```
sbt:scalation> runMain project1.SimpleRegression
[info] compiling 1 Scala source to /mnt/c/Libs/scalation_2.0/target/scala-
3.7.2/classes ...
[info] running (fork) project1.SimpleRegression
[error] WARNING: A terminally deprecated method in sun.misc.Unsafe has been
called
[error] WARNING: sun.misc.Unsafe::objectFieldOffset has been called by
scala.runtime.LazyVals$ (file:/mnt/c/Libs/scalation_2.0/target/bg-
jobs/sbt_1a1fd91/target/21dbe174/563b310f/scala3-library_3-3.7.2.jar)
[error] WARNING: Please consider reporting this to the maintainers of class
scala.runtime.LazyVals$
[error] WARNING: sun.misc.Unsafe::objectFieldOffset will be removed in a
future release
[info] DEBUG @ Predictor.trainNTest: b = VectorD(156.476,       187.572,
79.0176,        57.3810,        8.68939,       -15.9723)
[info] REPORT
[info]     ------------------------------------------------------------------
-----------
[info]     modelName  mn  = Regression @dfm = 5.0
[info]     ------------------------------------------------------------------
-----------
[info]     hparameter hp  = HyperParameter(factorization -> (Fac_QR,Fac_QR))
[info]     ------------------------------------------------------------------
-----------
[info]     features   fn  = Array(x0, x1, x2, x3, x4, x5)
[info]     ------------------------------------------------------------------
-----------
[info]     parameter  b   = VectorD(156.476,    187.572,        79.0176,
57.3810,        8.68939,        -15.9723)
[info]     ------------------------------------------------------------------
-----------
[info]     fitMap     qof = LinkedHashMap(rSq -> 0.945747, rSqBar ->
0.945044, sst -> 4281593.713648, sse -> 232291.405597, sde -> 24.334133,
mse0 -> 592.580116, rmse -> 24.342969, mae -> 17.857727, smape -> 9.982629,
m -> 392.000000, dfm -> 5.000000, df -> 386.000000, fStat -> 1345.749910,
aic -> -1795.584233, bic -> -1771.756662, mape -> 10.000989, mase ->
1.026261, smapeC -> 10.013241, picp -> -1.000000, pinc -> -1.000000, ace ->
-1.000000, pinaw -> -1.000000, iscore -> -1.000000, wis -> -1.000000)
[info]     ------------------------------------------------------------------
-----------
[info]
[info] Run + title
[info] --------------
[info] | Validation |
[info] --------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.942957, rSqBar -> 0.942218, sst ->
```

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842741.346154, sse -> 48072.430145, sde -> 24.981931, mse0 -> 616.313207,
rmse -> 24.825656, mae -> 17.328262, smape -> 9.330545, m -> 78.000000, dfm
-> 5.000000, df -> 386.000000, fStat -> 1276.166820, aic -> -349.239472, bic
-> -335.099219, mape -> 9.352022, mase -> 1.009684, smapeC -> 9.484391, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%
[info]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%
[info] -------------------------
[info] | Forward Selection Test |
[info] -------------------------
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.847325, rSqBar -> 0.847325, sst ->
842741.346154, sse -> 128665.612319, sde -> 37.566178, mse0 -> 1649.559132,
rmse -> 40.614765, mae -> 33.367742, smape -> 25.792448, m -> 78.000000, dfm
-> 0.000000, df -> 391.000000, fStat -> 0.000000, aic -> -397.618911, bic ->
-395.262202, mape -> 21.059110, mase -> 1.137689, smapeC -> 25.818089, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.847325,
0.847325,       842741, 128666, 37.5662,        1649.56,40.6148,
33.3677,        25.7924,        78.0000,        0.00000,        391.000,
0.00000,        -397.619,      -395.262,        21.0591,        1.13769,
25.8181,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.776622, rSqBar -> 0.776622, sst ->
723406.717949, sse -> 161592.925208, sde -> 41.225952, mse0 -> 2071.704169,
rmse -> 45.515977, mae -> 38.998384, smape -> 29.223432, m -> 78.000000, dfm
-> 0.000000, df -> 391.000000, fStat -> 0.000000, aic -> -407.917967, bic ->
-405.561259, mape -> 24.734355, mase -> 1.221034, smapeC -> 29.249073, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.776622,
0.776622,       723407, 161593, 41.2260,        2071.70,45.5160,
38.9984,        29.2234,        78.0000,        0.00000,        391.000,
0.00000,        -407.918,      -405.561,        24.7344,        1.22103,
29.2491,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
[info] ---------------------------------------------------------------
```

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[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.838675, rSqBar -> 0.838675, sst ->
981947.294872, sse -> 158413.079158, sde -> 39.864805, mse0 -> 2030.936912,
rmse -> 45.065917, mae -> 39.507706, smape -> 31.082420, m -> 78.000000, dfm
-> 0.000000, df -> 391.000000, fStat -> 0.000000, aic -> -406.923370, bic ->
-404.566661, mape -> 25.766717, mase -> 1.146992, smapeC -> 31.108061, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.838675,
0.838675,       981947, 158413, 39.8648,        2030.94,45.0659,
39.5077,        31.0824,        78.0000,        0.00000,        391.000,
0.00000,        -406.923,      -404.567,        25.7667,        1.14699,
31.1081,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.820775, rSqBar -> 0.820775, sst ->
811184.708333, sse -> 145384.534488, sde -> 40.904588, mse0 -> 1863.904288,
rmse -> 43.172958, mae -> 37.681604, smape -> 31.172151, m -> 78.000000, dfm
-> 0.000000, df -> 391.000000, fStat -> 0.000000, aic -> -402.848282, bic ->
-400.491573, mape -> 25.664007, mase -> 1.169109, smapeC -> 31.197792, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.820775,
0.820775,       811185, 145385, 40.9046,        1863.90,43.1730,
37.6816,        31.1722,        78.0000,        0.00000,        391.000,
0.00000,        -402.848,      -400.492,        25.6640,        1.16911,
31.1978,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.847783, rSqBar -> 0.847783, sst ->
880383.794872, sse -> 134008.967241, sde -> 40.600031, mse0 -> 1718.063683,
rmse -> 41.449532, mae -> 34.279130, smape -> 22.930926, m -> 78.000000, dfm
-> 0.000000, df -> 391.000000, fStat -> 0.000000, aic -> -399.290214, bic ->
-396.933505, mape -> 20.439573, mase -> 1.106861, smapeC -> 22.956567, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.847783,
0.847783,       880384, 134009, 40.6000,        1718.06,41.4495,
34.2791,        22.9309,        78.0000,        0.00000,        391.000,
0.00000,        -399.290,      -396.934,        20.4396,        1.10686,
22.9566,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
```

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[info] ------------------------------------------------------------------
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[info] | forwardSelAll: (l = 0) INITIAL variable (0, x0) => cols =
LinkedHashSet(0) |
[info] ------------------------------------------------------------------
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[info] ----------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.896841, rSqBar -> 0.896576, sst ->
842741.346154, sse -> 86936.595682, sde -> 32.717474, mse0 -> 1114.571740,
rmse -> 33.385202, mae -> 27.565097, smape -> 18.735411, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 3390.561252, aic -> -380.711028, bic
-> -375.997610, mape -> 16.870202, mase -> 1.113833, smapeC -> 18.786693,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.896841,
0.896576,       842741, 86936.6,        32.7175,       1114.57, 33.3852,
27.5651,        18.7354,        78.0000,        1.00000,        390.000,
3390.56,        -380.711,       -375.998,       16.8702,        1.11383,
18.7867,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.874055, rSqBar -> 0.873732, sst ->
723406.717949, sse -> 91109.613941, sde -> 31.860328, mse0 -> 1168.071974,
rmse -> 34.177068, mae -> 28.907503, smape -> 21.011489, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 2706.584518, aic -> -382.864500, bic
-> -378.151082, mape -> 18.809406, mase -> 1.105439, smapeC -> 21.062771,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.874055,
0.873732,       723407, 91109.6,        31.8603,       1168.07, 34.1771,
28.9075,        21.0115,        78.0000,        1.00000,        390.000,
2706.58,        -382.864,       -378.151,       18.8094,        1.10544,
21.0628,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.880702, rSqBar -> 0.880396, sst ->
981947.294872, sse -> 117144.398967, sde -> 35.161066, mse0 -> 1501.851269,
rmse -> 38.753726, mae -> 30.395633, smape -> 22.557026, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 2879.122966, aic -> -396.299665, bic
-> -391.586248, mape -> 20.070985, mase -> 1.096371, smapeC -> 22.608308,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
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iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.880702,
0.880396,       981947, 117144, 35.1611,        1501.85,38.7537,
30.3956,        22.5570,        78.0000,        1.00000,        390.000,
2879.12,        -396.300,      -391.586,        20.0710,        1.09637,
22.6083,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.920293, rSqBar -> 0.920089, sst ->
811184.708333, sse -> 64656.899769, sde -> 28.202770, mse0 -> 828.934612,
rmse -> 28.791225, mae -> 25.541167, smape -> 18.387402, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 4502.935439, aic -> -369.213664, bic
-> -364.500246, mape -> 16.816254, mase -> 1.088702, smapeC -> 18.438684,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.920293,
0.920089,       811185, 64656.9,        28.2028,        828.935, 28.7912,
25.5412,        18.3874,        78.0000,        1.00000,        390.000,
4502.94,        -369.214,       -364.500,       16.8163,        1.08870,
18.4387,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.929620, rSqBar -> 0.929439, sst ->
880383.794872, sse -> 61961.674620, sde -> 26.991971, mse0 -> 794.380444,
rmse -> 28.184756, mae -> 23.490604, smape -> 18.587401, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 5151.323441, aic -> -367.822801, bic
-> -363.109384, mape -> 16.399328, mase -> 1.091506, smapeC -> 18.638683,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.929620,
0.929439,       880384, 61961.7,        26.9920,        794.380, 28.1848,
23.4906,        18.5874,        78.0000,        1.00000,        390.000,
5151.32,        -367.823,       -363.109,       16.3993,        1.09151,
18.6387,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------------
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[info] | forwardSelAll: (l = 1) ADD variable (2, x2) => cols =
LinkedHashSet(0, 2) @ 0.9012388808919509 |
[info] ------------------------------------------------------------------------
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[info] ------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
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[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.911927, rSqBar -> 0.911474, sst ->
842741.346154, sse -> 74223.062282, sde -> 30.304061, mse0 -> 951.577722,
rmse -> 30.847653, mae -> 24.598643, smape -> 16.543146, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 2013.886272, aic -> -372.797724, bic
-> -365.727597, mape -> 15.107739, mase -> 1.100077, smapeC -> 16.620069,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.911927,
0.911474,       842741, 74223.1,        30.3041,       951.578, 30.8477,
24.5986,        16.5431,        78.0000,        2.00000,        389.000,
2013.89,        -372.798,       -365.728,       15.1077,        1.10008,
16.6201,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.884226, rSqBar -> 0.883630, sst ->
723406.717949, sse -> 83751.978397, sde -> 30.455377, mse0 -> 1073.743313,
rmse -> 32.768023, mae -> 27.479179, smape -> 19.383842, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 1485.491438, aic -> -378.778206, bic
-> -371.708079, mape -> 17.519822, mase -> 1.105838, smapeC -> 19.460765,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.884226,
0.883630,       723407, 83752.0,        30.4554,       1073.74, 32.7680,
27.4792,        19.3838,        78.0000,        2.00000,        389.000,
1485.49,        -378.778,       -371.708,       17.5198,        1.10584,
19.4608,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.911169, rSqBar -> 0.910712, sst ->
981947.294872, sse -> 87227.645689, sde -> 30.334404, mse0 -> 1118.303150,
rmse -> 33.441040, mae -> 27.343351, smape -> 20.364218, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 1995.043778, aic -> -380.959583, bic
-> -373.889457, mape -> 18.207480, mase -> 1.077956, smapeC -> 20.441141,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.911169,
0.910712,       981947, 87227.6,        30.3344,       1118.30, 33.4410,
27.3434,        20.3642,        78.0000,        2.00000,        389.000,
1995.04,        -380.960,       -373.889,       18.2075,        1.07796,
20.4411,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
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[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.933757, rSqBar -> 0.933416, sst ->
811184.708333, sse -> 53735.574630, sde -> 26.230343, mse0 -> 688.917623,
rmse -> 26.247240, mae -> 22.057085, smape -> 14.849046, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 2741.644758, aic -> -359.939488, bic
-> -352.869361, mape -> 14.160957, mase -> 1.066102, smapeC -> 14.925969,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.933757,
0.933416,       811185, 53735.6,        26.2303,       688.918, 26.2472,
22.0571,        14.8490,        78.0000,        2.00000,        389.000,
2741.64,        -359.939,       -352.869,       14.1610,        1.06610,
14.9260,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.943593, rSqBar -> 0.943303, sst ->
880383.794872, sse -> 49660.166550, sde -> 23.159956, mse0 -> 636.668802,
rmse -> 25.232297, mae -> 21.712312, smape -> 17.956064, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 3253.628752, aic -> -357.381704, bic
-> -350.311578, mape -> 15.813416, mase -> 1.079203, smapeC -> 18.032987,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.943593,
0.943303,       880384, 49660.2,        23.1600,       636.669, 25.2323,
21.7123,        17.9561,        78.0000,        2.00000,        389.000,
3253.63,        -357.382,       -350.312,       15.8134,        1.07920,
18.0330,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------------
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[info] | forwardSelAll: (l = 2) ADD variable (1, x1) => cols =
LinkedHashSet(0, 2, 1) @ 0.9186837278359002 |
[info] ----------------------------------------------------------------------
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[info] ----------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.938578, rSqBar -> 0.938103, sst ->
842741.346154, sse -> 51762.820698, sde -> 25.903606, mse0 -> 663.625906,
rmse -> 25.760938, mae -> 18.896442, smape -> 10.703619, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 1976.319836, aic -> -356.172599, bic
-> -346.745764, mape -> 10.673790, mase -> 1.009197, smapeC -> 10.806183,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.938578,
```

```
0.938103,       842741, 51762.8,        25.9036,       663.626, 25.7609,
18.8964,        10.7036,        78.0000,        3.00000,        388.000,
1976.32,        -356.173,       -346.746,       10.6738,        1.00920,
10.8062,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.914622, rSqBar -> 0.913961, sst ->
723406.717949, sse -> 61763.329578, sde -> 28.098726, mse0 -> 791.837559,
rmse -> 28.139608, mae -> 20.599200, smape -> 11.419868, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 1385.491124, aic -> -364.213883, bic
-> -354.787048, mape -> 11.311565, mase -> 0.997379, smapeC -> 11.522432,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.914622,
0.913961,       723407, 61763.3,        28.0987,       791.838, 28.1396,
20.5992,        11.4199,        78.0000,        3.00000,        388.000,
1385.49,        -364.214,       -354.787,       11.3116,        0.997379,
11.5224,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.935768, rSqBar -> 0.935271, sst ->
981947.294872, sse -> 63072.897623, sde -> 28.174720, mse0 -> 808.626893,
rmse -> 28.436366, mae -> 20.461106, smape -> 10.989688, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 1884.186286, aic -> -365.266891, bic
-> -355.840055, mape -> 10.981703, mase -> 0.993184, smapeC -> 11.092252,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.935768,
0.935271,       981947, 63072.9,        28.1747,       808.627, 28.4364,
20.4611,        10.9897,        78.0000,        3.00000,        388.000,
1884.19,        -365.267,       -355.840,       10.9817,        0.993184,
11.0923,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.948464, rSqBar -> 0.948066, sst ->
811184.708333, sse -> 41804.877798, sde -> 22.858562, mse0 -> 535.959972,
rmse -> 23.150809, mae -> 17.124220, smape -> 9.670710, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 2380.259513, aic -> -348.165541, bic
-> -338.738706, mape -> 10.173250, mase -> 0.996727, smapeC -> 9.773274,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
```

```
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.948464,
0.948066,       811185, 41804.9,        22.8586,       535.960, 23.1508,
17.1242,        9.67071,        78.0000,        3.00000,        388.000,
2380.26,        -348.166,       -338.739,       10.1733,        0.996727,
9.77327,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.964762, rSqBar -> 0.964490, sst ->
880383.794872, sse -> 31022.700121, sde -> 20.030609, mse0 -> 397.726925,
rmse -> 19.943092, mae -> 15.453099, smape -> 8.778333, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 3540.978095, aic -> -339.495726, bic
-> -330.068891, mape -> 8.858528, mase -> 0.966447, smapeC -> 8.880897, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.964762,
0.964490,       880384, 31022.7,        20.0306,       397.727, 19.9431,
15.4531,        8.77833,        78.0000,        3.00000,        388.000,
3540.98,        -339.496,       -330.069,       8.85853,        0.966447,
8.88090,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
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[info] | forwardSelAll: (l = 3) ADD variable (3, x3) => cols =
LinkedHashSet(0, 2, 1, 3) @ 0.9424662931713765 |
[info] ------------------------------------------------------------------
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[info] ------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.941142, rSqBar -> 0.940534, sst ->
842741.346154, sse -> 49601.903509, sde -> 25.372126, mse0 -> 635.921840,
rmse -> 25.217491, mae -> 17.605364, smape -> 9.537925, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1547.042263, aic -> -352.504646, bic
-> -340.721101, mape -> 9.537003, mase -> 1.009850, smapeC -> 9.666130, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.941142,
0.940534,       842741, 49601.9,        25.3721,       635.922, 25.2175,
17.6054,        9.53792,        78.0000,        4.00000,        387.000,
1547.04,        -352.505,       -340.721,       9.53700,        1.00985,
9.66613,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
```

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[info] LinkedHashMap(rSq -> 0.916527, rSqBar -> 0.915664, sst ->
723406.717949, sse -> 60385.157175, sde -> 27.789149, mse0 -> 774.168682,
rmse -> 27.823887, mae -> 20.821070, smape -> 12.192181, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1062.303039, aic -> -361.535988, bic
-> -349.752443, mape -> 12.049679, mase -> 1.004992, smapeC -> 12.320386,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.916527,
0.915664,       723407, 60385.2,        27.7891,       774.169, 27.8239,
20.8211,        12.1922,        78.0000,        4.00000,        387.000,
1062.30,        -361.536,       -349.752,       12.0497,        1.00499,
12.3204,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.939306, rSqBar -> 0.938678, sst ->
981947.294872, sse -> 59598.659543, sde -> 27.353643, mse0 -> 764.085379,
rmse -> 27.642094, mae -> 20.351033, smape -> 11.245368, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1497.302643, aic -> -360.877269, bic
-> -349.093725, mape -> 11.199130, mase -> 1.001813, smapeC -> 11.373574,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.939306,
0.938678,       981947, 59598.7,        27.3536,       764.085, 27.6421,
20.3510,        11.2454,        78.0000,        4.00000,        387.000,
1497.30,        -360.877,       -349.094,       11.1991,        1.00181,
11.3736,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.951608, rSqBar -> 0.951108, sst ->
811184.708333, sse -> 39254.619847, sde -> 22.369901, mse0 -> 503.264357,
rmse -> 22.433554, mae -> 16.844555, smape -> 9.691792, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1902.559147, aic -> -343.838443, bic
-> -332.054899, mape -> 9.958163, mase -> 1.009557, smapeC -> 9.819997, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.951608,
0.951108,       811185, 39254.6,        22.3699,       503.264, 22.4336,
16.8446,        9.69179,        78.0000,        4.00000,        387.000,
1902.56,        -343.838,       -332.055,       9.95816,        1.00956,
9.82000,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
```

```
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.964660, rSqBar -> 0.964295, sst ->
880383.794872, sse -> 31112.708696, sde -> 20.045441, mse0 -> 398.880881,
rmse -> 19.972002, mae -> 15.922825, smape -> 9.517474, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 2640.945807, aic -> -337.019315, bic
-> -325.235771, mape -> 9.493010, mase -> 0.967569, smapeC -> 9.645680, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.964660,
0.964295,       880384, 31112.7,        20.0454,       398.881, 19.9720,
15.9228,        9.51747,        78.0000,        4.00000,        387.000,
2640.95,        -337.019,       -325.236,       9.49301,        0.967569,
9.64568,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------------
-------------------------------------
[info] | forwardSelAll: (l = 4) ADD variable (5, x5) => cols =
LinkedHashSet(0, 2, 1, 3, 5) @ 0.9445524176505258 |
[info] ---------------------------------------------------------------------
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[info] ---------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.942957, rSqBar -> 0.942218, sst ->
842741.346154, sse -> 48072.430145, sde -> 24.981931, mse0 -> 616.313207,
rmse -> 24.825656, mae -> 17.328262, smape -> 9.330545, m -> 78.000000, dfm
-> 5.000000, df -> 386.000000, fStat -> 1276.166820, aic -> -349.239472, bic
-> -335.099219, mape -> 9.352022, mase -> 1.009684, smapeC -> 9.484391, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.942957,
0.942218,       842741, 48072.4,        24.9819,       616.313, 24.8257,
17.3283,        9.33055,        78.0000,        5.00000,        386.000,
1276.17,        -349.239,       -335.099,       9.35202,        1.00968,
9.48439,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.917809, rSqBar -> 0.916744, sst ->
723406.717949, sse -> 59457.769972, sde -> 27.661838, mse0 -> 762.279102,
rmse -> 27.609402, mae -> 20.448087, smape -> 11.649669, m -> 78.000000, dfm
-> 5.000000, df -> 386.000000, fStat -> 862.071665, aic -> -358.877619, bic
-> -344.737366, mape -> 11.608691, mase -> 1.007804, smapeC -> 11.803516,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.917809,
0.916744,       723407, 59457.8,        27.6618,       762.279, 27.6094,
```

```
20.4481,        11.6497,        78.0000,        5.00000,        386.000,
862.072,        -358.878,       -344.737,       11.6087,        1.00780,
11.8035,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.938026, rSqBar -> 0.937223, sst ->
981947.294872, sse -> 60854.967200, sde -> 27.511421, mse0 -> 780.191887,
rmse -> 27.931915, mae -> 19.922121, smape -> 10.658154, m -> 78.000000, dfm
-> 5.000000, df -> 386.000000, fStat -> 1168.488473, aic -> -360.060403, bic
-> -345.920150, mape -> 10.517492, mase -> 1.002315, smapeC -> 10.812000,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.938026,
0.937223,       981947, 60855.0,        27.5114,       780.192, 27.9319,
19.9221,        10.6582,        78.0000,        5.00000,        386.000,
1168.49,        -360.060,       -345.920,       10.5175,        1.00231,
10.8120,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.949630, rSqBar -> 0.948978, sst ->
811184.708333, sse -> 40859.387831, sde -> 22.790194, mse0 -> 523.838306,
rmse -> 22.887514, mae -> 16.870997, smape -> 9.473818, m -> 78.000000, dfm
-> 5.000000, df -> 386.000000, fStat -> 1455.457801, aic -> -343.133342, bic
-> -328.993089, mape -> 9.816001, mase -> 1.010998, smapeC -> 9.627664, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.949630,
0.948978,       811185, 40859.4,        22.7902,       523.838, 22.8875,
16.8710,        9.47382,        78.0000,        5.00000,        386.000,
1455.46,        -343.133,       -328.993,       9.81600,        1.01100,
9.62766,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.965575, rSqBar -> 0.965129, sst ->
880383.794872, sse -> 30307.155786, sde -> 19.777560, mse0 -> 388.553279,
rmse -> 19.711755, mae -> 15.610100, smape -> 9.088208, m -> 78.000000, dfm
-> 5.000000, df -> 386.000000, fStat -> 2165.360452, aic -> -334.200454, bic
-> -320.060201, mape -> 9.062984, mase -> 0.968849, smapeC -> 9.242055, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.965575,
```

```
0.965129,       880384, 30307.2,        19.7776,       388.553, 19.7118,
15.6101,        9.08821,        78.0000,        5.00000,        386.000,
2165.36,        -334.200,       -320.060,       9.06298,        0.968849,
9.24205,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------------
---------------------------------------
[info] | forwardSelAll: (l = 5) ADD variable (4, x4) => cols =
LinkedHashSet(0, 2, 1, 3, 5, 4) @ 0.945043743669959 |
[info] ------------------------------------------------------------------------
---------------------------------------
[info] Run + title
[info] x-axis: minX = 1.0, maxX = 6.0
[info] y-axis: minY = 9.0, maxY = 95.0
[info] rSq =
[info] MatrixD (82.9696,        82.9696,        27.9981,        82.6236,
[info]          90.1491,        90.1239,        19.8345,        90.0302,
[info]          91.9100,        91.8684,        17.7950,        91.6934,
[info]          94.2908,        94.2466,        10.2748,        94.0439,
[info]          94.5120,        94.4552,        10.3744,        94.2649,
[info]          94.5747,        94.5044,        9.98263,        94.2799)
[info]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%
[info]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%
[info] ----------------------------
[info] | Backward Elimination Test |
[info] ----------------------------
[info] ------------------------------------------------------------------------
-------------------------------------------
[info] | backwardElimAll: (l = 0) INITIAL variables (all) => cols =
LinkedHashSet(0, 1, 2, 3, 4, 5) @ 0.9450437436699589 |
[info] ------------------------------------------------------------------------
-------------------------------------------
[info] ------------------------------------------------------------------------
-------------------------------------------
[info] | backwardElimAll: (l = 1) REMOVE variable (4, x4) => cols =
LinkedHashSet(0, 1, 2, 3, 5) @ 0.94455524176505258 |
[info] ------------------------------------------------------------------------
-------------------------------------------
[info] ------------------------------------------------------------------------
---------------------------------------
[info] | backwardElimAll: (l = 2) REMOVE variable (5, x5) => cols =
LinkedHashSet(0, 1, 2, 3) @ 0.9424662931713765 |
[info] ------------------------------------------------------------------------
---------------------------------------
[info] ------------------------------------------------------------------------
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[info] | backwardElimAll: (l = 3) REMOVE variable (2, x2) => cols =
LinkedHashSet(0, 1, 3) @ 0.9350700464972614 |
[info] ---------------------------------------------------------------------
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[info] ---------------------------------------------------------------------
-------------------------------
[info] | backwardElimAll: (l = 4) REMOVE variable (3, x3) => cols =
LinkedHashSet(0, 1) @ 0.89267727884989 |
[info] ---------------------------------------------------------------------
-------------------------------
[info] k = 6
[info] Run + title
[info] x-axis: minX = 0.0, maxX = 6.0
[info] y-axis: minY = -0.0, maxY = 95.0
[info] rSq =
[info] MatrixD (82.9696,        82.9696,        27.9981,        -0.00000,
[info]          89.2952,        89.2677,        19.6595,        -0.00000,
[info]          93.5402,        93.5070,        11.1885,        -0.00000,
[info]          94.2908,        94.2466,        10.2748,        -0.00000,
[info]          94.5120,        94.4552,        10.3744,        -0.00000,
[info]          94.5747,        94.5044,        9.98263,        -0.00000)
[info]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%
[info]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%
[info] --------------------
[info] | Stepwise FS Test |
[info] --------------------
[info] ---------------------------------------------------------------------
----------
[info] | stepwiseSelAll: (l = 0) INITIAL variable (0, x0) => cols =
LinkedHashSet(0) |
[info] ---------------------------------------------------------------------
----------
[info] ERROR @ Predictor.backwardElim: could not find a variable x_j to
eliminate: best.col = -1
[info] DEBUG @ Predictor.stepwiseSelAll: bestf =
BestStep(2,VectorD(0.901491,   0.901239,       4.28159e+06,    421774,
31.1670,1075.95,        32.8017,        27.1653,        19.8345,
392.000,        1.00000,        390.000,        3569.05,        -1921.61,
-1913.66,       17.7830,        1.16540,        19.8447,        -1.00000,
-1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000),scalation.modeling.Regression@4a668b6e), bestb =
BestStep(-1,null,null)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
```

```
[info] LinkedHashMap(rSq -> 0.896841, rSqBar -> 0.896576, sst ->
842741.346154, sse -> 86936.595682, sde -> 32.717474, mse0 -> 1114.571740,
rmse -> 33.385202, mae -> 27.565097, smape -> 18.735411, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 3390.561252, aic -> -380.711028, bic
-> -375.997610, mape -> 16.870202, mase -> 1.113833, smapeC -> 18.786693,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.896841,
0.896576,       842741, 86936.6,        32.7175,       1114.57, 33.3852,
27.5651,        18.7354,        78.0000,        1.00000,        390.000,
3390.56,        -380.711,       -375.998,       16.8702,        1.11383,
18.7867,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.874055, rSqBar -> 0.873732, sst ->
723406.717949, sse -> 91109.613941, sde -> 31.860328, mse0 -> 1168.071974,
rmse -> 34.177068, mae -> 28.907503, smape -> 21.011489, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 2706.584518, aic -> -382.864500, bic
-> -378.151082, mape -> 18.809406, mase -> 1.105439, smapeC -> 21.062771,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.874055,
0.873732,       723407, 91109.6,        31.8603,       1168.07, 34.1771,
28.9075,        21.0115,        78.0000,        1.00000,        390.000,
2706.58,        -382.864,       -378.151,       18.8094,        1.10544,
21.0628,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.880702, rSqBar -> 0.880396, sst ->
981947.294872, sse -> 117144.398967, sde -> 35.161066, mse0 -> 1501.851269,
rmse -> 38.753726, mae -> 30.395633, smape -> 22.557026, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 2879.122966, aic -> -396.299665, bic
-> -391.586248, mape -> 20.070985, mase -> 1.096371, smapeC -> 22.608308,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.880702,
0.880396,       981947, 117144, 35.1611,        1501.85,38.7537,
30.3956,        22.5570,        78.0000,        1.00000,        390.000,
2879.12,        -396.300,      -391.586,        20.0710,        1.09637,
22.6083,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,        -1.00000)
[info] ---------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
```

```
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.920293, rSqBar -> 0.920089, sst ->
811184.708333, sse -> 64656.899769, sde -> 28.202770, mse0 -> 828.934612,
rmse -> 28.791225, mae -> 25.541167, smape -> 18.387402, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 4502.935439, aic -> -369.213664, bic
-> -364.500246, mape -> 16.816254, mase -> 1.088702, smapeC -> 18.438684,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.920293,
0.920089,       811185, 64656.9,        28.2028,       828.935, 28.7912,
25.5412,        18.3874,        78.0000,        1.00000,        390.000,
4502.94,        -369.214,       -364.500,       16.8163,        1.08870,
18.4387,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.929620, rSqBar -> 0.929439, sst ->
880383.794872, sse -> 61961.674620, sde -> 26.991971, mse0 -> 794.380444,
rmse -> 28.184756, mae -> 23.490604, smape -> 18.587401, m -> 78.000000, dfm
-> 1.000000, df -> 390.000000, fStat -> 5151.323441, aic -> -367.822801, bic
-> -363.109384, mape -> 16.399328, mase -> 1.091506, smapeC -> 18.638683,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.929620,
0.929439,       880384, 61961.7,        26.9920,       794.380, 28.1848,
23.4906,        18.5874,        78.0000,        1.00000,        390.000,
5151.32,        -367.823,       -363.109,       16.3993,        1.09151,
18.6387,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] stepwiseSelAll: (l = 1) ADD variable BestStep(2,VectorD(0.901491,
0.901239,       4.28159e+06,    421774, 31.1670,1075.95,        32.8017,
27.1653,        19.8345,        392.000,        1.00000,        390.000,
3569.05,       -1921.61,        -1913.66,       17.7830,        1.16540,
19.8447,        -1.00000,       -1.00000,       -1.00000,      -1.00000,
-1.00000,       -1.00000),scalation.modeling.Regression@4a668b6e)
[info] ------------------------------------------------------------------
-----------------------------
[info] | stepwiseSelAll: (l = 1) ADD variable (2, x2) => cols =
LinkedHashSet(0, 2) @ 0.9012388808919509 |
[info] ------------------------------------------------------------------
-----------------------------
[info] REPORT
[info]     ------------------------------------------------------------------
-----------
[info]     modelName  mn  = Regression @dfm = 1.0
[info]     ------------------------------------------------------------------
-----------
[info]     hparameter hp  = HyperParameter(factorization -> (Fac_QR,Fac_QR))
```

```
[info]     ------------------------------------------------------------
-----------
[info]     features   fn  = Array(x0, x2)
[info]     ------------------------------------------------------------
-----------
[info]     parameter  b   = VectorD(180.076,    245.642)
[info]     ------------------------------------------------------------
-----------
[info]     fitMap     qof = LinkedHashMap(rSq -> 0.901491, rSqBar ->
0.901239, sst -> 4281593.713648, sse -> 421773.516172, sde -> 31.167010,
mse0 -> 1075.952847, rmse -> 32.801720, mae -> 27.165252, smape ->
19.834497, m -> 392.000000, dfm -> 1.000000, df -> 390.000000, fStat ->
3569.047888, aic -> -1921.607295, bic -> -1913.664771, mape -> 17.783018,
mase -> 1.165397, smapeC -> 19.844702, picp -> -1.000000, pinc -> -1.000000,
ace -> -1.000000, pinaw -> -1.000000, iscore -> -1.000000, wis -> -1.000000)
[info]     ------------------------------------------------------------
-----------
[info]
[info] DEBUG @ Predictor.stepwiseSelAll: bestf =
BestStep(1,VectorD(0.919100,   0.918684,       4.28159e+06,    346382,
28.2614,883.628,        29.7259,        24.5712,        17.7950,
392.000,        2.00000,        389.000,        2209.69,       -1880.98,
-1869.07,       16.1330,        1.14846,        17.8103,        -1.00000,
-1.00000,       -1.00000,      -1.00000,        -1.00000,
-1.00000),scalation.modeling.Regression@524d6d96), bestb =
BestStep(2,VectorD(0.829696, 0.829696,       4.28159e+06,    729171,
40.0331,        1860.13,        43.1292,        36.7321,        27.9981,
392.000,       0.00000, 391.000,        0.00000,        -2032.16,
-2028.19,       23.5068,        1.30256,        28.0032,        -1.00000,
-1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000),scalation.modeling.Regression@306cf3ea)
[info] -------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] -------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.911927, rSqBar -> 0.911474, sst ->
842741.346154, sse -> 74223.062282, sde -> 30.304061, mse0 -> 951.577722,
rmse -> 30.847653, mae -> 24.598643, smape -> 16.543146, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 2013.886272, aic -> -372.797724, bic
-> -365.727597, mape -> 15.107739, mase -> 1.100077, smapeC -> 16.620069,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.911927,
0.911474,       842741, 74223.1,        30.3041,       951.578, 30.8477,
24.5986,        16.5431,        78.0000,        2.00000,        389.000,
2013.89,        -372.798,       -365.728,       15.1077,        1.10008,
16.6201,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] -------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
```

```
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.884226, rSqBar -> 0.883630, sst ->
723406.717949, sse -> 83751.978397, sde -> 30.455377, mse0 -> 1073.743313,
rmse -> 32.768023, mae -> 27.479179, smape -> 19.383842, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 1485.491438, aic -> -378.778206, bic
-> -371.708079, mape -> 17.519822, mase -> 1.105838, smapeC -> 19.460765,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.884226,
0.883630,       723407, 83752.0,        30.4554,       1073.74, 32.7680,
27.4792,        19.3838,        78.0000,        2.00000,        389.000,
1485.49,        -378.778,       -371.708,       17.5198,        1.10584,
19.4608,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.911169, rSqBar -> 0.910712, sst ->
981947.294872, sse -> 87227.645689, sde -> 30.334404, mse0 -> 1118.303150,
rmse -> 33.441040, mae -> 27.343351, smape -> 20.364218, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 1995.043778, aic -> -380.959583, bic
-> -373.889457, mape -> 18.207480, mase -> 1.077956, smapeC -> 20.441141,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.911169,
0.910712,       981947, 87227.6,        30.3344,       1118.30, 33.4410,
27.3434,        20.3642,        78.0000,        2.00000,        389.000,
1995.04,        -380.960,       -373.889,       18.2075,        1.07796,
20.4411,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ----------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.933757, rSqBar -> 0.933416, sst ->
811184.708333, sse -> 53735.574630, sde -> 26.230343, mse0 -> 688.917623,
rmse -> 26.247240, mae -> 22.057085, smape -> 14.849046, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 2741.644758, aic -> -359.939488, bic
-> -352.869361, mape -> 14.160957, mase -> 1.066102, smapeC -> 14.925969,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.933757,
0.933416,       811185, 53735.6,        26.2303,       688.918, 26.2472,
22.0571,        14.8490,        78.0000,        2.00000,        389.000,
2741.64,        -359.939,       -352.869,       14.1610,        1.06610,
14.9260,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ----------------------------------------------------------------
```

```
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ---------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.943593, rSqBar -> 0.943303, sst ->
880383.794872, sse -> 49660.166550, sde -> 23.159956, mse0 -> 636.668802,
rmse -> 25.232297, mae -> 21.712312, smape -> 17.956064, m -> 78.000000, dfm
-> 2.000000, df -> 389.000000, fStat -> 3253.628752, aic -> -357.381704, bic
-> -350.311578, mape -> 15.813416, mase -> 1.079203, smapeC -> 18.032987,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.943593,
0.943303,       880384, 49660.2,        23.1600,       636.669, 25.2323,
21.7123,        17.9561,        78.0000,        2.00000,        389.000,
3253.63,        -357.382,       -350.312,       15.8134,        1.07920,
18.0330,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] stepwiseSelAll: (l = 2) ADD variable BestStep(1,VectorD(0.919100,
0.918684,       4.28159e+06,    346382, 28.2614,883.628,        29.7259,
24.5712,        17.7950,        392.000,        2.00000,        389.000,
2209.69,       -1880.98,        -1869.07,       16.1330,        1.14846,
17.8103,        -1.00000,       -1.00000,       -1.00000,      -1.00000,
-1.00000,       -1.00000),scalation.modeling.Regression@524d6d96)
[info] ---------------------------------------------------------------------
--------------------------------
[info] | stepwiseSelAll: (l = 2) ADD variable (1, x1) => cols =
LinkedHashSet(0, 2, 1) @ 0.9186837278359002 |
[info] ---------------------------------------------------------------------
--------------------------------
[info] REPORT
[info]     -------------------------------------------------------------------
-----------
[info]     modelName  mn   = Regression @dfm = 2.0
[info]     -------------------------------------------------------------------
-----------
[info]     hparameter hp   = HyperParameter(factorization -> (Fac_QR,Fac_QR))
[info]     -------------------------------------------------------------------
-----------
[info]     features   fn   = Array(x0, x2, x1)
[info]     -------------------------------------------------------------------
-----------
[info]     parameter  b    = VectorD(150.957,    172.792,        137.217)
[info]     -------------------------------------------------------------------
-----------
[info]     fitMap     qof = LinkedHashMap(rSq -> 0.919100, rSqBar ->
0.918684, sst -> 4281593.713648, sse -> 346382.353578, sde -> 28.261377,
mse0 -> 883.628453, rmse -> 29.725889, mae -> 24.571202, smape -> 17.794972,
m -> 392.000000, dfm -> 2.000000, df -> 389.000000, fStat -> 2209.692848,
aic -> -1880.984180, bic -> -1869.070395, mape -> 16.132965, mase ->
1.148461, smapeC -> 17.810278, picp -> -1.000000, pinc -> -1.000000, ace ->
-1.000000, pinaw -> -1.000000, iscore -> -1.000000, wis -> -1.000000)
```

```
[info]     ------------------------------------------------------------------
-----------
[info]
[info] DEBUG @ Predictor.stepwiseSelAll: bestf =
BestStep(3,VectorD(0.942908,   0.942466,       4.28159e+06,    244446,
24.9682,623.587,        24.9717,        18.3745,        10.2748,
392.000,        3.00000,        388.000,        2136.01,        -1809.58,
-1793.70,       10.3404,        1.01440,        10.2952,        -1.00000,
-1.00000,       -1.00000,      -1.00000,        -1.00000,
-1.00000),scalation.modeling.Regression@40cb8df7), bestb =
BestStep(1,VectorD(0.901491, 0.901239,       4.28159e+06,    421774,
31.1670,        1075.95,        32.8017,        27.1653,        19.8345,
392.000,       1.00000, 390.000,        3569.05,        -1921.61,
-1913.66,       17.7830,        1.16540,        19.8447,        -1.00000,
-1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000),scalation.modeling.Regression@d6e7bab)
[info] -------------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] -------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.938578, rSqBar -> 0.938103, sst ->
842741.346154, sse -> 51762.820698, sde -> 25.903606, mse0 -> 663.625906,
rmse -> 25.760938, mae -> 18.896442, smape -> 10.703619, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 1976.319836, aic -> -356.172599, bic
-> -346.745764, mape -> 10.673790, mase -> 1.009197, smapeC -> 10.806183,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.938578,
0.938103,       842741, 51762.8,        25.9036,       663.626, 25.7609,
18.8964,        10.7036,        78.0000,        3.00000,        388.000,
1976.32,        -356.173,       -346.746,       10.6738,        1.00920,
10.8062,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] -------------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] -------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.914622, rSqBar -> 0.913961, sst ->
723406.717949, sse -> 61763.329578, sde -> 28.098726, mse0 -> 791.837559,
rmse -> 28.139608, mae -> 20.599200, smape -> 11.419868, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 1385.491124, aic -> -364.213883, bic
-> -354.787048, mape -> 11.311565, mase -> 0.997379, smapeC -> 11.522432,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.914622,
0.913961,       723407, 61763.3,        28.0987,       791.838, 28.1396,
20.5992,        11.4199,        78.0000,        3.00000,        388.000,
1385.49,        -364.214,       -354.787,       11.3116,        0.997379,
11.5224,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
```

```
[info] ------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.935768, rSqBar -> 0.935271, sst ->
981947.294872, sse -> 63072.897623, sde -> 28.174720, mse0 -> 808.626893,
rmse -> 28.436366, mae -> 20.461106, smape -> 10.989688, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 1884.186286, aic -> -365.266891, bic
-> -355.840055, mape -> 10.981703, mase -> 0.993184, smapeC -> 11.092252,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.935768,
0.935271,       981947, 63072.9,        28.1747,       808.627, 28.4364,
20.4611,        10.9897,        78.0000,        3.00000,        388.000,
1884.19,        -365.267,       -355.840,       10.9817,        0.993184,
11.0923,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.948464, rSqBar -> 0.948066, sst ->
811184.708333, sse -> 41804.877798, sde -> 22.858562, mse0 -> 535.959972,
rmse -> 23.150809, mae -> 17.124220, smape -> 9.670710, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 2380.259513, aic -> -348.165541, bic
-> -338.738706, mape -> 10.173250, mase -> 0.996727, smapeC -> 9.773274,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.948464,
0.948066,       811185, 41804.9,        22.8586,       535.960, 23.1508,
17.1242,        9.67071,        78.0000,        3.00000,        388.000,
2380.26,        -348.166,       -338.739,       10.1733,        0.996727,
9.77327,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.964762, rSqBar -> 0.964490, sst ->
880383.794872, sse -> 31022.700121, sde -> 20.030609, mse0 -> 397.726925,
rmse -> 19.943092, mae -> 15.453099, smape -> 8.778333, m -> 78.000000, dfm
-> 3.000000, df -> 388.000000, fStat -> 3540.978095, aic -> -339.495726, bic
-> -330.068891, mape -> 8.858528, mase -> 0.966447, smapeC -> 8.880897, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.964762,
0.964490,       880384, 31022.7,        20.0306,       397.727, 19.9431,
15.4531,        8.77833,        78.0000,        3.00000,        388.000,
3540.98,        -339.496,       -330.069,       8.85853,        0.966447,
8.88090,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
```

```
-1.00000,       -1.00000)
[info] stepwiseSelAll: (l = 3) ADD variable BestStep(3,VectorD(0.942908,
0.942466,       4.28159e+06,    244446, 24.9682,623.587,        24.9717,
18.3745,        10.2748,        392.000,        3.00000,        388.000,
2136.01,       -1809.58,        -1793.70,       10.3404,        1.01440,
10.2952,        -1.00000,       -1.00000,       -1.00000,      -1.00000,
-1.00000,       -1.00000),scalation.modeling.Regression@40cb8df7)
[info] ------------------------------------------------------------------
-----------------------------------
[info] | stepwiseSelAll: (l = 3) ADD variable (3, x3) => cols =
LinkedHashSet(0, 2, 1, 3) @ 0.9424662931713765 |
[info] ------------------------------------------------------------------
-----------------------------------
[info] REPORT
[info]     ------------------------------------------------------------------
-----------
[info]     modelName  mn   = Regression @dfm = 3.0
[info]     ------------------------------------------------------------------
-----------
[info]     hparameter hp   = HyperParameter(factorization -> (Fac_QR,Fac_QR))
[info]     ------------------------------------------------------------------
-----------
[info]     features   fn   = Array(x0, x2, x1, x3)
[info]     ------------------------------------------------------------------
-----------
[info]     parameter  b    = VectorD(160.480,    100.976,        164.416,
49.9700)
[info]     ------------------------------------------------------------------
-----------
[info]     fitMap     qof = LinkedHashMap(rSq -> 0.942908, rSqBar ->
0.942466, sst -> 4281593.713648, sse -> 244445.911771, sde -> 24.968243,
mse0 -> 623.586510, rmse -> 24.971714, mae -> 18.374520, smape -> 10.274768,
m -> 392.000000, dfm -> 3.000000, df -> 388.000000, fStat -> 2136.005379,
aic -> -1809.580243, bic -> -1793.695195, mape -> 10.340419, mase ->
1.014402, smapeC -> 10.295177, picp -> -1.000000, pinc -> -1.000000, ace ->
-1.000000, pinaw -> -1.000000, iscore -> -1.000000, wis -> -1.000000)
[info]     ------------------------------------------------------------------
-----------
[info]
[info] DEBUG @ Predictor.stepwiseSelAll: bestf =
BestStep(5,VectorD(0.945120,   0.944552,       4.28159e+06,    234975,
24.4646,599.427,        24.4832,        18.1448,        10.3744,
392.000,        4.00000,        387.000,        1666.18,       -1799.84,
-1779.98,       10.3678,        1.02540,        10.3999,        -1.00000,
-1.00000,       -1.00000,      -1.00000,        -1.00000,
-1.00000),scalation.modeling.Regression@6a370f4), bestb =
BestStep(2,VectorD(0.935402,  0.935070,       4.28159e+06,    276582,
26.5871,        705.565,        26.5625,        20.1025,        11.1885,
392.000,       2.00000, 389.000,        2816.44,        -1835.79,
-1823.87,       11.4029,        1.01598,        11.2038,        -1.00000,
```

```
-1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000),scalation.modeling.Regression@51f116b8)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 0: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.941142, rSqBar -> 0.940534, sst ->
842741.346154, sse -> 49601.903509, sde -> 25.372126, mse0 -> 635.921840,
rmse -> 25.217491, mae -> 17.605364, smape -> 9.537925, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1547.042263, aic -> -352.504646, bic
-> -340.721101, mape -> 9.537003, mase -> 1.009850, smapeC -> 9.666130, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 0: qof = VectorD(0.941142,
0.940534,       842741, 49601.9,        25.3721,       635.922, 25.2175,
17.6054,        9.53792,        78.0000,        4.00000,        387.000,
1547.04,        -352.505,       -340.721,       9.53700,        1.00985,
9.66613,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 1: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.916527, rSqBar -> 0.915664, sst ->
723406.717949, sse -> 60385.157175, sde -> 27.789149, mse0 -> 774.168682,
rmse -> 27.823887, mae -> 20.821070, smape -> 12.192181, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1062.303039, aic -> -361.535988, bic
-> -349.752443, mape -> 12.049679, mase -> 1.004992, smapeC -> 12.320386,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 1: qof = VectorD(0.916527,
0.915664,       723407, 60385.2,        27.7891,       774.169, 27.8239,
20.8211,        12.1922,        78.0000,        4.00000,        387.000,
1062.30,        -361.536,       -349.752,       12.0497,        1.00499,
12.3204,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------------
[info] | crossValidate: fold 2: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.939306, rSqBar -> 0.938678, sst ->
981947.294872, sse -> 59598.659543, sde -> 27.353643, mse0 -> 764.085379,
rmse -> 27.642094, mae -> 20.351033, smape -> 11.245368, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1497.302643, aic -> -360.877269, bic
-> -349.093725, mape -> 11.199130, mase -> 1.001813, smapeC -> 11.373574,
picp -> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 2: qof = VectorD(0.939306,
0.938678,       981947, 59598.7,        27.3536,       764.085, 27.6421,
20.3510,        11.2454,        78.0000,        4.00000,        387.000,
```

```
1497.30,        -360.877,       -349.094,       11.1991,        1.00181,
11.3736,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 3: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.951608, rSqBar -> 0.951108, sst ->
811184.708333, sse -> 39254.619847, sde -> 22.369901, mse0 -> 503.264357,
rmse -> 22.433554, mae -> 16.844555, smape -> 9.691792, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 1902.559147, aic -> -343.838443, bic
-> -332.054899, mape -> 9.958163, mase -> 1.009557, smapeC -> 9.819997, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 3: qof = VectorD(0.951608,
0.951108,       811185, 39254.6,        22.3699,       503.264, 22.4336,
16.8446,        9.69179,        78.0000,        4.00000,        387.000,
1902.56,        -343.838,       -332.055,       9.95816,        1.00956,
9.82000,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] ------------------------------------------------------------
[info] | crossValidate: fold 4: train-test splits sizes = (314, 78) |
[info] ------------------------------------------------------------
[info] DEBUG @ Predictor.validate: n_test = 78, rando = true
[info] LinkedHashMap(rSq -> 0.964660, rSqBar -> 0.964295, sst ->
880383.794872, sse -> 31112.708696, sde -> 20.045441, mse0 -> 398.880881,
rmse -> 19.972002, mae -> 15.922825, smape -> 9.517474, m -> 78.000000, dfm
-> 4.000000, df -> 387.000000, fStat -> 2640.945807, aic -> -337.019315, bic
-> -325.235771, mape -> 9.493010, mase -> 0.967569, smapeC -> 9.645680, picp
-> -1.000000, pinc -> -1.000000, ace -> -1.000000, pinaw -> -1.000000,
iscore -> -1.000000, wis -> -1.000000)
[info] DEBUG @ Predictor.crossValidate: fold 4: qof = VectorD(0.964660,
0.964295,       880384, 31112.7,        20.0454,       398.881, 19.9720,
15.9228,        9.51747,        78.0000,        4.00000,        387.000,
2640.95,        -337.019,       -325.236,       9.49301,        0.967569,
9.64568,        -1.00000,       -1.00000,       -1.00000,       -1.00000,
-1.00000,       -1.00000)
[info] stepwiseSelAll: (l = 4) ADD variable BestStep(5,VectorD(0.945120,
0.944552,       4.28159e+06,    234975, 24.4646,599.427,        24.4832,
18.1448,        10.3744,        392.000,        4.00000,        387.000,
1666.18,       -1799.84,        -1779.98,       10.3678,        1.02540,
10.3999,        -1.00000,       -1.00000,       -1.00000,      -1.00000,
-1.00000,       -1.00000),scalation.modeling.Regression@6a370f4)
[info] ------------------------------------------------------------------------
---------------------------------------
[info] | stepwiseSelAll: (l = 4) ADD variable (5, x5) => cols =
LinkedHashSet(0, 2, 1, 3, 5) @ 0.9445524176505258 |
[info] ------------------------------------------------------------------------
---------------------------------------
[info] REPORT
```

```
[info]     ------------------------------------------------------------------
-----------
[info]     modelName  mn   = Regression @dfm = 4.0
[info]     ------------------------------------------------------------------
-----------
[info]     hparameter hp   = HyperParameter(factorization -> (Fac_QR,Fac_QR))
[info]     ------------------------------------------------------------------
-----------
[info]     features   fn   = Array(x0, x2, x1, x3, x5)
[info]     ------------------------------------------------------------------
-----------
[info]     parameter  b    = VectorD(156.488,    79.8909,        187.761,
64.9839,        -14.7746)
[info]     ------------------------------------------------------------------
-----------
[info]     fitMap     qof = LinkedHashMap(rSq -> 0.945120, rSqBar ->
0.944552, sst -> 4281593.713648, sse -> 234975.334398, sde -> 24.464617,
mse0 -> 599.426873, rmse -> 24.483196, mae -> 18.144752, smape -> 10.374375,
m -> 392.000000, dfm -> 4.000000, df -> 387.000000, fStat -> 1666.176278,
aic -> -1799.836434, bic -> -1779.980125, mape -> 10.367767, mase ->
1.025401, smapeC -> 10.399885, picp -> -1.000000, pinc -> -1.000000, ace ->
-1.000000, pinaw -> -1.000000, iscore -> -1.000000, wis -> -1.000000)
[info]     ------------------------------------------------------------------
-----------
[info]
[info] stepwiseSelAll: selected features = LinkedHashSet(0, 2, 1, 3, 5)
[info] stepwiseSelAll: selected features = LinkedHashSet(x0, x2, x1, x3, x5)
[info] stepwiseSelAll: features in/out   = ArrayBuffer(2, 1, 3, 5)
[info] k = 5
[info] Run + title
[info] x-axis: minX = 0.0, maxX = 4.0
[info] y-axis: minY = 10.0, maxY = 95.0
[info] rSq =
[info] MatrixD (90.1491,        90.1239,        19.8345,        90.0302,
[info]          91.9100,        91.8684,        17.7950,        91.6934,
[info]          94.2908,        94.2466,        10.2748,        94.0439,
[info]          94.5120,        94.4552,        10.3744,        94.2649)
[info] Run + title
[success] Total time: 168 s (0:02:48.0), completed Sep 11, 2025, 4:56:36 PM
sbt:scalation>
```