



U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology

Bureau of Transportation Statistics

Office of Statistical and Economic Analysis

Negative Transportation Volumes?

COVID-19 Issues Seasonally Adjusting Transportation Data Series

June 8, 2022



Seasonally adjusted data series

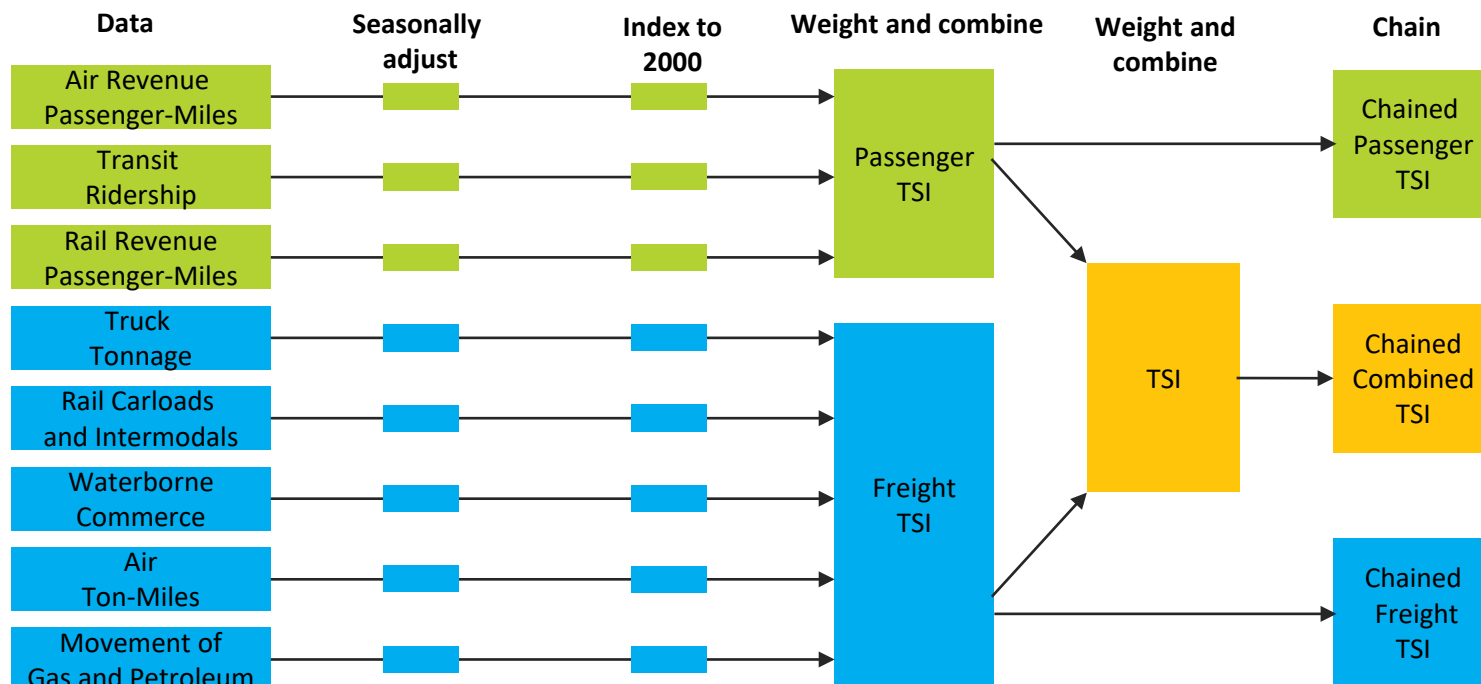
<https://data.bts.gov/stories/s/j32x-7fku>

- **Air traffic**
 - Enplanements
 - Available seats miles
 - Revenue passenger miles
- **Inputs to Transportation Services Index**
 - Freight:
 - Truck tonnage
 - Rail carloads
 - Rail intermodal units
 - Revenue ton miles of freight and mail
 - Pipeline petroleum
 - Natural gas pipeline
 - U.S. waterways tonnage
 - Passenger
 - Air revenue passenger miles
 - Rail passenger miles
 - Public transit ridership
- **Vehicle Miles Traveled**



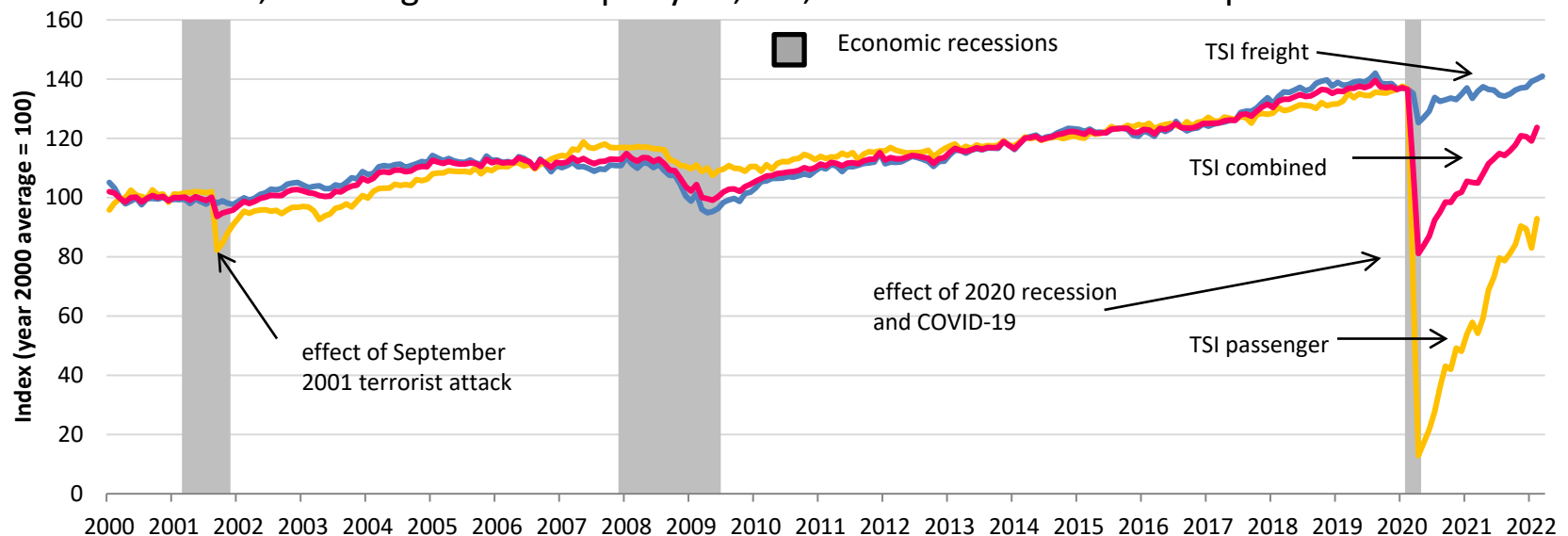
What is the Transportation Services Index (TSI)?

- TSI measures the volume of freight and passenger transportation services provided monthly by the for-hire transportation sector in the U.S.
- BTS combines multiple for-hire transportation data series and produces three indexes: a freight index, a passenger index, and a combined index



How is the TSI Used?

- The TSI is an economic indicator; it signals periods of economic growth and decline
- For example, during periods of economic growth
 - the demand for goods increases and industries require additional freight transportation services to move finished products and acquire raw materials
 - consumer confidence and consumer spending typically increases and unemployment declines, resulting in more trips by air, rail, and transit for work and pleasure



For more information on the TSI's relationship with the economy, see:

https://www.bts.gov/archive/publications/special_reports_and_issue_briefs/special_report/2014_12_10/entire



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What Is the Release Frequency?

- Monthly for-hire transportation data are available with a two-month lag for most transportation modes
 - For example, the June release of the TSI contains data through April
- Some data series lags by more than two-months. For these, BTS forecasts one month ahead
- Ideally, BTS would like to forecast all series or the TSI itself to:
 - Provide a more up-to-date picture of for-hire transportation activity and
 - Bring the series in-line with other economic indicators, such as industrial production, which lag one, rather than two, months from the release date

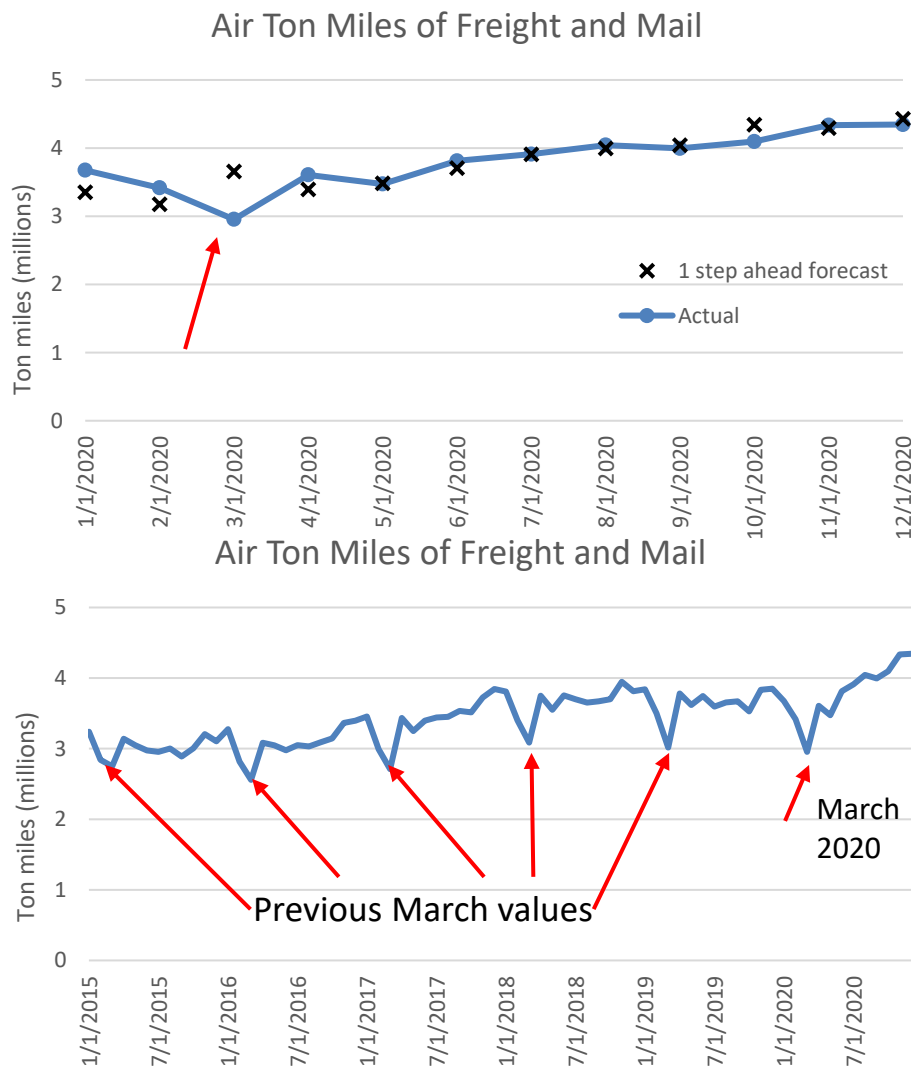


Effects of COVID-19 on the TSI

- COVID-19 and the 2020 economic recession caused transportation activity to decline in 2020 but freight activity declined less than passenger travel
- The freight TSI reached its lowest point in 2020 in April, declining 12% from the all-time time reached in August 2019
- The passenger TSI fell to an all-time low in April 2020, 84% less than the previous all-time low in September 2001
- The large declines in 2020 caused issues with the one-step ahead ARIMA forecasts used for series lagging all other inputs to the TSI
 - March 2020 forecast (based on data through February 2020) failed to capture the unexpected decline in freight and passenger transportation activity resulting from the recession and from stay-at-home orders, which took effect in March 2020 in many states
 - The depth of the decline among the passenger transportation series resulted in negative one-step ahead forecasts



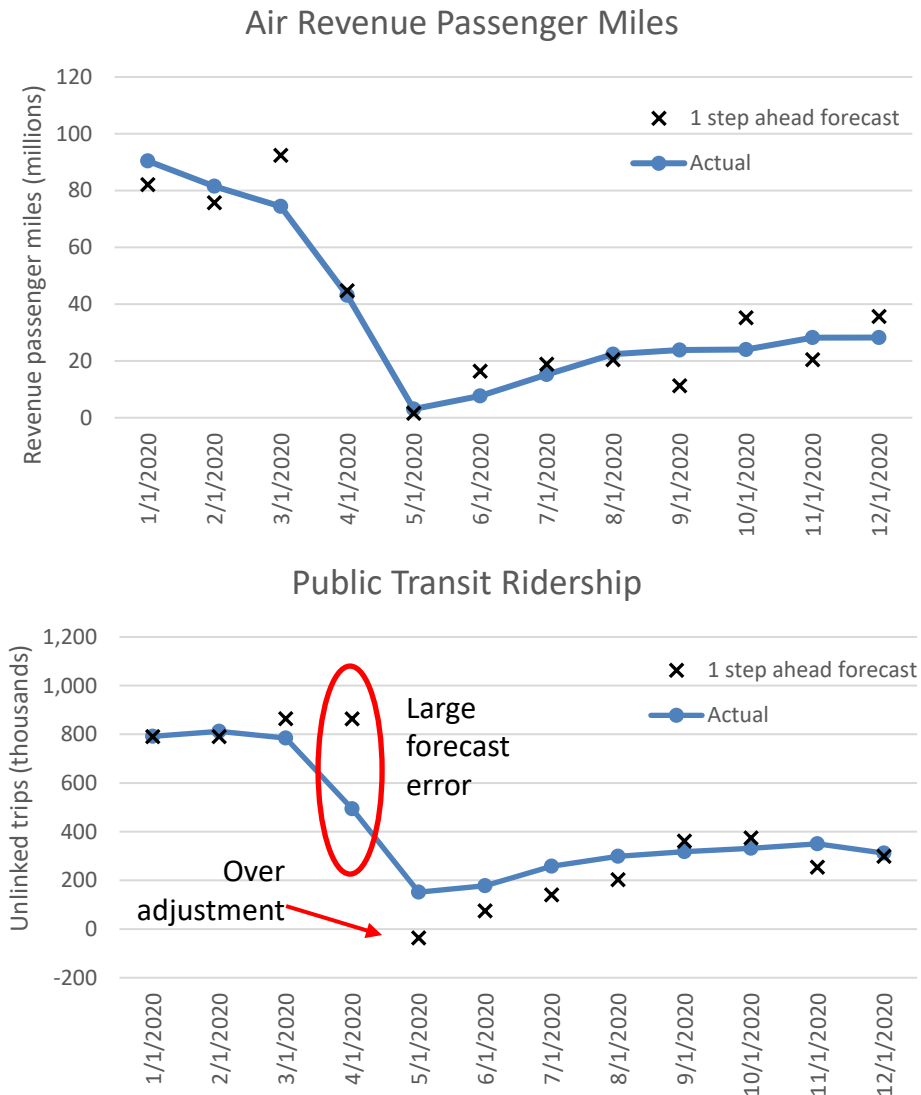
Freight transportation forecasts relatively unaffected by COVID-19



- BTS forecasts air ton miles of freight and mail one month ahead each month because the series lags one month behind the other inputs to the Transportation Services Index (TSI)
- March 2020 only month where forecast most inaccurate but observed decline every March
- Given no strong COVID-19 effects and small weighted contribution to freight TSI, BTS proceeded with one step ahead forecast



Passenger transportation forecasts sometimes negative due to the depth of the decline



- BTS forecasts all three passenger TSI inputs one month ahead each month because the series lag one month behind the other inputs to the TSI
- Given the strong COVID-19 effects, BTS withheld the release of the passenger TSI (releasing data for months with actual data only)



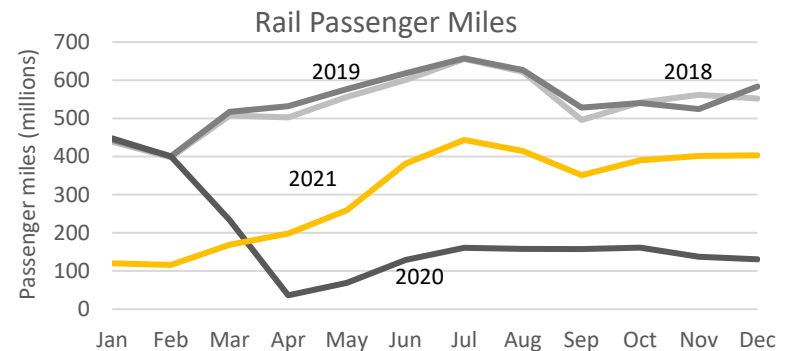
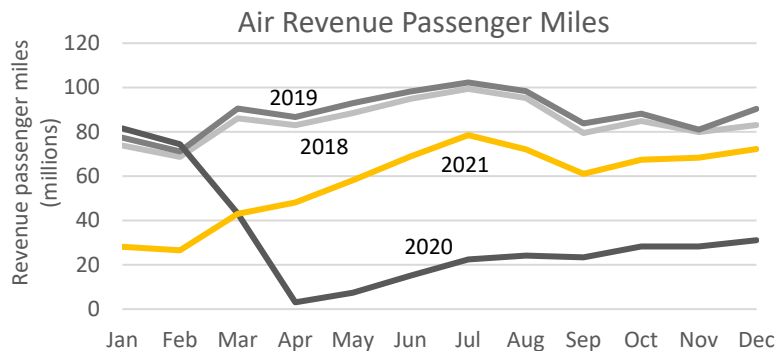
Where are we now?

- BTS has continued to withhold the release of the passenger TSI (releasing data for months with actual data only) due to the large forecast errors

Mean Absolute Percentage Error for One-Step Ahead Forecast

	Air ton miles of freight and mail	Air revenue passenger miles	Public transit ridership	Rail passenger miles
2018	5.1	7.7	6.0	10.4
2019	6.9	8.2	4.5	9.7
2020	5.0	32.6	33.8	44.3
2021	6.6	13.0	10.0	24.9

- But data series beginning to return to normal seasonal patterns, starting in mid-2021



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