth for the aviation market in the coming years.

Not only Income is the main determinant of air travel but their relationship is elastic, as air travel shows an income elasticity around 2 implying that it may be considered a luxury good. As it is considered a luxury good, when the income increases, the higher is the propensity to travel (Zhang & Zhang,2018). Zheng & Graham (2018) point out that in 2013 the average air trips made by high-income passengers was 1.48. On the other hand, this number was 0.29 for middle-income passengers and only 0.04 for the low-income passengers.

Following this approach and analysing country-level data we appreciate a high correlation between GDP per capita and Air travels per capita as it can be seen in Figure 2. According to what is expected, the higher the income per capita, the more the people that will be travelling. In Figure 2, countries have been set apart if they are isolated meaning that there are no land borders with any other country thus making air travel a much more necessary mean of transport.

Figure 2: Correlation between GDP and Air travels



Source: Own graph based on Airbus(2021) numbers

While analysing air travel demand, it is important to segment passengers at least in two big groups; business and leisure travellers. This distinction will shed some light on the behaviour of each particular demand and how airlines interact with the market. Although business travelers are less, they generate more revenue per seat than a leisure traveller (Mason, 2005). It is important to understand the dynamics between income or economic activity and both groups of travellers.

As stated in Ishutkina and Hansman (2008), the way economic activity develops has positive impact on business activity, therefore driving business travellers to travel more often, generating an extra demand for airline tickets. Economic growth will mean more needs for passenger travel and freight impacting positively in air traffic demand. Also they argue that this could potentially feedback into more economic growth as the airlines have an impact called 'enabling effect'. This effect is caused by the service that airlines provide and can be summarised as every access that air traffic enables: to markets, to people, to capital, to ideas and knowledge, to labor supply, to skills, to opportunity, and

to resources.

This effect was studied by Hovhannisyan and Keller (2015) who showed that business travel had also had a positive impact in R&D generating patents that will eventually impact in larger productivity. It is highlighted that the origin of the travelers is important, as they find that passengers originating in places with substantial innovation have a larger effect in the number of patents. Poole (2010) finds that more travel leads to more commerce between the parts. The main driver behind this is because traveling helps reducing the communication barriers, as talking face to face is the most efficient way to communicate. Similarly to Hovhannisyan and Kelly(2015) it is argued that the effect will be larger if the travellers are high-skilled or the products that are being promoted are strongly differentiated. Additionally, Coscia et. al. (2020) found that business travel had a positive impact on economic development, as it will affect trade and investments. Moreover, they found that business travel from an area specialized in a particular industry will lead to the development of said industry in the destination region due to the diffusion of knowledge.

Similarly, income also have a considerable effect in the leisure travellers. As income grows, this group of passengers will allocate more time and resources towards more leisure activities, such as tourism. According to Jang and Ham (2009) the growth in the tourism sector will rely heavily on the growth of disposable income related to a steady growth of an economy. This affects air travel greatly, as with greater income means that people may consider longer distances at the moment of choosing their destination. This newly available and further destinations make air travel a much more attractive option, as it is much safer and faster than other traditional means of transport. This is shown in Schafer & Victor (2000) who find a positive relationship between income and faster means of transport. It is shown that people normally spend a fixed amount of time while travelling meaning that while choosing a faster mean of transport, people will be able to travel further without incurring in any extra time expenditure. This will increase the average travel distance of the passengers without increasing the time spent travelling. Aligned with this point, Graham & Metz (2017) find that budget constraint is the main

reason why people desist from flying meaning that lower-income travellers while not opt for air travel while picking the mean of transport.

Air travel also plays an important role in the tourism sector. It was highlighted in Zheng & Graham (2018) that during the 80s only a third of tourism passengers arrived by air while in 2015 over 50% travelled by this mean. The GDP growth, increasing seat offer and the surge of Low Cost Carriers (LCCs) have helped to develop tourism. While considering tourism demand, the mean of tranport is only one of the decisions a traveller needs to make. Brons et al.(2002) argues that the leisure travellers will be heavily influenced by income, as an airline ticket is only a part of the budget that a consumer will allocate when he decides to travel, as it has to spend money in accommodation, food and any other travel-related expenses. This would explain why income plays such an important role, as passengers buying an airline ticket are also purchasing a bigger basket of goods which they should be able to afford. This also weighs down the impact of the price of a ticket, as it effect will be affected by the proportion of that cost in terms of the entire cost of the trip.

Wang (2014) studies the impact of income related to tourism and finds a positive relationship between GDP per capita and tourism expenditure. However, the author finds that the effect of the GDP per capita on tourism expenditure will depend on how much people save. This means, the higher the savings rate, as opposed to disposable income rate, the smaller the effect of GDP. Divisekera (2010) estimates the importance of income and prices on the tourism sector. It is shown that income has a positive impact in the expenditure consumers destine for vacations. Moreover, it finds that income elasticity is significantly greater than price in the selected categories; Accommodation, Food, Transport, Shopping and Entertainment. Similar findings were found by Pyo et al(1991) who found that income elasticity for tourism expenditure was positive and significant meaning that the higher the income, more money was destined to tourism. Furthermore, it is found that transportation was highly sensitive to income explaining that people tend to travel further when income rose, assuming the distance is proportional to the expenditure on transportation.

The other big economic determinant behind the demand of is the price of the airline tickets. As economic theory suggests there is a inverse relationship in the price of a good and the quantity demand for it. This is also the case for aviation market as it has been studied that with deregulation, increased competition and the surge of LCCs fares have decreased allowing people to travel more often and longer distances.(Aguilo et al. (2007), Chung & Whang (2011), Graham & Dennis (2010), Zhang et al (2017), Oum et al. (2009)). The LCCs allowed people that usually were not travelling before due to the high prices of the tickets rather than passengers switching from 'Full Service Carriers' (FSCs). However, this effect has decreased as the difference in fares between carrier types have decreased meaning that the FSCs had to adapt to a more competitive environment (Abda,2012). Similarly, Brons et al(2002) finds that air travel passengers have become less elastic to changes in prices over the time. It is also suggested by literature that market price elasticity may be lower than the elasticity faced by every airline (Zheng & Graham, 2018).

In a market with high fixed-costs, every seat has to be sold in the most efficient way in order to maximise profit in a low-margin industry. To achieve this a high level of price discrimination exists within the industry. This allows carriers to maximise their flows of revenue by adequately targeting different customers to improve their efficiency. As technology and internet became massive, customers now have the possibility to compare more efficiently prices between carriers making customers more elastic to relative change in prices among airlines (Granados et al., 2012). This has changed over the past years as the price gap between different airlines became narrower due to price competition which led to a commoditization of tickets, erasing the differences and the power of airlines to compete just by price. This presents challenges and opportunities as airlines must compete in other way, offering different products and different services related to each fare (Granados et al., 2012b).

Accordingly, there are many ways in which airlines can execute a price discrimination strategy. Periods of time with higher demand, i.e holiday or special events will have higher fares than any other regular flight as the demand increases but the supply is inflexible

in the short term. Additionally, usual ways of price discrimination are anticipation of purchase as it can be seen in Groves & Gini (2011) who develop a model to optimally purchase a ticket based on the days prior to departure. Escobari & Jindapon (2014) develop a model of price discrimination in airlines based on the possibility of refunding the ticket targeting customers who still are not certain of travelling. Another way is addressing the length of stay of the passenger as business travellers have shorter stays than leisure ones (Hellström, 2006). By imposing restrictions on the length of stay, airlines could increase the revenue by obtaining higher fares from business travellers. Other forms of discrimination include point of sale (Lutmann, 2019), day of purchase (Puller & Taylor,2012) and time of purchase (Escobari et al, 2018).

2.2 Market Structure

Aviation is a sector that historically has been heavily regulated and faced a liberalisation process starting in the late 1970s, with the first deregulation coming in the United States in 1978 (Scharpenseel, 2001). Before this deregulation process began, governmental agencies took the decisions on what routes to fly, which fares were going to be charged and did not allow new companies to operate. This did not let airlines to compete in any other way other than offering a better quality of service, but not much more than that. After deregulation, competition among airlines began, with a reduction in fares which allowed more people to travel. Moreover, companies changed their operations creating new HUBs in order to attract more revenue and the new competition created needs for airlines to join by merging to gain in efficiency. This competition made the airlines become more efficient and productive as found in Semenick & Sickles(2000).

In Europe a similar non-competition scheme ruled the skies during a large portion of the XXth Century. Every country had sovereignty over their own air space, which led to a system ruled by bilateral agreements, where competition was almost null as there was no freedom in setting new routes and where the fares were virtually fixed. This was changed in the early 1990s with liberalisation of the air market having the expected effect of reducing fares and increasing both frequencies and passengers (Scharpenseel, 2001).

Abate(2016) present similar findings in the liberalisation of the Air Market in Africa. After being heavily regulated by Bilateral Agreements, the African market went a process of deregulation following the signing the Yamoussoukro Decision in 1999, which made the countries to commit to fully liberalise air services including capacity, frequencies, fares and route access. This had a result of a decrease in fares, more seats were offered thus incentivising the passengers flow.

Similar cases can be found around the globe, for example Wang et al.(2018) uses the cases of India and China to measure the impact of market composition in price and demand. Both countries faced a liberalisation of their aviation market during the 1980s but in China most of the market is still captured by 4 state-owned airlines, while in India private airlines have an 80% of the market share with a high share of Low-Cost Carriers component. This liberalisation had the expected result of lower fares and increased demand. Moreover, this new composition shaped the behaviour of the customers as it is shown that Indian Passengers are more elastic to changes in prices than the Passengers in China.

We find that New Zealand presents a similar case as the rest of the globe as it went into a deregulation process in 1984. In that time the entire New Zealand government was moving towards a new direction, leaving behind a government that was characterised by being highly bureaucratic, with a strong sense of allegiance to a political leader and highly inefficient to a model of government that deregulated the economy, letting the business improve their efficiencies and limiting the government to 'keeping the house in order' (Lyon,2011). What this implied for the aviation industry, was similar to what had happened in the rest of the world. The 'New Public Management' represented a change in two important aspects: it allowed competition within the airline market, offering more routes and allowing new players to join the market; it also changed the ways airport were managed as now they were viewed and administered as a commercial unit. This represented a change in the incentives in the market opening new opportunities to airlines and aviation related business to grow.

This ultimately led to Ansett joining the New Zealand aviation market in 1987, as a

first competitor. This happened 3 years later the deregulation of the market, given that New Zealand market was not big enough, with a highly urban population concentrated in the 3 largest cities (Mills,1992). This gave time to Air New Zealand, the solely incumbent in this market to prepare and adapt to the new conditions of the market. This had had the expected effect of increasing the frequencies flown by the carriers, reducing the fares and increasing air traffic.

2.3 Geographic and Socio-Demographic factors

Geographic and socio-demographic factors also shapes the behaviour of the consumers and the choices they make while travelling. As it affects demand, it will ultimately also have a great impact on how the market is structured.

It is shown by Bhadra & Wells(2005) that air traffic will be located in large urban areas, implying that air travel will be heavily influenced by the location of the population and what economic activities are performed in any given region. In addition to this point, Dobruzkes et al.(2011) find that air traffic will be heavily linked to the importance of a metropolitan region. The authors argue that the size of a metropolitan region and the decision-power they have will help to generate more air travel.

Size and economic activity of a region cannot solely explain air traffic demand as explained by Addepalli et al.(2018). The authors correctly address that not only the size of the population will have an impact on air traffic, but also its composition and they behavioural attitude. The authors mention that the higher the percentage of working people in the population, the higher growth there will be in the demand for air traffic. Moreover, they also mention the ascending mobility of the social classes highlighting the importance of the growth of the middle class. As the economy and the middle class population grows, more air traffic will be expected as a consequence of the increased income of this share of the population. Lastly, it also mentions the importance of the culture and the attitude of the population towards air travel.

Schubert et al.(2020) find that several demographic factors have a relationship with air travel. More precisely, he finds that gender, family composition, age and having

a family could be used to explain the demand of air travel. Moreover, he finds that higher educated people travel more than those with a lower level of education. Similar findings can be found in Reichert & Holz-Rau(2015). Regarding this last point, several studies have been considering the cultural aspect and how different events may shape the air traffic demand. Mokhtarian et al.(2001) shows that not only travel is influenced by mobility needs, but also it is heavily influenced by the passengers' attitude towards travel. The authors indicate the travel might not be only a derived demand based on the necessity of mobility but also the action of travelling reports utility to the consumer. They find that subjective variables such as Travel Liking, how stressed a person becomes when travelling and their own personality add significant explanatory power to the traditional demographic variables used to define the determinants of travel.

Catastrophic events, such as terrorist attacks, natural disasters can also halt the demand for air travel. Cro & Martins (2017) address the fact that tourism is widely affected by natural disasters, terrorists attacks, political stability, economic and financial crisis, and bio-security and disease threats. This adds another challenge to the airline industry, as these are factors that are out of the scope of control. However, this impacts greatly and the time it takes to recover vary depending on the nature, magnitude and scale of the underlying event that triggers the crisis (Backer & Ritchie, 2017). A terrorist attack may be an issue that it is resolved quickly, while a natural disaster may damage infrastructure hence having a more persistent effect. However, this events may have a larger impact than as they may shape the behaviour of the consumer. Gordon et al. (2007) analyses the impact of the 11S terrorist attack and finds out that the impact it had in the airline industry is larger than what is expected from property damage and interrupted business activity, explained due to the behavioural impact of the attack.

3 Literature Review

The dynamics and elasticities regarding air travel have been studied widely in the literature. As expected, many authors rely on Income and Fares to estimate the determinants of air travel. In this section, we will be analysing several papers to understand the variability of the results and what tools have been used to fit the demand model for air travel. No paper addressing the New Zealand domestic demand for air travel has been found, which highlights the importance of the current work.

Valdes (2015) uses panel data of 41 countries to estimate elasticities regarding air traffic demand. The author works with static and dynamic models which present similar findings regarding the income elasticity. In both cases the elasticity sits well above 1, implying that it is a highly elastic good regarding income. Moreover, it finds that the passenger growth is explained 75% by the variation in income making it the most important variable. It is shown that the presence of Low Cost Carriers have an impact in the amount of passengers, but the effect is negligible as these companies do not have a strong position in the markets analysed.

Similarly, Cheze et al. (2010) study how air travel responds to growth in GDP, but also to changes to jet fuel prices, that can be understood as a proxy variable for airfares, and to external shocks, whether they are general shocks (economic slow-down) or sectorial shocks (i.e terrorist attacks). The authors find that income explains the growth in air travel but also that these kind of shocks affect differently the demand so understanding the nature of the events that may slow down growth in air traffic is crucial to analyse the impact they will have.

As mentioned before, air travel passengers also take into consideration certain subjective attributes while choosing to travel. Ogwude et al. (2017) studies the air travel demand for Nigeria by using both aggregate and disaggregate data for commercial flights. The authors include not only economic factors as GDP per capita and fares but also add quality service indicators such as frequencies, the On-time performance, circuity and geographic factors modelled as the distance between Origin and Destination. The authors find that both Income and Price have a significant impact on air travel. Additionally, the

authors show that service related variables have an impact in the demand, implying that passengers prefer routes with more frequencies hence allowing them to find the product that suits best their needs. Also, they find that shorter routes are preferred as well as a good on-time performance.

Following this way of addressing the demand, Jorge-Calderon (1997) shows that the relationship between the variables relies on the distance and the different markets. For example, it is found that Price elasticity is higher in the shorter-haul market. This could be explained by the fact that in shorter distances, airplanes have more competition by other means of transport such as car and trains. In short distance travels, the fixed time of air travelling may be larger compared to the on-board time. Travelling to the airport, checking-in and other airport duties will make the total travel time longer. On the other hand, this sector faces less price sensitivity in larger distances routes. This means that other means of transport are costly in time, so the airlines face a demand that may not respond to changes in price. Also, the author find that the elasticity of the amount of frequencies is more important in shorter distances and that effect dilutes in the longer distance as the size of the aircraft, hence more technology or better service in-flight, become more important.

Alperovich & Machnes(1994) studies the impact of income and fares for air travel in Israel. The importance of this paper relies on the variables used to explain the demand for air travel. Alongside the income variables, the author also uses assets to explain the demand for air traffic. The argument behind this is that the people base their decisions not only in any flow of income, but also depend on more permanent wealth. The study finds a positive relationship between income both transitory and permanent and air travel, presenting a elasticity larger than 1. Accordingly, it finds that the demand is fairly inelastic regarding price.

Aderamo(2010) argues that the best way to understand the demand for air travel is through economic activity. For this reason the author uses GDP, the index of Agricultural Production and the index of Manufacturing production to explain air traffic demand, both passenger and freight. It finds a positive relation, with the demand responding in

an fairly elastic way to changes in the level of product for the selected country. The author concludes that the best way to boost air traffic demand is allowing for a stable economic environment as the country studied faced several decades of economic turmoil.

Caglar(2012) uses an Error Correction Model to explain short and long run elasticities of air traffic. The author finds that the Income is the most important factor explaining the growth of the aviation market in the studied country, while prices of fuel and the competition with other means of transport seems to have no effect in the number of passengers. What is more important, the author shows that the elasticities in the long run are higher than in the short run. This could be explained by the fact that passengers in the long term are able to adjust their expectations and take more rational decisions. On the contrary, in the short term passengers may not be able to swiftly adapt the consumption behaviour making them less elastic to changes in income. In both cases we find that the air passengers respond elastically to changes in income.

Similarly Wadud (2014) estimates short and long term elasticities for income and price using jet fuel price as a proxy variable for price. Additionally, the author explores whether the interaction of these variables with the amount of passengers is reversible, trying to understand if variations in income and price affects in the same way when the variation is positive or negative. The author found that this is not the case by showing that the elasticity of income will depend on the type of change and starting point. More importantly, they find that an income growth after a recession has a larger impact than in cases where income follows a steady path of growth. This is aligned with the anecdotal evidence of the resilience in the aviation industry, as the industry will recover quickly after a recession. The author finds that in the short term, the customers cannot adjust efficiently enough having a fairly inelastic response to changes in income. On the contrary, for the long term the changes in income have a larger impact in the amount of passengers. For prices, it is found that the demand will respond fairly inelastically.

Chi and Baek (2013) use an ADRL model to measure the impact that economic growth has on the demand for air services. The authors analyse the case of both passenger and freight demand, while also accounting for external shocks such as terrorists attacks and

the 2003 SARS pandemic. They find that both in the short and long run, the main driver for air services, more specifically passenger traffic demand is caused greatly by the growth of income. In both short and long run, the elasticity is higher than 1 with the elasticity in the case of the long run being greater than in the short run. They show that the terrorist attack of 11S has a negative effect in demand, both in the short run as it is expected but also a persistent effect that is captured by the long term coefficient.

Sabitov (2019) analyses the case of an specific pair of cities and consider not only economic variables, but also some service variables such as frequencies and the scheduled time of other means of transport. As it is found in the literature, the author finds that the main driver of the demand for air travel for that particular market is income, with an estimated elasticity larger than 1. The author also find that the demand responds significantly to changes in prices, both of the fare itself and also the price of the substitute mean of transport. In this case, the service indicators are not statistically significant so the author highlights the importance of income as the main force driving demand for air services.

For the New Zealand case, Tsui (2017) uses economic and aviation market variables to explain domestic tourism in the country. Although not being strictly explaining the demand for air travel, the study presents some interest findings. The most important finding, and as is it mentioned greatly in the literature, is that the main driver for tourism is income. The author finds a significant relationship across all model specifications estimated being the most important contributor to domestic tourism. Additionally, the author shows that competition in the Aviation market has a positive impact in tourism implying that the having more options to fly is encouraging people to travel more. On the other hand, the author does not find strong evidence about the price of air fares or the price of fuel in the country. The main argument is that the price will not be what people look while travelling in the country but it is the destination and how time efficient are each mean of transport. It is not the same for a passenger to travel between the North and South Island or to travel within the same island. In the first case, air travel is way more convenient as it reduces the time drastically while in the latter example driving

remains as a more viable option.

Similar findings can be found in Becken and Schiff (2011) who estimate a model to understand the impact of variation of road transport cost and air fares to explain the distance that a group of tourists will travel while being in New Zealand. The authors do not find significant evidence that prices are driving people to travel longer distances, both in road transport travel or air travel. In this case, the authors argue that the main determinants are given by the length of stay and the purpose of their visit.

There are not many examples of studies regarding domestic air travel in New Zealand, although some papers on international travel for the New Zealand will help us to shed some light into this market. As expected, and aligned with literature, the way that international travel is affected in this particular country is like in the rest of the world. Papers address the importance of economic performance, and add different variables depending on where they want the focus to be.

Tsui et al.(2017) explores the growth and dynamics of international business air travellers between New Zealand and different business partners estimating a model using panel data. In their findings, the authors argues that the main determinants while explaining international business travel to the country are how much do the countries trade among them, the economic stability of the country and the availability of direct flights between them. This is something important as indicates that as more options and better schedules i.e direct flights are given to the customer, this could potentially increase air traffic between two destinations. Although not necessarily linked to domestic travel, this could indicate that a stable and positive economic performance will help to boost the demand for air travel.

Duval & Schiff (2011) also focuses in international travel for New Zealand country. In this case, the authors focus on the availability of air services to account for the growth of air travel between two destinations. The authors find significant evidence that GDP of the origin countries going to New Zealand has an impact on the amount of travellers. However, it is found that adding more direct flights will not have a significant impact on the amount of passengers that travel to the country as the indirect offer of flights seems

to be enough to carry the passengers. Nonetheless, the author highlights that this may not be the case with business travelers as they are sensitive to more convenient direct flights offer.

Wang et al. (2013) also studies the relationship between international passengers arrival in New Zealand. As it is expected and suggested by literature, GDP is the main driver of travel between the selected countries and New Zealand. However, for some particular selected Asian markets exchange rates and more importantly immigration policy have a significant in the amount of passengers, as it increases an important part of travellers that are those who use their trip to visit friends or family.

Henderson et al.(2019) studies the New Zealand case and how consumers behave in the presence of a duopoly as it is the domestic market. There are mainly 2 airlines who dominate the New Zealand domestic market, with Air New Zealand acting as the dominant company and operating under a FSC business model and Jetstar, a subsidiary of an Australian Company that operates with the logic of a LCC. As it is expected, price is the main factor attributed to the customers choosing one airline over the other. As it is suggested by literature, it is normal that airlines face a larger price elasticity than the entire market itself. This concept implies that airlines may win market share by reducing the prices but the total passengers of a given market won't necessarily grow. Additionally, a variable 'time' was found the other large driver for customers. This 'time' variable includes the flight being on time and the availability of several schedules that fit the passenger in a convenient way. What this findings represent is that airline managers should focus on basic metrics when assessing their market share in the New Zealand domestic market.

Hazledine(2011) also analyses the oligopoly in the New Zealand aviation market and how this affect the fares in the market. He proposes three hypothesis framed in the Cournot oligopoly modelling. The author emphasises that in this particular market, price discrimination is way higher than other markets hence there is not only 1 price for the service, but several that will depend on many factors such as anticipation of purchase, length of stay or how many bags has the customer checked in. The first hypothesis

is that despite this price discrimination, the standard price under the Cournot should still prevail despite the temporal price discrimination. Second is that the difference between maximum and minimum price will be lower as competition increases. Lastly the distribution bell of prices will be fatter, meaning that more will be sold at higher prices despite the decrease in the maximum price. These hypothesis are backed by the results of the model estimated by the author. He finds that competition affects in the higher end of fares, as passengers who pay lower fares are quite elastic hence limiting the airlines power. The most interest finding by this paper is that Air New Zealand is able to charge higher fares than its competitors, while market price remains stable. This may be because Air New Zealand maybe because it faces a better image to the customers or because the schedules are better and more variate giving business travellers better options while flying.

Gillen and Hazledine(2016) study the impact of competition in the New Zealand market alongside others countries of interest. Similarly to Hazledine(2011) they find that having the competition in duopoly reduces the average fare than would happen if the market had only one supplier. Additionally, and aligned with what literature suggests the competition increases the seats offered to the customers improving the schedules available to match better with the passenger needs. Something interesting from these papers is that they show how the flexibility of an airline in terms of aircrafts allows them to adjust better and obtain more revenue in specific routes.

4 Methodology

The approach used is in this paper is based on the existence of co-integration relationships between time series. This idea was first studied by Granger (1981) as suggested by Engle & Granger (1987), who extend the idea to develop estimation procedures. Mainly, the idea behind co-integration of time series is that even though the co-integrated series may wander and drift apart, they will be in the long term in a equilibrium relationship. Normally, there is some economic approach on why this relationship exists and what force pulls them together. The definition of co-integration of a vector x_t proposed by Engle & Granger(1987) is what follows:

The components of the vector $x_t = (x_{1t}, x_{2t}, .., x_{nt})$ are cointegrated of order (d,b) if:

- All components of x_t are I(d)
- There exists a vector $\alpha(\neq 0)$ so that $z_t = \alpha' x_t \sim I(d-b)$, $b > 0$.

  α is known as the co-integration vector.

What this definition implies, is that in the case z_t is $I(0)$ and has zero mean the equilibrium (or close approximation) will occur and that this could be used to estimate the relationship between variables. If co-integration exists, an Error Correction Model (ECM) can be estimated by explaining the growth rate of the regressand (Δx_{1t}) by the growth rate of the explanatory variables (Δx_{nt}) and the past imbalance of this relationship. The last component is called Error Correction Term and it is what brings the variables into equilibrium. A simple two variable ECM can be expressed in the following way:

$$\Delta x_{1t} = \beta_1 \ \Delta x_{2t} + \beta_2 \ \epsilon_{t-1} + \mu_t$$

Where we can see that the variation of the dependant variable is regressed in the variation of the independent variable, what we can call the short run dynamic. ϵ_{t-1} is called the Error Correction Term (ECT). The coefficient β_2 will explain how fast will the equilibrium be recovered when exists a deviation from it. μ_t is the stationary disturbance. The usefulness of an ECM comes from its ability to represent both the short and long run

dynamics in the same equation. Assuming that x_1 and x_2 are I(1), what we need in this particular equation, in order to obtain meaningful results and no spurious regressions is that the ECT is I(0) so that the equation is in balance.

The methodology proposed then is to first obtain the long term relationship and estimate the residuals. To check for co-integration of the variables the stationarity of the residuals must be checked to see if a unit root exists or not. If it does not, then we can say that the variables regressed are cointegrated and an ECM could be estimated. In order to correctly check for stationarity in the residuals the Engle & Granger (1987) proposed 7 different statistics as the usual ones are not as effective as required.

Moreover, Engle & Yoo (1987) expanded the work previously mentioned by generating a new set of critical values to check for co-integration of multiple variables and for different sample size so that checking for the stationarity of the residuals should be using the t-statistic estimated by the authors. This will allow to correctly address the stationarity of the residuals by making a simple auxiliary regression of the form.

$$\Delta ECT_t = -\phi ECT_{t-1} + \epsilon_t$$

The t-statistic for ϕ is the value to compare to the critical ones proposed by Engle & Yoo (1987).

Given the nature of this paper and working with airline passengers, seasonality is something that should be taken care of. Following the ideas of Hylleberg et al. (1990) propose that all the work proposed by Engle Granger (1987) fails to address the existence of seasonality in economic time-series. Moreover, they propose the possibility of the existence of unit root in other orders or frequencies, generating a framework to analyse this pattern. To check for seasonal cointegration among the series we first use the Hylleberg et al. (1990) procedure to test for Seasonal Unit Roots and we continue to evaluate cointegration at different frequencies. This procedure consists of factorizing the polynomial as follows:

$$(1 - B^4) = (1 - B)(1 + B)(1 - iB)(1 + iB)$$

$$= (1 - B)(1 + B)(1 + B^2)$$

As we can appreciate in this equations for quarterly data, there are 4 units roots: 1, -1, *i* and *-i*. This respectively correspond to zero frequency ($\omega = 0$), 1/2 cycle per year ($\omega = 1/2$) and one cycle per year ($\omega = 1/4$). The roots *i* and *-i* cannot be distinguished for quarterly data, so they are both interpreted as the annual cycle. The model to test the existence of seasonal unit roots can be expressed as follows:

$$\varphi^*(B)\ x_{4t} = \pi_1\ y_{1t-1} + \pi_2\ y_{2t-1} + \pi_3\ y_{3t-1} + \pi_4\ y_{4t-1} + \epsilon_t$$

where $y_{1t} = S_1(L)x_t$, $y_{2t} = S_2(L)x_t$, $y_{3t} = S_3(L)x_t$ and $y_{4t} = S_4(L)x_t$. With the operator S_1 being a seasonal filter that removes all seasonal unit roots, while S_2 and S_3 eliminates the $\omega = 1/2$ and $\omega = 1/4$ respectively as well as the zero frequency unit root. To test for unit roots, Hylleberg et al. (1990) proposes a t-statistic for π_1 and π_2 and a joint F-statistic for π_3 and π_4.

In addition this approach to seasonality, Engle et al. (1993) broadens its usefulness and develop a two-step approach to estimate a Seasonal Error Correction Model, testing the cointegration at different frequencies and including a seasonal Error Correction Term in a similar way to Engle-Granger. In this case, the Seasonal Error Correction Model can be expressed in the general manner as:

$$\tilde{A}^*(B)\Delta_4 x_t = \gamma_1\ \alpha_1\ y_{1,t-1}\ + \gamma_2\ \alpha_2\ y_{2,t-1} - (\gamma_3 + \gamma_4 B)(\alpha_3 + \alpha_4 B)\ y_{3,t-2} + \epsilon_t$$

Where γ_1, γ_2, γ_3 and γ_4 contain the weights of the cointegration relations for the different frequencies. Then y_{1t}, y_{2t} and y_{3t} are vectors that contain the transformed observations in x_t. In this equation we can appreciate, that the model adjusts because of its Long term cointegration relationship but also based on the cointegration relationships existing at different frequencies.

5 Data and Results

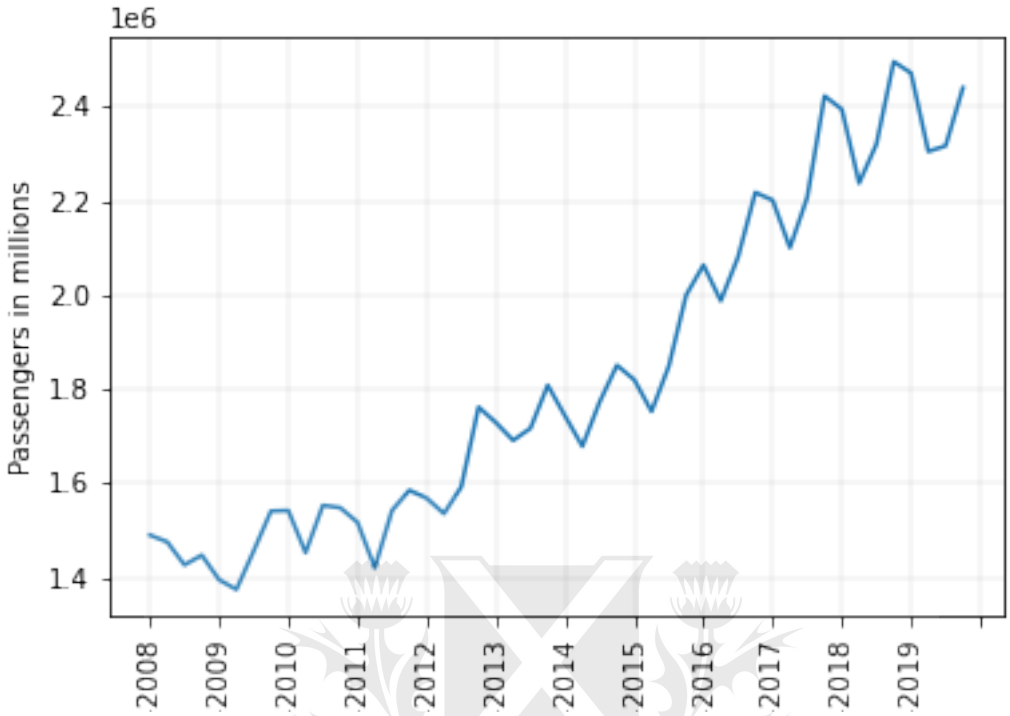
5.1 Data

For this paper quarterly data has been used from 1Q:2008 to 4Q:2019. The information for Domestic Airline Ticket prices, the cost of road transport, the Gross Domestic product has been obtained from the official Statistics database from New Zealand Government. The quarterly domestic passengers and departures from Auckland Region have been retrieved from the monthly reports of Auckland Airport.

Symbol	Description
Pax	Number of quarterly domestic passengers from Auckland Airport
GDP	Gross Domestic Product per capita of New Zealand
Road	Cost of Road Transport for New Zealand
Price	Price of Domestic Air travel for New Zealand
Freq	Total domestic departures from Auckland Airport
Recession	Dummy accounting for recession in Q3-Q4 of 2010
Shift	Dummy accounting for shift in Pax in Q1-2016
Q_{1-3}	Seasonal dummies

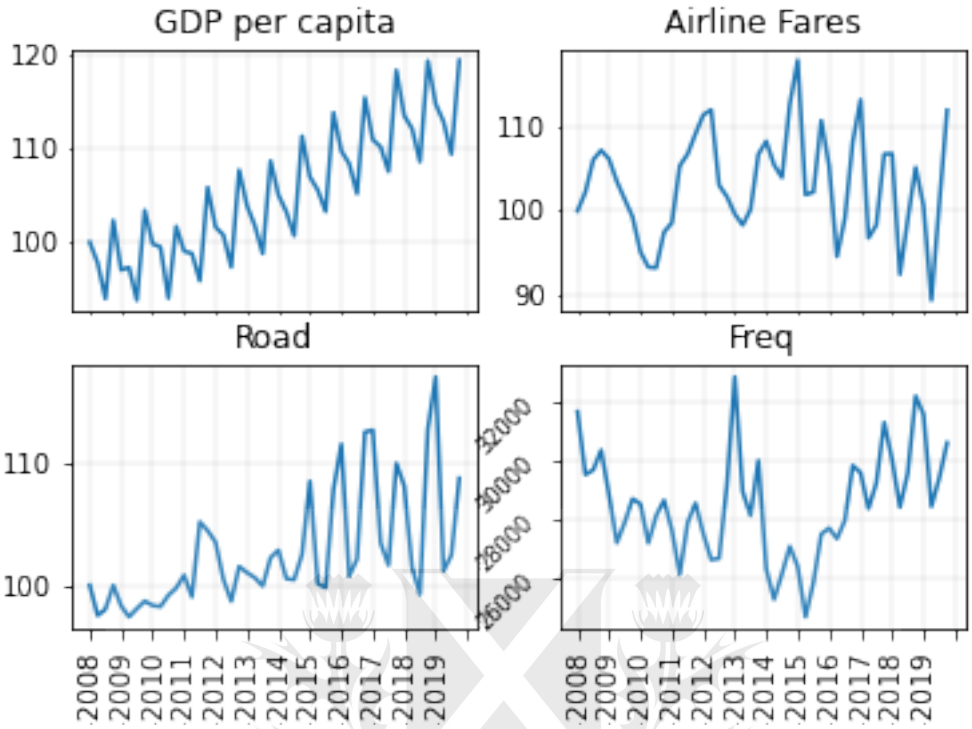
As it can be seen in Figure 3, the domestic air travel passengers have continuously grown during the period of study at a annual rate of 3% with maximum growth of 13% YoY in 2016. As it was mentioned before, this growth can be associated and as it is suggested by literature to the high level of income for the country. Moreover, the geography of the country and the lack of options, makes air travel the best, fastest and safest mean of transport available. Also the structure of the market and how it has been through a process of liberalisation helps greatly. Despite being a duopoly, the threat of a new competitor to join the market makes the incumbents to act in a competitive and efficient way. On top of that, it was shown that this duopolical structure, even though is not ideal, it offers better prices than a monopoly and faces limitations by the elasticities of the demand, particularly on the lower section of the fares.

Figure 3: Auckland Domestic Passengers



In figure 4, we can appreciate the evolution of GDP per capita and real prices of domestic air travel. GDP presents a path of growth, with variation from beginning to end of the series of 20%, with a recession in late 2010-beginning of 2011. On the other hand, fares follow an erratic path and no consistent trend can be observed throughout the period observed. However, there is a decrease in the real price of airline tickets after 2015. Regarding of the price of road transport, we see that its value has increased in the period studied showing a behaviour that is quite volatile. For the case of the amount of frequencies, we see that there is no apparent trend after a decrease in the amount of flights for the period of 2014-2016.

Figure 4: Variables of interest



To understand the nature of the processes behind the series to be analysed unit root tests are applied. The results of Augmented Dickey Fuller, Phillip-Perron and KPSS tests are shown in Table 1. By analising these results, we see that according to ADF all of the series of interest are non-stationary. However, we see that the cost of road transport and the amount of departures are stationary according to Philip-Perron test. Additionally, KPSS shows that the variable *Road* is trend stationary. However, after analysing the graph info we can appreciate how the variance is non-constant thus making it non stationary. Analysing *Freq* is not as simple, as the graph is not that clear. Nonetheless, for the purpose of the work we will assume that ADF is correct and that the serie is indeed non-stationary, and check if a cointegration relationship exists. As it will be shown in the next section, this is not the case so the possibility of the serie being stationary does not affect our model, as it will not be included in our cointegration model. After seasonal differencing, all the series are stationary so the variables are I(1), which will allow us to check for a cointegration relationship. As it was said before, in order to do so all variables should be integrated of the same order.

Table 1: Unit root tests

		Original series	**Seasonal Differenced Series**
Pax	ADF	-0.82	-3.56*
	Phillips-Perron	0.46	-3.21**
	KPSS	0.26*	0.19**
GDP	ADF	1.23	-3.81*
	Phillips-Perron	-2.26	-4.2*
	KPSS	0.24*	0.19**
Price	ADF	-2.35	-5.81*
	Phillips-Perron	0.38	-3.1**
	KPSS	0.15**	0.19**
Road	ADF	-0.82	-4.57*
	Phillips-Perron	-3.84*	-4.45**
	KPSS	0.07	0.07
Freq	ADF	-1.89	-4.00*
	Phillips-Perron	-3.39**	-3.36**
	KPSS	0.23**	0.55**

*: significant at 1% level. **: significant at 5% level. ***: significant at 10% level

5.2 Estimation of the model

The first step will be to check the cointegration of the variables to be used in this work. As we checked the integration order in Table 1, we will proceed to check for cointegration among the variables. To check for cointegration, we run one to one regressions between Pax and the explanatory variables. Then we proceed to run an auxiliary regression of the residuals to see if they are stationary. If they are, we can say that our series are cointegrated and estimate a long term equation model. In table 2, the t statistic for the auxiliary regressions and t critical values are reported.

Table 2: Cointegration test on residuals

Residuals of Pax and	t-statistic	5% Critical Value
GDP	-5.50*	-4.11
Road	-2.61	-4.11
Price	-2.18	-4.11
Freq	-2.35	-4.11

We can appreciate in Table 2 that only the null hyphotesis can be rejected for GDP, indicating that only Pax and GDP are cointegrated series. Hence, our long term relationship equation will be between these two variables.

One limitation of the ECM is that the independent variable should be weakly exogenous in order to be included in the model. If this is not the case, an ECM is no longer appropriate and other representation should be used. In our case, to check if an ECM is correct for our paper, we perform the trace test proposed by Johansen (1988,1991) with our variables. The results are shown in Table 3. We find that the GDP is weakly exogenous and we proceed to estimate an ECM.

Table 3: Cointegration analysis for Pax and GDP

Cointegration rank	*r≤0*	*r≤1*	*r≤2*
Log-likelihood	281.9	300.2	300.2
Eigenvalue	-	0.54	0.00
Null Hypothesis	*r=0*	*r≤1*	r≤2
Trace statistic	36.6	0.01*	
5% critical value	15.4	3.76	
Variable	Pax	GDP	Cons.
Restricted Cointegrated Vector	1	-2.97	-0.75
	(-)	(0.14)	(-)
Adjustment coefficients	-0.51	0.04	
	(0.15)	(0.04)	

The next step would be to check for seasonal cointegration between the series. To do so we first use the Hylleberg et al. (1990) test for seasonal unit roots and then, if they share a unit root in the same frequency, we should use the Engle et al. (1993) approach to check for cointegration. The null hypothesis for the seasonal unit roots test is the existence of unit roots at given frequency. A t-statistic test is used for π_1 and π_2 and a joint F test is used for π_3 and π_4. The results are shown in Table 4.

As we can see in Table 4, the test for all the series fail to reject the null hypothesis for π_1 meaning that they all have a unit root in the zero frequency, as we have seen before in Table 1. While checking the results for the other frequencies, we see that no series

Table 4: Seasonal unit roots test

Variable	π_1	π_2	$\pi_3 \cap \pi_4$
Pax	0.03	-2.42	20.78*
GDP	0.13	-4.16*	7.21*
Price	-1.71	-4.21*	6.05**
Road	-0.62	-3.12*	2.27
Freq	-2.23	-4.16*	15.92*

* Significant at 5% level

** Significant at 10% level

share a seasonal unit root with one another. In the case of *Pax* we see a unit root at frequencies 0 and 1/2 but we reject H0 for the joint test for π_3 and π_4. For *GDP*, *Price* and *Freq* we only fail to reject H0 for π_1 while for π_2 and the joint test for π_3 and π_4 we reject the null hypothesis of the existence of unit roots. Different is the case for *Road* where we find unit roots at 0 and 3/4 frequencies while rejecting the hypothesis for 1/2.

Given these results, we can say that the series do not share any seasonal unit root, so we can proceed with our model without checking for seasonal cointegration among the series.

The cointegration equation (Equation 1) is estimated and shown in Table 5. The residuals from this equation will constitute the Error Correction Term. Also, different Error Correction models including the series that are not cointegrated are used to explain the short term variations in the Auckland domestic air travel are presented in Table 5. The following models are then estimated:

- Long Term Relationship

$$Pax_t = \beta_1\ GDP + \beta_2\ Recession + \beta_3\ Shift + \beta_4\ Q_1 + \beta_5\ Q_2 + \beta_6\ Q_3 + \mu_t \qquad (1)$$

- Error Correction Model-1

$$\Delta_4 Pax_t = \beta_1 \Delta_4 Pax_{t-1} + \beta_2 \Delta_4 GDP_t + \beta_3 \Delta_4 Price_{t-1} + \beta_4 Q_1 + \\ + \beta_5 Q_2 + \beta_6 Q_3 + \beta_7 Recession + \beta_8 Shift + \beta_9 ECT_{t-1} + \epsilon_t \quad (2)$$

- Error Correction Model-2

$$\Delta_4 Pax_t = \beta_1 \Delta_4 Pax_{t-1} + \beta_2 \Delta_4 GDP_t + \beta_3 \Delta_4 Price_{t-1} + \beta_4 ECT_{t-1} + \epsilon_t \quad (3)$$

- Error Correction Model-3

$$\Delta_4 Pax_t = \beta_1 \Delta_4 Pax_{t-1} + \beta_2 \Delta_4 GDP_t + \beta_3 \Delta_4 Price_{t-1} + \\ + \beta_4 \Delta_4 Road_{t-1} + \beta_5 \Delta_4 Freq_{t-1} + \beta_6 ECT_{t-1} + \epsilon_t \quad (4)$$

From the results of the equations there are interesting results to interpret. First, we start from the long term relationship. We find the expected sign for the Income and a significant relationship. We see that there is a highly elastic relationship between these two variables, meaning that a 1% change in Income will have a 2.9% in the amount of domestic passengers for Auckland Airport. All our dummy variables are also significant at 1% level. We find no evidence of the existence of Autocorrelation, ARCH effects, Heteroskedasticity and the residuals are normally distributed.

To analyse the Short-term dynamics of these variables we estimated 3 different ECM. The first one only included Price and GDP as explanatory variables as well as the dummies included in the long term relationship and the Error Correction Term. The second one also only includes Price, GDP and the ECT leaving aside the dummies that were not significant in the first model. Lastly, we also include the variables Road and Freq. The variable Road was included to understand the substitution effect between the road transport and the Air traffic. Freq was included to analyse the impact of the quality of the service in the demand for air tickets, as more frequencies implies more options to the customer that

Table 5: Regression Results

VARIABLES	(1) Long Term relationship	(2) ECM-1	(3) ECM-2	(4) ECM-3
GDP	2.91***			
	(0.12)			
Q1	0.100***	0.0020		
	(0.011)	(0.011)		
Q2	0.091***	-0.0040		
	(0.012)	(0.011)		
Q3	0.22***	-0.0056		
	(0.014)	(0.010)		
Recession	0.071***	-0.0044		
	(0.017)	(0.023)		
Shift	0.054***	0.00058		
	(0.013)	(0.0089)		
$\Delta_4 Pax_{t-1}$		0.36**	0.37***	0.39***
		(0.14)	(0.11)	(0.12)
$\Delta_4 GDP$		1.85***	1.90***	1.87***
		(0.47)	(0.38)	(0.38)
$\Delta_4 Price_{t-1}$		-0.26***	-0.25***	-0.22***
		(0.081)	(0.074)	(0.079)
$\Delta_4 Road_{t-1}$				-0.12
				(0.14)
$\Delta_4 Freq_{t-1}$				0.09
				(0.08)
ECT_{t-1}		-0.46**	-0.43**	-0.45**
		(0.22)	(0.19)	(0.19)
Constant	0.74	0.0045	0.0015	0.0022
	(0.55)	(0.010)	(0.0061)	(0.0062)
Observations	48	43	43	43
Adjusted R^2	0.986	0.704	0.734	0.734
ARCH (1) effect χ^2	0.34	0.48	0.46	0.12
	[0.55]	[0.48]	[0.49]	[0.73]
Heteroskedacity χ^2 test	1.57	0.96	0.25	0.57
	[0.21]	[0.33]	[0.61]	[0.45]
Normality χ^2 test	1.6	2.51	2.00	1.79
	[0.21]	[0.29]	[0.37]	[0.41]
Breusch-Godfrey LM test	2.2	0.82	0.49	0.63
	[0.14]	[0.37]	[0.48]	[0.43]

Standard errors in parentheses. P-values in squared brackets

*** p<0.01, ** p<0.05, * p<0.1

could select a better schedule for its needs.

The first thing to highlight is that both GDP and Price are statistically significant across the 3 models, and show the expected signs. In three models, GDP is still the main driver for the demand of passengers despite having a smaller elasticity than in the long term (∼36% less). For Price, we see that it has a negative inelastic relationship implying that airlines could lower the prices in the short term to boost demand but given the inelasticity every 1% of decrease in price, the passengers will only raise ∼ 0.25%.

Regarding Road and Freq we see that even though they have the expected signs, we find that they are statistically insignificant and therefore we cannot confirm that they have an impact on domestic demand for Auckland Region. The non significance of Road may be explained by the country's geography. Given the natural characteristics of New Zealand, the prices may not be enough incentive to drive more people to opt for road transport as flying will still be a far more inconvenient option. Regarding Freq we might see a demand that is not influenced by a better schedule as it could be more heavily influenced by Price or Income.

Lastly, if we analyse the Error Correction term we see that it has the expected negative sign implying that the model will converge to equilibrium. The coefficient related to this Term of -0.43 for the ECM-2 shows that the equilibrium will be restored in less than 3 periods of time.

6 Concluding Remarks

We estimated three ECM for the chosen determinants of domestic air travel for Auckland region finding some interesting results. We also checked for cointegration at a seasonal level and did not find evidence that exists. Regarding the main focus of this paper we understood that the main driver of the demand is the income, as it was suggested by the literature. We find also that in the short-term demand has a significant relationship with the price of the tickets. Nonetheless, this effect is fairly inelastic and do not affect in the same magnitude as income.

We find that airlines should be taking several variables into account when planning their operations. In this work, we see that the main determinant of the demand is the income, so a good estimation of the growth rate of the economy for the future should be taken into account. Unfortunately for airlines, the only variable they could control and has an impact is price, as we see that the quality of the serviced, modelled as the amount of frequencies, do not have an impact in the demand.

Even though this is a partial analysis and does not include the entire New Zealand, this paper provides some insights in the demand for domestic travel. It would be more that interesting to follow this study with more information or dissagregation. For instance, taking into account different pair of cities when estimating the elasticities as not all the demand is equivalent. It will also be enriching to separate the demand in two, business and leisure to understand if there are some tools to at least boost the demand in one segment. Last but not least, it should be positive to understand the impact of other economic variables, i.e immigration or trade, in the demand for domestic air travel.

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