

Bitcoin Data with a Future Dummy

Tram Nguyen

4/9/2018

R code to run data on cryptocurrencies data

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   count = col_integer(),
##   date = col_character(),
##   btc_index = col_integer(),
##   txCount = col_integer(),
##   activeAddresses = col_character(),
##   count_vendors = col_integer(),
##   sum = col_integer(),
##   txCount_e_e = col_integer(),
##   activeAddresses_e_e = col_integer(),
##   txCount_l = col_integer(),
##   activeAddresses_l = col_character(),
##   Price_futures = col_number(),
##   dum_future = col_integer(),
##   btc_per = col_integer()
## )

## See spec(...) for full column specifications.

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##   as.Date, as.Date.numeric

## Loading required package: grid

## Loading required package: Matrix

## Loading required package: survival

##
## Attaching package: 'survey'

## The following object is masked from 'package:graphics':
##
##   dotchart

## Loading required package: timeDate

## Loading required package: timeSeries

##
## Attaching package: 'timeSeries'

## The following object is masked from 'package:zoo':
##
##   time<-
```

```

## Loading required package: fBasics

## [1] "dBTC ~ btc_lg + eth_lg + ltc_lg + gg_btc + transact_count + totalcoin + sum_vendor + future + c

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## on the right-hand side and was dropped

## Warning in model.matrix.default(mt, mf, contrasts): problem with term 11 in
## model.matrix: no columns are assigned

##
## Call:
## lm(formula = str, data = tsdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.156710 -0.014283 -0.000628  0.014737  0.157352
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.044e+00   5.261e-01   3.885 0.000110 ***
## btc_lg         6.519e-02   1.098e-02   5.939 4.16e-09 ***
## eth_lg        -1.870e-04   1.936e-03  -0.097 0.923077
## ltc_lg        -1.684e-02   4.737e-03  -3.555 0.000398 ***
## gg_btc        -8.614e-03   2.565e-03  -3.359 0.000818 ***
## transact_count -2.824e-02   9.974e-03  -2.832 0.004736 **
## totalcoin      2.931e-03   6.889e-03   0.425 0.670579
## sum_vendor    -2.322e-01   5.884e-02  -3.946 8.59e-05 ***
## future        -1.101e-02   7.047e-03  -1.563 0.118411
## cy_at         -1.023e-03   9.938e-04  -1.029 0.303761
## vix           4.055e-03   7.126e-03   0.569 0.569458
## lBTC1         -5.046e-02   3.410e-02  -1.480 0.139358
## lBTC2         -8.878e-02   3.400e-02  -2.611 0.009183 **
## lBTC3         -4.336e-02   3.389e-02  -1.280 0.201052
## lBTC4         -1.145e-01   3.325e-02  -3.442 0.000605 ***
## lBTC5         -8.298e-02   3.345e-02  -2.481 0.013295 *
## lBTC6         -3.835e-02   3.353e-02  -1.144 0.253015
## lBTC7         -5.971e-02   3.322e-02  -1.797 0.072627 .
## lBTC8         -4.786e-03   3.290e-02  -0.145 0.884378
## dETH          1.064e-01   1.653e-02   6.435 2.05e-10 ***
## lETH1         -2.998e-02   1.696e-02  -1.767 0.077584 .
## lETH2          1.044e-02   1.694e-02   0.616 0.537993
## lETH3         -7.427e-03   1.701e-02  -0.437 0.662480
## lETH4         -1.163e-03   1.704e-02  -0.068 0.945630
## lETH5         -8.967e-03   1.663e-02  -0.539 0.589969
## lETH6          5.130e-04   1.662e-02   0.031 0.975379
## lETH7         -2.683e-02   1.636e-02  -1.639 0.101486
## lETH8         -1.176e-02   1.630e-02  -0.721 0.470935
## dLTC           3.345e-01   1.936e-02  17.277 < 2e-16 ***
## lLTC1         -7.937e-03   2.247e-02  -0.353 0.724060
## lLTC2          1.410e-02   2.240e-02   0.629 0.529245
## lLTC3          1.544e-02   2.217e-02   0.696 0.486358
## lLTC4          5.129e-02   2.203e-02   2.329 0.020098 *
## lLTC5          4.854e-02   2.203e-02   2.204 0.027798 *
## lLTC6          8.428e-03   2.228e-02   0.378 0.705318
## lLTC7          1.340e-02   2.216e-02   0.604 0.545735

```

## llTC8	-2.624e-05	2.217e-02	-0.001	0.999056	
## dtransact_count	1.283e-02	1.198e-02	1.071	0.284526	
## ltransact_count1	4.438e-02	1.506e-02	2.946	0.003307	**
## ltransact_count2	6.350e-02	1.558e-02	4.077	4.99e-05	***
## ltransact_count3	4.000e-02	1.564e-02	2.558	0.010685	*
## ltransact_count4	4.576e-02	1.510e-02	3.031	0.002511	**
## ltransact_count5	4.512e-02	1.478e-02	3.052	0.002344	**
## ltransact_count6	2.020e-02	1.411e-02	1.432	0.152612	
## ltransact_count7	1.367e-02	1.303e-02	1.049	0.294552	
## ltransact_count8	1.169e-02	1.161e-02	1.007	0.314229	
## dtotalcoin	2.608e-05	1.076e-02	0.002	0.998066	
## ltotalcoin1	7.945e-03	1.324e-02	0.600	0.548628	
## ltotalcoin2	-1.122e-02	1.372e-02	-0.818	0.413851	
## ltotalcoin3	2.279e-02	1.381e-02	1.651	0.099187	.
## ltotalcoin4	5.160e-03	1.366e-02	0.378	0.705794	
## ltotalcoin5	8.438e-03	1.354e-02	0.623	0.533214	
## ltotalcoin6	2.286e-03	1.307e-02	0.175	0.861154	
## ltotalcoin7	-1.067e-02	1.227e-02	-0.869	0.384952	
## ltotalcoin8	5.498e-03	1.086e-02	0.506	0.612791	
## dgg_btc	7.617e-03	5.776e-03	1.319	0.187573	
## lgg_btc1	1.555e-02	5.880e-03	2.644	0.008338	**
## lgg_btc2	1.509e-02	5.873e-03	2.570	0.010336	*
## lgg_btc3	7.937e-03	5.909e-03	1.343	0.179531	
## lgg_btc4	-2.678e-04	5.896e-03	-0.045	0.963787	
## lgg_btc5	1.966e-02	5.842e-03	3.365	0.000800	***
## lgg_btc6	2.145e-02	5.853e-03	3.664	0.000263	***
## lgg_btc7	-2.411e-04	5.886e-03	-0.041	0.967339	
## lgg_btc8	-6.033e-03	5.862e-03	-1.029	0.303706	
## dcy_at	3.963e-04	1.706e-03	0.232	0.816384	
## lcy_at1	-1.361e-03	1.798e-03	-0.757	0.449251	
## lcy_at2	1.233e-03	1.792e-03	0.688	0.491610	
## lcy_at3	-1.895e-04	1.783e-03	-0.106	0.915368	
## lcy_at4	1.263e-03	1.785e-03	0.708	0.479264	
## lcy_at5	-1.216e-03	1.793e-03	-0.678	0.497916	
## lcy_at6	3.003e-04	1.800e-03	0.167	0.867539	
## lcy_at7	-8.515e-04	1.778e-03	-0.479	0.632042	
## lcy_at8	7.240e-05	1.742e-03	0.042	0.966865	
## dvix	-1.881e-02	1.558e-02	-1.207	0.227673	
## lvix1	-9.773e-03	1.559e-02	-0.627	0.530952	
## lvix2	-2.954e-02	1.559e-02	-1.895	0.058481	.
## lvix3	-1.351e-02	1.571e-02	-0.860	0.390071	
## lvix4	-6.728e-03	1.569e-02	-0.429	0.668129	
## lvix5	1.923e-02	1.553e-02	1.239	0.215853	
## lvix6	1.771e-02	1.549e-02	1.144	0.253073	
## lvix7	2.526e-02	1.556e-02	1.623	0.104962	
## lvix8	2.523e-03	1.557e-02	0.162	0.871311	
## dsum_vendor	3.148e+00	1.631e+00	1.930	0.053957	.
## lsum_vendor1	2.944e+00	1.656e+00	1.777	0.075876	.
## lsum_vendor2	-3.214e+00	1.659e+00	-1.936	0.053134	.
## lsum_vendor3	-3.025e+00	1.675e+00	-1.806	0.071316	.
## lsum_vendor4	5.132e-01	1.668e+00	0.308	0.758383	
## lsum_vendor5	-1.782e-02	1.662e+00	-0.011	0.991449	
## lsum_vendor6	-1.498e+00	1.659e+00	-0.903	0.366884	
## lsum_vendor7	-5.232e-01	1.653e+00	-0.316	0.751747	

```

## lsum_vendor8      1.677e+00  1.650e+00   1.017 0.309512
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03178 on 861 degrees of freedom
## (19 observations deleted due to missingness)
## Multiple R-squared:  0.4505, Adjusted R-squared:  0.393
## F-statistic: 7.842 on 90 and 861 DF,  p-value: < 2.2e-16

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## Call:
## lm(formula = str, data = tsdata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.168031 -0.014287  0.000066  0.014367  0.171343
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    1.9187308   0.4755503   4.035 5.92e-05 ***
## lBTC1          -0.0656796   0.0261671  -2.510 0.012245 *
## lBTC2          -0.0575118   0.0258895  -2.221 0.026566 *
## lBTC4          -0.0954600   0.0309639  -3.083 0.002111 **
## lBTC5          -0.0854926   0.0309796  -2.760 0.005902 **
## lBTC7          -0.0619128   0.0257149  -2.408 0.016252 *
## dETH           0.1004966   0.0158379   6.345 3.49e-10 ***
## dLTC           0.3334709   0.0184088  18.115 < 2e-16 ***
## lLTC4          0.0493240   0.0209197   2.358 0.018594 *
## lLTC5          0.0545425   0.0208826   2.612 0.009153 **
## ltransact_count1 0.0355565   0.0114368   3.109 0.001936 **
## ltransact_count2 0.0473599   0.0110094   4.302 1.88e-05 ***
## ltransact_count3 0.0264891   0.0109148   2.427 0.015421 *
## ltransact_count4 0.0278647   0.0097215   2.866 0.004248 **
## ltransact_count5 0.0307220   0.0090193   3.406 0.000687 ***
## lttotalcoin3    0.0226672   0.0090551   2.503 0.012479 *
## lttotalcoin7   -0.0158087   0.0082853  -1.908 0.056699 .
## lgg_btc1       0.0158966   0.0055042   2.888 0.003968 **
## lgg_btc2       0.0155390   0.0055400   2.805 0.005140 **
## lgg_btc5       0.0177672   0.0054986   3.231 0.001277 **
## lgg_btc6       0.0215634   0.0054398   3.964 7.94e-05 ***
## lcy_at4        0.0008914   0.0015780   0.565 0.572277
## lvix2         -0.0301922   0.0146840  -2.056 0.040053 *
## lvix7          0.0272312   0.0147998   1.840 0.066097 .
## dsum_vendor    3.3156465   1.5486585   2.141 0.032539 *
## lsum_vendor1    2.9123578   1.5650493   1.861 0.063083 .
## lsum_vendor2   -2.8982468   1.5714385  -1.844 0.065459 .
## lsum_vendor3   -3.5707959   1.5788660  -2.262 0.023955 *
## btc_lg         0.0637636   0.0100703   6.332 3.79e-10 ***
## eth_lg        -0.0008532   0.0017998  -0.474 0.635570
## ltc_lg        -0.0157140   0.0043301  -3.629 0.000300 ***
## gg_btc        -0.0095944   0.0022016  -4.358 1.46e-05 ***
## transact_count -0.0280743   0.0088868  -3.159 0.001635 **
## totalcoin      0.0021527   0.0055407   0.389 0.697719

```

```

## sum_vendor      -0.2165491  0.0534319  -4.053 5.49e-05 ***
## future          -0.0130032  0.0066181  -1.965 0.049739 *
## cy_at           -0.0012330  0.0007771  -1.587 0.112912
## vix             0.0054229  0.0059120   0.917 0.359244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03142 on 915 degrees of freedom
## (18 observations deleted due to missingness)
## Multiple R-squared:  0.429, Adjusted R-squared:  0.406
## F-statistic: 18.58 on 37 and 915 DF, p-value: < 2.2e-16

## Warning in model.matrix.default(model, data = structure(list(dBTC =
## c(-0.00216877820185601, : the response appeared on the right-hand side and
## was dropped

## Warning in model.matrix.default(model, data = structure(list(dBTC =
## c(-0.00216877820185601, : problem with term 1 in model.matrix: no columns
## are assigned

## Wald test for btc_lg eth_lg ltc_lg gg_btc transact_count totalcoin sum_vendor cy_at
## in lm(formula = str, data = tsdata)
## F = 6.574609 on 8 and 915 df: p= 2.2894e-08

## Long Run Elasticities:

## Variable, Coeff, Std-Errors, t-stat, prob
## (Intercept), -30.09134 , 0.4755503 , 4.034759 , 5.922244e-05
## 1ETH1, 0.01338124 , 0.001799846 , -0.4740603 , 0.63557 ,
## 1LTC1, 0.2464411 , 0.004330106 , -3.629001 , 0.0003002814
## BTC_searchterm, 0.1504677 , -0.002201564 , 4.357973 , -1.461397e-05
## Transaction Count, 0.4402868 , -0.008886839 , 3.159082 , -0.001634612
## Total Coin, -0.0337608 , -0.00554075 , -0.3885231 , -0.6977194
## Vendors, 3.396127 , -0.05343191 , 4.052805 , -5.490743e-05
## Futures Price, 0.2039283 , -0.006618057 , 1.964805 , -0.04973902
## Cyberattack searchteam 0.01933748 , -0.0007770714 , 1.586761 , -0.1129124
## VIX Index, -0.0850465 , -0.005911975 , -0.9172684 , -0.3592437
## [1] "dBTC ~ dBTC + 1BTC1 + 1BTC2 + 1BTC4 + 1BTC5 + 1BTC7 + dETH + dLTC + 1LTC4 + 1LTC5 + 1transact_
## Warning in model.matrix.default(mt, mf, contrasts): the response appeared
## on the right-hand side and was dropped

## Warning in model.matrix.default(mt, mf, contrasts): problem with term 1 in
## model.matrix: no columns are assigned

## [1] "dBTC ~ dBTC + 1BTC1 + 1BTC2 + 1BTC4 + 1BTC5 + 1BTC7 + dETH + dLTC + 1LTC4 + 1LTC5 + 1transact_
##
## Call:
## lm(formula = str, data = tsdata)
##
## Coefficients:
## (Intercept)          1BTC1          1BTC2          1BTC4

```

```
##      0.0006159      -0.0255974      -0.0257293      -0.0622126
##      lBTC5          lBTC7          dETH          dLTC
##      -0.0570218      -0.0477486          0.1004123      0.3415820
##      lLTC4          LLTC5  ltransact_count1  ltransact_count2
##      0.0373690          0.0460394          0.0138301          0.0286697
##  ltransact_count3  ltransact_count4  ltransact_count5      ltotalcoin3
##      0.0115202          0.0192619          0.0284508          0.0234345
##      ltotalcoin7      lgg_btc1          lgg_btc2          lgg_btc5
##      -0.0165198          0.0117632          0.0112327          0.0144150
##      lgg_btc6          lcy_at4          lvix2          lvix7
##      0.0193681          0.0005068          -0.0323625          0.0269070
##      dsum_vendor      lsum_vendor1      lsum_vendor2      lsum_vendor3
##      4.2412618          3.6468681          -2.5311081          -2.9463273
##      ecm1
##      -0.0024824
```

```
##
```

```
## Call:
```

```
## lm(formula = str, data = tsdata)
```

```
##
```

```
## Residuals:
```

```
##      Min          1Q      Median          3Q          Max
## -0.188084 -0.013636  0.000424  0.014894  0.184754
```

```
##
```

```
## Coefficients:
```

```
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.0006159  0.0017082   0.361 0.718529
## lBTC1          -0.0255974  0.0268319  -0.954 0.340337
## lBTC2          -0.0257293  0.0264656  -0.972 0.331215
## lBTC4          -0.0622126  0.0318805  -1.951 0.051308 .
## lBTC5          -0.0570218  0.0317696  -1.795 0.073003 .
## lBTC7          -0.0477486  0.0261356  -1.827 0.068029 .
## dETH           0.1004123  0.0160580   6.253 6.14e-10 ***
## dLTC           0.3415820  0.0187496  18.218 < 2e-16 ***
## lLTC4          0.0373690  0.0213832   1.748 0.080868 .
## lLTC5          0.0460394  0.0212717   2.164 0.030693 *
## ltransact_count1 0.0138301  0.0097225   1.422 0.155224
## ltransact_count2 0.0286697  0.0099802   2.873 0.004164 **
## ltransact_count3 0.0115202  0.0104081   1.107 0.268648
## ltransact_count4 0.0192619  0.0095402   2.019 0.043774 *
## ltransact_count5 0.0284508  0.0090723   3.136 0.001767 **
## ltotalcoin3     0.0234345  0.0092919   2.522 0.011835 *
## ltotalcoin7    -0.0165198  0.0085023  -1.943 0.052322 .
## lgg_btc1        0.0117632  0.0055450   2.121 0.034152 *
## lgg_btc2        0.0112327  0.0056114   2.002 0.045601 *
## lgg_btc5        0.0144150  0.0055826   2.582 0.009972 **
## lgg_btc6        0.0193681  0.0055263   3.505 0.000479 ***
## lcy_at4         0.0005068  0.0016012   0.317 0.751690
## lvix2          -0.0323625  0.0148207  -2.184 0.029243 *
## lvix7           0.0269070  0.0150024   1.794 0.073218 .
## dsum_vendor     4.2412618  1.5343601   2.764 0.005820 **
## lsum_vendor1    3.6468681  1.5435348   2.363 0.018350 *
## lsum_vendor2   -2.5311081  1.5511034  -1.632 0.103060
## lsum_vendor3   -2.9463273  1.5638397  -1.884 0.059874 .
```

```

## ecm1          -0.0024824  0.0087505  -0.284 0.776716
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03227 on 924 degrees of freedom
## (18 observations deleted due to missingness)
## Multiple R-squared:  0.3919, Adjusted R-squared:  0.3735
## F-statistic: 21.27 on 28 and 924 DF,  p-value: < 2.2e-16

## Warning in model.matrix.default(terms(formula), model.frame(formula)): the
## response appeared on the right-hand side and was dropped

## Warning in model.matrix.default(terms(formula), model.frame(formula)):
## problem with term 1 in model.matrix: no columns are assigned

##
## Durbin-Watson test
##
## data: regress
## DW = 1.9179, p-value = 0.1045
## alternative hypothesis: true autocorrelation is greater than 0

## Warning in model.matrix.default(terms(formula), model.frame(formula)): the
## response appeared on the right-hand side and was dropped

## Warning in model.matrix.default(terms(formula), model.frame(formula)):
## problem with term 1 in model.matrix: no columns are assigned

##
## Breusch-Godfrey test for serial correlation of order up to 4
##
## data: regress
## LM test = 1.0713, df1 = 4, df2 = 920, p-value = 0.3694

## Warning in model.matrix.default(terms(formula), mf): the response appeared
## on the right-hand side and was dropped

## Warning in model.matrix.default(terms(formula), mf): problem with term 1 in
## model.matrix: no columns are assigned

##
## RESET test
##
## data: regress
## RESET = 64.391, df1 = 2, df2 = 922, p-value < 2.2e-16

##
## Jarque Bera Test
##
## data: ecm[4:length(ecm)]
## X-squared = 62.859, df = 2, p-value = 2.243e-14

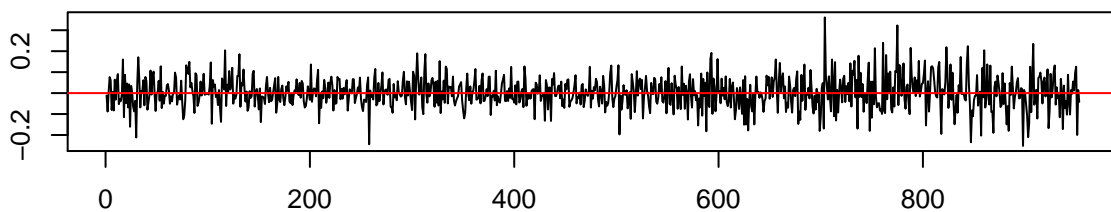
## Warning in adf.test(ecm[4:length(ecm)]): p-value smaller than printed p-
## value

##
## Augmented Dickey-Fuller Test
##
## data: ecm[4:length(ecm)]

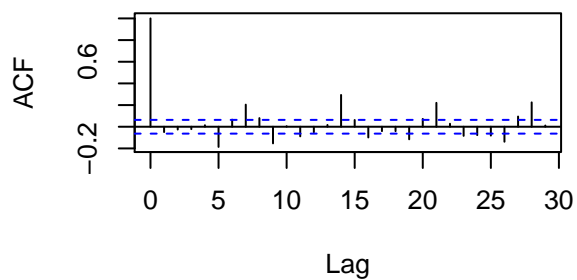
```

```
## Dickey-Fuller = -4.6578, Lag order = 9, p-value = 0.01
## alternative hypothesis: stationary
## [1] "Unit Root Test"
##
## Title:
## Augmented Dickey-Fuller Test
##
## Test Results:
## PARAMETER:
## Lag Order: 4
## STATISTIC:
## DF: -5.1869
## P VALUE:
## t: 3.36e-07
## n: 0.117
##
## Description:
## Thu Apr 19 12:00:59 2018 by user:
```

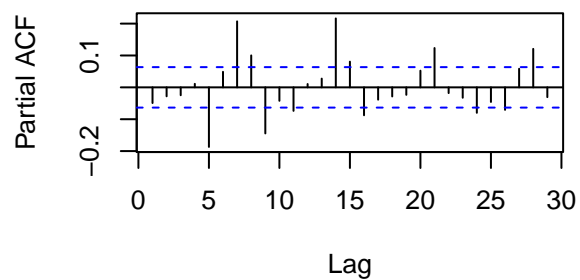
Residuals



Autocorrelations of Residuals



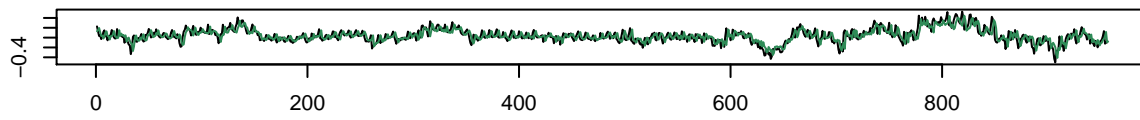
Partial Autocorrelations of Residuals



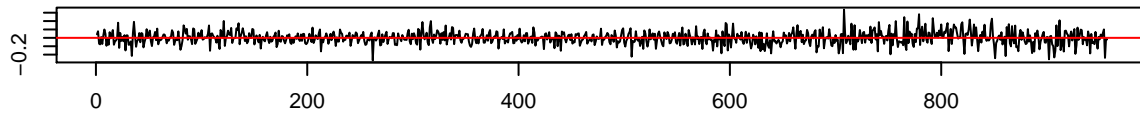
```
##
## Title:
## Augmented Dickey-Fuller Unit Root Test
##
## Test Results:
##
##
## Description:
## Thu Apr 19 12:00:59 2018 by user:
```

Actual and fitted values

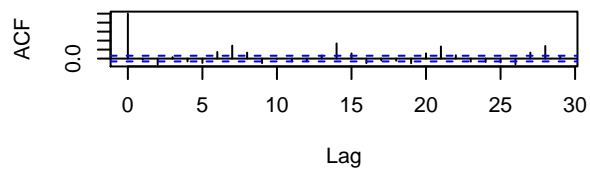
Diagram of fit for model with intercept



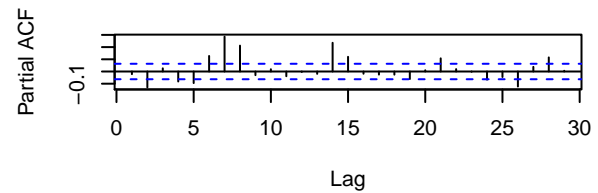
Residuals



Autocorrelations of Residuals



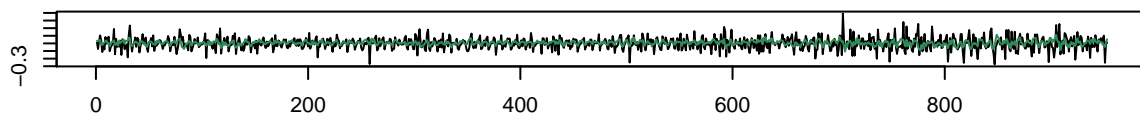
Partial Autocorrelations of Residuals



```
##
## Title:
## Phillips-Perron Unit Root Test
##
## Test Results:
##
##
## Description:
## Thu Apr 19 12:00:59 2018 by user:
```

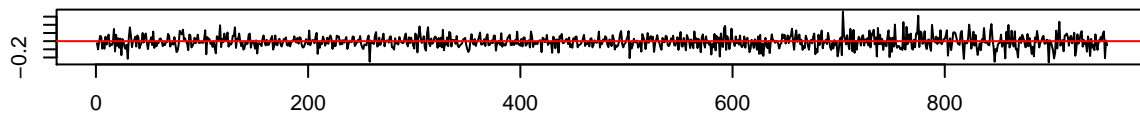
Actual and fitted values

Diagram of fit for test regression

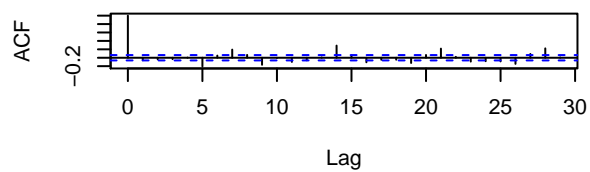


detrending with intercept and 4 lagged differences used in test regression

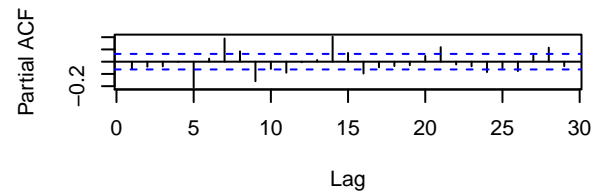
Residuals



Autocorrelations of Residuals



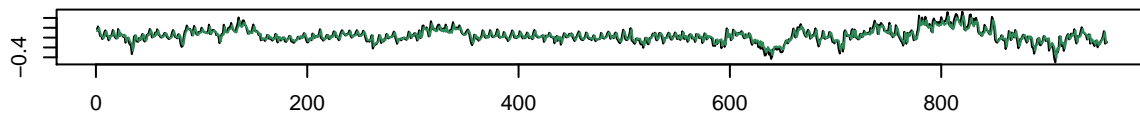
Partial Autocorrelations of Residuals



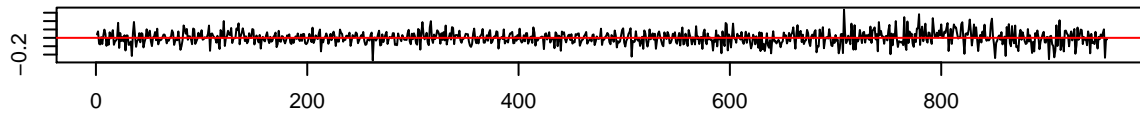
```
##
## Title:
## Elliott-Rothenberg-Stock Unit Root Test
##
## Test Results:
##
##
## Description:
## Thu Apr 19 12:00:59 2018 by user:
```

Actual and fitted values

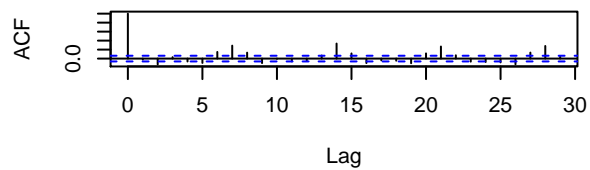
Diagram of fit for model with polynomial degree of 1



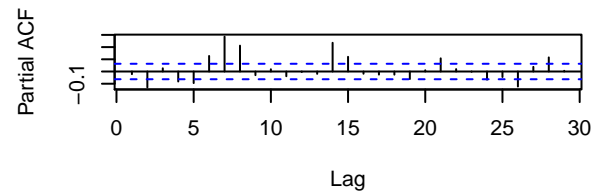
Residuals



Autocorrelations of Residuals



Partial Autocorrelations of Residuals



```
##
## Title:
## Schmidt-Phillips Unit Root Test
##
## Test Results:
## NA
##
## Description:
## Thu Apr 19 12:00:59 2018 by user:
~~~~~' 1. set up time variable
```