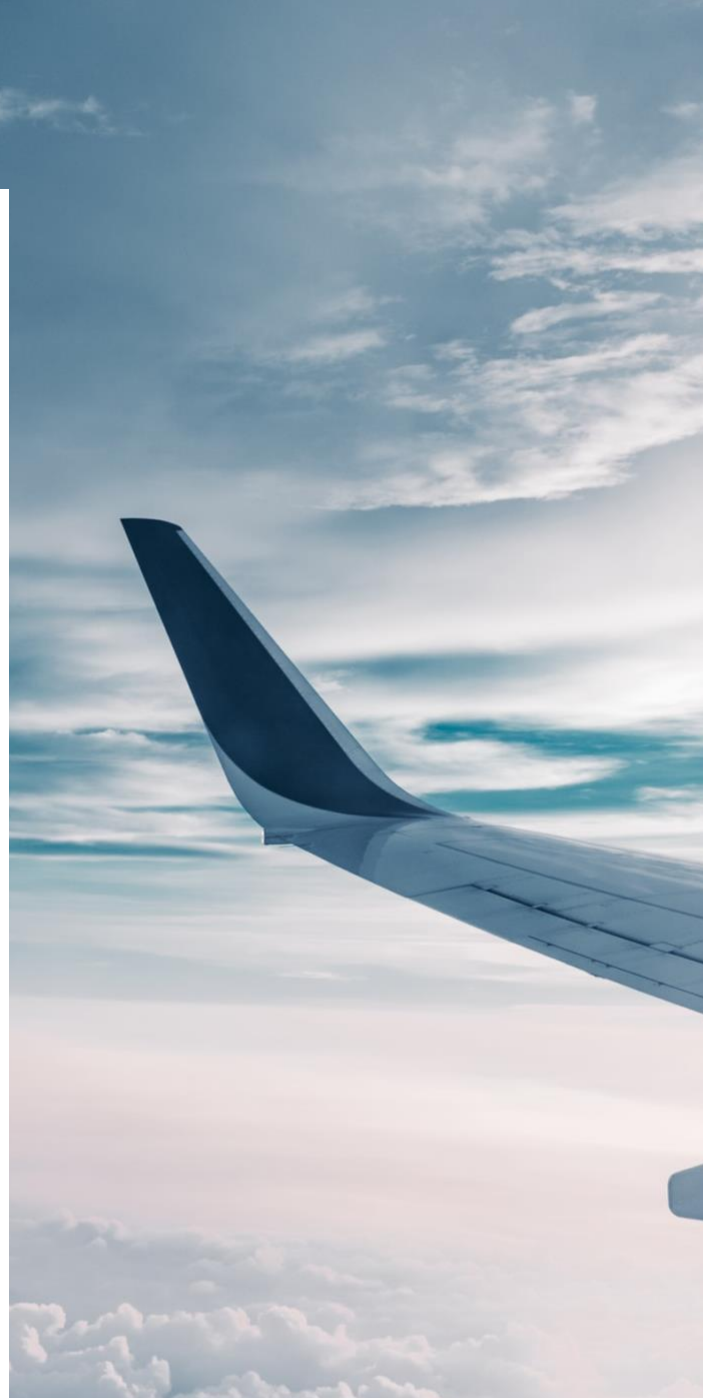


TEXT ANALYTICS ON AIRLINE PRESS RELEASES

FEBRUARY 10, 2021

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SENTIMENT ANALYSIS & VISUALIZATION OF PUBLICATIONS OF AIRLINES IN CRISIS MODE

Most airlines have spent the better part of the last 12 months fighting for economic survival. The industry has been hit by the COVID-19 pandemic like no other industry. Fear of traveling and legal restrictions to operate aircraft on various international routes caused major parts of the global air travel network to collapse.

Understanding the full context of the situation and the uncertainties ahead is crucial for creating a crisis response plan with the goal of quickly returning to the levels of connectivity present before the pandemic. Analysis of the sentiment of public statements can give valuable insights into how an airline – consciously or subconsciously – paints a picture around what investors can expect in the periods ahead.

Sentiment of quarterly earnings press releases serves as forward guidance. Even though mandatory publications of stock listed corporations are meant to review the most recent completed quarter's performance, the sentiment can indicate expectations about next quarter as well. In the case of airlines in crisis mode, communication to stakeholders (including shareholders, governments, and passengers) is key to assess risks and potential mitigating measures.

Not surprisingly, research indicates that the sentiment of press releases (as measured with the AFINN lexicon assigning scores between -5 and 5) takes a turn to the negative once the first effects of a (health, political, natural, etc.) crisis hit in. What is rather surprising is that the sentiment – on the decline and the rise – is leading the passenger volume by approximately one quarter.

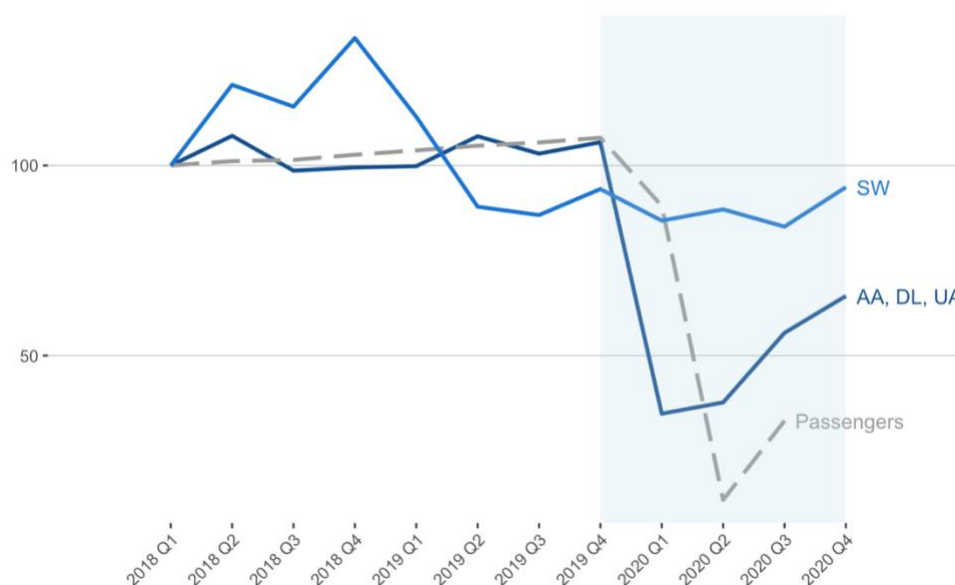


Figure 1: Airline sentiment and passenger volume (indexed, legacy carriers consolidated)¹

¹ SW: Southwest Airlines, AA: American Airlines, DL: Delta Air Lines, UA: United Airlines

As visualized in *Figure 1*, especially the sentiment of quarterly statements of legacy carriers (in the US: American Airlines, Delta Air Lines, United Airlines) serves as a forward guidance for the next quarter’s passenger volume.

In order to prove this mathematically, a new variable is introduced: *passenger volume lag-1*. This variable represents the time-series of *passenger volume* moved backwards by one quarter. As the correlation of *the passenger volume lag-1* is higher than the *passenger volume* on the non-adjusted time-series, there is the predictive power of the sentiment on next quarter’s passenger volume.

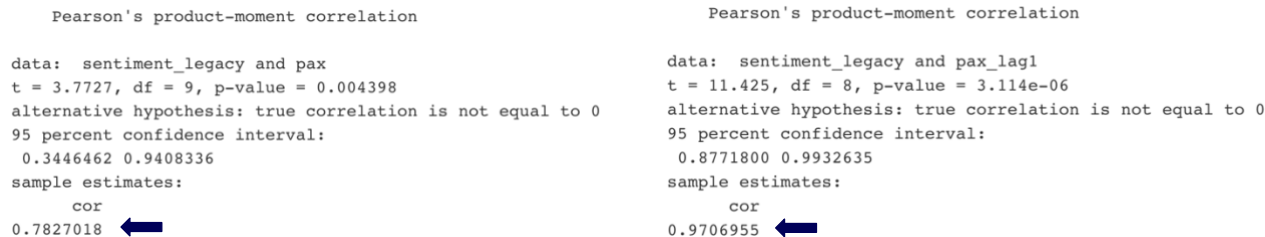


Figure 2: Correlation analysis of sentiment with (1) normal time-series and (2) lag-1 time-series

Using this information, equity researchers and other observers of the financial markets can adjust their expectations about the upcoming performance based on the sentiment of the most recent press releases. More details about the sentiment gap between low-cost carriers (Southwest Airlines) and legacy carriers (American Airlines, Delta Air Lines, United Airlines) are described in the following paragraphs.

Utilizing press releases as opportunities to demonstrate achievements rather than only reporting results. While the legal requirement of giving access to the financial conduct of a corporation cannot be neglected, there is potential to send signals to the market through the sentiment of the reporting. The choice of words gives the observers an understanding of what is important.

Figure 3 demonstrates the differences in words that are most prominently used in press releases of airlines. The findings are in line with *Figure 1*, that Southwest Airlines maintained a more positive sentiment throughout the crisis whereas legacy carriers took a deep dive into more negative terminology.

The metric to build the word clouds are trigrams which showed more meaningful results after also reviewing bigrams and quadrograms for the respective periods. For the size of the words, the term frequency–inverse document frequency (tf_idf) in decreasing order was used. This metric highlights the trigrams that are most unique and meaningful to the press releases dependent on the year and the airline.

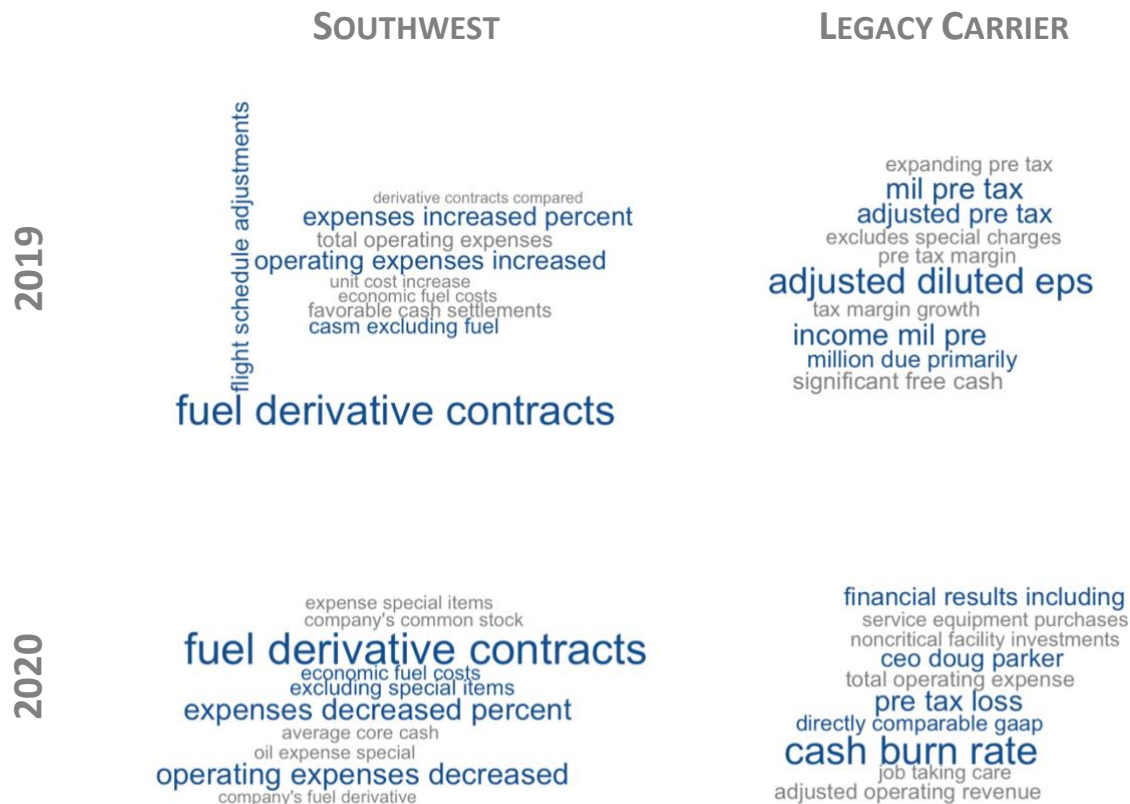


Figure 3: Word clouds per year and airline (word size: decreasing tf_idf)

Overall, the word clouds demonstrate that the concerns of airlines quickly changed from 2019 to 2020. While operational matters such as adjustments to the flight schedule or the increase of operating expenses were relevant in 2019, the situation quickly changed. Similarly, reporting financial matters about significant free cash and earnings per share (eps) are out of reach in 2020. In contrast, the most recent reportings are coined by the effects of the COVID-19 pandemic with a clear focus on decreasing expenses, managing the cash burn rate and a pre-tax loss.

Differentiating between the type of carrier reveals that Southwest Airlines used the publications to prominently highlight the achievements such as decreasing the expenses with noun-verb combinations in the 2020. In contrast, the word cloud of the legacy carriers shows more noun-only combinations of accounting terms such as cash burn rate or pre-tax loss.

In order to maintain better public perceptions, airlines – even in a crisis – are recommended to use press releases as means of demonstrating their achievements in dealing with challenges rather than purely disseminating accounting terminology (which can be better placed in the 10-Q and 10-K reports).

Airlines can use press releases to gauge the sentiment about their business. Outsiders can draw additional information from the choice of words. This report highlights the underlying information that can be drawn from the sentiment of quarterly press releases of airlines in a crisis. Using sentiment analysis and visualization tools for the results, provides a surprising method to approximate next

quarter's expected passenger volume in a crisis. On the other hand, airlines can consciously decide which words they want to communicate to the public to shape an opinion about their most recent and expected upcoming performance. By focusing on achievements and reducing the accounting terminology to a regulatory required minimum bears the potential of more positive sentiment and better public perception.

References:

Bureau of Transportation Statistics. (2020). *Monthly Passengers on U.S. Scheduled Airlines (Domestic + International), Seasonally Adjusted, October 2017 - October 2020*. Retrieved from <https://www.bts.gov/figure-1-monthly-passengers-us-scheduled-airlines-domestic-international-seasonally-adjusted-october>