A Truck-o-meter for South Africa

Byron Botha, Samkelo Duma and Daan Steenkamp
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The views expressed are those of the authors and do not necessarily represent those of the South African Reserve Bank or Reserve Bank policy.
What we do

- We produce automated daily and monthly indicators based on traffic flow data from almost 9000 monitoring sites.

- Traffic volume data is available almost immediately, making such data useful for real-time assessment of economic activity.

- We construct an index of transport activity as a coincident indicator of economic activity.
Creation of traffic flow indicators

- We use hourly data for light passenger vehicles, short-, medium-, long-heavy trucks

- We focus on aggregations for main routes, and aggregations based on type of road

- Over time, new measurement stations added, so we aggregate hourly flows from hourly to daily frequency, summing for each category at station-level before averaging across all sites per route

- Monthly series are based on averaged daily (unseasonally adjusted) data for each category at station-level before being aggregated to route level and being seasonally adjusted

- Large number of Municipal and Provincial stations stopped reporting data during Covid, so we eliminate these
Truck flows very noisy and have some aberrations
Truck flows clearer once cleaned

N1

N2

N3

Other N-roads

R-roads

M-roads

Rest

Total
Covid crisis complicates seasonal adjustment

Figure: Trucking flows (total routes since 2020)
Automatable Seasonal adjustment

- Daily data: Ollech (2018) approach, with
  - Recommended default window sizes recommended for trend-cycle decomposition and estimating seasonal factors
  - Add regressors for all observed historical public holidays for SA
  - Outlier identification using Ollech’s (2018) default critical values

- Monthly data: Sax and Eddelbuettel’s (2018) implementation of X-13ARIMA-SEATS with
  - X-11 procedure to estimate seasonal adjustments
  - Trading day and Easter (8) regressors
  - All outlier types offered by X-13ARIMA-SEATS

- To account for the Covid crisis, we estimate the seasonal model on pre-Covid data and apply forecasted seasonal factors to seasonally adjust COVID period data

- We confirm that each series is free of residual seasonality using a F-test
Seasonal adjustment allows clearer comparisons
Seasonally adjusted daily data enables like-for-like comparisons across time

Figure: Total trucking flows (all categories and routes)
Traffic flows during the Covid crisis

Legend
- Red: Light Passenger Vehicles
- Blue: Total Truck Index
Creation of Truck-o-meter as a coinciding indicator

- We sum daily data for each of the three categories of trucks for 77 routes.

- We select monitoring stations from major routes that have over 90 percent complete data and have a correlation with GDP $> 0.5$.

- Seasonally adjust once aggregated to monthly and quarterly frequencies.
Introducing the Truck-o-meter
Truck-o-meter highly correlated with current activity

Note: Scaled to have unit variance and zero mean. Both series have been seasonally adjusted.
Truck-o-meter highly correlated with current activity
What does the Truck-o-meter imply for the next GDP outturn?

Figure: Nowcasting GDP using Truck-o-meter

Note: OLS model with constant, AR(1) term and contemporaneous Truck-o-meter. Sample for GDP: 2000Q1 to 2020Q3.
Summary 1

- We construct automated daily and monthly traffic flow indicators for aggregate, route and vehicle type volumes.

- Ours is the first example of seasonal adjustment of daily South African data we are aware of.

- We show the importance of thinking carefully about the impact of Covid crisis on seasonal adjustment.
Summary 2

- We suggest that our Truck-o-meter provides a useful signal of current economic activity, and daily indicators provide concrete examples that can be used for MPC presentations and analytical assessments.

- Since Covid, traffic flows declined dramatically, with trucking flows falling over 50 percent and light passenger flows down almost 80 percent during initial lockdown.

- Although traffic flows returned to pre-crisis levels by end of 2020, introduction of adjusted level three lockdown saw renewed weakness in traffic flows.

- Trucking flows consistent with January MPC GDP forecast for 2020Q4, but more pessimistic about growth in 2021Q1 than SARB official nowcast.
Extra slides
Seasonal adjustment of Total road flows

- Moving hol. effect
- Intra-weekly effect
- Intra-monthly effect
- Intra-annual effect
Total routes Truck-o-meter monthly seasonal adjustment
Total Truck Index (Daily Seasonal Adjustment vs Monthly Seasonal Adjustment)
Truck flows correlated to various forms of activity

Figure: Truck flows vs Mining (SA)

Figure: Total Truck flows vs Wholesale trade (SA)
Truck flows correlated to various forms of activity

Figure: Short Truck flows vs light commercial vehicle sales (SA)

Figure: Truck flows vs Heavy, Medium and buses sales (SA)
Trucking flows vs Truck-o-meter
The truck-o-meter contemporaneously correlated with GDP

Figure: Cross-correlations between Truck-o-meter and GDP (Quarterly, seasonally adjusted)
Possible future research

- Could create alternative metrix for business cycle analysis, forecasting, economic analysis (e.g. matching geolocations of stations to those of centres of economic activity such as mines, factories, drydocks, ports or airports)

- Include truck-o-meter in a GDP Tracker and assess whether it a useful predictor of current GDP or GDP turning points
Considering creating alternative indicators for forecasting.