



7° CONGRESO IAPG
**Producción
y Desarrollo
de Reservas**

5 – 8 de Noviembre 2019
Mar del Plata, Argentina



SEASONAL ADJUSTMENT OF OIL AND GAS PRODUCTION DATA SERIES IN ARGENTINA

Description of Seasonal Patterns

Pablo Esteban Johanis

HALLIBURTON

Pablo.Johanis@Halliburton.com



Methodology proposed

Seasonal patterns in production data series





Definitions

Time series

Missing

Outlier

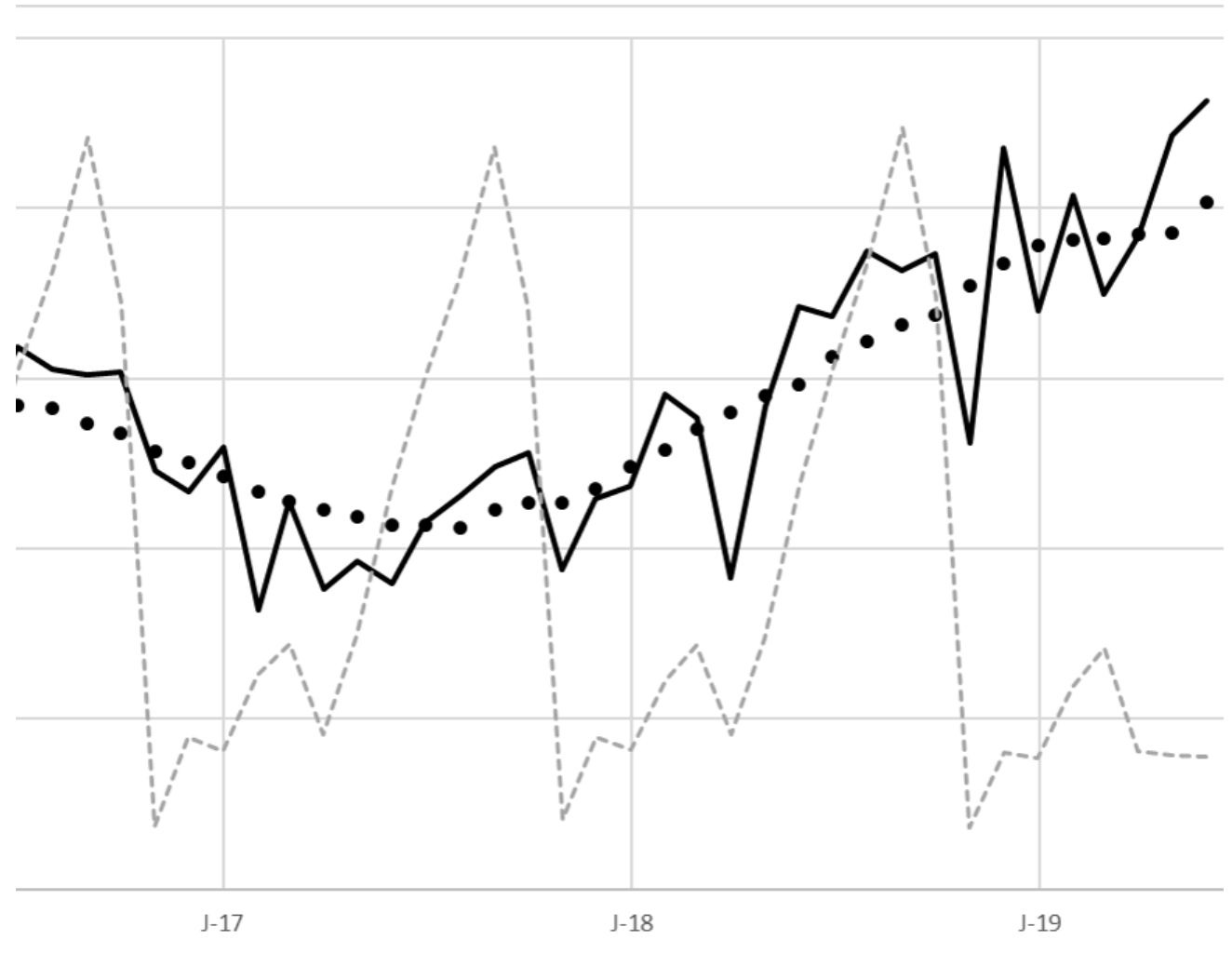
Trend

Cycle

Seasonality

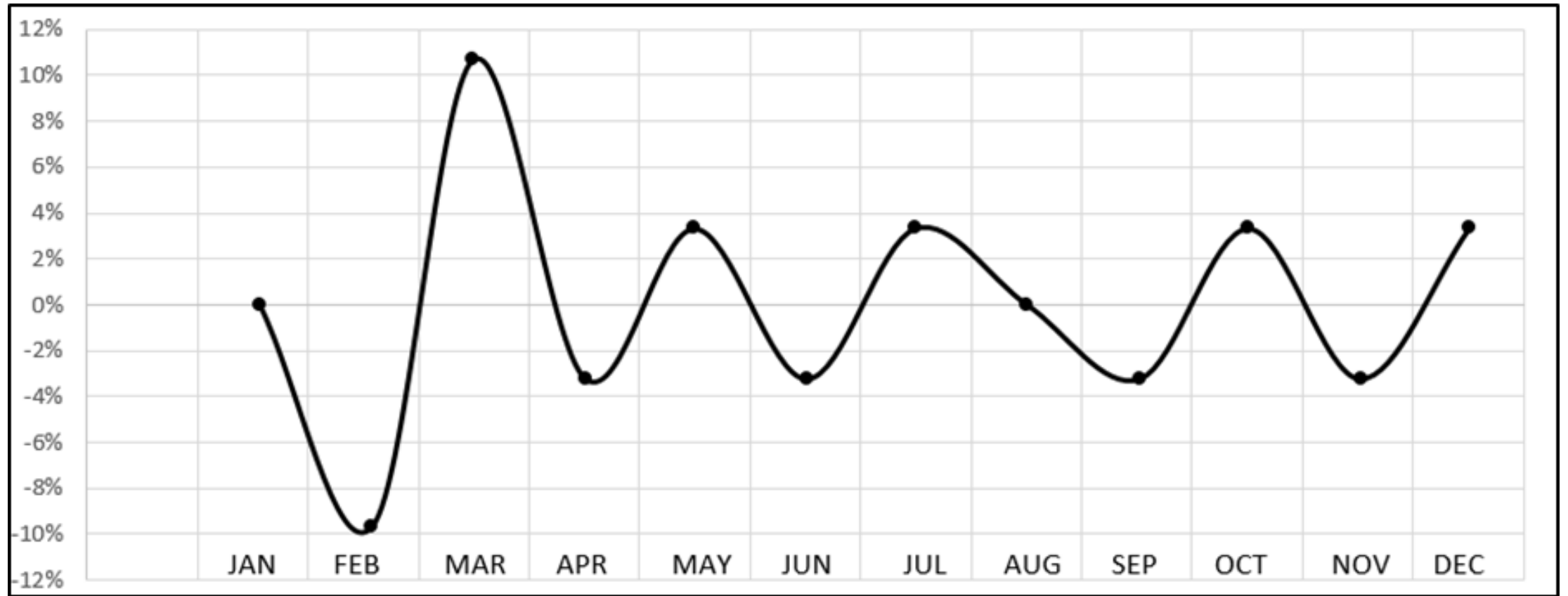
Anomaly

ARIMA/TRAMO-SEATS





Month-to-month percentage change because of the **length of month** seasonality

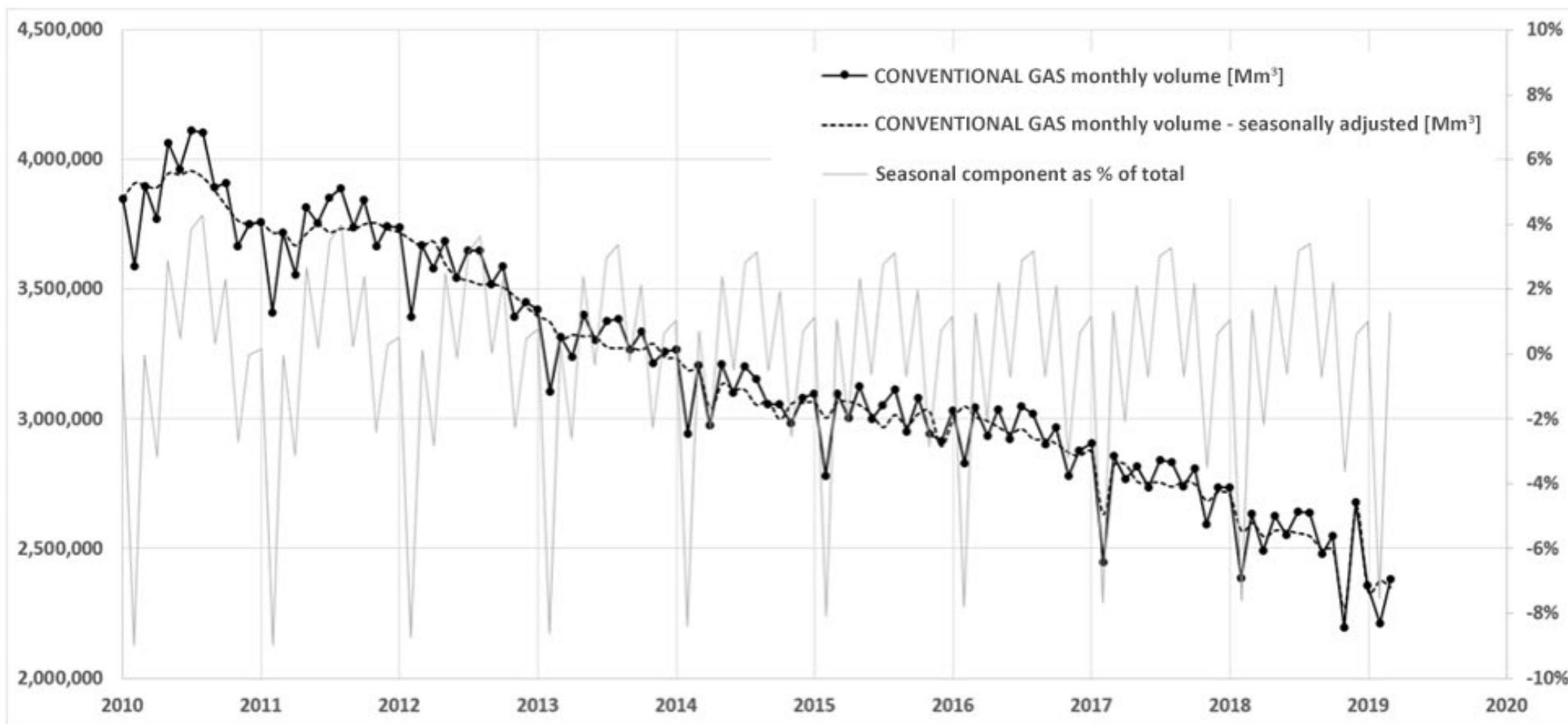


X-13ARIMA-SEATS

- Seasonal adjustment program produced, distributed, and maintained by the Time Series staff of the US Census Bureau's Center for Statistical Research and Methodology
- Time series modeling and model selection capabilities for linear regression models with ARIMA errors and the capability to generate ARIMA model-based seasonal adjustments using a version of the SEATS procedure originally developed at the Bank of Spain, as well as nonparametric adjustments from the X-11 procedure
- Free distributions of X-13ARIMA-SEATS for Windows® PC and Linux/Unix platforms are available (US Census Bureau 2018; Gomez and Maravall 1996)

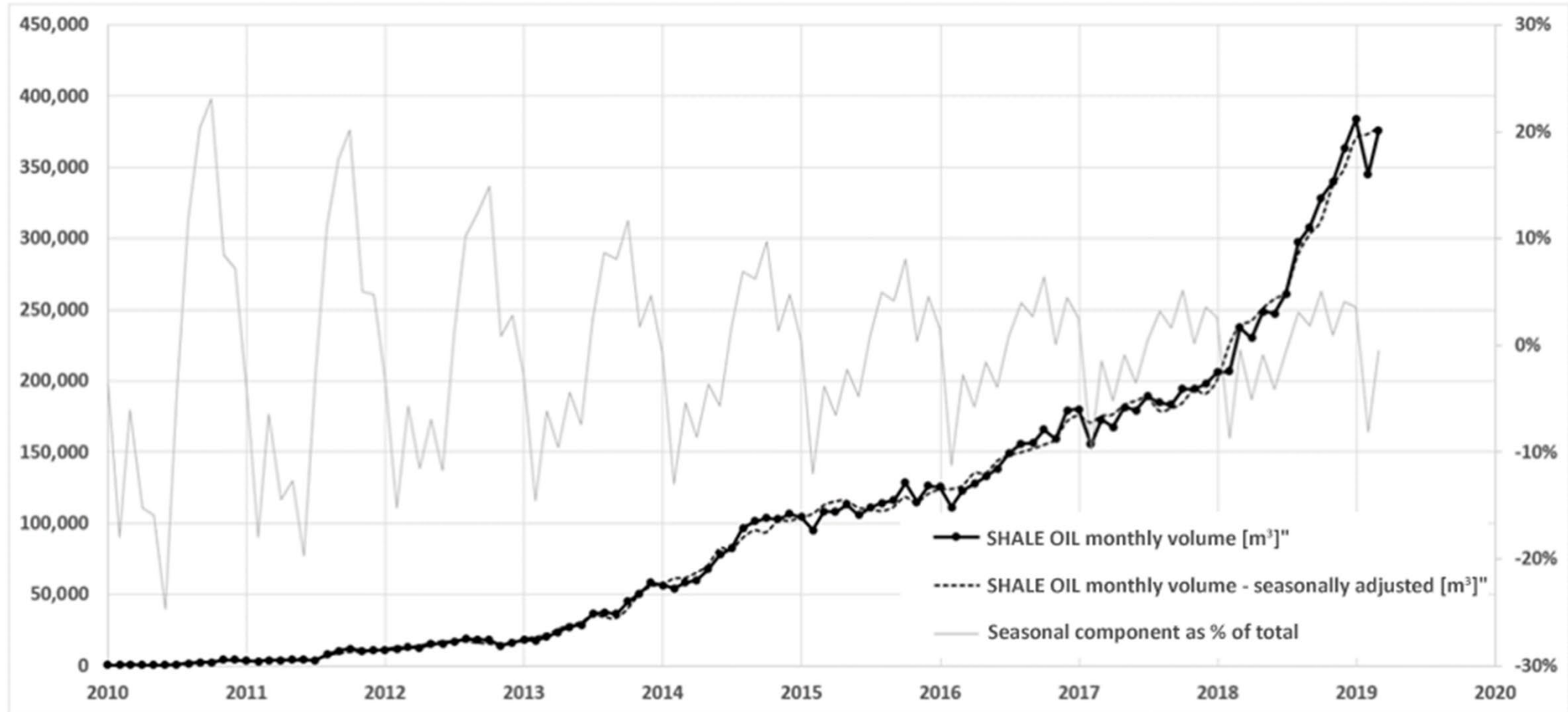


Conventional gas monthly production data series; general and seasonally adjusted series



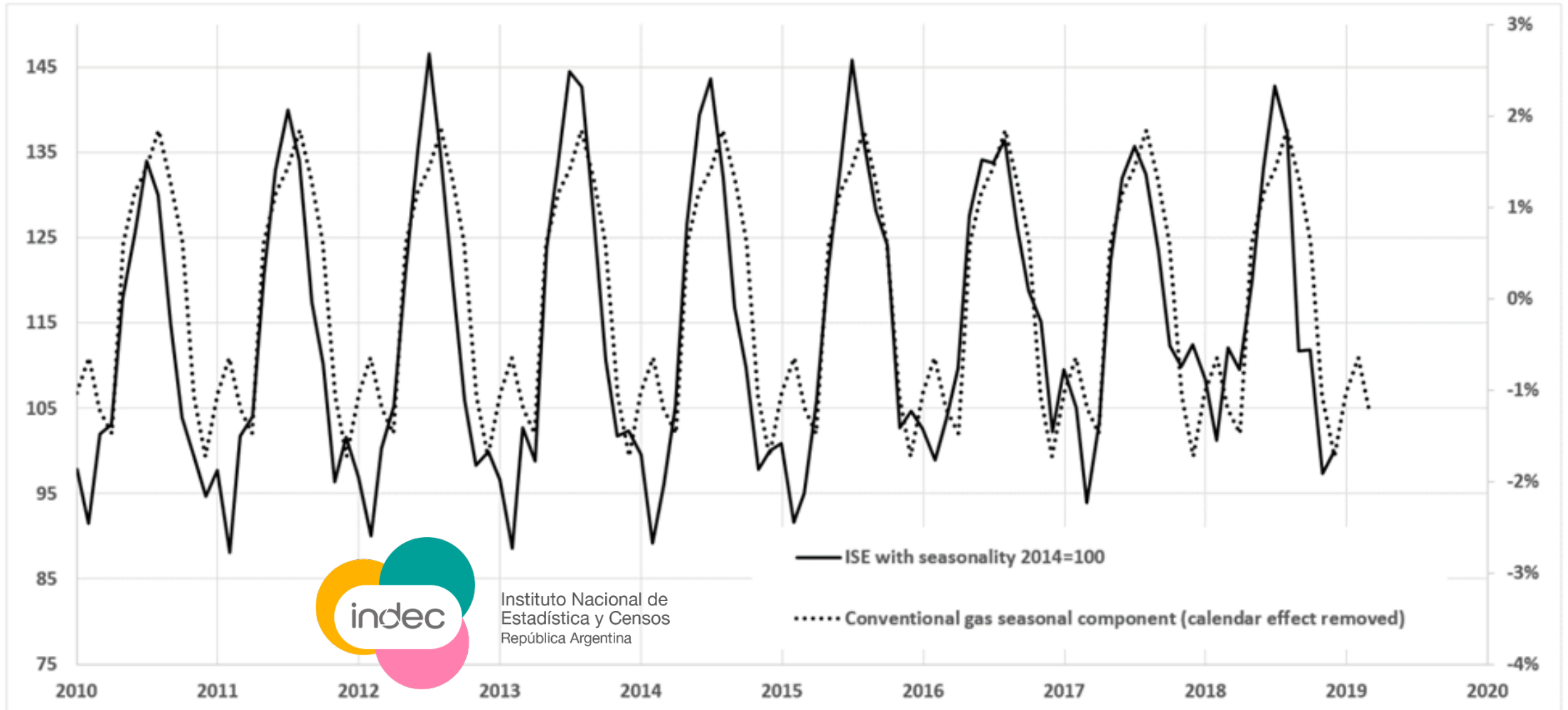


Shale oil monthly production data series; general and seasonally adjusted series





ISE general series vs conventional gas monthly rate seasonal component as percentage of total volume



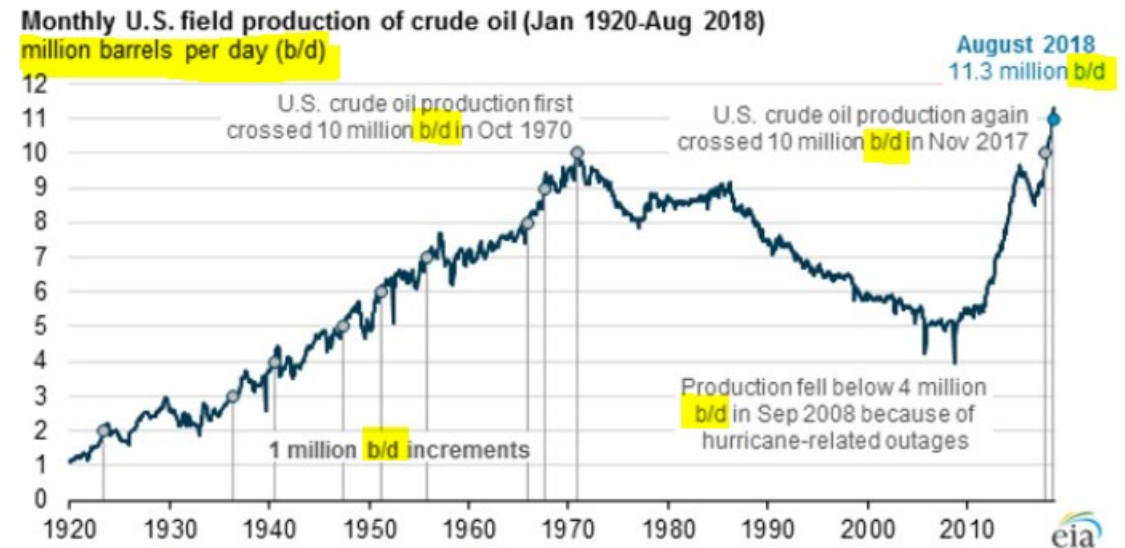
Conclusions

- Production data reported as monthly volumes include an inherent seasonal component because of the calendar effect that produces oscillations of up to one-tenth the total value, capable of masking other underlying trends and fluctuations.
- Any monthly volume hydrocarbon production data series analyzed exhibits seasonality because of calendar effects.
- Expressing hydrocarbon production in rate-per-day units removes the seasonal effect caused by the calendar effect, without the need to use any special software.



Conclusions

- It is advisable to express hydrocarbon production data series in daily rate units and analyze it for seasonality with available applications to identify and characterize seasonal patterns underlying the calendar effect.



Source: U.S. Energy Information Administration, Petroleum Supply Monthly

Conclusions

- Conventional gas production (in Mm^3/d) has a recognizable seasonal component. To adjust the series, the maximum deduction is applied during August (circa -1.3%) and the maximum addition during December (circa +1.7%).
- A strong correlation exists between the ISE and the seasonal component of conventional gas production, once deduced the calendar effect.
- The remaining seasonality in conventional gas production, once deduced the calendar effect, responds to the influence of energy demand.
- The total gas production data series bears a proportion of seasonality provided by its conventional gas fraction.



Conclusions

- The series of monthly averages of shale oil production daily rates (in m^3/d) has a recognizable seasonal component. To adjust the series, the maximum deduction is applied during October (circa -1.9%) and the maximum addition during December (circa +1.7%).
- The unconventional oil and the total oil production data series bear a proportion of seasonality provided by the shale oil fraction.



Acknowledgments

The author thanks Halliburton for permission and support to publish this paper. Special recognition is owed to Lic. Silvina Costantino, economist at the Central Bank of Argentina, for her support in the seasonal adjustment of production data series.



7° CONGRESO IAPG
**Producción
y Desarrollo**
de Reservas

5 – 8 de Noviembre 2019
Mar del Plata, Argentina

IAPG INSTITUTO ARGENTINO
DEL PETRÓLEO Y DEL GAS

THANK YOU

Further questions are welcome at Pablo.Johanis@Halliburton.com