EXACTA Engenharia de Produção eISSN 1983-9308

Artigos

https://doi.org/10.5585/exactaep.2022.21495

Natal international airport and the strategic early hand back decision

Recebido: 22 jan. 2022
Aprovado: 19 abr. 2022
Versão do autor aceita publicada online: 19 abr. 2022
Publicado online: 23 maio 2022

Como citar esse artigo - American Psychological Association (APA)

Rocha, C. H., & Costa, F. A. (jan./mar. 2024). Natal International Airport and the strategic early hand back decision. *Exacta, 22*(1), p. 279- 303. https://doi.org/10.5585/exactaep.2022.21495

EXACTA Engenharia de Produção eISSN 1983-9308

https://doi.org/10.5585/exactaep.2022.21495

Processo de Avaliação: *Double Blind Review*
Editor: Prof. Dr. Luiz Fernando Rodrigues Pinto
Recebido em: 22 jan. 2022
Aprovado em: 19 abr. 2022

Artigos

NATAL INTERNATIONAL AIRPORT AND THE STRATEGIC EARLY HAND BACK DECISION

Carlos Henrique Rocha[1] **Felipe Amaral Costa**[2]

[1]Universidade de Brasília / UnB – Brasília, DF. Programa de Pós-graduação em Transportes (PPGT-UnB)

[2]Universidade de Brasília / UnB – Brasília, DF. Programa de Pós-graduação em Transportes (PPGT-UnB)

Nota dos autores

Autores declaram que não há conflito de interesses.

Abstract

In 2020, Natal International Airport, granted in 2011, declared bankruptcy and filed a request with the National Civil Aviation Agency (ANAC) for its return. Inability to service the scheduled debt and part of the costs of providing services and maintenance were claimed. The financial misfortune of Natal airport has not yet been studied. This gap justifies this article. The assessment of the bankruptcy petition can serve as a benchmark for the conduction of government policy for airport regulation. The purpose of this article is to assess whether the airport made the right strategic decision when requesting its return. The financial accounts of Natal airport between 2014 and 2019 are analyzed using two methodologies. One static and one dynamic. The data were extracted from the ANAC website. The first uses classical financial indicators and the second applies concepts from Economic Engineering. It is concluded that the decision was correct.

Keywords: Natal International Airport bankruptcy, financial indicators, time value of money, hand back, aeronautical territorial arrangements

AEROPORTO INTERNACIONAL DE NATAL E DECISÃO ESTRATÉGICA DE DEVOLUÇÃO

Resumo

Em 2020, o Aeroporto Internacional de Natal, concedido em 2011, declarou falência e ingressou com pedido na Agência Nacional de Aviação Civil (ANAC) para a sua devolução. Alegaram-se incapacidade de servir a dívida programada e parte dos custos de prestação de serviços e manutenção. O infortúnio financeiro do aeroporto de Natal ainda não foi estudado. Esta brecha justifica este artigo. A avaliação do requerimento de falência pode servir de *benchmark* para a condução da política governamental de regulação de aeroportos. O objetivo deste artigo é avaliar se o aeroporto tomou a decisão estratégica acertada ao pedir a sua devolução. São analisadas as contas financeiras do aeroporto de Natal entre 2014 e 2019 com duas metodologias. Uma estática e outra dinâmica. Os dados foram extraídos do *site* da ANAC. A primeira usa indicadores financeiros clássicos e a segunda aplica conceitos da Engenharia Econômica. Conclui-se que a decisão foi acertada.

Palavras-chave: falência do Aeroporto Internacional de Natal, indicadores financeiros, valor do dinheiro no tempo, estratégia de devolução, arranjos territoriais aeronáuticos

Introduction

When airports worldwide began to be privatized or become the object of concession, they stopped being mere locations for the handling of passengers and freight and began to integrate the metropolitan life of their areas of influence and to capture and attract aeronautical and non-aeronautical revenues more intensely. The non-aeronautical revenues endow airport enterprises with a reasonable degree of attractiveness and on average account for 35% of airport revenues for concession holders of the world's airports (Jones & Dunse, 2015). A one percent increase in passenger flows in the world's main airports leads to an increase in non-aeronautical revenues of between 0.7% and 1% (Airport Council International [ACI], 2015).

In their research, Weisbrod, Reed and Neuwirth (1993) considered four types of non-aeronautical business or territorial arrangement that can emerge around an airport. They may be: (a) in the airport itself; (b) adjacent to the airport; (c) in the neighboring areas; or (d) anywhere in the metropolitan region the airport is associated to. Among the activities carried out in the airport itself are vehicle rental, restaurants and snack bars, shopping malls, cafés, cinemas, barber shops, beauty parlors, drugstores, museums, designer clothes stores and bookstores. Activities in the neighboring areas include dispatching non-bulk goods, aircraft maintenance services, catering services, hotels, and restaurants. Typical activities in the neighboring areas are fuel supply, manufacturing, supermarkets, outlet networks, relatively cheaper hotels, and others. The activities in the metropolitan area at large are or can be those that make use of the airport. Factories located in the metropolitan region can import their raw materials and supplies and export manufactured goods via air transportation, for example.

There is a contemporary tendency to construct cargo airports nearby industrial areas as is the case with airports in Silicon Valley in the USA, for example. Another example is the agglomeration

of factories near to existing airports such as the airport of Viracopos in Campinas in the state of São Paulo (Cappa & Ribeiro, 2015). The airports of Frankfurt, in Germany, Incheon, in South Korea, Schiphol, in Holland, and Bangalore, in India are other examples of successful 'industrial' airports (Zhu & Zhang, 2017). Both the abovementioned trends seek to obtain competitive advantages by reducing logistics costs, especially transportation, reducing loss of cargo through stealing and, consequently, reducing the cost of insurance. Many airports have customs installations to dispatch and receive goods to and from other countries, especially high-value, low-weight parts, and components. That factory-airport-factory proximity leads to local development with the creation of income and employment (Cappa & Ribeiro, 2015; Tveter, 2017).

In the wake of all that, the logistics management of the production chain has been improved and perfected in the aspect of formal communication systems (Bowersox, Closs, & Cooper, 2013) favoring 'just-in-time' production. It is worth noting that airport construction is rigorously monitored by the authorities in view of their associated noise and gas emissions and other environmental externalities that affect families living nearby. Industrial airports have additional land-use requirements such as road networks and demand certain highly sophisticated services (Bursztein, 2012).

It is a well-known fact that airports are an integral part of the domestic and international tourism chains. Safety conditions, efficiency in embarking and disembarking operations, accessibility and connectivity are among the crucial functions that passengers demand of modern airports. Notably, the economic growth of many countries, such as Spain, for example, is strongly dependent on tourism and to a certain extent, depends on their airports. Several Mediterranean and Caribbean countries have abandoned fishing and agriculture to ingress in tourism activities (Button, Doh, & Yuan, 2009).

Tveter (2017) points out that airports contribute to regional development to a greater or lesser degree according to the scale of their services production. Econometric studies have been undertaken to measure the relationship between airports and metropolitan economic activity (Baker,

Merkert, & Kamruzzman, 2015; Button & Yuan, 2013; Green, 2007). The findings of empirical studies have largely confirmed the existence of that relationship. Baker *et al.* (2015) used the Granger Causality test to evaluate that relationship and concluded that the causality is bi-directional.

It is worth mentioning the Dubai airport in the United Arab Emirates, the largest one in the Middle East. It is a transit airport for passengers travelling from the west to the far-east and vice versa and it registers considerable non-aeronautical revenues of at least USD $30 per passenger (Zhu & Zhang, 2017). The airport handled an average of 14 million passengers a year in the period from 2014 to 2019.

According to Brazilian Law, the airports are federal government assets and formerly they were administered by the Infraero. In 2010, Infraero administered 67 airports which answered for 97% of all regular Brazilian air traffic. The Brazilian government then set in course a process of transferring the operation of those assets to private enterprise by means of concession contracts. The Brazilian privatization model corresponds to Private/I in the classification proposed by Baird (2000) and displayed in Chart 1 below. Private enterprise either constructs the airport or invests in expansion and improvement of an existing one and then operates it for a predefined period at the end of which it is handed back to the State. On the other hand, the airport benefits from the knowledge acquired from a company specializing in airport management and it creates rules to ensure that the operator's performance comes close to what is expected.

Chart 1

Infrastructure privatization matrix

Model	Regulator	Land	Operator
Public	Public	Public	Public
Private/I	Public	Public	Private
Private/II	Public	Private	Private
Private/III	Private	Private	Private

Source: Baird (2000).

The concession of Brazilian airports was motivated by the lack of adequate infrastructure to meet the demands of national and international passengers (Almeida, Capeluppi, & Vieira, 2021), the insufficiency of governmental financial resources for investment and the need to increase revenues (Costa, Santos, Nascimento, & Silva, 2017).

The International Airport of the city of Natal was the first to be the object of concession in Brazil. It was conceded in 2011 when the Argentinean operator Inframerica became the winning bidder at the concession auction. The acquisition cost R$ 170 million to be liquidated as soon as the airport went into operation. The project was constructed from zero (there was no kind of building, runway or other infrastructure on the site) and it went operational in 2014. The concession was for a period of 28 years. The airport is located in the municipality of São Gonçalo do Amarante in the greater area of Natal, in the state of Rio Grande do Norte and it functions as a hub in the national and international tourism chain. In 2020, the concessionaire filed a request to the National Civil Aviation Agency (*Agência Nacional de Aviação Civil* -ANAC) for an amicable hand back of the airport to the State. Inframerica alleged that the concession had become incapable of servicing its programed debts (the principal plus interest) and even unable to cover some of the costs of maintenance and service provision.

There are no financial studies of the handing back of the Natal airport in the specialized literature and that gap in knowledge is the justification for the present article. The results of this evaluation of the concession's bankruptcy can serve as a benchmark reference for the evaluation of other aerodromes being considered for concession and to provide supporting information for an eventual review of the government's regulatory policy.

This article seeks to answer whether the strategic decision to return the Natal airport was correct from a financial point of view. As far as is known, we are among the first to explore the Natal airport return decision.

The literature identifies three factors that can lead to the returning of infrastructure operated under concession agreements, namely: economic factors, financial factors, and negligence. The economic factors include weakness of the respective sector itself and poor localization (production unit location-planning errors). The financial factors involve high levels of liability and insufficient capital. Managerial negligence is almost always associated to failure to adhere to technological innovations in the ambit of the respective business. An important economic-financial factor is over-estimating demand. Lastly, a combination of those factors can do even more serious harm to the companies involved (Brigham & Ehrhardt, 2010).

This assessment of the Natal airport hand back is made from a financial perspective. The theoretical reference includes two methodologies, a static one based on classic financial indexes and a dynamic one based on Economic Engineering concepts (the time value of money) (Ferreira, 2009; Samanez, 2009). The data has been gathered from government civil aviation sources and corporate financial reports.

Brazilian airport under concession

In 2012 the airports of Brasília in the Federal District, and Guarulhos and Viracopos in São Paulo state were the object of concession. In the following year the government granted the concession of the Galeão Airport in Rio de Janeiro and that of Confins, in the greater Belo Horizonte region. The Galeão, Guarulhos and the Brasília airport are the top three in Brazil, in terms of

passenger movement and flights. The notable feature of the concession awards for all of them, including the one in Natal, was the difference between the acquisition value and the stipulated minimum bid in the tendering process. To give an idea of the difference, the Brasília Airport was awarded for 7.73 times the minimum value stipulated in the bidding process, Galeão for 3.96 times the minimum bid and Guarulhos for 4.76 times the minimum. According to Pereira and Rocha (2019), commitment to serving the high acquisition debt (interest and amortization of the principal) has jeopardized the accounts of the airports.

In the fourth round of concession auctions the airports were those of Fortaleza, Porto Alegre, Salvador and Florianópolis. In that round, the government stipulated, in the official tendering process documents, that 25% of the total acquisition value had to be paid at the moment of signing the concession contract thereby curbing the impetus to overbid at the auction.

More recently other airports have been auctioned off in a fifth and sixth round of the process. Smaller airports were negotiated in blocs sometimes associated to a relatively larger airport. Currently there six such blocs in effect: the Northeast bloc, the Central-western bloc, the Southeast bloc, the Southern bloc, the Central bloc, and the Northern bloc. From 2011 to now, more than forty airports have passed into private hands (considering here those in a handing back process).

Initially the government allowed international airport operators to associate with Brazilian national companies to participate in the auctions. Later, however, it agreed to allow foreign companies to participate on their own. Some foreign operators bought participation in national companies whose partners had already initiated the business. The Argentinean company Inframerica operates the Brasília airport and the German company FRAPORT operates the airports of Fortaleza, in Ceará, and of Porto Alegre, in Rio Grande do Sul. The French company Vinci runs the airport of Salvador in Bahia and the Spanish company AENA operates six airports, including that of Recife in Pernambuco. The Galeão airport is currently run by the Singaporean company Changi.

The length of time of concession contract validity depends on the estimated payback time, that is, the time it takes to recover the invested capital. For example, the concession duration for the airport of Brasilia is 25 years whereas that for Galeão is just 20 years.

The strategic decision to abandon the concession

General approaches

A company has its own objectives different from those of a social organization such as the government, non-profit entities or Brazilian public universities, among other organizations. Many pursue the objective of obtaining a value over and above the costs incurred – the profit (Ansoff, 1977) or, in other words, creating value for their owners. Drucker (1958) proposes a different objective, that of corporate survival, but even that survival depends on the financial aspect, understood to be the market values of its equity capital and of its liabilities.

Even though it has some of the features of an investment project, insofar as it has a beginning middle and end, an airport concession is a company and, as such, it has the objective of obtaining a profit every year. If a company recurrently registers losses, it will not attract investors nor will it survive over the long-term (Ansoff, 1977; Brigham & Ehrhardt, 2010).

As Xiong, Zhang and Chen (2016) and Song, Jin, Zhao, & Hu (2017) observed, the decision to abandon a transportation concession has often been made in the world. A survey by Xiong *et al.* (2016) showed that in recent years seven out of every hundred such concessions were closed down before their time of expiry. The early termination of a transportation concession is almost always related to the materialization of one or more risks with resulting damage to the operator's finances (Costa & Rocha, 2021). That financial misfortune of a concession may come about when the assessment of the future flow of net receipts is negative and there is little possibility of their recuperation.

The precocious extinction of transportation infrastructure concession contracts calls for compensation (Xiong *et al.*, 2016). Costa and Rocha (2021) studied the handing back of one Brazilian federal tolled highway concession and the respective payment of compensation, using a binomial

model with real options. In the conditions foreseen in the respective Brazilian legislation, of compensation to the amount of the accountable value of the depreciated investment in goods reversible, the results obtained suggest that the abandonment option aggregates a significant value to the project.

Although it exists as an alternative to prevent undue gains on the part of public administration, in the case under analysis, the compensation showed itself to be a significant guarantee that the public administration confers on the private partner. In the face of conflict of interest between the parties, the concession awarder and the concession holder or controversies that arise during the negotiation of the precocious termination, researchers have studied what the 'reasonable, fair' pricing methods would be. Such studies have used various techniques such as discounted cash flow analysis, real options, and game theory (Song *et al.*, 2017; Xiong *et al.*, 2016; Liu; Gao, & Cheah, 2017).

Real options

The literature on real options has investigated the question of project abandonment (Copeland & Antikarov, 2001). Real options is derived from financial options. An option is always set against an asset-object, normally a share; the shareholder has the right to exercise the option but never the obligation. The options may be to purchase or to sell and allow the shareholder to buy or sell the share at the price of the financial year in question or at the price pre-established in the contract terms. The options are classified as European, American or Asian. The European options can only be taken at the date of contract expiry, the American ones can be taken whenever the option favors the shareholder, and the Asian ones only at pre-established times. The most commonly used pricing models are the binomial model and the Black-Scholes-Merton model (Copeland & Antikarov, 2001; Ross, Westerfield, Jaffe, & Lamb, 2015).

Whenever the value of the abandonment option is greater than the present-day value of future cash flows, returning the concession is considered. The real option to abandon is equivalent to a sales option and its foreseeable results are set out in chart 2 below.

Chart 2

Foreseeable results of an abandonment option

	Results	
	If ROV > CNV	If CNV > ROV
Sales option value	Take the option	Do not take the option

ROV = real abandonment option value. CNV = Current net value of the investment project.

Source: authors (2021).

Real options technique is said to have various possible applications. As an example, Souza, Rocha and Souza (2018) evaluated the privatization of nine Brazilian deep-water ports also using the Black-Scholes-Merton model. Rocha and Britto (2012), using real options, established a way of calendarizing the differentiated services offer (sleeper coaches) to passengers in inter-state highway coach transportation.

Theoretical foundation

Financial indicators and discounted cash flow

The analysis that follows is based on classic financial indictors that have been widely discussed in financial textbooks and on financial engineering concepts (Assaf & Lima, 2019; Brigham & Ehrhardt, 2010; Ross *et al.*, 2015).

Static approach to financial indicators

Financial indicators enable a vision of a company's performance, an understanding of its probable future performance and a comparison with other companies in the same sector. Financial indicators are usually grouped in the following categories: (a) short term solvency (liquidity) indicators, (b) long-term solvency or financial leverage indicators, (c) asset management efficiency indictors, (d) profitability indicators and (e) market value indicators, applicable to open capital companies only.

The Current Liquidity Indicator (CLI) is the ratio of the current assets to the current liabilities. The higher the Index or Ratio, the more solvent the company is. The CLI is an indicator of short-term

solvency. The long-term indicator for solvency is the General Liability Indicator which is the ratio between the total liabilities and the total assets. This indicator is of particular interest to creditors. The asset productivity indicator shows how well a company transforms fixed investments into turnover. It is the ration between the turnover and the total assets and classified as an indicator of asset [management] efficiency. A company's profitability is measured by the returns on its assets (net profit divided by the equity) and by the return on investment (net profit divided by the investment). Traditionally, profitability represents a measure of company success or of its business efficiency (Ansoff, 1977). Profitability is of interest to the groups directly involved in the activity the company performs such as owners, investors, creditors, clients, and government.

Many studies have used financial indicators to evaluate companies and among them the work of Sousa and Grando (2019) stands out. Those authors analyzed the liquidity of the TAM and GOL Brazilian airline companies. They concluded that the pattern of liquidity of the two companies is similar to those of Brazilian airlines VARIG, VASP and TRANSBRASIL which all went bankrupt.

Dynamic approach to the time value of money

The formulations that follow below are based on the time value of money. Considering the financial result of an airport concession *k* awarded in the year *t*, then S_{kt}, is represented by the following equation:

$$S_{kT} = (R - C)_{kt} - IA_k \qquad 1)$$

Where *R* is the total revenue for the year *t*, *C* is the total annual cost except for the cost of investments *I* and the value of the acquisition of the airport *A.* The variable *IA* in equation (1) represents the annualized value of the sum of *I* and *A* for a given interest rate and a given temporal horizon.

The values of the variable S_{kt} can be negative or positive. If S_{kt} is equal to zero then it can be said that the airport accounts are balanced.

The accumulated financial balance of airport *k* in *T* years (SA_{kT}) is:

$$SA_{kT} = \sum_{t=1}^{T} S_{kt} \times (1+r)^{T-t} \quad (2)$$

Where *r* is the minimum attractive rate (interest rate) established by the government. Expression (2) represents the formula for the future value of the economic engineering.

The annual additional cash needs (NAC in equation 3) of airport *k* from now until the end of the concession is calculated as follows:

$$NAC_k = SA_{kT} \times \frac{r \times (1+r)^m}{(1+r)^m - 1} \quad (3)$$

Where *m* is the number of remaining years of concession validity. If the accumulated financial balance of airport *k* is negative (positive) then $NAC_k > 0$ (< 0). Equation (3) is the equivalent of the ordinary annuity formula (Brigham & Ehrhardt, 2010; Ross *et al.*, 2015).

Rocha and Britto (2020) used a similar approach to evaluate the financial health of hypothetical awarded airports.

Data and methodology

Data

The consolidated balance sheets and profit and losses statement for the financial year of the Natal Airport were obtained from the ANAC site and Inframerica's financial reports (ANAC, 2021). The greenfield International Airport of Natal was auctioned in 2011 and took three years to build. The airport began operations on 2014 and was designed to handle six million passengers a year (Costa *et al*, 2017). It has a 3,000 meter-long, 60 meter-wide runway and there are six boarding bridges for passenger boarding and disembarking two of which are double so 8 aircraft can be accommodated and connected to the main building at one time.

The airport is in the municipality of São Gonçalo do Amarante in the greater Natal region in the state of Rio Grande do Norte. It was auctioned for R$ 170 million and the investments required were to the order of R$ 650 million (Costa *et al.*, 2017). The operational area occupies 40 thousand m^2. There is an ample parking area of approximately 30 thousand m^2 capable of accommodating 858

vehicles. Like any other airport it has both aeronautical and non-aeronautical revenues with the latter answering for 45% of the total annual revenue. The volume of the non-aeronautical revenues is evidence of the airport's capacity to create local employment and generate income (Florida, Mellander, & Holgersson, 2015).

The typical passenger served by the Natal Airport is a tourist and because of the expected volume of passengers the metropolitan region of the airport was stimulated to invest in hotels, bars and restaurants and in the entertainment industry in general thereby creating direct and indirect employment and income for the local population.

Research methodology

The present research can be classified as documental and empirical (Gil, 2008). First, for each of the years 2014 to 2019, the following financial indicators were calculated: the current liquidity index, the level of indebtedness, asset productivity, returns on assets, returns on the net equity, and returns on investment.

Secondly, the value of the *IA* was calculated for 25 years (*n* is the total time of airport operation) using the minimum attractive rate of return *r* of 6.3% a year (ANAC, 2010). The minimum attractive rate was determined by the government. The expression used to calculate *IA* was:

$$IA_k = (I_k + A_k) \times \frac{r \times (1+r)^n}{(1+r)^n - 1} \qquad (4)$$

Equation 4 also represents an ordinary annuity. The variables in this equation were previously defined.

Thirdly, the accumulated financial balance in the year 2019 was calculated using equation (2) and the need for additional cash from 2020 on, using equation (3) where *m* = 19 years and *r* = 6.3% a year.

Results and discussion

Static analysis

Table 1 represents the results of selected accounts of the net equity and the yearly results demonstrations for the Natal Airport for the years 2014 to 2019. The worst year in financial terms was 2015 when the net profit registered was negative to the amount of R$ 377.2 million. Throughout the analyzed period the airport showed a deficit even before servicing the installment of its acquisition value and the planned investments (the GOP variable in Table 1). Those facts show that the airport was insolvent ever since the beginning of the concession. The investment fell steadily over the five-year period at a rate of 25.6%/year. It should be remembered that the most expressive investments were made at the beginning, during the period of airport construction.

Table 1

Accounts of the consolidated balance sheets and profit and losses statement of the Natal Airport (2014-2019, R$ 100)

Account	2014	2015	2016	2017	2018	2019
CA	14,193	22,860	27,379	59,151	23,750	21,592
TA	890,592	604,274	551,366	605,538	554,836	363,299
CL	150,760	115,216	71,658	39,531	28,739	33,494
E	177,064	-117,015	-159,164	-133,911	92,912	104,701
NOR	178,050	44,911	47,204	49,431	50,750	49,046
INV[1]	562,948	257,245	207,406	238,132	172,470	-22,415
GOP	-13,757	-14,746	-8,238	-6,029	-5,874	-10,731
NP	-37,296	-377,198	-135,742	-79,265	-49,761	-219,093

[1] Investment was calculated according to the suggestion of Assaf and Lima (2019: p. 271). CA = current assets. TA = total assets. CL = current liabilities. E = equity. NOR = net operating revenue. GOP = the gross operating profit prior to payment of the concession and the investments. NP = net profit.

Source: ANAC.

Table 2 displays the financial indicators for the Natal Airport for the period 2014-2019 calculated using the figures in Table 1. Current liquidity was only reasonable for the year 2017. In the first year of operation the airport registered very low levels of liquidity. Overall, the airport can be considered insolvent insofar as the current assets are incapable of meeting the short time liabilities. On the other hand, the productivity of the assets can be considered acceptable insofar as they show that the airport has fixed assets with which to generate revenues. On average, indebtedness to third parties was greater than the total value of assets. In thesis, the liquidation of the assets would not be sufficient to cover the debt. During all of the analyzed period, the return on assets (ROA) was negative. The return on the net capital assets was replaced by the return on investment (ROI) because the return on equity was negative from 2015 to 2017 (Table 1). In regard to the indicators *(ROA)* and *(ROI)* it can be said that the Natal airport has not been efficient in financial terms. The average of the returns on investment have been calculated for the period 2014-2019 (see the last column of Table 2).

Table 2

Financial indicators for the Natal Airport (2014-2019)

Indicator	2014	2015	2016	2017	2018	2019	Average
CLI	0.094	0.198	0.382	1.496	0.826	0.644	0.709
IND	0.801	1.194	1.289	1.221	0.833	0.711	1.068
AP	0.200	0.074	0.086	0.082	0.091	0.135	0.111
ROA	-0.042	-0.624	-0.246	-0.131	-0.090	-0.603	-0.289
ROI	-0.066	-1.466	-0.654	-0.333	-0.289	9.774*	-0.562

* Net profit and investment are negative values.

CLI = current liquidity index. IND = indebtedness. AP = assets productivity. ROA = returns on assets. ROI = returns on investments.

Source: elaborated by the authors based on ANAC data.

A company in financial difficulties presents some or all of the following characteristics: negative profits, inability to service its debts and a high ration of indebtedness to net equity (Damodaran, 2008). During the analyzed period all those characteristics were observable in the Natal International Airport venture.

Dynamic analysis

It is important to state that the variables of interest are: (a) gross profit before paying the concession value installments and (b) the annualized value of the sum of the current value of the investments and the value of airport acquisition according to equation (4). The GOP variable can be considered to represents the first term on the right-hand side of equation (1).

By 2019, the Natal Airport had an accumulated negative balance of R$ 360.5 million. The financial results for the years 2014 to 2019 were carried over to 2019 using the future value expression of financial mathematics. To keep its accounts balanced up until the end of the concession period the airport would have to generate an additional net amount of R$ 32.9 million a year and just to service the installment of the airport acquisition value, it would need an additional revenue of R$ 15.6 million a year. Those calculations were made using equation (4) and considering the minimum attractive rate of 6.3% a year and 19 years for the parameter *m*. Its financial record shows that the airport's deficit is greater than its capacity to generate cash flows.

At no time during the 2014 to 2019 period did the Airport show a positive net profit. The quantities of freight and numbers of passengers and aircraft would have to greatly increase and maintain that high level for it to be able to balance its accounts

A less onerous alternative for the Natal Airport

The effective growth rate of passengers, aircraft and cargo for the Natal Airport in the period 2014 to 2019 actual growth rates are quite expressive as shown in the last column of Table 3. However, the absolute values associated to passengers never attained the level of those estimated before the concession award (Table 4). The average annual passenger deficit over the period was 1.2 million short of the estimated average number, a considerable volume of non-received revenue.

Table 3

Passenger, aircraft and cargo flows at the Natal Airport for the period 2014 to 2019

Statistic	2014	2015	2016	2017	2018	2019	Rate
PAX (10^3)	1,495.7	2,584.4	2,316,3	2,403.1	2,429.3	1,185.2	12.9%
Aircraft	11,986	22,625	18,553	18,835	18,812	9,852	11.9%
Cargo (t)	4,608	10,895	12,077	12,389	15,420	12,981	35.3%

PAX = passengers.

Source: Inframerica (Natal Airport operator).

Considering the effective dynamic financial results demonstrations of the Natal Airport for 2014 to 2019 it can safely be said that the airport could hardly expect to achieve positive results in 2020, that is, it would tend to continue to register deficits.

The activities of domestic and international airports have been severely hit by the world health crisis, terrorist attacks, the eruption of volcanoes, and other events. The accounts of the Natal Airport for the year 2020 must have certainly deteriorated even further. It is clear the investments were super-dimensioned to address what was thought to be the probable demand in terms of passengers and aircraft.

Table 4

Estimated passenger and aircraft flows at the Natal Airport for the Years 2014 to 2030.

Year	Passengers (A)	Aircraft (B)	(A) / (B)
2014	2,931,864	27,215	108
2015	3,171,780	29,326	108
2016	3,436,057	31,645	109
2017	3,722,510	34,149	109
2018	4,033,085	36,852	109
2020	4,784,472	43,155	111
2030	7,955,264	68,571	116

The last column shows the estimated evolution of passengers per aircraft.

Source: ANAC (2010).

Conclusion

In 2020, the Natal International Airport located in Natal, capital of the state of Rio Grande do Norte, filed a petition with the ANAC proposing the handing back of the airport. This article analyzes the Natal Airport finances over the period 2014 to 2019. The aim was to identify empirical evidence that would support the decision to abandon the airport concession. Two complementary approaches were adopted. The first, a static approach, was based on the classic financial indicators and the second, a dynamic approach, was based on the concept of the time value of money.

From the year its activities began in 2014 through to 2019 the airport showed a low level of liquidity. Theoretically the liquidation of the total assets for their average book value over the analyzed period would not pay off the debt to third parties. That is to say the airport has a high level

of indebtedness. The profitability was insufficient in the six analyzed years and failed to create value for the owners.

Added to that situation there is the considerable accumulated deficit from 2014 to 2019 and the need to substantially increase the turnover before the concession expiry date if the accounts are to be kept balanced. Given that scenario, it can be inferred that the decision to devolve the Natal Airport was a correct one. That is, the answer from the financial analysis developed in this article on the return of Natal airport is that the right decision was made. The Airport's financial situation is increasingly critical with drastic reduction in aeronautical and non-aeronautical revenues partly due to the extant health pandemic. It may take a long time for airport activity to recuperate

In conclusion, the above reasons most certainly afflict other concession airports. A recommendable public policy action would be to apply the analysis carried out in this article to other airports foreseeing and forestalling possible instability in the national civil aviation system and possible paralyzation or interruption of what is an important inducer of urban and regional economic development.

Finally, the analysis could have been done for the national wing, the international wing and cargo, in an attempt to identify a possible focus of financial insufficiency. And it is suggested to apply the methodologies used in this article to other airports granted, anticipating possible financial misfortunes.

References

Airport Council International - ACI. (2015). ***Airport Service Quality***. Québec: ACI Press.

Agência Nacional De Aviação Civil – ANAC. Demonstrações Financeiras - Natal (RN). Available at: https://www.gov.br/anac/pt-br/assuntos/concessoes/aeroportos-concedidos/natal/documentos-relacionados/08demonstracoes-financeiras Consulted on: November 15, 2021.

Agência Nacional De Aviação Civil – ANAC. (2010). Relatório 2 - Estudos de Mercado. Available at: https://www.gov.br/anac/pt-br/assuntos/concessoes/aeroportos-concedidos/natal/documentos-relacionados/audiencia-asga. Consulted on: November 15, 2021.

Almeida, H., Capeluppi, M., & Vieira, P. (2021). ***Long-term effects of extraordinary events on Brazilian airport infrastructure concessions***. Trabalho Final de Curso (Especialização em Regulamentação de Infraestrutura de Aeroportos), Porto Alegre, Rio Grande Sul, Brasil.

Ansoff, H. I. (1977). ***Estratégia empresarial***. São Paulo: Ccgraw-Hill.

Assaf, A., & Lima, F. G. (2019). ***Curso de administração financeira***. São Paulo: Atlas.

Baird, A. J. (2000). Port privatization: objectives, extent, process, and the UK experience. ***Maritime Economics & Logistics, 2***(3), 177-194. DOI: https://doi.org/10.1057/ijme.2000.16

Baker, D., Merkert, R., & Kamruzzman, M. D. (2015). Regional aviation and economic growth: cointegration and causality analysis in Australia. ***Journal of Transport Geography, 43***(1), 140-150. DOI: https://doi.org/10.1016/j.jtrangeo.2015.02.001

Bowersox, D. J., Closs, D. J., & Cooper, M. B. (2013). ***Gestão logística da cadeia de suprimentos***. Porto Alegre: Bookman.

Brigham, E. F., & Erhardt, M. C. (2010). ***Administração financeira: teoria e prática***. São Paulo: Cengage.

Bursztein, V. (2012). ***Mais que um aeroporto, mais que uma cidade. Projeto Vetor Norte pode materializar em Minas Gerais a primeira Aerotropólis da América Latina***. Belo Horizonte: Airport News, n. 6.

Button, K., & Yuan, J. (2013). Airfreight transport and economic development: an examination of causality. ***Urban Studies, 50***(2), 329-340. DOI: https://doi.org/10.1177/0042098012446999

Button, K., Doh, S., & Yuan, J (2009). The role of small airports in economic development. ***Journal of Airport Management, 4***(1), 1–12.

Cappa, J., & Ribeiro, S. (2015). Aeroporto Internacional de Viracopos e o desenvolvimento na região de Campinas-SP. ***Revista Brasileira de Gestão e Desenvolvimento Regional, 11***(2), 3-33.

Copeland, T., & Antikarov, V. (2001) ***Opções reais: um novo paradigma para reinventar a avaliação de investimentos***. Rio de Janeiro: Campus.

Costa, F. A., & Rocha, C. H. (2021). Demand risk and contractual abandonment: a real options analysis of the BR-381/262/MG/ES highways concession. ***Transportes, 29***(4), 1-16. DOI: https://doi.org/10.14295/transportes.v29i4.2371

Costa. L. H. G., Santos, E., Nascimento, M. A., & Silva, J. A. (2017) Análise da evolução dos modelos de participação privada nos aeroportos brasileiros. ***Congresso de Pesquisa e Ensino em Transporte***, Recife, Pernambuco, Brazil, 31.

Damodaran, A. (2008). ***Avaliação de investimentos: ferramentas e técnicas para a determinação do valor de qualquer ativo***. Rio de Janeiro: Qualitymark.

Drucker, P. F. (1958) Business objectives and survival needs: notes on a discipline of business enterprise. ***Journal of Business, 31***(2), 81-90.

Ferreira, R. G. (2009). ***Engenharia econômica e avaliação de projetos de investimento***. São Paulo: Atlas.

Florida, R., Mellander, C., & Holgersson, T. (2015) Up in the air: the role of airports for regional economic development. ***The Annals of Regional Science, 54***, 197-214. DOI: https://doi.org/10.1007/s00168-014-0651-z

Gil, A.C. (2008). ***Como elaborar projetos de pesquisa***. São Paulo: Atlas.

Green, R. K. (2007). Airports and economic development. ***Real Estate Economics, 35***(1), 91-112. DOI: https://doi.org/10.1111/j.1540-6229.2007.00183.x

Inframerica. (2021). O Aeroporto – Estatísticas. Availabel at: http://www.natal.aero/br/o-aeroporto/dados-operacionais/estatisticas/. Consulted on: November 15 2021.

Jones, C., & Dunse, N. (2015). The valuation of an airport as a commercial enterprise. ***Journal of Property Investment and Finance, 33***(6), 574-585. DOI: https://doi.org/10.1108/JPIF-07-2015-0048

Liu, J., Gao, R., & Cheah, C. Y. J. (2017). Pricing Mechanism of Early Termination of PPP Projects Based on Real Option Theory. ***Journal of Management in Engineering, 33***(6). DOI: https://doi.org/10.1061/(ASCE)ME.1943-5479.0000556

Pereira, E. S., & Rocha, C. H. (2019). Concessões aeroportuárias brasileiras, saúde financeira e prática regulatória: uma aplicação do modelo Fleuriet. ***Revista Estudos e Pesquisas em Administração, 3***, 148-161. DOI: https://doi.org/10.30781/repad.v3i3.9011

Rocha, C. H., & Britto, P. A. P. (2012). Marco regulatório do transporte rodoviário interestadual de passageiros e opções reais. ***Journal of Transport Literature, 6***(3), 34-48. DOI: https://doi.org/10.1590/S2238-10312012000300003

Rocha, C. H., & Britto, P. A. P. (2020). Performance financeira de aeroportos concedidos de um país hipotético. ***Revista Ciências Administrativas, 26***(2), 1-10. DOI: https://doi.org/10.1590/S2238-1031201200030000310.5020/2318-0722.2020.26.2.10852

Ross, S. A., Westerfield, R.W., Jaffe, J. F. & Lamb, R. (2015). ***Administração financeira: corporate finance***. Porto Alegre: Bookman.

Samanez, C. P. (2009). ***Engenharia econômica***. São Paulo: Person.

Song, J., Jin, L., Zhao, Y. & Hu, W. (2017). Using bargaining-game model to negotiate compensation for the early termination of BOT highway projects. ***Transportation Research Part A: Policy and Practice, 105***, 197–209. DOI: https://doi.org/10.1016/j.tra.2017.06.017

Sousa, R. R. C. & Grando, E. (2019). Análise do risco de liquidez: um estudo de caso sobre as companhias aéreas TAM e GOL. ***Revista Científica Multidisciplinar Núcleo do Conhecimento. 12***(10), 40-55.

Souza, J. C. F., Rocha, C. H., & Souza, J. G. (2018). Modelo de opções reais para avaliação de

investimentos em novos portos e terminais portuários brasileiros. ***Transportes, 26***(4), 103-115. DOI: https://doi.org/10.14295/transportes.v26i4.1497

Tveter, E. (2017). The effect of airports on regional development: Evidence from the construction of regional airports in Norway. ***Research in Transportation Economics, 63***(1), 50-58. DOI: https://doi.org/10.1016/j.retrec.2017.07.001

Weisbrod, G. E., Reed. J. S., & Neuwirth, R. M. (1993). Airport area economic development model. ***The PTRC International Transport Conference***. Manchester, United Kingdon.

Xiong, W., Zhang, X., & Chen, H. (2016). Early-termination compensation in public–private partnership projects. ***Journal of Construction Engineering and Management, 142***(4), 1-10. DOI: https://doi.org/10.1590/S2238-10312012000300003 10.1061/(ASCE)CO.1943-7862.0001084

Zhu, Y., & Zhang, H. (2017). The Exploration on the Development Mode of Airport Industry. ***MATEC Web Conference***. Shangai, China. DOI: https://doi.org/10.1590/S2238-10312012000300003 10.1051/matecconf/201710001010