JMP 16 Updates in Time Series Platforms

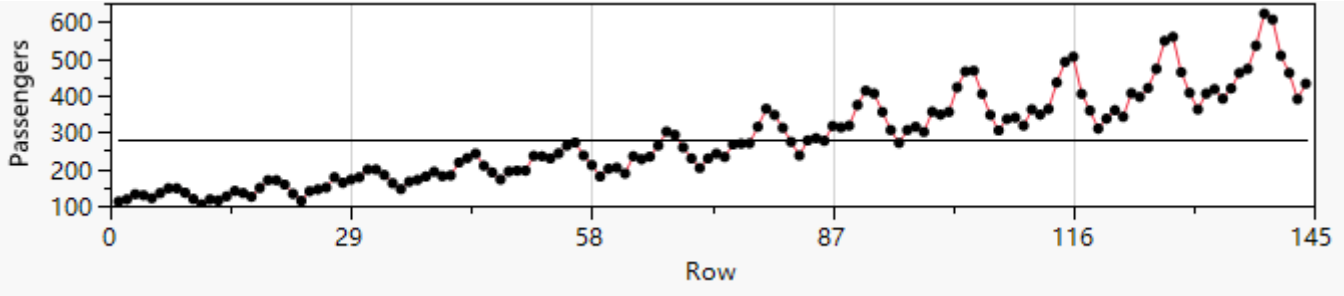
Peng Liu, Principal Research Statistician Developer, JMP
Jian Cao, Principal Systems Engineer, JMP

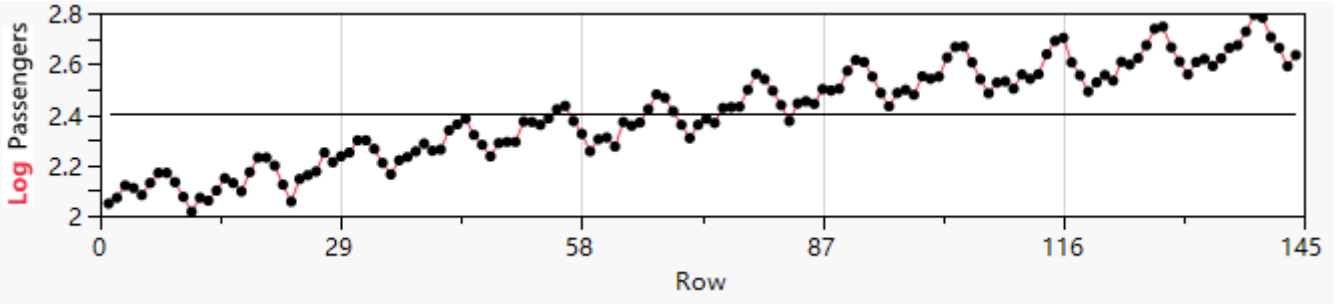
Briefing

1. Analyze Box-Cox Transformed Time Series (Time Series)
2. Fit State Space Smoothing Models (Time Series)
3. Analyze Forecasting Performance Using Holdback (Time Series)
4. Select Models Using Holdback (Time Series Forecast)

Analyze Box-Cox Transformed Time Series

- Time series need to be transformed so that variations remain constant as series changes. Example: Seriesg.jmp, variation increases as value increases.

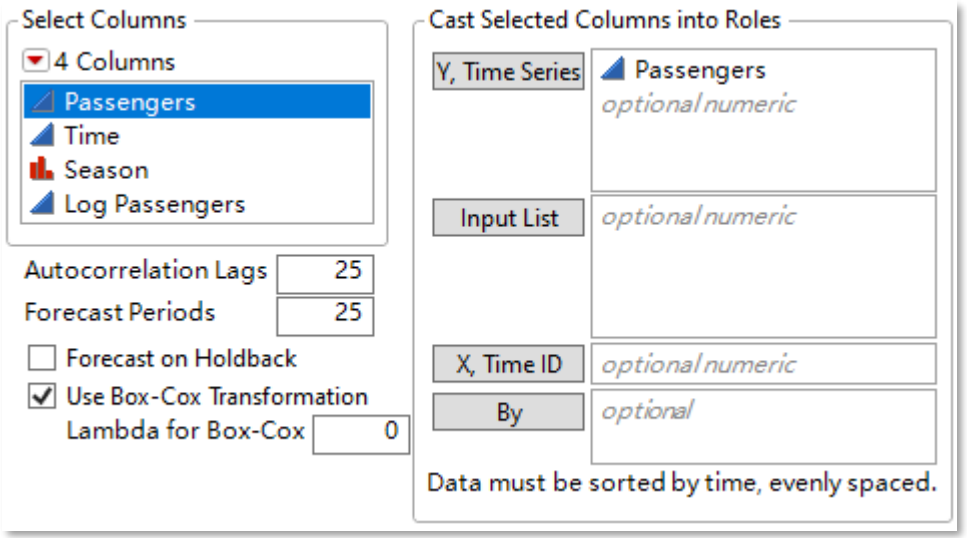


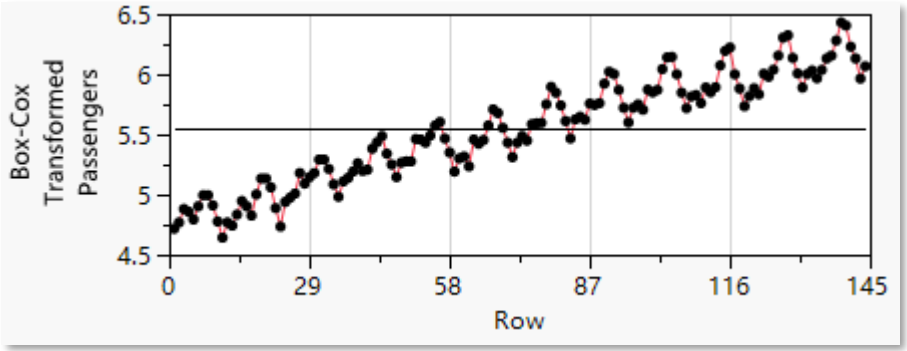


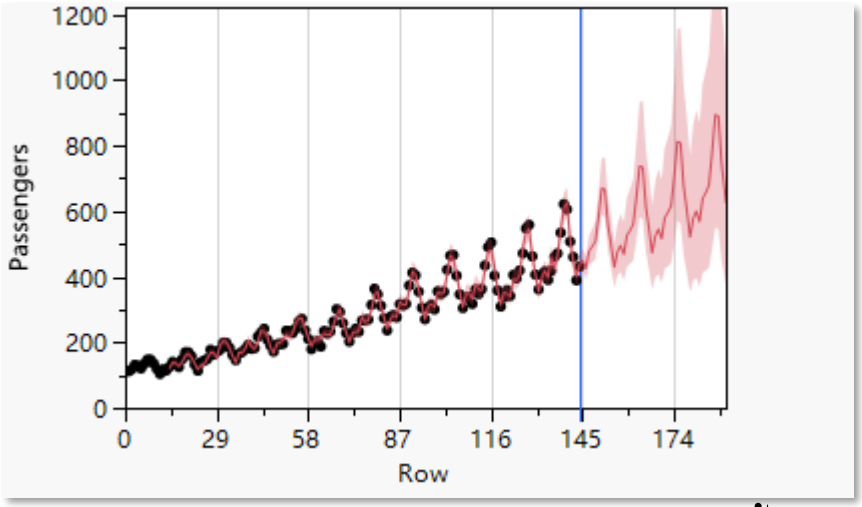
Analyze Box-Cox Transformed Time Series

- Time series need to be transformed so that variations remain constant as series changes. Example: Seriesg.jmp
- Before JMP 16, series needs to be manually transformed, followed by differencing if needed, fitting models, selecting model, making forecasts, and finally transforming forecasts back to the original scale.
- Starting from JMP 16, one can provide a Box-Cox transformation parameter value, the software will transform the series before modeling and inverse transform the forecasts to the original scale.
- The platform also provides “Box-Cox Transformation Plot” for identifying a desired transformation parameter value.

Analyze Box-Cox Transformed Time Series





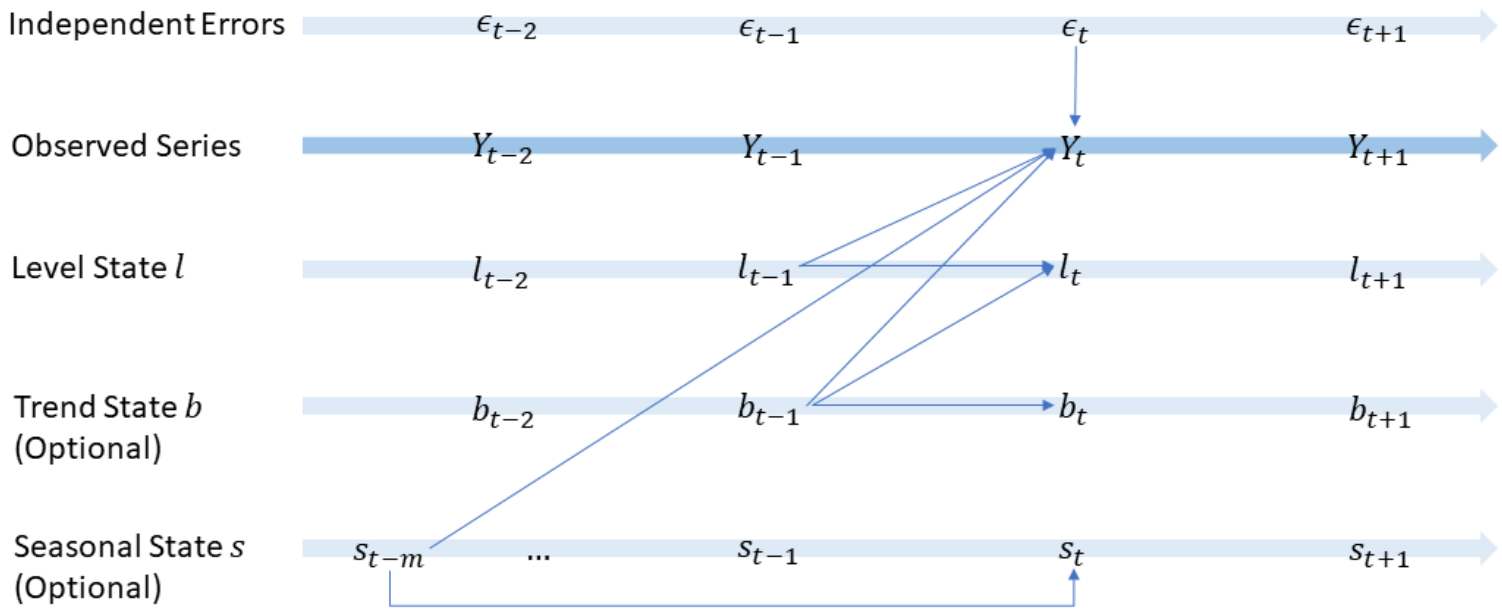


State Space Smoothing Models

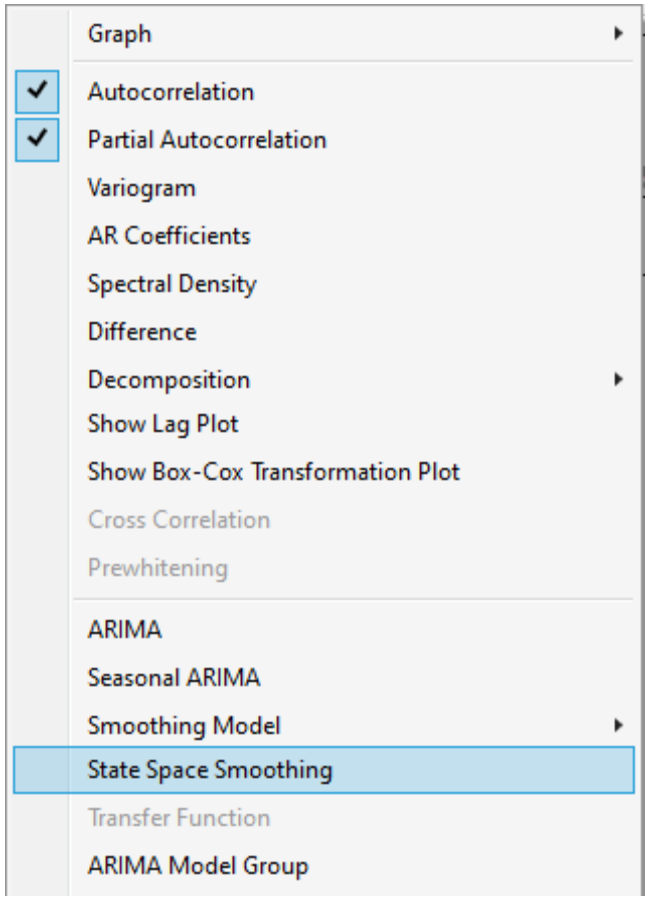
1. Workhorse in Time Series Forecast Platform (JMP15).
2. Fit and forecast a lot of series quickly.
3. Easy to specify - usually in two to three clicks.
4. Forecasting performance is comparable to ARIMA..
5. We were not able to study them individually in JMP 15.

State Space Smoothing Models – Highly Distilled

$$Y_t = \left(\left(l_{t-1} \begin{matrix} + \\ \times \end{matrix} b_{t-1} \right) \begin{matrix} + \\ \times \end{matrix} s_{t-m} \right) \begin{matrix} + \epsilon_t \\ \times (1 + \epsilon_t) \end{matrix}$$



State Space Smoothing Models in Time Series



- State Space Smoothing Models are added along the side of ARIMA models in Time Series platform in JMP 16.

State Space Smoothing Models in Time Series

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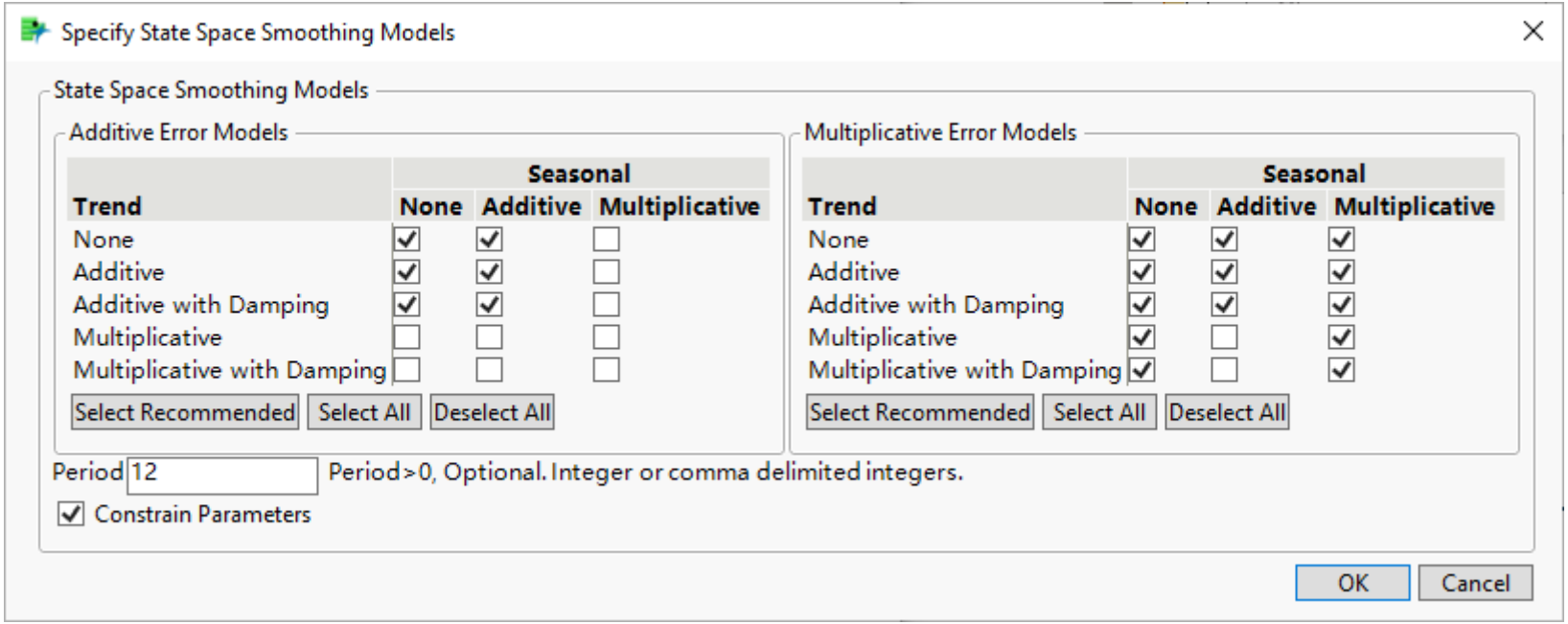
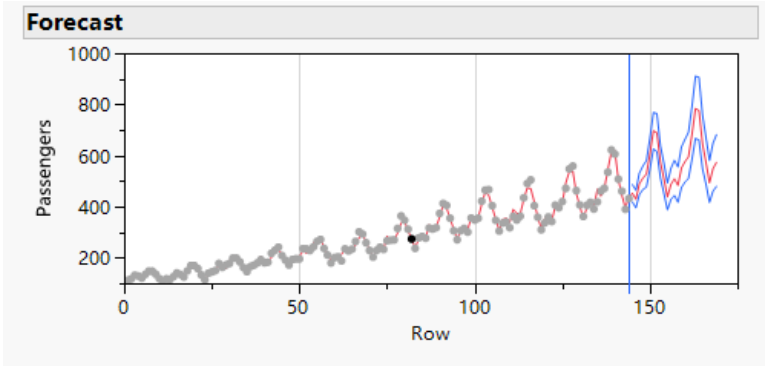
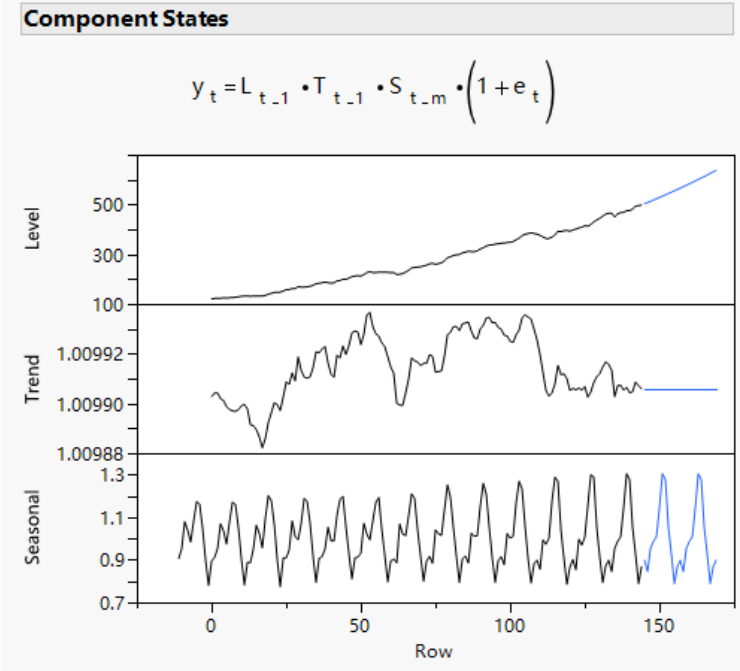


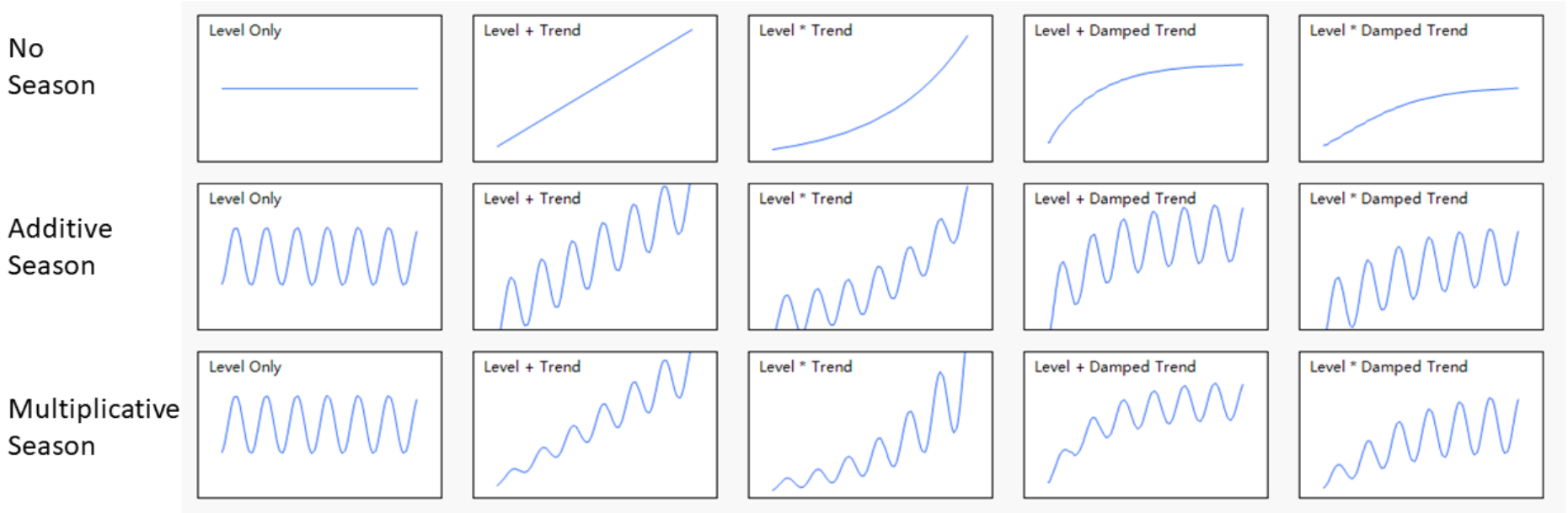
State Space Smoothing Models in Time Series

- State Space Smoothing Models are added along the side of ARIMA models in Time Series platform in JMP 16.
- We can study them more carefully.





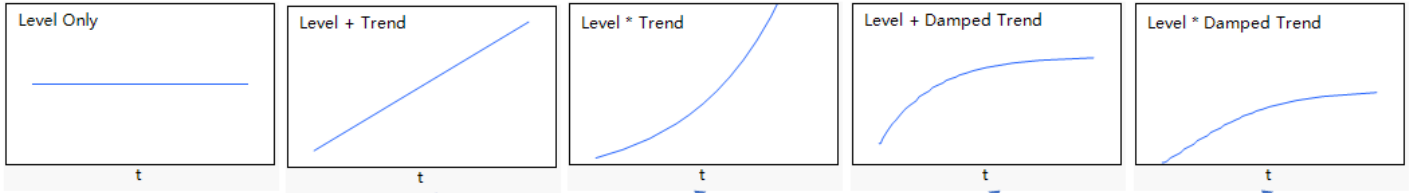
Interpret Forecasts from Models



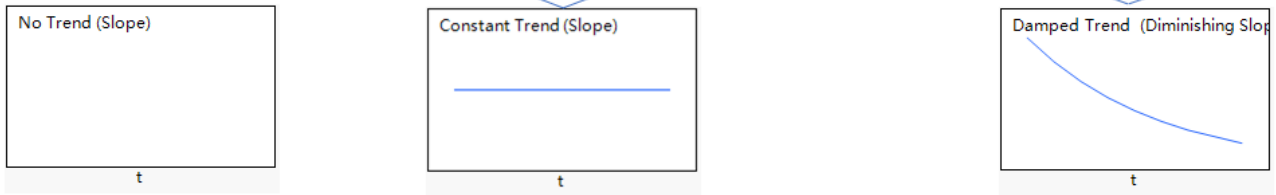
Interpret Forecasts from Models

$$Y_t = \left(\left(l_{t-1} \begin{matrix} + \\ \times \end{matrix} b_{t-1} \right) \begin{matrix} + \\ \times \end{matrix} s_{t-m} \right) \begin{matrix} + \epsilon_t \\ \times (1 + \epsilon_t) \end{matrix}$$

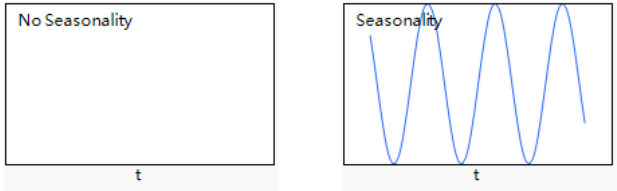
Level l



Trend b



Seasonal s

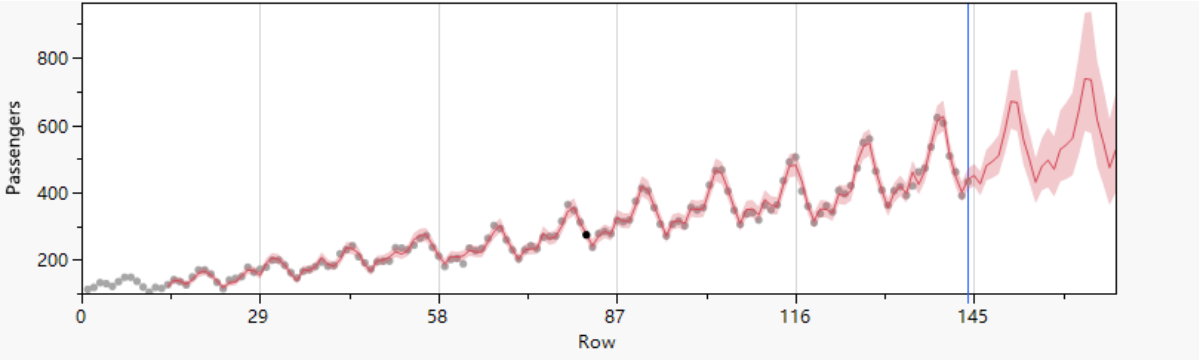


What have we learned about them?

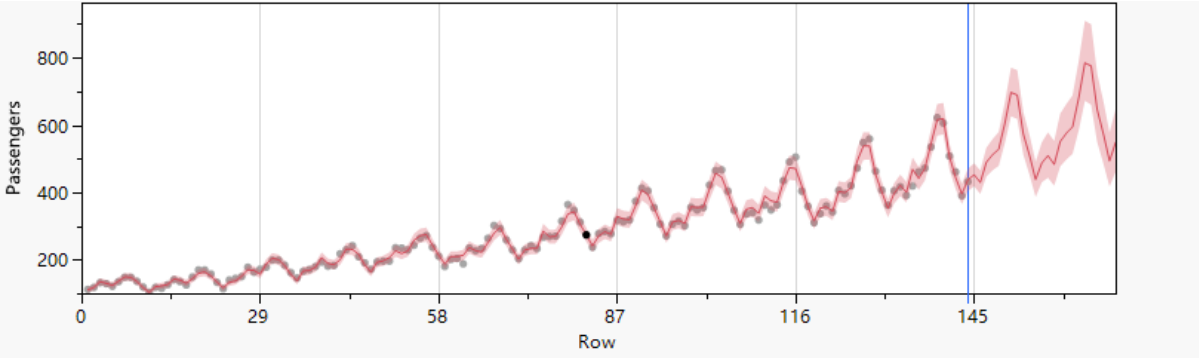
- Serious contenders to some ARIMA models.
- **NOT** stationary. None of them (30 MODELS)!
- Component-wised model and interpretation: Level, Trend, Seasonality. Give these models a try, if you see:
  - A linear or exponential growth trend
  - With or without seasonality
  - Non-stationary in general
- Be careful with stationary time series. (Try a simulated AR1.)
- AIC and other criteria are not comparable to those of ARIMA.

Serious Contenders

- ARIMA(0,1,1)(0,1,1)12 No Intercept

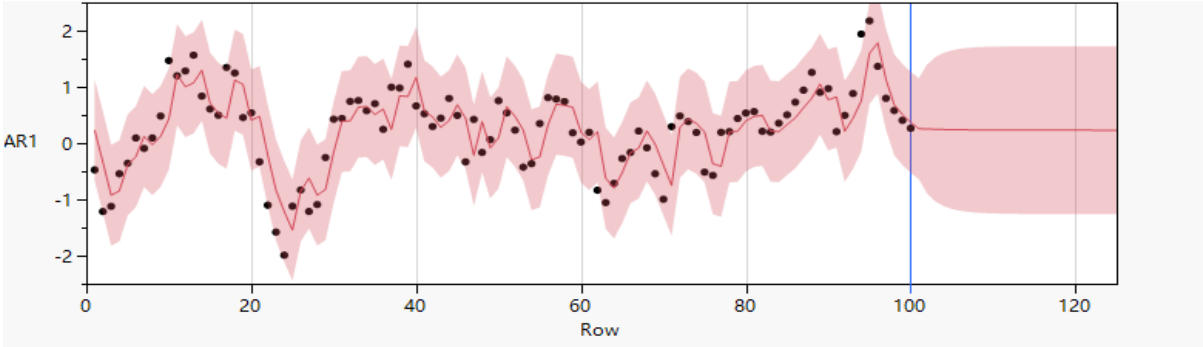


- MMM12 Constrained

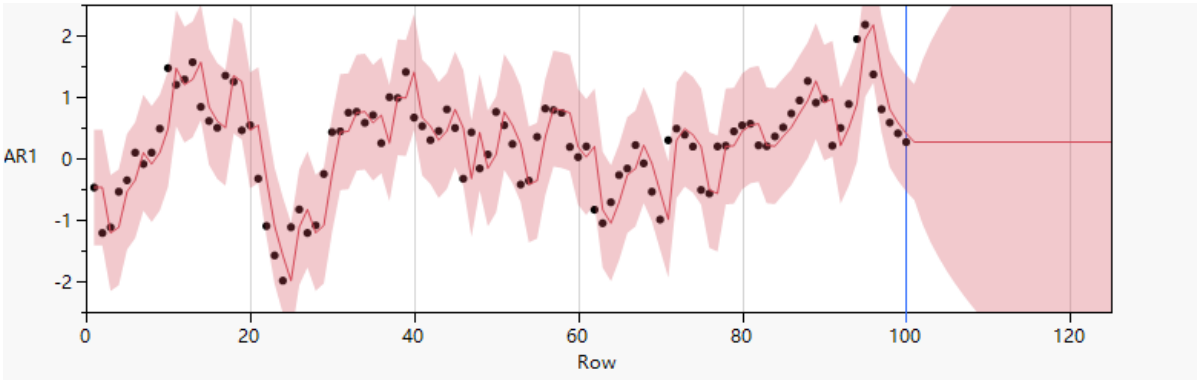


Be Careful with Stationary Series

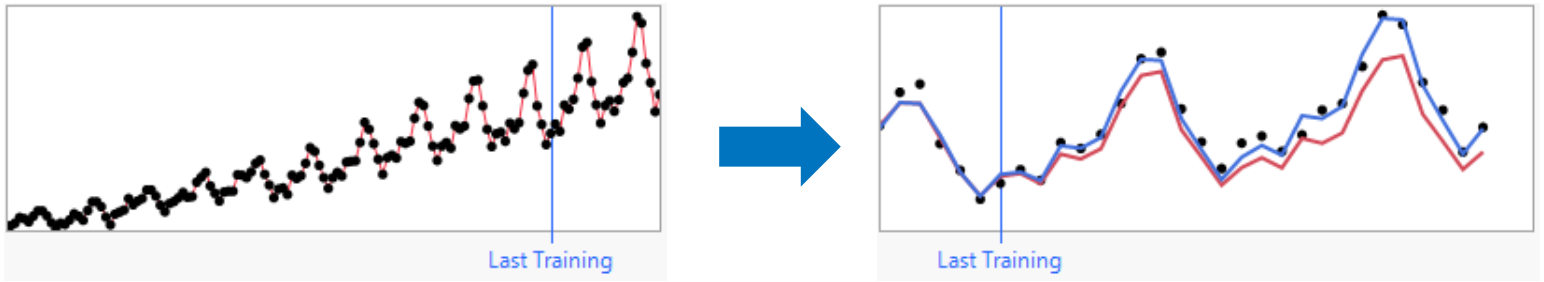
- AR(1)



- ANN12

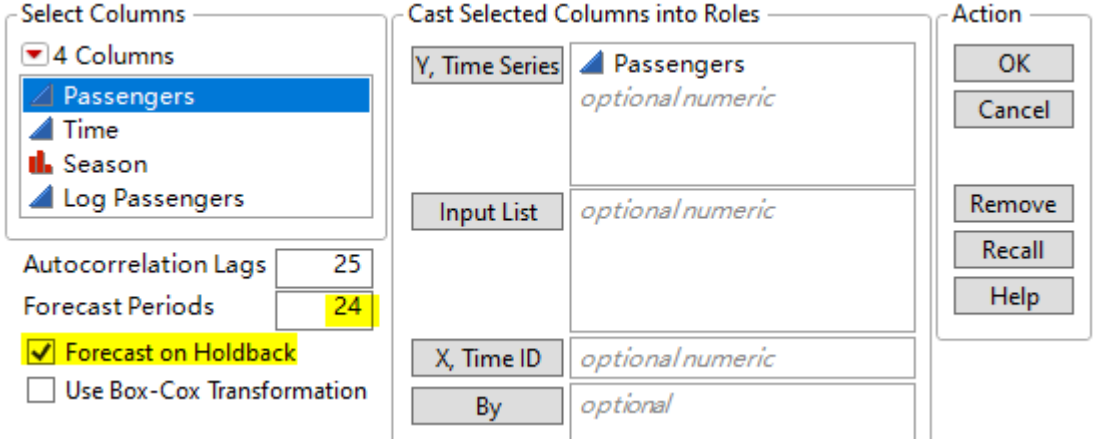


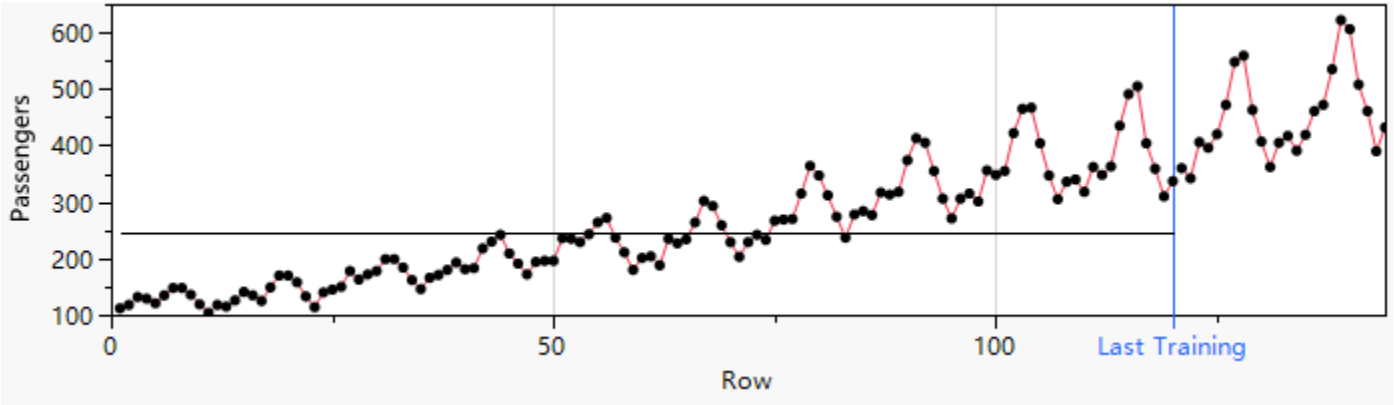
Forecast on Holdback in Time Series



Forecast on Holdback in Time Series

Definition and Setup





Forecast on Holdback in Time Series

Model Comparison using Holdback

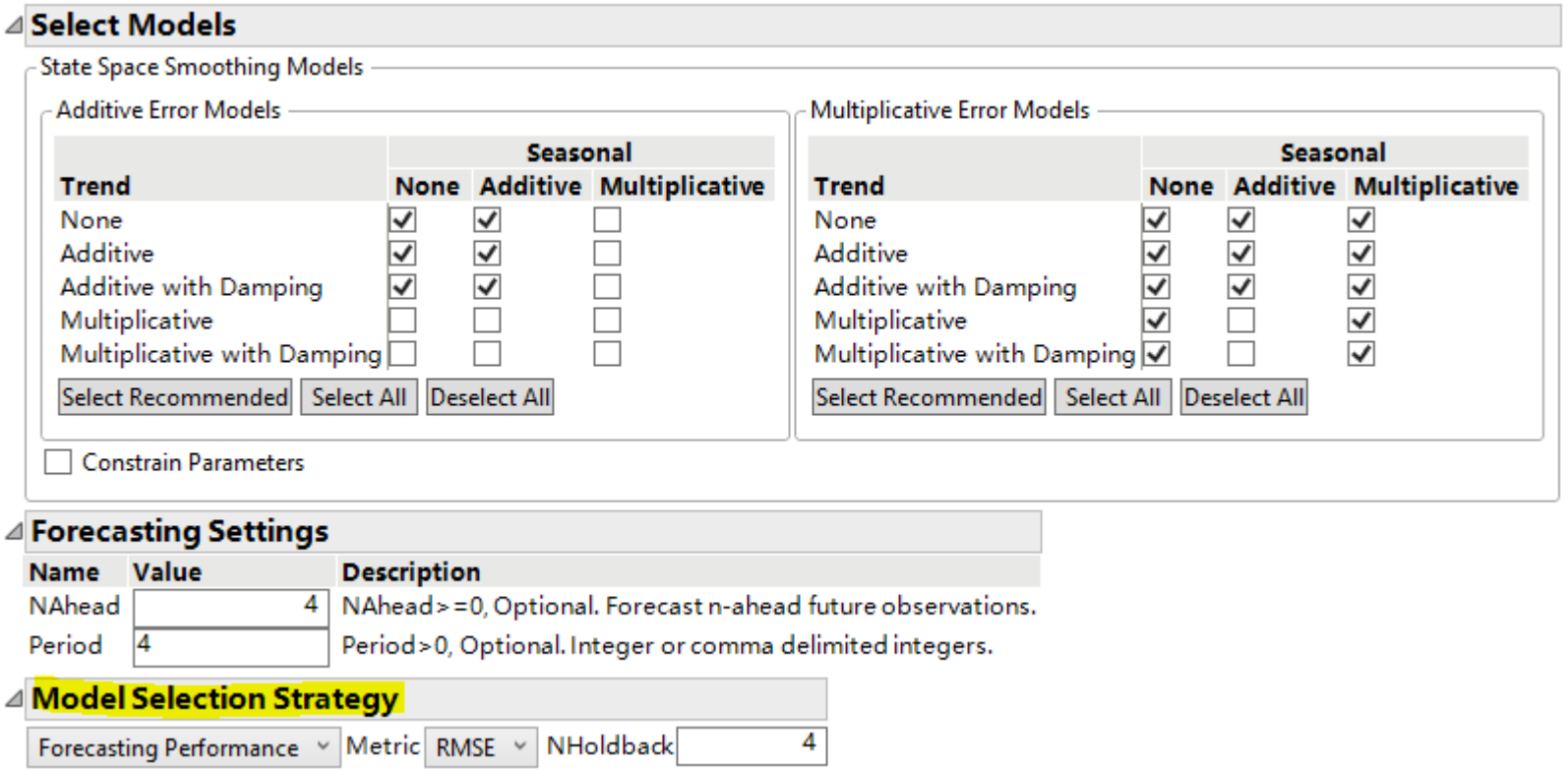
Model Comparison

Report	Graph		Model	Holdback Evaluation RMSE	MSE	MAPE	MAE
☐	☐		MMM12 Constrained	13.710324	187.97297	2.428228	10.796131
☐	☐		AAA12 Constrained	37.626487	1415.7525	7.091265	33.050751
☐	☐		MAA12 Constrained	44.147394	1948.9924	8.434577	39.175353
☐	☐		MAdA12 Constrained	52.518783	2758.2226	10.044976	46.515838
☐	☐		MAM12 Constrained	54.937136	3018.0889	10.011957	47.596804
☐	☐		AAdA12 Constrained	58.172039	3383.9861	10.857980	50.070617
☐	☐		MAdM12 Constrained	62.118775	3858.7422	11.352640	53.485414
☐	☐		ANA12 Constrained	69.011395	4762.5727	13.292534	61.457064
☐	☐		MNM12 Constrained	82.306686	6774.3905	15.659781	73.589230
☐	☐		MMdM12 Constrained	84.353128	7115.4502	15.720692	74.340471
☐	☐		MMN Constrained	84.810488	7192.8188	12.573460	62.401343
☐	☐		AAN Constrained	117.48380	13802.443	18.855019	93.657697
☐	☐		MAN Constrained	118.58666	14062.796	19.129286	94.911715
☐	☐		MNA12 Constrained	123.41372	15230.946	22.272453	106.86659
☐	☐		MMdN Constrained	129.19050	16690.184	21.675540	106.56881
☐	☐		MAdN Constrained	135.75546	18429.545	23.213358	113.58829
☐	☐		AAdN Constrained	135.95150	18482.811	23.258402	113.79428
☐	☐		ANN Constrained	137.33125	18859.873	23.578081	115.25270
☐	☐		MNN Constrained	137.33127	18859.878	23.578086	115.25273

What have we learned from holdback?

1. Information criteria describe how well a model fits the training data.
2. Holdback criteria describe how well a model performs over the holdback data.
3. The criteria are not equivalent to forecasting performance in the future. But give some degree of assurance.
4. Evaluating forecasting performance is **NOT** a part of model fitting process.

Holdback Based Selection in Time Series Forecast



Thank You!

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