Abstract
The purpose of this article is to apply empirical models that have adherence with the airlines companies’ experiences. The paper will also help in the search of the necessary conditions to overcome the competition with appropriate pricing and consistent profits in such market. Looking towards the Brazilian market, this study is appropriate because of the accelerated growth of this sector. The methodology is based on a literature review, resulting from a database involving academic articles, dissertations, theses and books. This article contributes to the analysis of the necessary conditions for the longevity of airlines companies. Finally, the originality of this paper is in its conclusions in which profit is a function of market dynamics and the managerial airlines companies that comprise it.

INTRODUCTION
The Brazilian airport sector has been growing 10% a year, according to IATA (2010), requiring appropriate terminals, adequate numbers of routes for the volume of passengers and airlines companies for the long-term demands.

However, this data is not a new phenomenon once it has been widely analyzed by logistics airport experts for some years with widespread concern about the capacity of the management sector and associated innovations. Soon, through long-term growth, it is essential to understand competition, prices charged by airlines and the necessary conditions to achieve profits according to market behavior.

This article has two objectives being the first one a literature review focusing on competition, prices and profits under a competitive environment in Brazil and the second objective is to identify proposals and possible suggestions for the Brazilian market for full functioning of this segment for the national economy. The originality of this study is based on literature review and the conceptual focus on the studied themes.

The proposal for the development of this article originated from a series of studies conducted by authors, such as GILLEN (2006), TADEU and SILVA (2010), in which the significance of the concepts of competition, prices and profits were elucidated, especially for its relevance to the aviation market. Studies were conducted by TADEU and SILVA (2010) using different approaches such as, semi-structured interviews with Brazilian airport industry experts, reviews and comments from the literature.

This article is divided into five sessions: introduction, methodology, literature review, proposals applied for Brazilian market and conclusions and recommendations.

METHODOLOGY
The used research method was bibliographic, in general, using a set of techniques for qualitative and quantitative research, respectively, to meet the proposed objectives. Initially, the researches were conducted on the topics of “competitiveness”, “prices” and “profits” through the virtual library of the University of British Columbia. Search results showed academic papers, dissertations, thesis and applied case studies discussing the American and Canadian realities.

Soon, it turns out to be necessary to expand the research to other bibliographic bases, such as the portal of CAPES (Coordination for the Improvement of Higher Education, in Brazil), in search of academic reference to the same themes, but within the Brazilian market applications. Figure 1 illustrates the results of the research conducted and its strategies, including the following databases:

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This search strategy database yielded total of 64 articles, two essays, three books and 13 theses. All used papers vary from 1989 to 2010 including academic authors and executives from different parts of the world. PATTON (2002) suggests that research occurs in three stages: data collection, analysis and conclusions done during the research. Finally, the set of articles, dissertations, theses and books were carefully analyzed in order to extract the necessary concepts.

LITERATURE REVIEW

DANIEL (2001) proposes an airport infrastructure analysis through an interesting question: is it possible to analyze the competition, prices and profits of the airlines companies? Following this question another one can be made: Is it possible to verify a series of studies on the proposed themes for the Brazilian case? Several studies on competition may be presented, such as, LEVINE (1987), BORENSTEIN (1988), and MORRISON and WINSTON (1989). For prices, there have been studies such as DANIEL (1991, 1992 and 1995), ending with the texts on profit, according to BUCHANAN (1969), BRONS, PELS, NIJKAMP and RIETVELD (2002), and BRUECKNER (1991, 2001 and 2002).

According to TADEU and SILVA (2010), there are necessary conditions for evaluating the competition, prices and profits, for the Brazilian case, such as follows:

"The change in the airports organization expressed an evolution in the roles that they play and in the financing models for basic aeronautical infrastructure, changing from simple airports to complex multifunctional systems. Nevertheless, there are hurdles to be overcome in the process of implementing this development model, involving aspects such as regulation, competition, pricing and profit "(p. 29).

Competition

For FERREIRA and OLIVEIRA (2006), air transport is dynamic and correlated with economic behavior and also provides flexible exchange of people and cargo around the world. In Brazil, this kind of transport is relevant not only because of the continental distances, but also because of the inefficiencies in the highway, railway and waterway transportation systems.

Historically, airport transportation in Brazil has going through a series of changes in terms of regulatory aspect, facilitating the development of a more competitive environment with new firms’ entry. In that way, encouraging them to act on strategic and less operational expenses conditions.

According to ANAC (2010), the Brazilian aviation market was genuinely composed by companies that opted for the differentiation, or being classified as Full Service Carriers (FSCs), such as Varig, VASP and Transbrasil. However, the market was low competitive, high prices, satisfactory profit for companies, but consumers had to pay for expensive tickets. But, according to BARAT (2007), the process of trade liberalization and national economic growth, stimulated the entry of low-cost airlines in the market, or Low Costs Carriers (LCCs) with a lean management structure, resulting in cheaper tickets.

As a result, TADEU (2009) suggests that the immediate response of the FSCs was the adoption of a strategy towards improving existing services, with the development of loyalty programs, better aircraf indoor comfort, improved in-flight services and formatting alliances. OTT and PATINO (2011) discusses properly the airline alliances as an instrument for market integration. For these firms, the passengers’ appropriate profile would be the executive, with more demand than the tourists, with more expensive tickets, but a timely and value-added operation.

To PEDRINA (2000), the only way to ensure a competitive market with benefits to consumers would be a government direct action, in the specific case of Brazil, by ANAC (National Agency of Civil Aviation), regulating the frequency of routes, prices, available seats and other related indicators, thus punishing companies that contravene the rules. According to FORSYTH, GILLEN, MUELLER and NIEMEIER (2010), competition is established based on the entry capacity of new airlines, however, is government's responsibility to avoid predatory pricing policies, such as entry barriers.

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The fundamental conditions for the maintenance of competition for the airport sector can be presented as follows: (i) antitrust policy, (ii) prices analysis and (iii) cartel.

**Antitrust Policy**

For PORTER (1990), the rightful functioning of an antitrust policy should start from the applied prices supervision to avoid short term losses and even the removal of a company from the market. Therefore, the starting point consists into analyzing the behavior of the dominant company in search of possible consumers’ advantages or disadvantages.

According to CADE (2011), the competition analysis pervades the behavior of prices up to the adoption of sophisticated game theory models in search of the business functions perfect balance, avoiding so, and the abusive behavior. Corroborating this, it is possible to understand the competition supervision improvement process in Brazil. This is the result of the economic openness, from the stabilization economic policy program from 1994 and Law No. 8.884/1994, LOVADINE, TUROLLA and OLIVEIRA (2006).

Antitrust policy for airport sector can be conducted through prevention actions, evaluating potential mergers, acquisitions and prices process, such as recent case of the merging negotiations process between the Chilean LAM and Brazilian TAM which still under review by regulatory officials and its potential impacts to the consumer market. According to CADE (2011), the ideal conditions for maintaining the market full functioning are: (i) free competition among its agents, (ii) conduct control, (iii) price, and (iv) the enterprises financial performance so they have business longevity. Therefore, predatory policies associated with low prices, the use of computerized reverse tickets and even an excessive concentration of power at airports (such as slots distribution) can be characterized as illegal action if encouraging excess capacity.

According to OSTER and STRONG (2001), the airport sector presents a unique behavior and special features in a strategic point of view, being the central issue price analysis versus competition. Pricing strategies may be deleterious to the market, inhibiting potential entrants. However, it is possible to evaluate the airline companies’ behavior identifying inappropriate actions and thereby avoiding possible damage to entrants. In the case of Brazil it is observed that there are inadequate pricing policies followed by the LCCs and business operations related to the excess capacity at airports such as São Paulo, Rio de Janeiro and Belo Horizonte, according to DOMINGOS, SANTOS and ESPIRITO SANTO (2004).

**Price Analysis and Inadequate Policies**

One of the most recurrent strategic actions used to inhibit competition, for the airport sector, is the practice of inadequate pricing which is far below the industry standards. It is observed that low prices can be a airline positive action in terms of cost control, routing, intensive use of technology and adequate staff allocation. However, according to OSTER and STRONG (2001), there are numerous examples of airlines that use low-cost strategies with very low prices and threatening the functioning of the market.

A price can only be regarded as legitimate if not threading other airlines companies or generating outlook profit for the operator. Otherwise, it is characterized as an inadequate policy leading to government actions to avoid a possible monopoly.

It is noted that certain conditions must be observed for a possible monopoly in the airport sector, such as: financial benefits, tax and airports operations with high passenger movement. To EDLIN and FARRELL (2004), there are good prices practices which are not characterized as inadequate policies or monopoly, such as: high prices with low service quality and little competition, low fares, caused by low cost and offers. For the authors, prices above the cost can also harm consumers by limiting the competitive action.

**Cartel**

To CADE (2011), cartel is defined as a set of tactical agreements between market competitors, involving pricing and distribution in attempt to increase profits. Still, there are factors that can determine the formation of cartels like market concentration and costs homogeneity.
In the specific case of the airport sector, some particular conditions are decisive for the cartel formation, such as: (i) coordinated actions between firms, involving promotions and offers, (ii) system control for booking tickets, (iii) control of on services information, with full guarantee of quality of communication and, (iv) ability to exercise bargaining with suppliers.

The cartel's negative behaviors are harmful to consumers and so, is the defense supervising agencies the responsibility, being the CADE and ANAC to control airport operations. Recent research conducted by TADEU (2009) and TADEU and SILVA (2010), indicate that agreements between airlines (code share) are not beneficial to consumers, avoiding risks to the cartels formation. Several examples in the history of Brazilian aviation may be presented as recent agreements between TAM Linhas Aereas, TRIP and Passaredo, as well as between the GOL and smaller companies. These agreements intended to look forward connections for regional airports and Brazilians average distance aviation. These practices can be configured as beneficial for companies, but with the risk of inappropriate conduct formation with the reduced competition and higher prices.

Other recent aspects of Brazilian market, especially after the entry of GOL, is that LCC involved coordinated policies to reduce or increase prices, changes or cancellations of flights. As the market is in opening to the expansion of routes and for entry of new firms, the definition of cartel needs to be carefully defined, because as LOVADINE, TUROLLA e OLIVEIRA (2006) says, there may be interdependence between firms, resulting in a noncooperative equilibrium, or Nash equilibrium for markets with few competitors and organizations.

In markets with the existence of a non-cooperative equilibrium upraise phenomena of rising prices by a certain company, and it can be followed by other companies, a parallel move, but not structured coordinated. That is, each airline is free to decide it’s the best pricing policy and its short and long term decisions. Therefore, it becomes important to study the price determination by Brazilian airlines, as described in session 3.2.

**Price Formation**

The Brazilian airlines prices formation stems from recent studies proposed by PALLADINO (2005), seeking to evaluate possible strategies and service differentiation between FSCs and LCCs. The author proposes a methodology for analyzing the Brazilian airlines prices formation, specifically of GOL and TAM, using collected data by the ANAC and econometric models to estimate its long-term trend. In this case, the price analysis is an important factor to determine policies and inadequate cartel formation.

In general, the airlines pricing formation is considered strategic to its long-term survival. According to the IATA (2010) and IPEA (2010), the aviation industry in Brazil grew 10% annually, compared to 7% of the entire economy. This information represents that the passengers demand is greater than the services capacity offered by the airline companies.

As a result, the air tickets prices have been increasing slowly and that is harmful to competition. It is known that the airport sector behavior is directly linked to economic performance and income growth, as proposed by SHUMPETER (1997).

Studies by STARKIE and YARROW (2008) and World Bank (2010), indicate that air traffic is growing at higher rates than income during periods of economic growth, especially the tourism sector in detriment to the business.

Recent observations of Brazilian market, conducted by TADEU and SILVA (2010), indicated that there are problems such as: overcrowded airports, airlines problems ending with flight cancellations, fines and the possibility the reduction of air network due to the growth in the Brazilian aviation in recent years. As discussed in section 3.1, the aviation market can be divided between FSCs and LCCs companies. Through the entry of LCCs, the aviation market watched the advent of the internet ticket sales, lower prices with valued shares in the stock market and high occupancy rates. For PALLADINO (2005), on average, LCCs firms have been presenting superior financial performance if compared with FSCs. It is observed the entry of new competitors in this model.

In response, the FSCs are using a variety of services, diversifying schedules, improving board services, among others. The direct result would be a benefit to the yield management of these companies and a satisfactory pricing policy. However, according to EVANS and KESSIDES (1993), airlines should
note the specific characteristics of its market such as positioning, customer profile, money exchange and suppliers before determining the price.

However, for BORENTEIN (1989), potential economies of scale can influence the airlines' prices. Operations from the hubs, such as Congonhas Airport (São Paulo) and Santos Dumont Airport (Rio de Janeiro) may determine the price increase, regardless of flights being unidirectional or multidirectional.

There are two possibilities for the Brazilian airlines' prices evaluation: (i) business environment and (ii) tourism.

(i) Business environment: the typical business passengers' behavior involves buying tickets at least a week in advance, staying up to one week at the destination. Many trips occur in groups, with preference for FSCs due to flight schedules despite the premium price offered by LCCs.

(ii) Tourism: Passengers travels in association with tourism agencies, choosing LCCs due to the lower price. They purchase their tickets thirty days in advance with options of flights during the weekends.

For BERRY (1990), the airport sector prices composition indicates that, on average, the FSCs prices are superior to the LCCs. According to TADEU (2009), TAM prices are, on average, 20% higher than its direct competitor GOL, specially for the routes to São Paulo. It is also possible to observe that the connecting flights have prices higher than the non-stop ones, with the leadership of TAM in this criteria.

Some important observations regarding the fares should be taken into consideration, EVANS and KESSIDES (1993). Routes that have higher frequencies tend to have higher prices due to the dominance effect, being a negative aspect to the competition and quality. Long journeys have higher prices if compared to those of short duration. Tickets sold for dawn and evening departures are priced higher than the morning period.

Profits

The company's profits formation for the airport sector is the direct result of competition and pricing policy, SILVEIRA (2003). Therefore, the existence of oligopolies and the possibility of free price competition as an alternative for passengers are determinant factors. The purpose of this session is to presentation a model associated with the previous topics in order to attend profitable businesses airport.

The legislation flexibility is another important aspect in which contributes to the entry of new businesses and services diversity. To COMBES AND LINNEMER (2000), investments in airport infrastructure can increase competition in the sector by reducing the potential for possible inappropriate policies, as 3.1.2.

Therefore, the purpose of this session is to present an empirical model to previous topics in order to show a profitable way for the airport companies. Finally, we present the conclusions and recommendations.

Considering that: (a) aviation market operates according FSCs and LCCs business and (b) an operator $i$ versus an operator $j$, with their routes and flexible schedules changes, it is assumed than the following demand system:

$$q_i = \alpha_i \rho_i^{-\beta_i} \rho_j^\gamma$$

$$q_j = \alpha_j \rho_j^\gamma \rho_i^{-\beta_i}$$

$$\alpha_i, \alpha_j, \beta_i, \beta_j, \gamma > 0$$

(1)

In which:

$q_i$ and $\rho_i$ are the companies $i$ quantity and price.

$\rho_j$ is the price of companies $j$.

$\alpha_i$ and $\alpha_j$ are the demands for companies $i$ and $j$.®Society for Business and Management Dynamics
\( \beta_i \) and \( \beta_j \) are the price elasticity for companies \( i \) and \( j \).

According to DIXIT (1979), it is also assumed that there are different products, tickets offers, airfares, different airports choices, the distance between them and possible competition with other transport modes. Therefore, the differentiation in search of profits can be expressed as follows:

\[
\theta = \frac{\gamma^2}{\beta_i \beta_j}; \gamma = \gamma(\theta, \beta_i, \beta_j) = \theta^{0.5} \beta_i^{0.5} \beta_j^{0.5}; 0 < \theta < 1
\]

(2)

The equation (2) is a proposal of SINGH and VIVES (1984), in which:
\( \theta \) is the market heterogeneity in relation to different products offered, assuming 0 and 1 values.

For \( \theta \) equal to 0, the significance are independent markets and heterogeneous.

For \( \theta \) equal to 1, the significance are substitutes markets and homogeneous.

Considering costs aspects, according to CAVES (1984), impacting airlines companies profit can be shown as:

\[
TC_i = FC_i + \frac{\varphi_i}{2} q_i^2; FC_i > 0
\]

(3)

In which:
\( TC_i \) is the airlines \( i \) total cost.
\( FC_i \) is the fixed cost.
\( \frac{\varphi_i}{2} \) is the return elasticity factor in relation to the market demand.

Simplifying equation (3):

\[
c_i = \frac{dT C_i}{dq_i} = \varphi_i q_i
\]

(4)

Through equation (4) and according to a hypothetic company \( i \) and considering a general situation:

\[
\pi = p_i q_i (p_i, p_j, \alpha_i, \beta_i, \theta) - TC_i \left[ q_i (p_i, p_j, \alpha_i, \beta_i, \theta), FC_i, \varphi_i \right]
\]

(5)

Equation (5) shows the airlines companies profit with the given importance to associated analysis in relation to the integrated market dynamics and not only for isolated companies.

However, through studies conducted by GIBBONS (1992), we find that equation (5) presents the possibility of maximization under conditions of price competition and for adequate profits. To this assumption, it is proposed a optimization function (6), following the optics "Bertrand-Nash," which:

\[
Max_{\pi_i} \rightarrow \frac{d\pi_i}{dp_i} = 0 \rightarrow \frac{dq_i}{dp_i} p_i + \frac{dp_i}{dq_i} q_i - \frac{dT C_i}{dq_i} \frac{dq_i}{dp_i} = 0
\]

(6)

Since the central goal of the airlines is the profits maximization, it is proposed the tickets pricing, such as:

\[
q_i + q_i p_i - q_i c_i = 0 \rightarrow p_i = c_i - \frac{q_i}{q_i}
\]

(7)

However, according to equation (1), equation (7) can be represented as:

\[
\frac{q_i}{q_j} = \frac{\alpha_i p_i^{-\beta_i} p_j^\gamma}{(-\beta_i p_i^{-\beta_i}) \alpha_i p_i^{-\beta_i} p_j^\gamma} = \frac{p_i}{\beta_i}
\]

(8)

Inserting equation (8) in (7), we have:
\[ p_i = c_i + \frac{p_i}{\beta_i} \rightarrow p_i = \left( \frac{1}{1 - \frac{1}{\beta_i}} \right) c_i, \beta_i > 1 \]  

Substituting (4) in (9) and (1) in (10) the answer is:

\[ \beta_i = \left( \frac{1}{1 - \frac{1}{\beta_i}} \right) = \frac{\beta_i}{\beta_i - 1} \]  

And therefore, after simplifications:

\[ p_i = \Omega^\beta p_j^{\beta,\gamma} \]  

Equation (11) represents the best price for an airline in a competitive environment. However, according to the model proposed by Nash for competitive environments, there is an equilibrium model, W:

\[ W = \left\{ p_i = R_i(p_j)\Omega^\beta p_j^{\beta,\gamma} \right\} \]  

Simplifying algebra W by \( p_j \) in \( R_i(p_j) \) and therefore, adopting the model of Nash equilibrium and the equation (2), we have:

\[ \{ p_i^*, p_j^* \} = \left\{ \Omega_i^{\beta_i} \Omega_j^{\beta_j \beta_i \gamma_i \gamma_j}, \Omega_j^{\beta_j} \Omega_i^{\beta_i \beta_j \gamma_j \gamma_i} \right\} \rightarrow \left\{ \Omega_j^{\beta_j} \Omega_i^{\beta_i \beta_j \gamma_i \gamma_j}, \Omega_j^{\beta_j} \Omega_i^{\beta_i \beta_j \gamma_i \gamma_j} \right\} \]  

In this case equation (13) becomes the price solution in the airlines competitive market with the freedom to take decisions on the tickets value. However, to ascertain the profits, some algebraic steps are necessary. In other words, substitute equation (3) in equation (5) and substituting therefore all equations of (10) to (13), than profits can be determined by:

\[ \pi_i^* = \Omega_i \Omega_j^{\ln(z^\gamma)} \Omega_j^{\ln(z^\gamma)} \]  

Therefore, after the literature review, applied mathematical models and their empirical applications, it is observed that profits are a function of competitive environment, prices and fixed costs, in which they must be managed so as to obtain the equilibrium point. However, a question is still remaining, in other words, what is the price behavior? Such discussion is presented in session 3.3.1 as follows.

**Price Elasticity Function**

According to session 1, the Brazilian airport sector has been growing at high rates as a unique characteristic in the world. Prices analysis depends on the elasticity demand size. Therefore, it is necessary to highlight price-demand elasticity.

Several models are found in the literature to estimate the airport sector demand. In general, demand is a price function, costs and companies choices. OUM and WATERS (1990) proposed that price-demand elasticity is lower for FSCs and higher for LCCs, according to the price variation.

The concern here is to present a methodology to assess price elasticity for the airport companies. Therefore:

\[ Lnq_{it} = \beta_0 + \beta_1 Ln\rho_{it} + \beta_2 Ln\rho_{jt} + LnX_{it} + \Omega LnX_{jt} \]  

In which:

- \( q_{it} \) is the demand of companies i on time t.
- \( \rho_{it} \) is the prices of companies i on time t.
\( X_{it} \) is the characterizes of the companies \( i \) and similar for the companies \( j \)

However, equation (16) can be improved, due to competitive markets and is expressed below:

\[
\ln q_{it} = \beta_0 + \beta_1 \ln p_{it} + \beta_2 \ln \rho_{it} + \ln X_{it} + \Omega \ln X_{jt} + \beta_3 NCS + \beta_4 T
\]

(16)

In which:

- \( NCS \) are new companies and products.
- \( T \) is time dummy function.

For competitive markets it is observed that prices are a linear attributes combination involving route characteristics, airplanes models, selected airports, costs and dummies as the service differentiation.

**PROPOSALS APPLIED FOR BRAZILIAN MARKET**

The conditions for the Brazilian market development proposal are related to the creation of a competitive environment with emphasis on airlines prices and profits. After the literature review it was possible to identify a set of important factors for these conditions, such as:

- **Competition**: How the airport sector can contribute to Brazilian economic growth, especially due to the numerous infrastructure problems? What is the best strategy for LCCs and FSCs? For BARAT (2007), the economic liberalization process has stimulated competition among Brazilian airlines.

- **Antitrust Policy**: how to evaluate the dominant behavior firm? What are the benefits for end consumers? To CADE (2011), the necessary conditions for market equilibrium is to free airline competition, prices and financial performance.

- **Prices Analyses and Inadequate policies**: how to assess airlines prices? Prices are appropriate? The government is assessing the enterprises performance, due to the possible monopoly formation? To EDLIN and FARRELL (2004), there are good prices practices which are not characterized as inadequate policies or monopoly.

- **Cartel**: are actions coordinated between the airlines? There is control of information and ticket sales? To CADE (2011), there are factors that can determine cartels like market concentration and costs homogeneity, involving promotions and offers.

- **What is the difference price between the LCCs and FSCs in Brazil?** For PALLADINO (2005), the airlines strategies would be different to suit different markets. However, it is perceived, according to ANAC (2010), a price difference, according to the passengers’ type: (i) business or (2) tourism.

- **Profits**: would result in profits, a competition and pricing function? Thus, the stimulus to the passenger free market is an essential factor for the airlines. Likewise, how flexible is the legislation for the new businesses entry? Profit is a function of competition between operators, their prices, demands, costs and elasticity, as proposed in equations (1) to (16).

Thus, for full functioning of the Brazilian market, it is necessary to liberalize the market with free competition between LCCs and FSCs, with pricing freedom and full government oversight over their actions.

**CONCLUSIONS AND RECOMMENDATIONS**

This paper intended to make a competition, prices and profits literature review related to the Brazilian market conditions in search for suggestions correlated to its national economy. The used methodology is represented in Figure 1 and is a summary of all studies and research conducted in the literature in search of concepts of competition, prices, profits and markets. The results from the literature review have shown the importance of airlines management in the profit pursuit. More specifically, the analysis identified that the explored concepts may result into appropriate conditions for the airlines management.

The implications for further research include studies related to new targeted models taking into consideration behavioral aspects and the price competition among airlines, FSCs and LCCs including profit maximization proposed by the Nash equilibrium.
For future studies, we recommend the use of the proposed equations, involving the LCCs and FSCs updated with Brazilian market data for a consistent analyses process.

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**Figure 1 – Research Strategy**