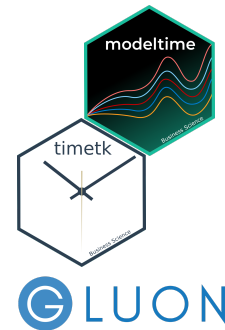


# Forecasting with External Regressors Workflow

If you want to apply this workflow to a *real business analysis*, take the [High-Performance Forecasting Course](https://business-science.github.io/timetk/) through Business Science University.

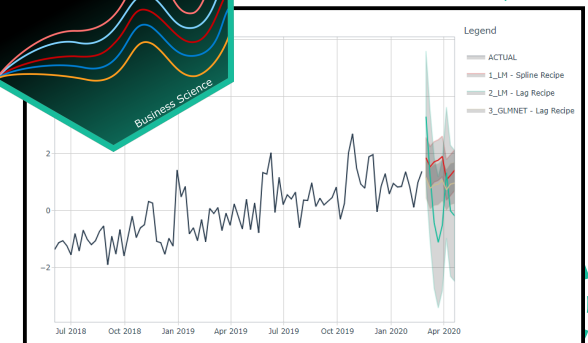
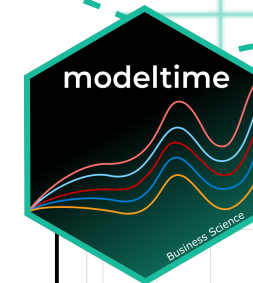


## Important Resources

- **Timetk:** <https://business-science.github.io/timetk/>
- **Modeltime:** <https://business-science.github.io/modeltime/>
- **GluonTS:** <https://gluon-ts.mxnet.io/index.html>



Business Science University  
[university.business-science.io](https://university.business-science.io)



# MODELTIME Workflow

Create Modeltime Table  
modeltime\_table()

Calibrate  
modeltime\_calibrate()

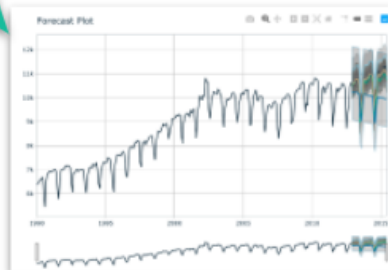
Refit  
modeltime\_refit()

```
# Modeltime Table
# A tibble: 5 x 3
  .model_id .model .model_desc
  <int> <list> <chr>
1 1 <fit(+)> ARIMA(0,1,1)(0,1,1)[12]
2 2 <fit(+)> ARIMA(0,1,1)(0,1,1)[12] W/ XGBOOST ERRORS
3 3 <fit(+)> ETS(M,A,A)
4 4 <fit(+)> LM
5 5 <fit(+)> EARTH
```

```
# Modeltime Table
# A tibble: 6 x 5
  .model_id .model .model_desc .type .calibration_data
  <int> <list> <chr>
1 1 <fit(+)> ARIMA(0,1,1)(0,1,1)[12] Test <tibble [31 x 4]>
2 2 <fit(+)> ARIMA(0,1,1)(0,1,1)[12] W/ XGBOOST ERRORS Test <tibble [31 x 4]>
3 3 <fit(+)> ETS(M,A,A) Test <tibble [31 x 4]>
4 4 <fit(+)> PROPHET Test <tibble [31 x 4]>
5 5 <fit(+)> LM Test <tibble [31 x 4]>
6 6 <fit(+)> EARTH Test <tibble [31 x 4]>
```

```
# Modeltime Table
# A tibble: 6 x 5
  .model_id .model .model_desc .type .calibration_data
  <int> <list> <chr>
1 1 <fit(+)> ARIMA(0,1,1)(0,1,1)[12] Test <tibble [31 x 4]>
2 2 <fit(+)> ARIMA(0,1,1)(0,1,1)[12] W/ XGBOOST ERRORS Test <tibble [31 x 4]>
3 3 <fit(+)> ETS(M,A,A) Test <tibble [31 x 4]>
4 4 <fit(+)> PROPHET Test <tibble [31 x 4]>
5 5 <fit(+)> LM Test <tibble [31 x 4]>
6 6 <fit(+)> EARTH Test <tibble [31 x 4]>
```

Forecast Test Set  
modeltime\_forecast()



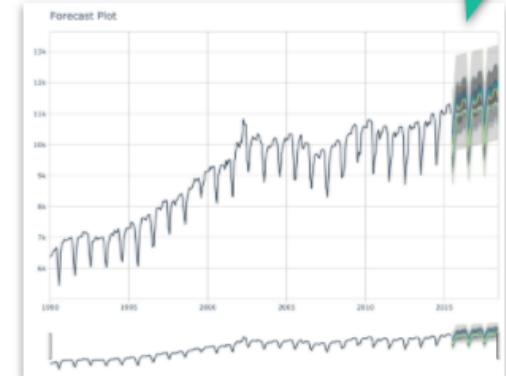
plot\_modeltime\_forecast()

Test Accuracy  
modeltime\_accuracy()

.model_id	.model_desc	.type	mae	mape	mase	smape	rmse	rsq
1	ARIMA(0,1,1)(0,1,1)[12]	Test	161.33	1.41	0.52	1.43	197.71	0.93
2	ARIMA(0,1,1)(0,1,1)[12] W/ XGBOOST ERRORS	Test	147.04	1.37	0.50	1.39	191.84	0.93
3	ETS(M,A,A)	Test	77.00	0.73	0.26	0.73	90.27	0.98
4	PROPHET	Test	177.51	1.70	0.61	1.70	234.65	0.88
5	LM	Test	629.12	6.01	2.15	5.81	657.19	0.91
6	EARTH	Test	709.83	6.59	2.42	6.86	782.82	0.55

table\_modeltime\_accuracy()

Forecast Future  
modeltime\_forecast()



plot\_modeltime\_forecast()



Business Science University  
[university.business-science.io](http://university.business-science.io)

