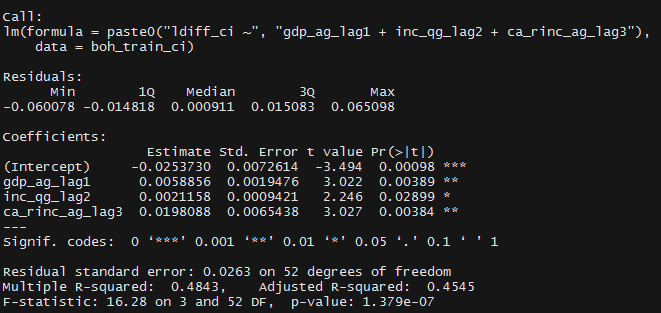
**1. Variable Selection Methodology**

**1.1. C&I Ending Balance**

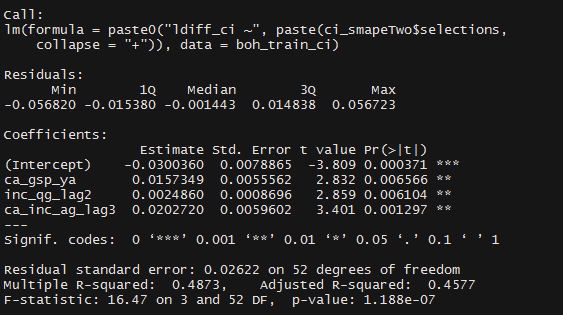
To check for path dependency, the model development team re ran the variable selection algorithm, this time exploring two additional paths by intentionally removing the first chosen variable. The original champion model has R output shown below.



**SMAPE**

0.929448

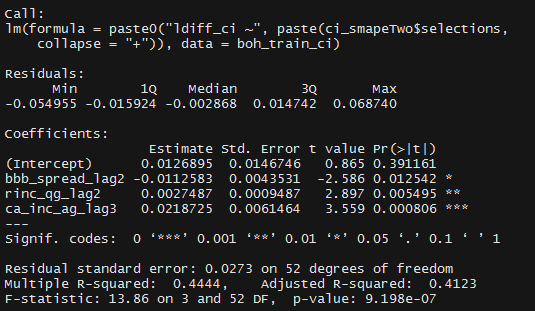
Once removing the US GDP from the candidate list, the selection algorithm chose almost the exact same variable, instead this time opting for the CA GSP instead of the GDP and the CA Nominal Income instead of the CA Real Income. While R squared is very similar, the SMAPE is significantly lower in the first model.



**SMAPE**

0.9659579

Once going further and removing GDP and CA GSP from the selection, the result is shown below. As seen it picks almost the same variables, this time opting for the real U.S. income and nominal CA income. The new variable chosen first is the BBB spread with the 10-year treasury rate. It was not selected even though the SMAPE is marginally lower because the tradeoff of the R squared was too large.



**SMAPE**

0.9291055

As seen, despite exploring different paths, the algorithm decided to choose similar variables in each case, and the performance of these other similar models is not as good as the original model. As a result, there does not appear to be a better model that could have been chosen given other paths.

**1.2. CRE Ending Balance (Multifamily & Non-Owner Occupied) and CRE Ending Balance (Owner Occupied)**

The Model Developers performed Out-of-Time Back testing. To do so, the team held out the last 8 quarters in the modeling data (2015 Q3 – 2017 Q2) and the set the training window to include the remaining observations (2007 Q1 – 2015 Q2). Also, the team compare the 8 quarters hold out period and 4 quarters holdout period of model specification. The model specification of Income Producing and Owner Occupied are presented in table 1. The model specification of full sample, 4 quarters hold out, and 8 quarters hold out are very similar. Therefore, the forecasting result of output will be very similar and will have minor differences.

Table . Model specification

|  |  |  |  |
| --- | --- | --- | --- |
| Income Producing | Intercept | crei\_eg\_lag4 | dow\_ya |
| Full Sample | 0.0021 | 0.0010 | 0.0028 |
| 4 quarters hold out | 0.0037 | 0.0011 | 0.0029 |
| 8 quarters hold out | 0.0028 | 0.0011 | 0.0029 |

|  |  |  |
| --- | --- | --- |
| Owner Occupied | Intercept | crei\_eg\_lag2 |
| Full Sample | 0.0032 | 0.0007 |
| 4 quarters hold out | 0.0041 | 0.0008 |
| 8 quarters hold out | 0.0044 | 0.0008 |

With above model specification, the team fits the models with different time periods and compare the forecast outputs. The below figures present the comparison between model fits and actual.

Figure . Income Producing Model Fits vs Actual

Figure . Owner Occupied Model fits vs Actual

**2. Stationarity Test Results**

For all models below, the stationary testing on the dependent and independent variables revealed that at least in one test they passed for one type of stationarity. The other tests were inconclusive; however, it is believed to be due to the smaller sample size for the independent variables. The residual testing revealed a similar result of passing some tests but inconclusive on others. As a result it is believed that all tested are stationary. Based on this and the various other metrics used to measure model performance, including the out of time back-testing, there does not appear to be any sign of a spurious correlation, so this further corroborates that they are stationary.

2.1. CRE Ending Balance (Multifamily & Non-Owner Occupied)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Type of Test | ADF Test Statistic | ADF Critical Value | PP Test Statistic | PP Test P Value | KPSS Test Statistic | KPSS Test P Value | Flag ADF | Flag PP | Flag KP | Flag |
| ldiff\_ip | Zero Mean | -1.83 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| ldiff\_ip | Single Mean | -2.22 | -2.58 | NA | NA | 0.19 | 0.10 | 0 | 0 | 1 | 1 |
| ldiff\_ip | Trend | -2.46 | -3.15 | -16.49 | 0.10 | 0.14 | 0.06 | 0 | 1 | 0 | 1 |
| ip\_resid | Zero Mean | -5.48 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| ip\_resid | Single Mean | -5.40 | -2.58 | NA | NA | 0.13 | 0.10 | 1 | 0 | 1 | 1 |
| ip\_resid | Trend | -5.45 | -3.15 | -28.99 | 0.01 | 0.07 | 0.10 | 1 | 1 | 1 | 1 |
| crei\_eg\_lag4 | Zero Mean | -1.78 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| crei\_eg\_lag4 | Single Mean | -1.81 | -2.58 | NA | NA | 0.23 | 0.10 | 0 | 0 | 1 | 1 |
| crei\_eg\_lag4 | Trend | -2.83 | -3.15 | -4.71 | 0.83 | 0.19 | 0.02 | 0 | 0 | 0 | 0 |
| dow\_ya | Zero Mean | -3.03 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| dow\_ya | Single Mean | -4.39 | -2.58 | NA | NA | 0.21 | 0.10 | 1 | 0 | 1 | 1 |
| dow\_ya | Trend | -3.83 | -3.15 | -12.81 | 0.32 | 0.10 | 0.10 | 1 | 0 | 1 | 1 |

2.2. CRE Ending Balance (Owner Occupied)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Type of Test | ADF Test Statistic | ADF Critical Value | PP Test Statistic | PP Test P Value | KPSS Test Statistic | KPSS Test P Value | Flag ADF | Flag PP | Flag KP | Flag |
| ldiff\_oo | Zero Mean | -2.41 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| ldiff\_oo | Single Mean | -2.35 | -2.58 | NA | NA | 0.11 | 0.10 | 0 | 0 | 1 | 1 |
| ldiff\_oo | Trend | -2.42 | -3.15 | -28.36 | 0.01 | 0.09 | 0.10 | 0 | 1 | 1 | 1 |
| oo\_resid | Zero Mean | -2.79 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| oo\_resid | Single Mean | -2.96 | -2.58 | NA | NA | 0.34 | 0.10 | 1 | 0 | 1 | 1 |
| oo\_resid | Trend | -3.33 | -3.15 | -30.20 | 0.01 | 0.04 | 0.10 | 1 | 1 | 1 | 1 |
| crei\_eg\_lag2 | Zero Mean | -1.41 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| crei\_eg\_lag2 | Single Mean | -1.53 | -2.58 | NA | NA | 0.28 | 0.10 | 0 | 0 | 1 | 1 |
| crei\_eg\_lag2 | Trend | -2.21 | -3.15 | -5.12 | 0.81 | 0.16 | 0.04 | 0 | 0 | 0 | 0 |

2.3. C&I Net Chargeoff

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Type of Test | ADF Test Statistic | ADF Critical Value | PP Test Statistic | PP Test P Value | KPSS Test Statistic | KPSS Test P Value | Flag ADF | Flag PP | Flag KP | Flag |
| NCOR\_CnI | Zero Mean | -1.04 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| NCOR\_CnI | Single Mean | -1.34 | -2.58 | NA | NA | 0.26 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_CnI | Trend | -1.29 | -3.15 | -16.89 | 0.11 | 0.25 | 0.01 | 0 | 0 | 0 | 0 |
| resid\_CnI | Zero Mean | -4.43 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_CnI | Single Mean | -4.39 | -2.58 | NA | NA | 0.14 | 0.10 | 0 | 0 | 1 | 1 |
| resid\_CnI | Trend | -4.27 | -3.15 | -79.73 | 0.01 | 0.11 | 0.10 | 0 | 0 | 0 | 0 |
| ca\_rgsp\_yg\_EWMA4 | Zero Mean | -1.69 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| ca\_rgsp\_yg\_EWMA4 | Single Mean | -2.42 | -2.58 | NA | NA | 0.22 | 0.10 | 0 | 0 | 1 | 1 |
| ca\_rgsp\_yg\_EWMA4 | Trend | -2.38 | -3.15 | -10.27 | 0.50 | 0.20 | 0.02 | 0 | 0 | 0 | 0 |
| ca\_unemp\_yd\_EWMA4 | Zero Mean | -2.07 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| ca\_unemp\_yd\_EWMA4 | Single Mean | -2.04 | -2.58 | NA | NA | 0.37 | 0.09 | 0 | 0 | 1 | 1 |
| ca\_unemp\_yd\_EWMA4 | Trend | -2.34 | -3.15 | -5.81 | 0.77 | 0.19 | 0.02 | 0 | 1 | 0 | 1 |
| vix\_qd\_lag4 | Zero Mean | -7.56 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| vix\_qd\_lag4 | Single Mean | -7.50 | -2.58 | NA | NA | 0.04 | 0.10 | 1 | 0 | 1 | 1 |
| vix\_qd\_lag4 | Trend | -7.44 | -3.15 | -59.68 | 0.01 | 0.04 | 0.10 | 1 | 0 | 1 | 1 |
| prime\_spread\_log\_qd | Zero Mean | -6.55 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| prime\_spread\_log\_qd | Single Mean | -6.48 | -2.58 | NA | NA | 0.06 | 0.10 | 0 | 0 | 1 | 1 |
| prime\_spread\_log\_qd | Trend | -6.44 | -3.15 | -69.44 | 0.01 | 0.06 | 0.10 | 0 | 0 | 0 | 0 |
| ca\_hpi\_yg\_EWMA4\_lag4 | Zero Mean | -1.52 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| ca\_hpi\_yg\_EWMA4\_lag4 | Single Mean | -1.72 | -2.58 | NA | NA | 0.47 | 0.05 | 0 | 0 | 1 | 1 |
| ca\_hpi\_yg\_EWMA4\_lag4 | Trend | -2.89 | -3.15 | -3.94 | 0.89 | 0.22 | 0.01 | 1 | 1 | 0 | 1 |

2.4. CRE Net Chargeoff (Multifamily)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Type of Test | ADF Test Statistic | ADF Critical Value | PP Test Statistic | PP Test P Value | KPSS Test Statistic | KPSS Test P Value | Flag ADF | Flag PP | Flag KP | Flag |
| NCOR\_MF\_Bank of Hope | Zero Mean | -2.39 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Bank of Hope | Single Mean | -2.75 | -2.58 | NA | NA | 0.15 | 0.10 | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Bank of Hope | Trend | -2.93 | -3.15 | -50.75 | 0.01 | 0.14 | 0.06 | 0 | 1 | 0 | 1 |
| NCOR\_MF\_Banner Corporation | Zero Mean | -5.54 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Banner Corporation | Single Mean | -5.54 | -2.58 | NA | NA | 0.18 | 0.10 | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Banner Corporation | Trend | -5.87 | -3.15 | -32.16 | 0.01 | 0.07 | 0.10 | 1 | 1 | 1 | 1 |
| NCOR\_MF\_Cathay General Bancorp | Zero Mean | -2.60 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Cathay General Bancorp | Single Mean | -2.87 | -2.58 | NA | NA | 0.33 | 0.10 | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Cathay General Bancorp | Trend | -3.62 | -3.15 | -22.70 | 0.02 | 0.09 | 0.10 | 1 | 1 | 1 | 1 |
| NCOR\_MF\_Columbia Banking System | Zero Mean | -1.92 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_MF\_Columbia Banking System | Single Mean | -2.34 | -2.58 | NA | NA | 0.20 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_MF\_Columbia Banking System | Trend | -4.79 | -3.15 | -43.48 | 0.01 | 0.14 | 0.06 | 1 | 1 | 0 | 1 |
| NCOR\_MF\_EAST WEST BANCORP | Zero Mean | -1.45 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| NCOR\_MF\_EAST WEST BANCORP | Single Mean | -1.62 | -2.58 | NA | NA | 0.38 | 0.09 | 0 | 0 | 0 | 0 |
| NCOR\_MF\_EAST WEST BANCORP | Trend | -3.13 | -3.15 | -11.65 | 0.39 | 0.14 | 0.06 | 0 | 0 | 0 | 0 |
| NCOR\_MF\_PacWest Bancorp | Zero Mean | -2.32 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_MF\_PacWest Bancorp | Single Mean | -2.62 | -2.58 | NA | NA | 0.18 | 0.10 | 1 | 0 | 1 | 1 |
| NCOR\_MF\_PacWest Bancorp | Trend | -2.96 | -3.15 | -32.60 | 0.01 | 0.09 | 0.10 | 0 | 1 | 1 | 1 |
| NCOR\_MF\_UMPQUA BANK | Zero Mean | -2.83 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_MF\_UMPQUA BANK | Single Mean | -3.00 | -2.58 | NA | NA | 0.25 | 0.10 | 1 | 0 | 1 | 1 |
| NCOR\_MF\_UMPQUA BANK | Trend | -3.40 | -3.15 | -20.50 | 0.03 | 0.10 | 0.10 | 1 | 1 | 1 | 1 |
| resid\_MF\_Bank of Hope | Zero Mean | -2.56 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_MF\_Bank of Hope | Single Mean | -2.53 | -2.58 | NA | NA | 0.13 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_MF\_Bank of Hope | Trend | -2.47 | -3.15 | -50.24 | 0.01 | 0.11 | 0.10 | 0 | 1 | 0 | 1 |
| resid\_MF\_Banner Corporation | Zero Mean | -4.71 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_MF\_Banner Corporation | Single Mean | -4.64 | -2.58 | NA | NA | 0.32 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_MF\_Banner Corporation | Trend | -5.82 | -3.15 | -33.65 | 0.01 | 0.13 | 0.09 | 1 | 1 | 1 | 1 |
| resid\_MF\_Cathay General Bancorp | Zero Mean | -4.85 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_MF\_Cathay General Bancorp | Single Mean | -4.77 | -2.58 | NA | NA | 0.17 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_MF\_Cathay General Bancorp | Trend | -5.57 | -3.15 | -30.28 | 0.01 | 0.04 | 0.10 | 1 | 1 | 1 | 1 |
| resid\_MF\_Columbia Banking System | Zero Mean | -5.03 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_MF\_Columbia Banking System | Single Mean | -4.96 | -2.58 | NA | NA | 0.10 | 0.10 | 0 | 0 | 1 | 1 |
| resid\_MF\_Columbia Banking System | Trend | -4.87 | -3.15 | -43.63 | 0.01 | 0.08 | 0.10 | 1 | 1 | 0 | 1 |
| resid\_MF\_EAST WEST BANCORP | Zero Mean | -3.30 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| resid\_MF\_EAST WEST BANCORP | Single Mean | -3.27 | -2.58 | NA | NA | 0.36 | 0.09 | 0 | 0 | 0 | 0 |
| resid\_MF\_EAST WEST BANCORP | Trend | -5.17 | -3.15 | -37.47 | 0.01 | 0.19 | 0.02 | 0 | 0 | 0 | 0 |
| resid\_MF\_PacWest Bancorp | Zero Mean | -3.99 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_MF\_PacWest Bancorp | Single Mean | -3.93 | -2.58 | NA | NA | 0.05 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_MF\_PacWest Bancorp | Trend | -3.86 | -3.15 | -47.02 | 0.01 | 0.05 | 0.10 | 0 | 1 | 1 | 1 |
| resid\_MF\_UMPQUA BANK | Zero Mean | -4.70 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_MF\_UMPQUA BANK | Single Mean | -4.62 | -2.58 | NA | NA | 0.10 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_MF\_UMPQUA BANK | Trend | -4.58 | -3.15 | -28.42 | 0.01 | 0.06 | 0.10 | 1 | 1 | 1 | 1 |
| empl\_qg\_EWMA2\_lag3 | Zero Mean | -1.95 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| empl\_qg\_EWMA2\_lag3 | Single Mean | -1.97 | -2.58 | NA | NA | 0.38 | 0.09 | 1 | 0 | 1 | 1 |
| empl\_qg\_EWMA2\_lag3 | Trend | -3.32 | -3.15 | -7.74 | 0.64 | 0.12 | 0.10 | 1 | 1 | 1 | 1 |
| gdp\_grw\_yoy\_NL\_lag2 | Zero Mean | -2.98 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| gdp\_grw\_yoy\_NL\_lag2 | Single Mean | -3.19 | -2.58 | NA | NA | 0.18 | 0.10 | 1 | 0 | 1 | 1 |
| gdp\_grw\_yoy\_NL\_lag2 | Trend | -3.73 | -3.15 | -13.87 | 0.25 | 0.07 | 0.10 | 1 | 1 | 1 | 1 |

2.5. CRE Net Chargeoff (Non Owner Occupied)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Type of Test | ADF Test Statistic | ADF Critical Value | PP Test Statistic | PP Test P Value | KPSS Test Statistic | KPSS Test P Value | Flag ADF | Flag PP | Flag KP | Flag |
| NCOR\_NOOCRE\_Bank of Hope | Zero Mean | -1.16 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_Bank of Hope | Single Mean | -1.47 | -2.58 | NA | NA | 0.31 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_Bank of Hope | Trend | -2.96 | -3.15 | -15.39 | 0.16 | 0.15 | 0.05 | 0 | 0 | 0 | 0 |
| NCOR\_NOOCRE\_Cathay General Bancorp | Zero Mean | -1.79 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_Cathay General Bancorp | Single Mean | -2.11 | -2.58 | NA | NA | 0.28 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_Cathay General Bancorp | Trend | -3.06 | -3.15 | -18.55 | 0.06 | 0.13 | 0.08 | 0 | 0 | 0 | 0 |
| NCOR\_NOOCRE\_EAST WEST BANCORP | Zero Mean | -2.25 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_EAST WEST BANCORP | Single Mean | -2.63 | -2.58 | NA | NA | 0.31 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_EAST WEST BANCORP | Trend | -3.95 | -3.15 | -14.88 | 0.19 | 0.11 | 0.10 | 0 | 0 | 0 | 0 |
| NCOR\_NOOCRE\_UMPQUA BANK | Zero Mean | -1.39 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_UMPQUA BANK | Single Mean | -1.83 | -2.58 | NA | NA | 0.28 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_UMPQUA BANK | Trend | -3.03 | -3.15 | -9.46 | 0.53 | 0.15 | 0.05 | 0 | 1 | 0 | 1 |
| NCOR\_NOOCRE\_Western Alliance | Zero Mean | -0.80 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_Western Alliance | Single Mean | -0.99 | -2.58 | NA | NA | 0.35 | 0.10 | 1 | 0 | 1 | 1 |
| NCOR\_NOOCRE\_Western Alliance | Trend | -4.21 | -3.15 | -19.76 | 0.04 | 0.20 | 0.02 | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_Bank of Hope | Zero Mean | -5.59 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| resid\_NOOCRE\_Bank of Hope | Single Mean | -5.53 | -2.58 | NA | NA | 0.09 | 0.10 | 0 | 0 | 1 | 1 |
| resid\_NOOCRE\_Bank of Hope | Trend | -5.45 | -3.15 | -41.39 | 0.01 | 0.09 | 0.10 | 0 | 0 | 0 | 0 |
| resid\_NOOCRE\_Cathay General Bancorp | Zero Mean | -4.56 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| resid\_NOOCRE\_Cathay General Bancorp | Single Mean | -4.49 | -2.58 | NA | NA | 0.24 | 0.10 | 0 | 0 | 1 | 1 |
| resid\_NOOCRE\_Cathay General Bancorp | Trend | -5.21 | -3.15 | -32.79 | 0.01 | 0.09 | 0.10 | 1 | 1 | 0 | 1 |
| resid\_NOOCRE\_EAST WEST BANCORP | Zero Mean | -4.29 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_EAST WEST BANCORP | Single Mean | -4.22 | -2.58 | NA | NA | 0.07 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_EAST WEST BANCORP | Trend | -4.20 | -3.15 | -25.33 | 0.01 | 0.05 | 0.10 | 0 | 1 | 0 | 1 |
| resid\_NOOCRE\_UMPQUA BANK | Zero Mean | -4.32 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_UMPQUA BANK | Single Mean | -4.28 | -2.58 | NA | NA | 0.13 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_UMPQUA BANK | Trend | -4.19 | -3.15 | -38.79 | 0.01 | 0.10 | 0.10 | 1 | 1 | 1 | 1 |
| resid\_NOOCRE\_Western Alliance | Zero Mean | -4.97 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_Western Alliance | Single Mean | -4.91 | -2.58 | NA | NA | 0.19 | 0.10 | 1 | 0 | 1 | 1 |
| resid\_NOOCRE\_Western Alliance | Trend | -4.92 | -3.15 | -37.00 | 0.01 | 0.19 | 0.02 | 1 | 1 | 1 | 1 |
| empl\_yg\_EWMA4\_lag1 | Zero Mean | -0.97 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| empl\_yg\_EWMA4\_lag1 | Single Mean | -1.12 | -2.58 | NA | NA | 0.42 | 0.07 | 0 | 0 | 1 | 1 |
| empl\_yg\_EWMA4\_lag1 | Trend | -2.96 | -3.15 | -6.05 | 0.75 | 0.14 | 0.06 | 1 | 1 | 0 | 1 |
| rgdp\_grw\_NL\_lag3 | Zero Mean | -3.21 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| rgdp\_grw\_NL\_lag3 | Single Mean | -3.56 | -2.58 | NA | NA | 0.21 | 0.10 | 0 | 0 | 0 | 0 |
| rgdp\_grw\_NL\_lag3 | Trend | -4.40 | -3.15 | -18.99 | 0.05 | 0.07 | 0.10 | 0 | 0 | 0 | 0 |
| crei\_yg\_EWMA4\_lag3 | Zero Mean | -3.00 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| crei\_yg\_EWMA4\_lag3 | Single Mean | -3.01 | -2.58 | NA | NA | 0.22 | 0.10 | 1 | 0 | 1 | 1 |
| crei\_yg\_EWMA4\_lag3 | Trend | -4.27 | -3.15 | -5.87 | 0.76 | 0.16 | 0.04 | 0 | 1 | 1 | 1 |

2.6. CRE Net Chargeoff (Owner Occupied)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Type of Test | ADF Test Statistic | ADF Critical Value | PP Test Statistic | PP Test P Value | KPSS Test Statistic | KPSS Test P Value | Flag ADF | Flag PP | Flag KP | Flag |
| NCOR\_OOCRE | Zero Mean | -1.64 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| NCOR\_OOCRE | Single Mean | -1.93 | -2.58 | NA | NA | 0.24 | 0.10 | 0 | 0 | 1 | 1 |
| NCOR\_OOCRE | Trend | -2.50 | -3.15 | -16.06 | 0.11 | 0.15 | 0.05 | 0 | 0 | 0 | 0 |
| resid\_OOCRE | Zero Mean | -6.96 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| resid\_OOCRE | Single Mean | -6.84 | -2.58 | NA | NA | 0.08 | 0.10 | 0 | 0 | 1 | 1 |
| resid\_OOCRE | Trend | -6.78 | -3.15 | -46.49 | 0.01 | 0.06 | 0.10 | 0 | 0 | 0 | 0 |
| empl\_yg\_EWMA4\_lag4 | Zero Mean | -1.17 | -1.61 | NA | NA | NA | NA | 0 | 0 | 1 | 1 |
| empl\_yg\_EWMA4\_lag4 | Single Mean | -1.23 | -2.58 | NA | NA | 0.29 | 0.10 | 0 | 0 | 1 | 1 |
| empl\_yg\_EWMA4\_lag4 | Trend | -2.53 | -3.15 | -4.69 | 0.84 | 0.18 | 0.02 | 0 | 0 | 0 | 0 |
| crei\_yg\_EWMA2\_lag4 | Zero Mean | -2.53 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| crei\_yg\_EWMA2\_lag4 | Single Mean | -2.81 | -2.58 | NA | NA | 0.21 | 0.10 | 0 | 0 | 1 | 1 |
| crei\_yg\_EWMA2\_lag4 | Trend | -3.73 | -3.15 | -6.75 | 0.71 | 0.15 | 0.05 | 0 | 1 | 0 | 1 |
| prime\_spread\_log\_qd\_EWMA2\_lag4 | Zero Mean | -4.48 | -1.61 | NA | NA | NA | NA | 1 | 0 | 1 | 1 |
| prime\_spread\_log\_qd\_EWMA2\_lag4 | Single Mean | -4.47 | -2.58 | NA | NA | 0.10 | 0.10 | 1 | 0 | 1 | 1 |
| prime\_spread\_log\_qd\_EWMA2\_lag4 | Trend | -4.46 | -3.15 | -31.89 | 0.01 | 0.08 | 0.10 | 1 | 0 | 1 | 1 |