



# Analyzing and Enhancing Punctuality in Brazilian Air Transportation: A Process Capability Perspective

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**Abstract.** This work in progress paper investigates the 2023 performance of the Brazilian air transportation system, with a focus on punctuality and key contributors to flight distribution. Analysis of 983,381 flights reveals a concentration of 90.53% among the top 10 companies. Primary airports constitute 59.75% of all flights. Punctuality examination shows varied performance among top 10 companies, with an overall system punctuality of 79.03% in 2023. This study lays the foundation for a more comprehensive analysis of operational patterns and punctuality in Brazilian aviation.

**Keywords:** On-time Performance; Flight Punctuality Rate; Quantitative Methods Analysis; Flight Delay; Airline.

## 1. Introduction

In the realm of airline preferences, punctuality stands out as a decisive factor for passengers (Medina-Muñoz et al., 2018). Flight delays not only disrupt individual plans but reverberate through the intricate network of an airline (Tucci and Neto, 2019). In 2023, the Brazilian air transportation system witnessed 983,381 scheduled flights, with 926,464 successfully completed, forming the focus of our study (ANAC, 2024).

Flight punctuality is a pivotal metric in aviation, influencing market dynamics, customer loyalty, and profitability (Han et al., 2010; Loth, S., & Helm, S. M., 2015). For discerning passengers, punctuality is a key factor, reflecting its direct link to economic viability, particularly in higher price segments and transfer scenarios (Han et al., 2010; Loth, S., & Helm, S. M., 2015).

This paper investigates punctuality within the Brazilian air transportation system, aiming to assess current customer-perceived process capability. We scrutinize ANAC-mandated methods (ANAC, 1999) against the present performance of aviation companies.

## 2. Materials and Methods

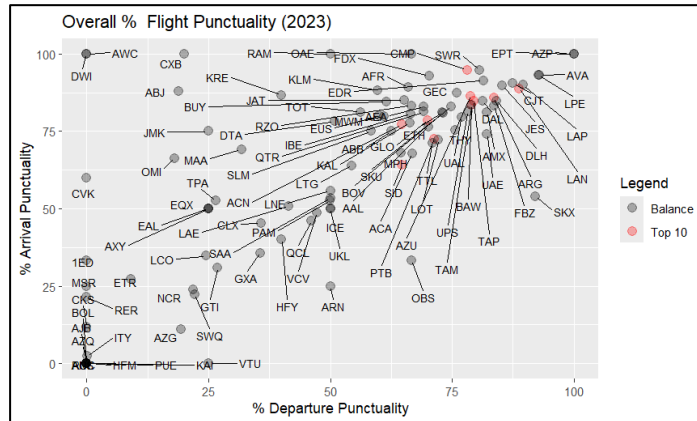
This study aims to portray the current process performance of the Brazilian air transportation system through a statistical analysis that describes historical trends in this sector. To achieve this, we leverage historical and publicly available data extracted from the ANAC's active regular flight database, covering flight schedules, cancellations, and completions. The analysis focuses on the year 2023, utilizing a dataset comprising 812,508 realized flights as data points, representing 100 distinct flight companies that operates flights across 145 airports located in Brazil. This dataset serves as a robust foundation for the ensuing statistical exploration, allowing us to gain valuable insights into the dynamics of the Brazilian air transportation system.

## 3. Preliminary Results

Examining the 2023 flight landscape, 90.53% of flights are concentrated among the top 10 companies, with significant contributors being AZUL (31.00%), LATAM (26.70%), and GOL (23.70%). Simultaneously, 59.75% of all flights are focused on the top 10 airports, prominently featuring GRU (13.80%), CGH (9.85%), and VCP (6.70%) as primary hubs in terms of traffic passengers.

Shifting focus to punctuality within the Brazilian air transportation system, Figure 1 illustrates the dispersed performance of flight companies, where the best placements are at the top right. Among the top 10, % departure punctuality ranges from 59.33% to 87.62%, while % arrival punctuality varies from 71.86% to 89.60%. Overall, the Brazilian air transportation system exhibited a punctuality rate of 75.61% for departures and 82.44% for arrivals, resulting in an overall % punctuality of 79.03%.

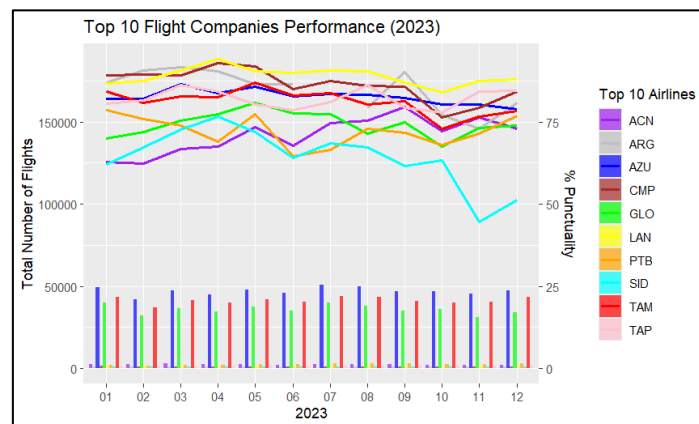
Figure 1



Source: Author

While Brazilian airlines are known for their punctuality (CIRIUM, 2024), this study reveals ample room for improvement. Figure 2 below specifically underscores the performance of the top 10 companies, highlighting variations throughout the year and indicating potential seasonal effects deserving further investigation.

Figure 2



Source: Author

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