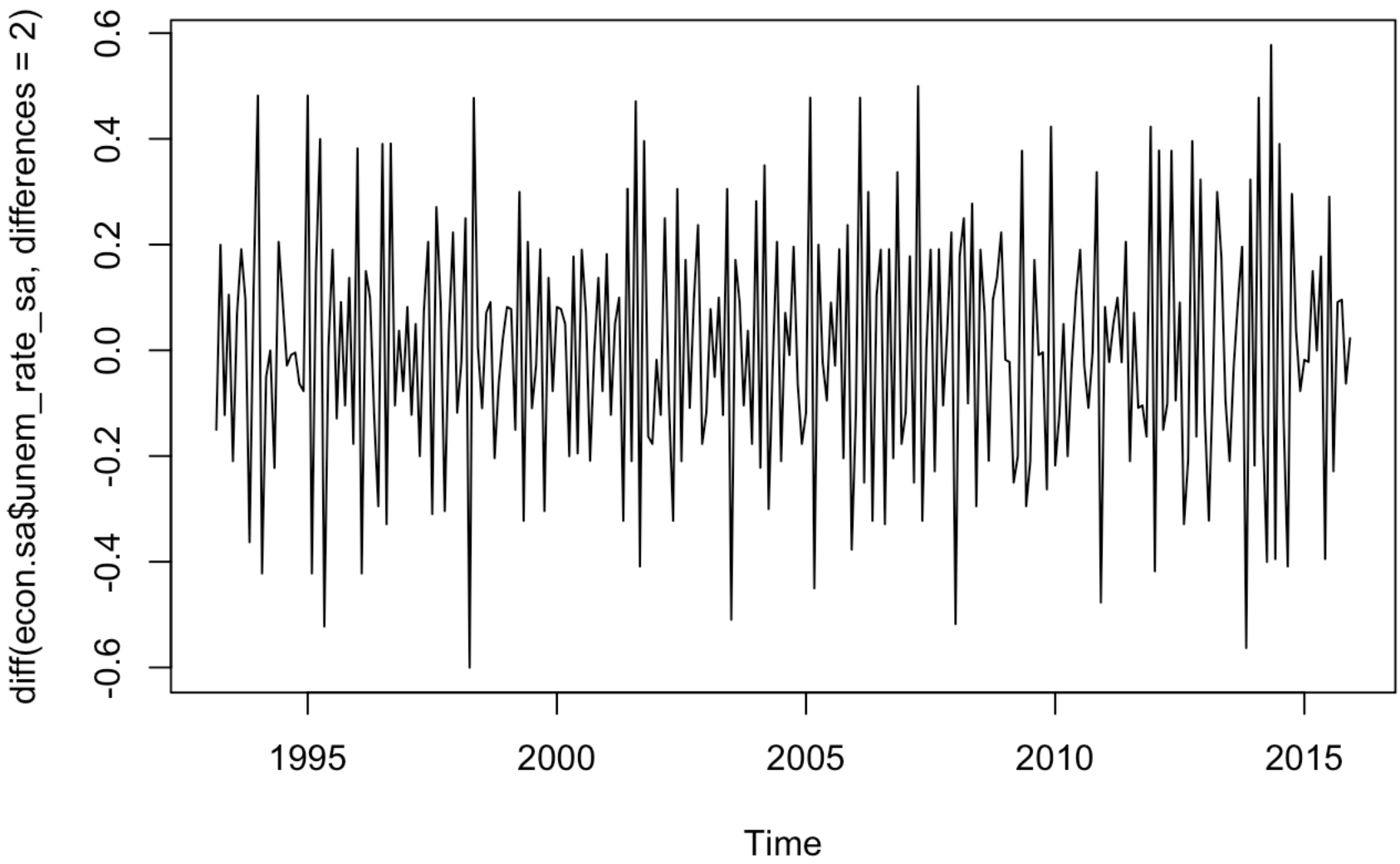
MultivariateR

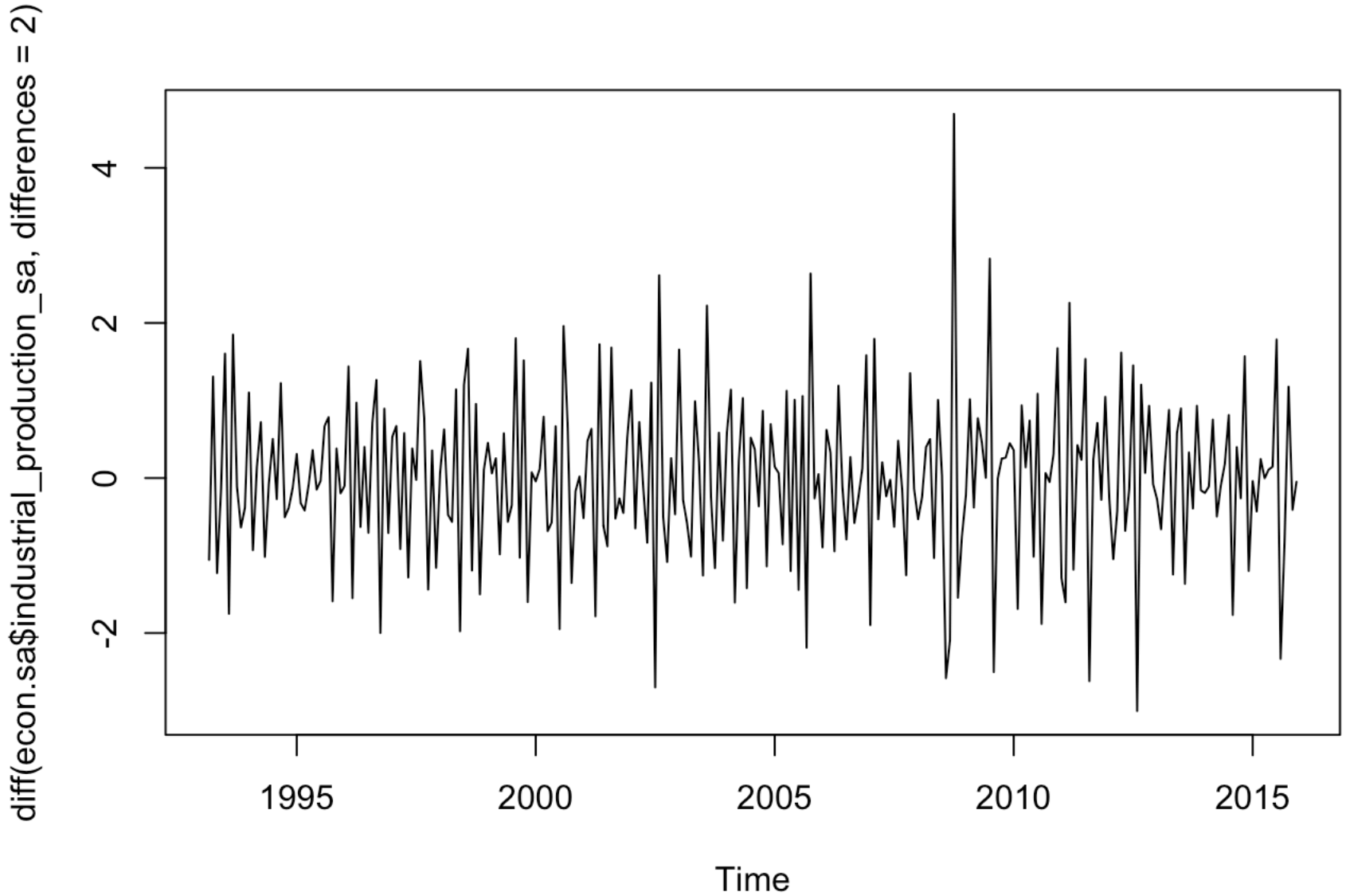
Group4

July 23, 2016

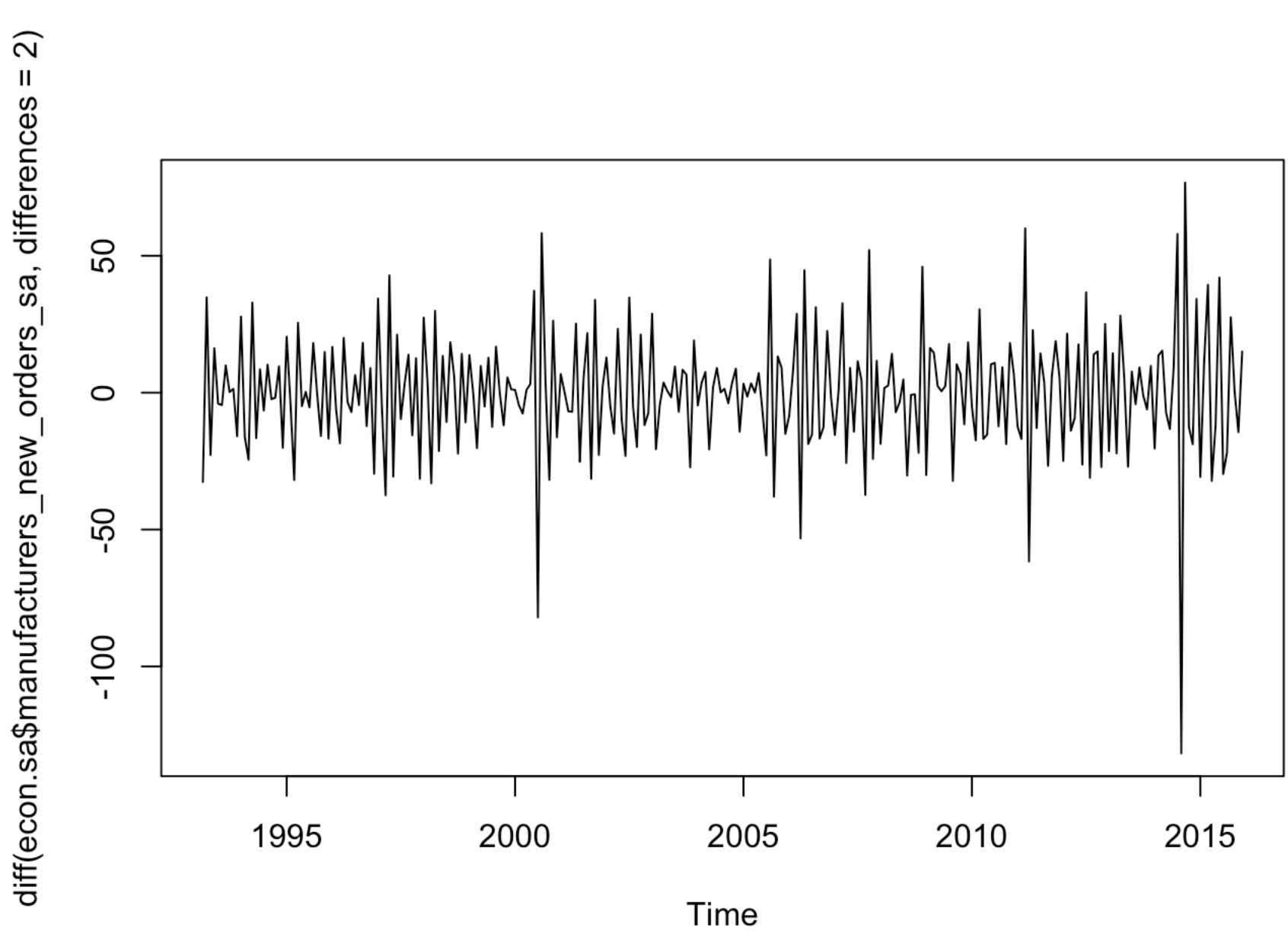
```
## Establish stationarity for predictor variables
plot.ts(diff(econ.sa$unem_rate_sa, differences = 2))
```



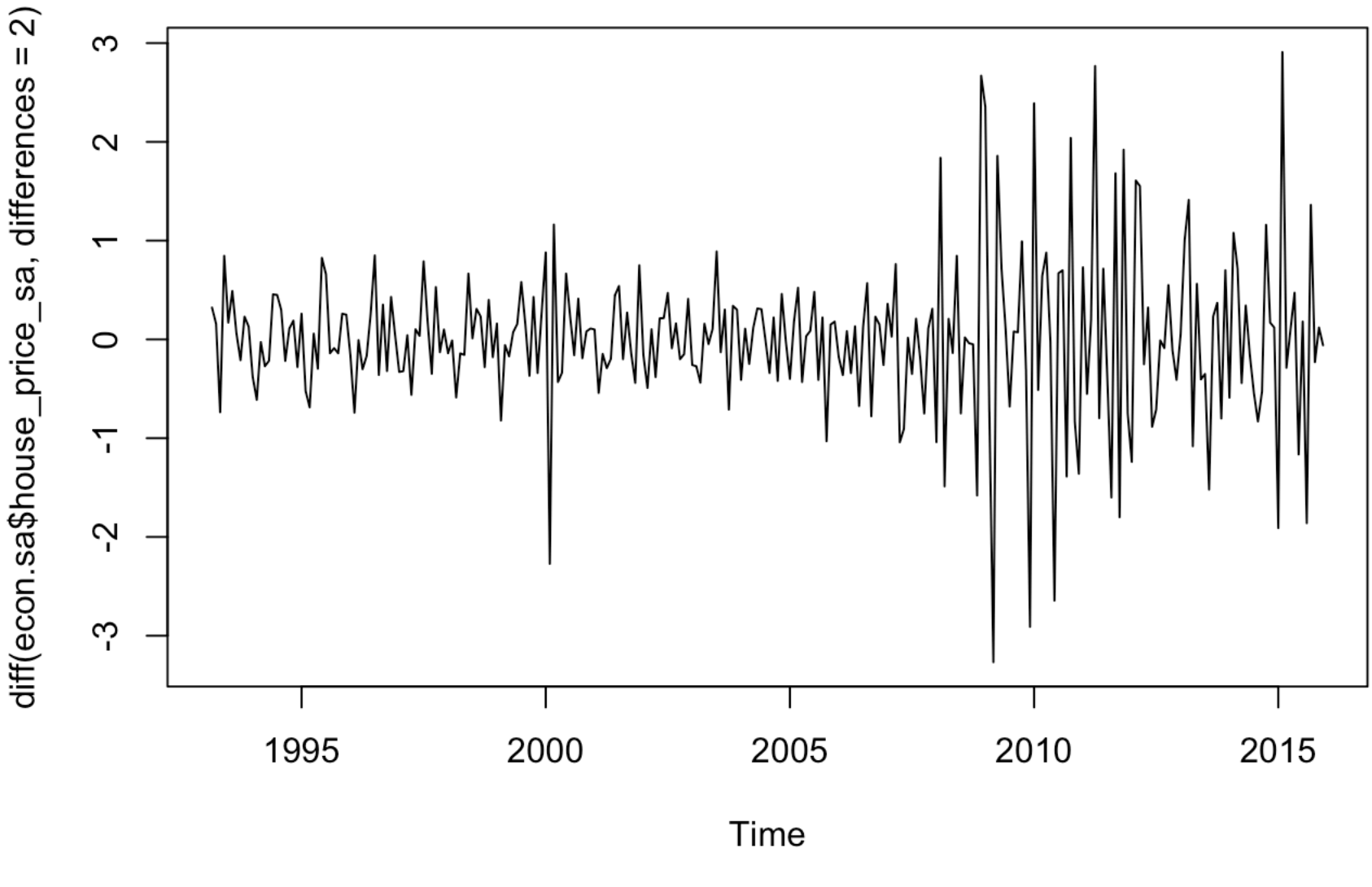

```
plot.ts(diff(econ.sa$industrial_production_sa, differences = 2))
```



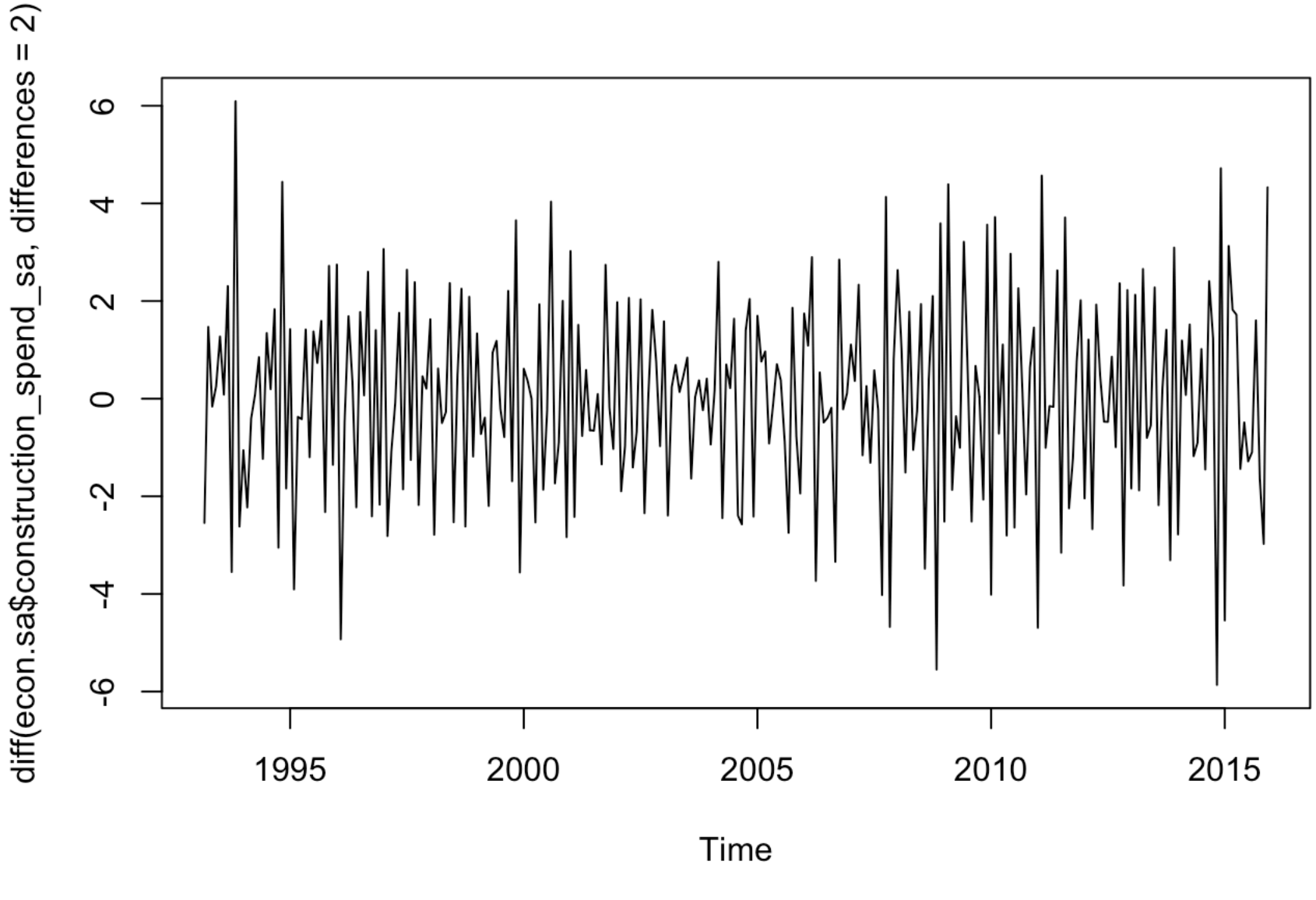

```
plot.ts(diff(econ.sa$manufacturers_new_orders_sa, differences = 2))
```



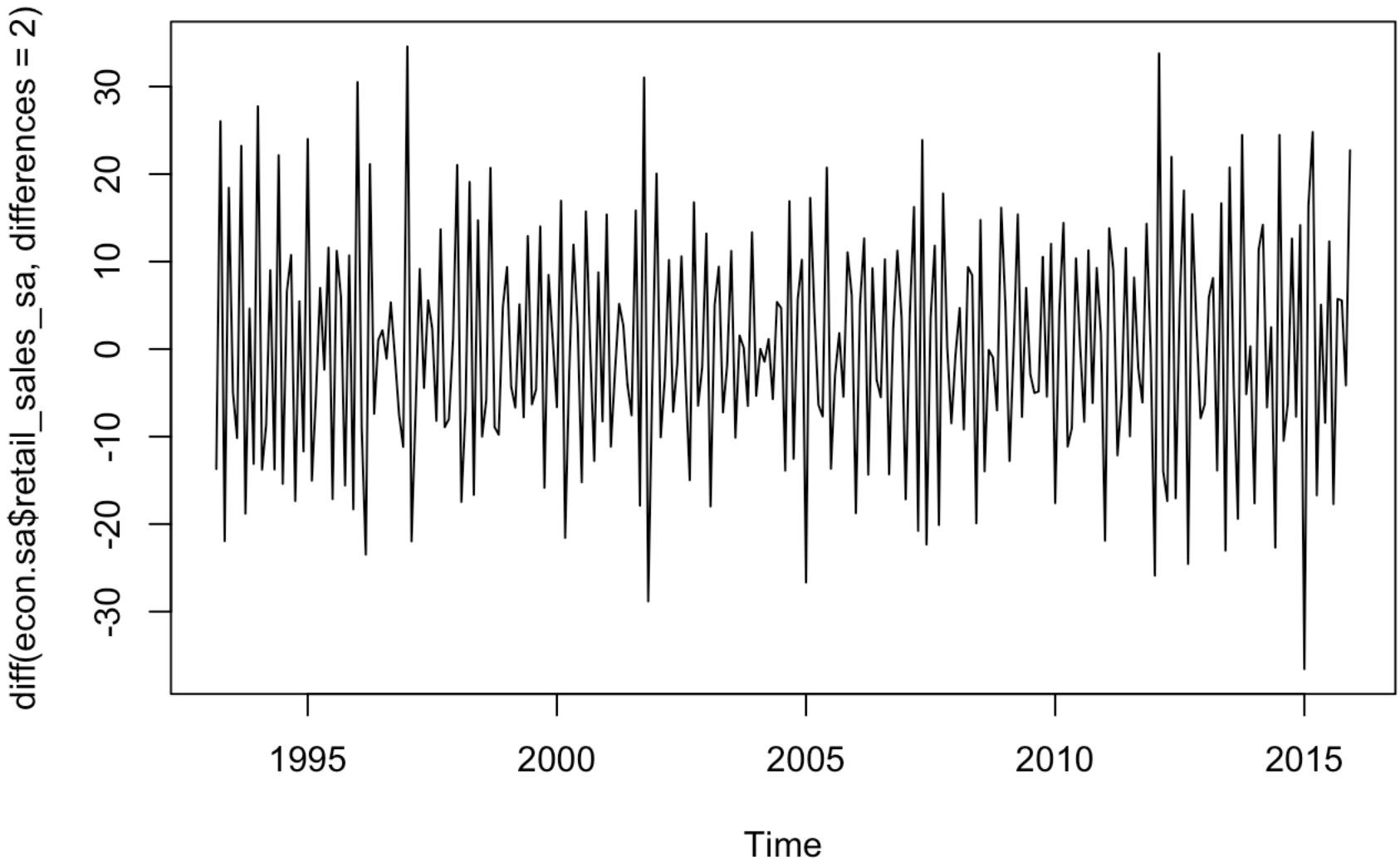

```
plot.ts(diff(econ.sa$house_price_sa, differences = 2))
```



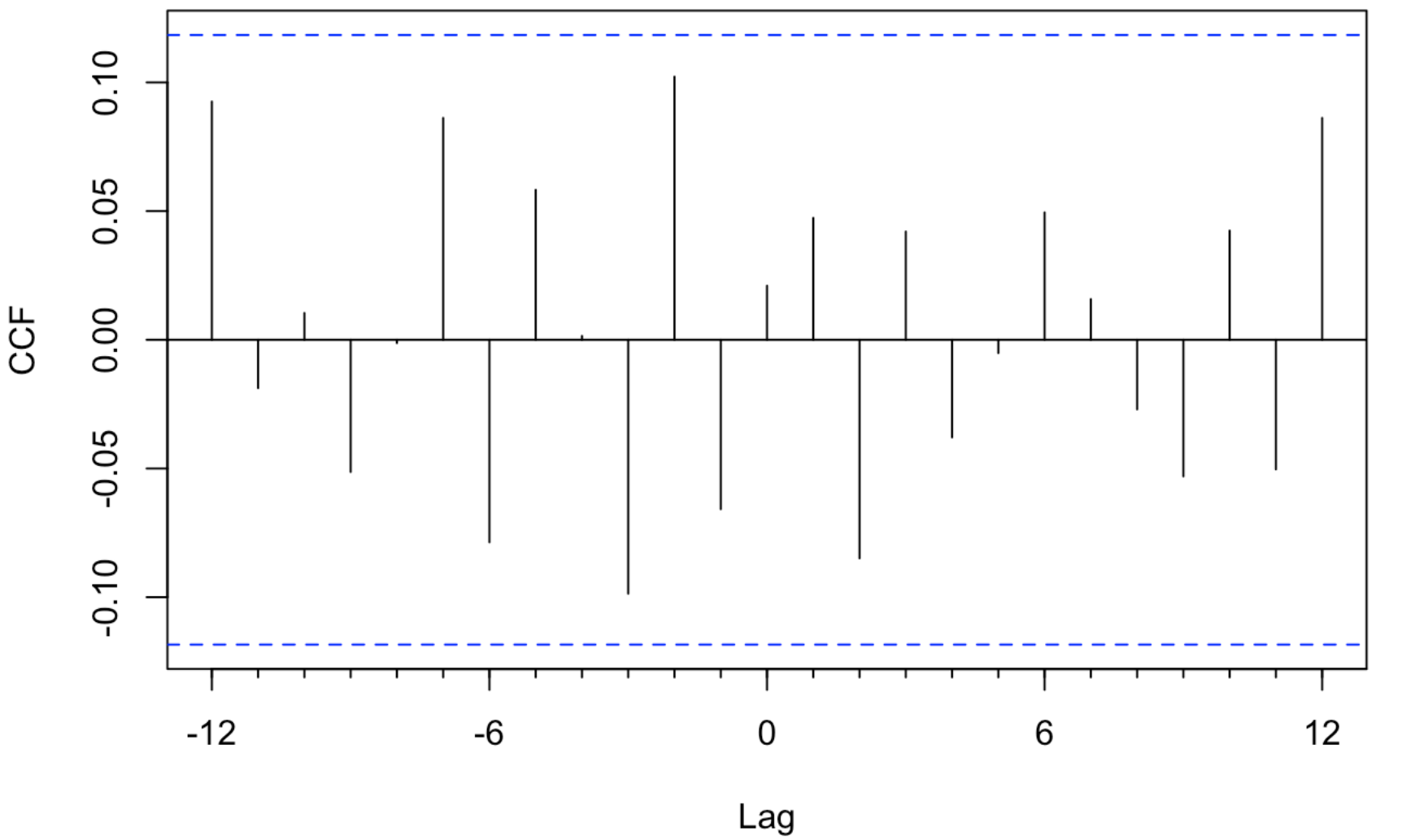

```
plot.ts(diff(econ.sa$construction_spend_sa, differences = 2))
```



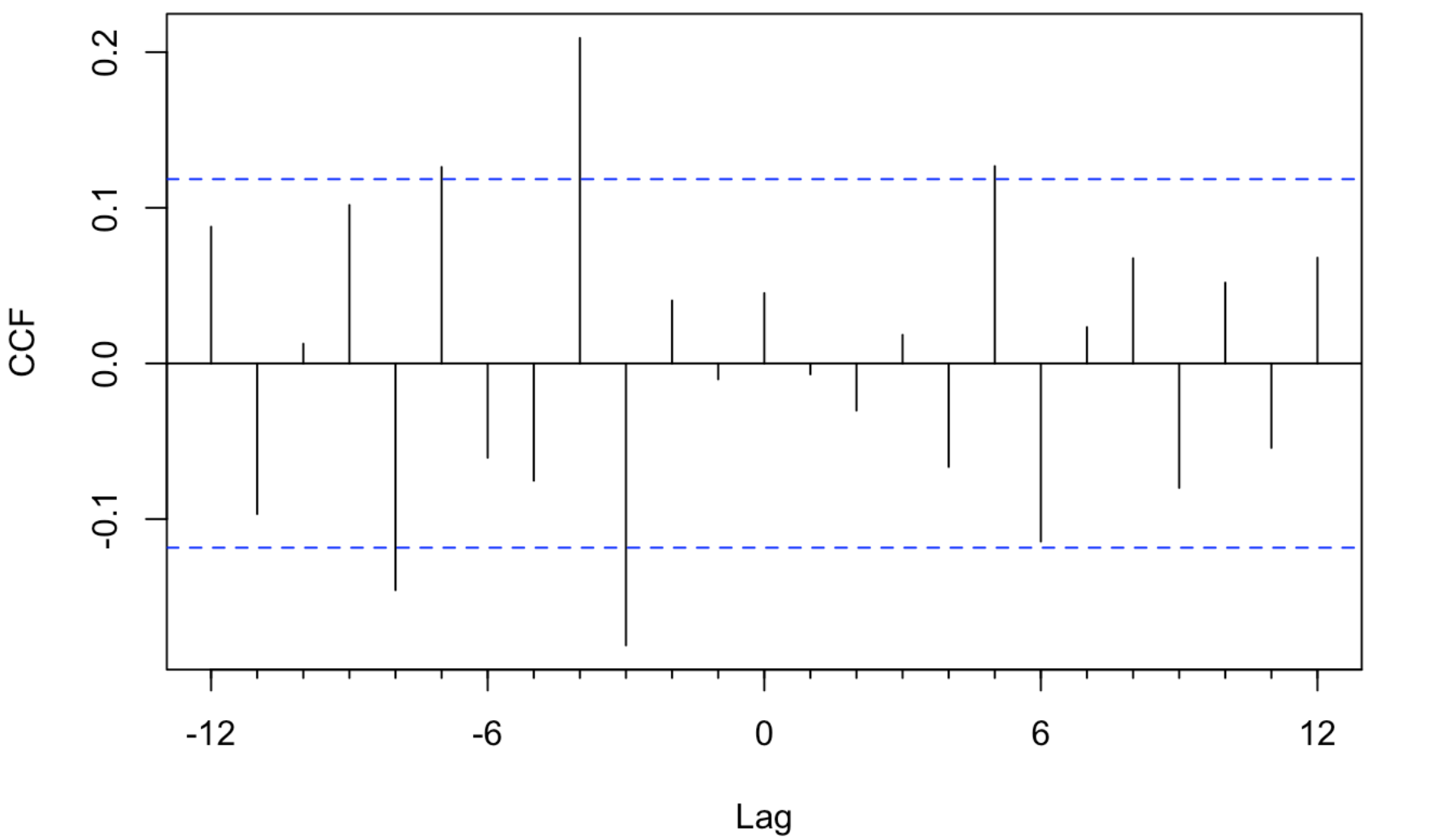

```
plot.ts(diff(econ.sa$retail_sales_sa, differences = 2))
```



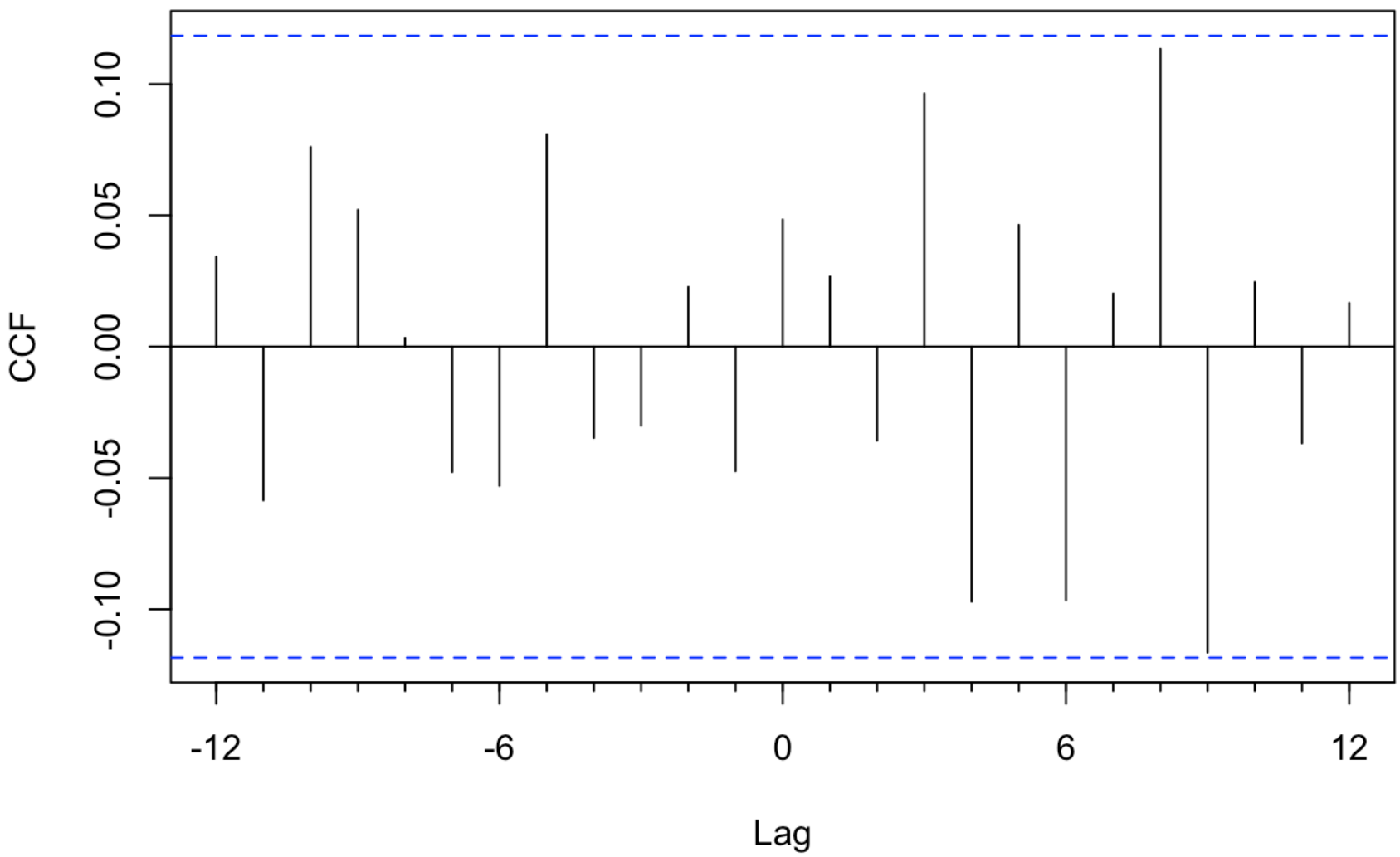

```
econ.sa.st = data.frame(
  unem_rate_sa = diff(econ.sa$unem_rate_sa, differences = 2),
  industrial_production_sa = diff(econ.sa$industrial_production_sa, differences = 2),
  manufacturers_new_orders_sa = diff(econ.sa$manufacturers_new_orders_sa, differences
= 2),
  house_price_sa = diff(econ.sa$house_price_sa, differences = 2),
  construction_spend_sa = diff(econ.sa$construction_spend_sa, differences = 2),
  retail_sales_sa = diff(econ.sa$retail_sales_sa, differences = 2),
  recession_ind = diff(econ.sa$recession_ind, differences = 2)
)


Ccf(x = econ.sa.st$unem_rate_sa, y = econ.sa.st$industrial_production_sa, lag.max = 1
2)
```



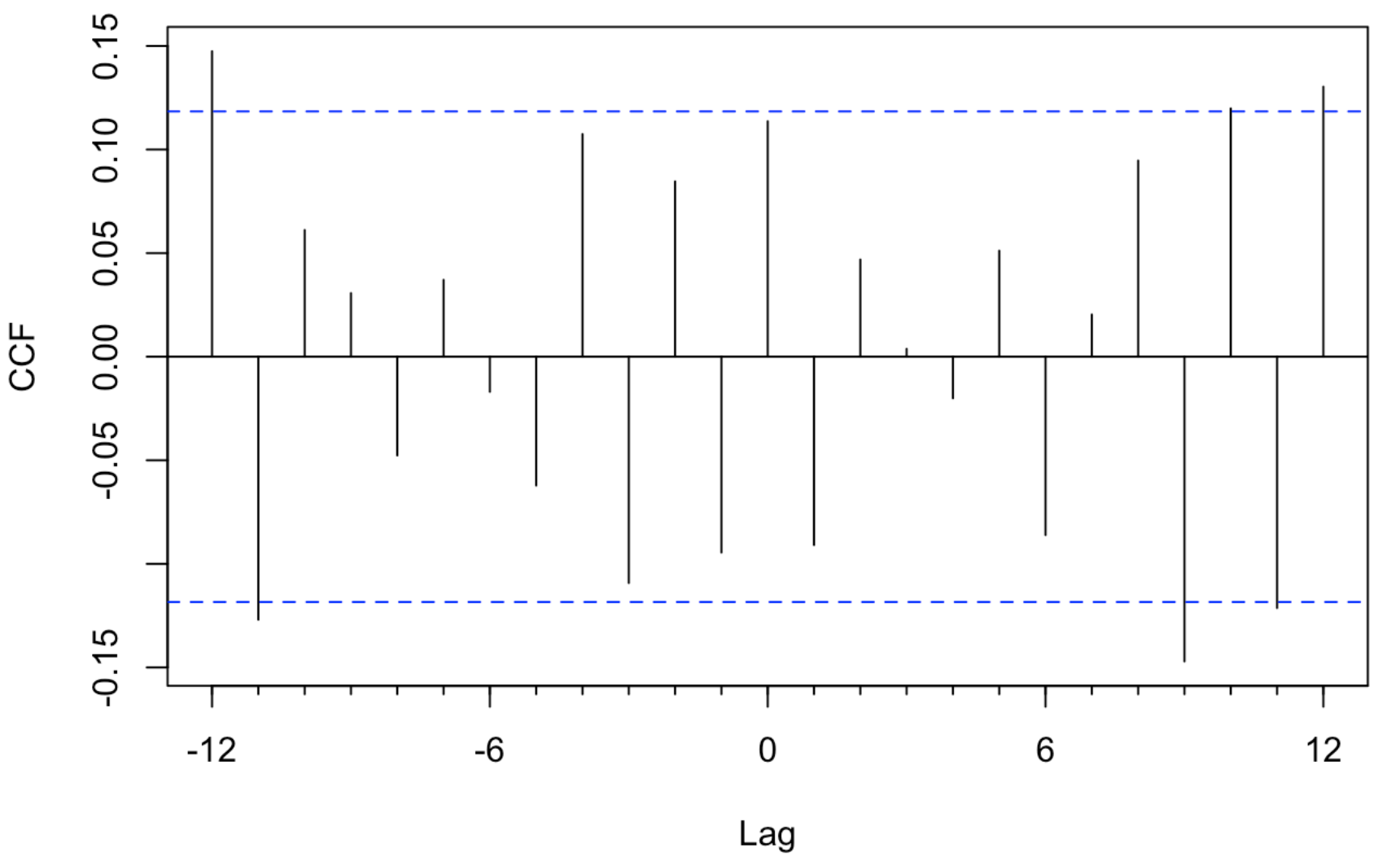

```
Ccf(x = econ.sa.st$unem_rate_sa, y = econ.sa.st$manufacturers_new_orders_sa, lag.max
= 12)
```



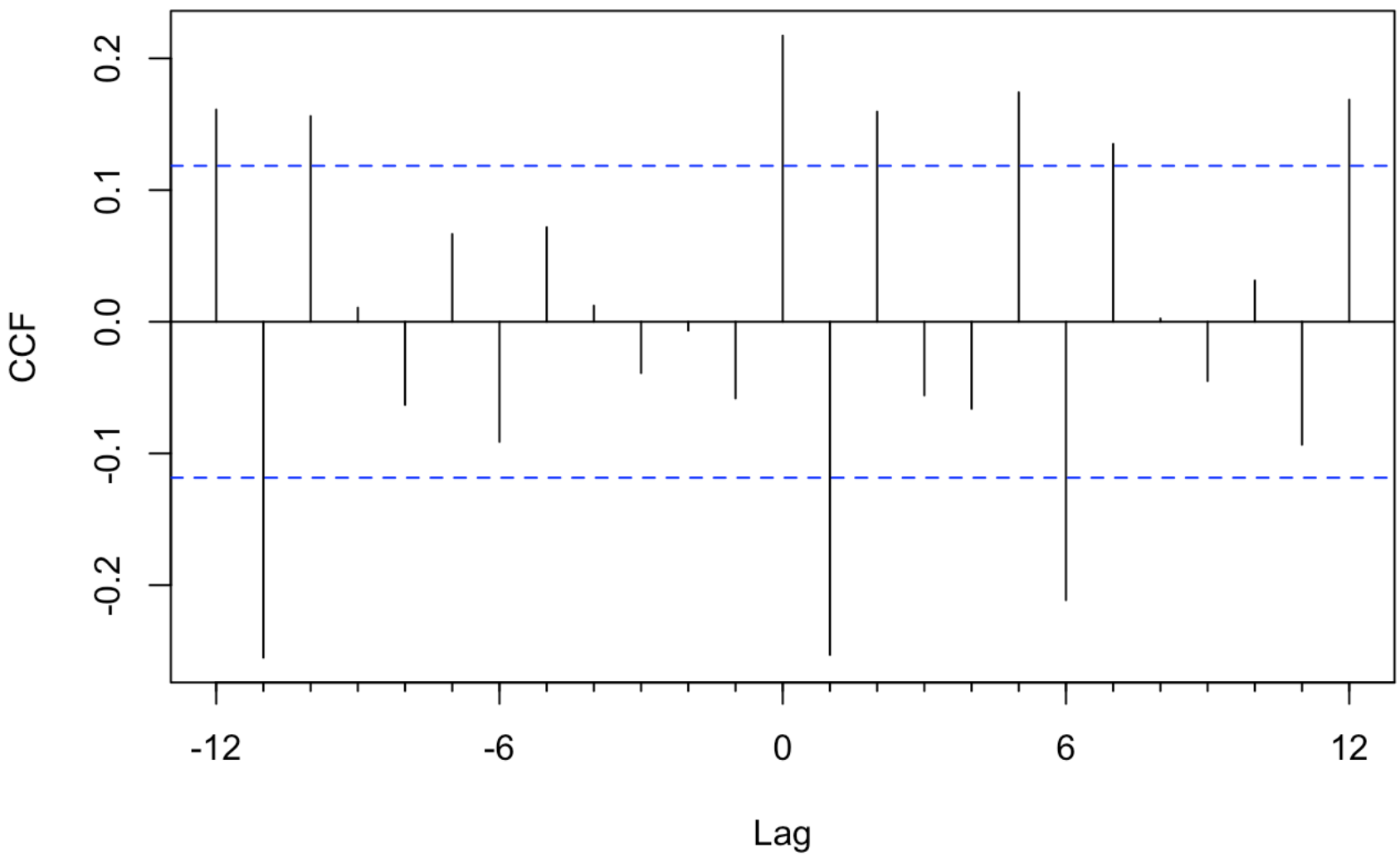

```
Ccf(x = econ.sa.st$unem_rate_sa, y = econ.sa.st$house_price_sa, lag.max = 12)
```



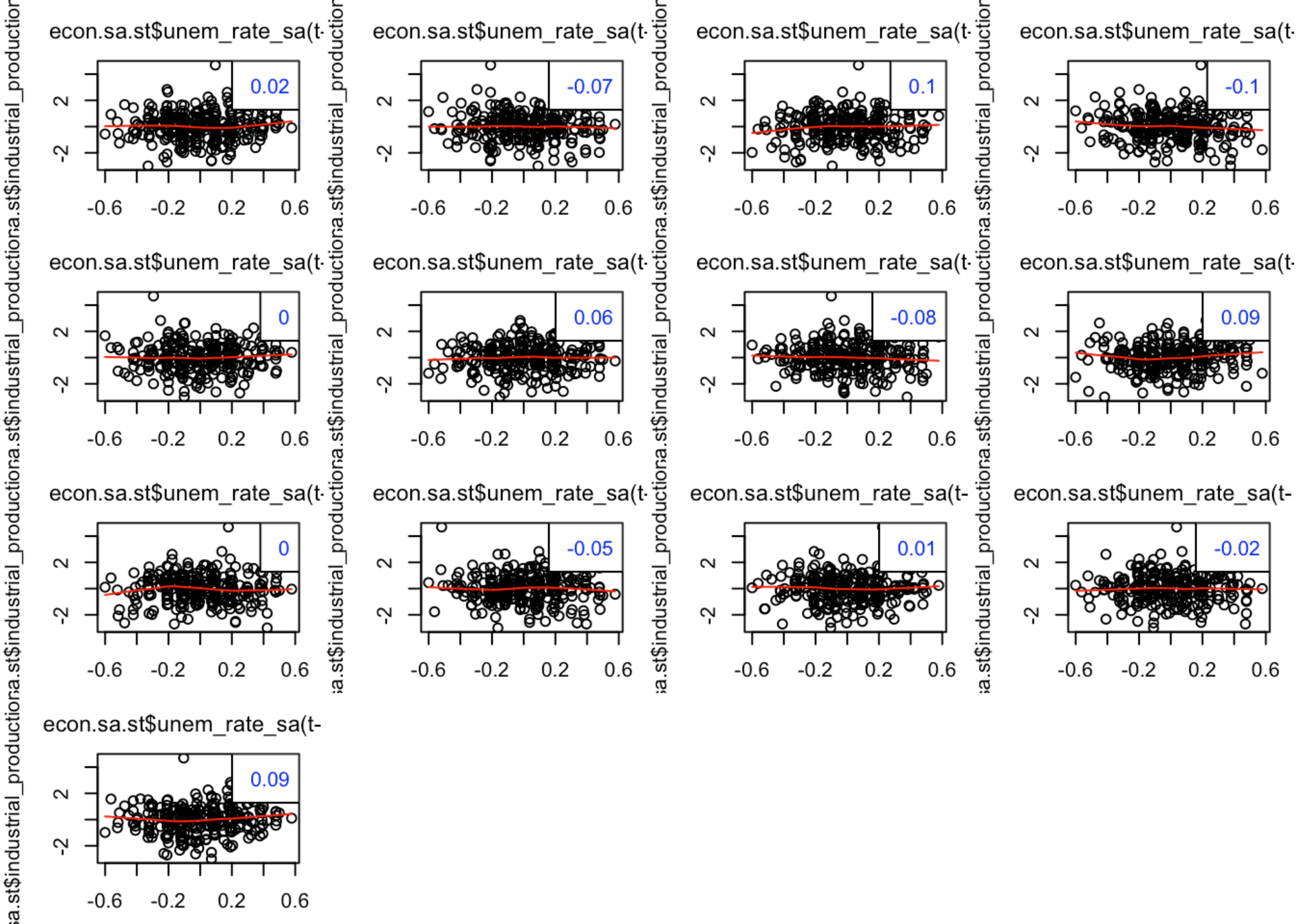

```
Ccf(x = econ.sa.st$unem_rate_sa, y = econ.sa.st$construction_spend_sa, lag.max = 12)
```



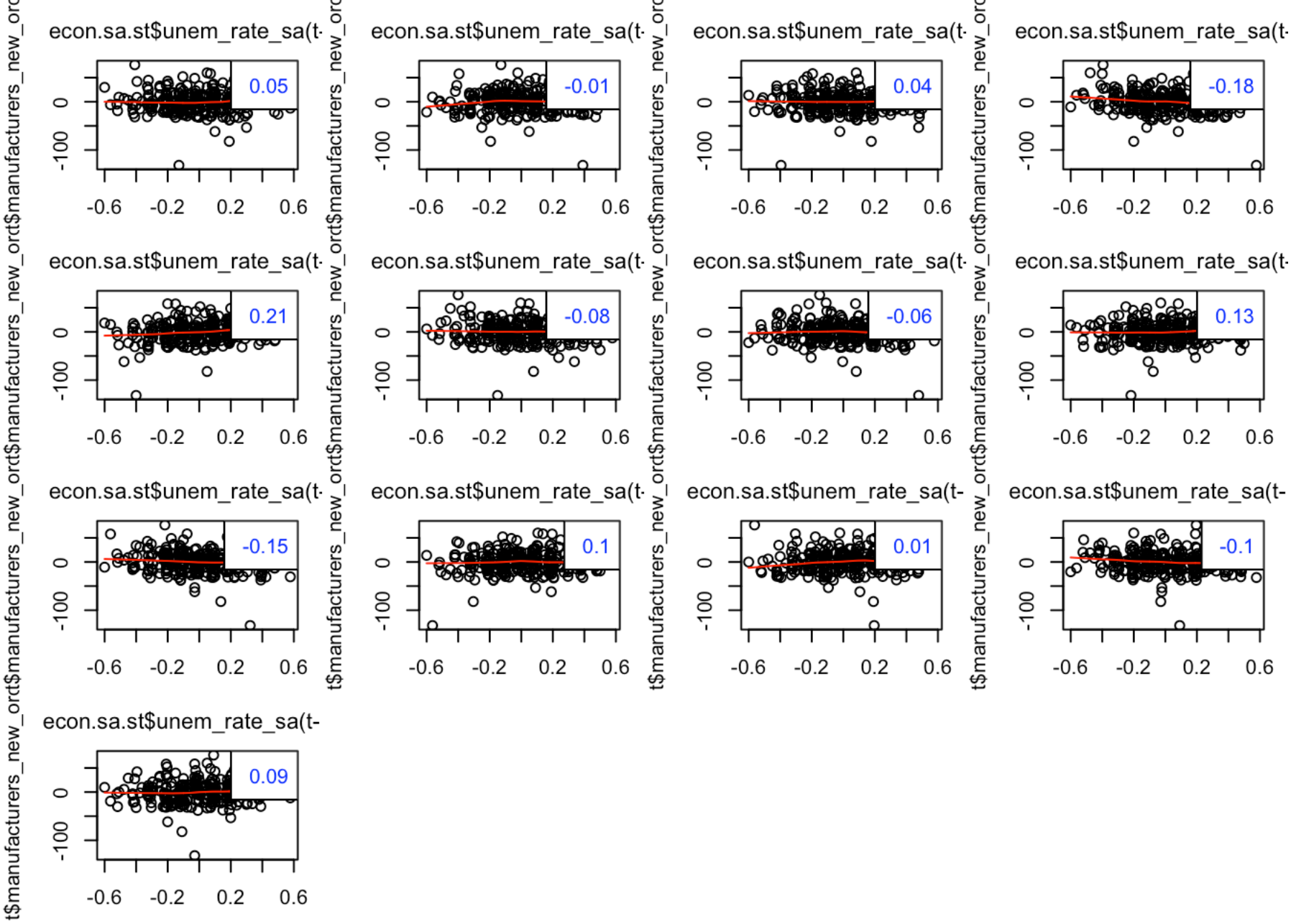

```
Ccf(x = econ.sa.st$unem_rate_sa, y = econ.sa.st$retail_sales_sa, lag.max = 12)
```



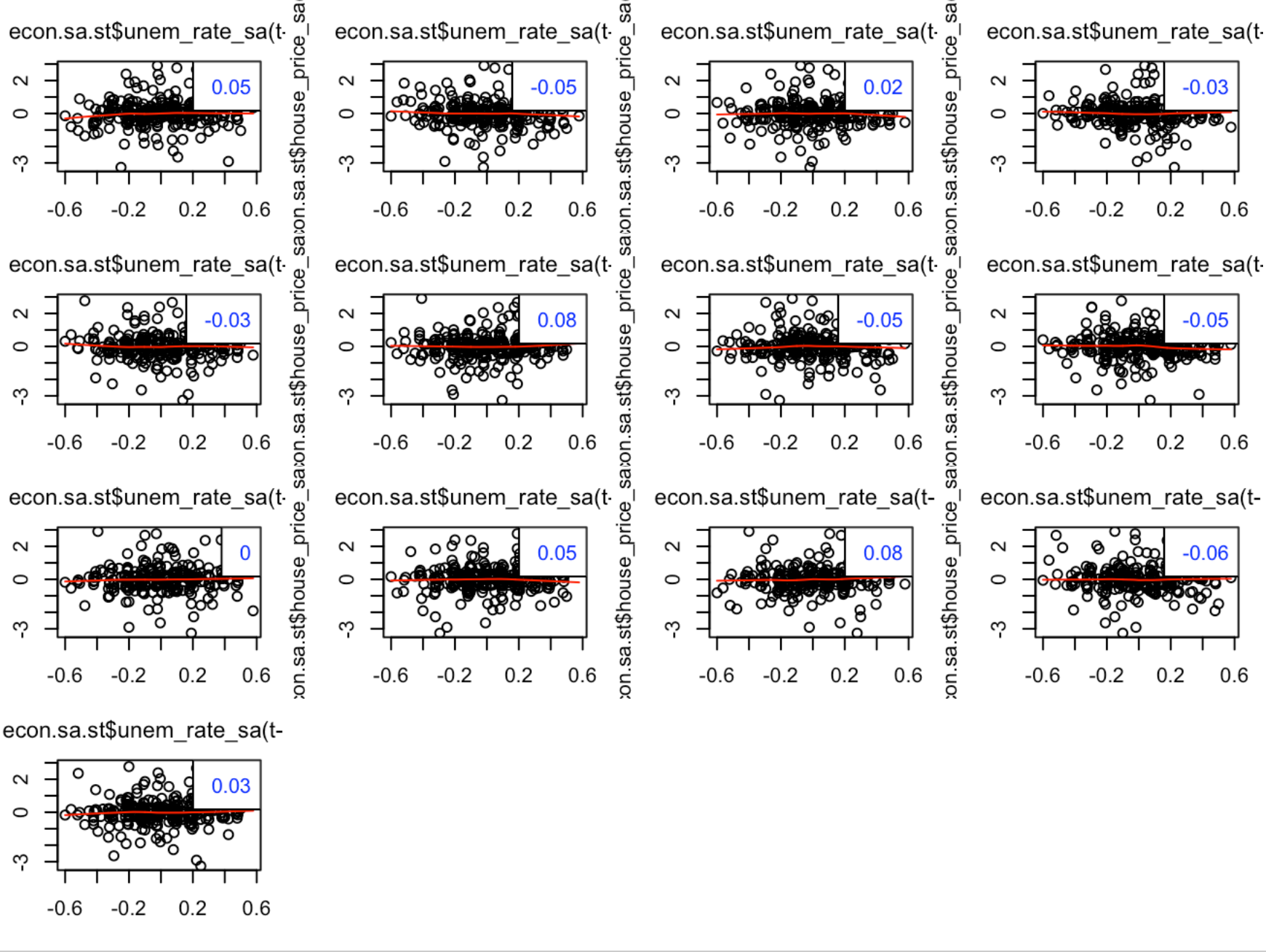

```
lag2.plot(econ.sa.st$unem_rate_sa, econ.sa.st$industrial_production_sa, max.lag = 12)
## No real lag, setting to 2
```



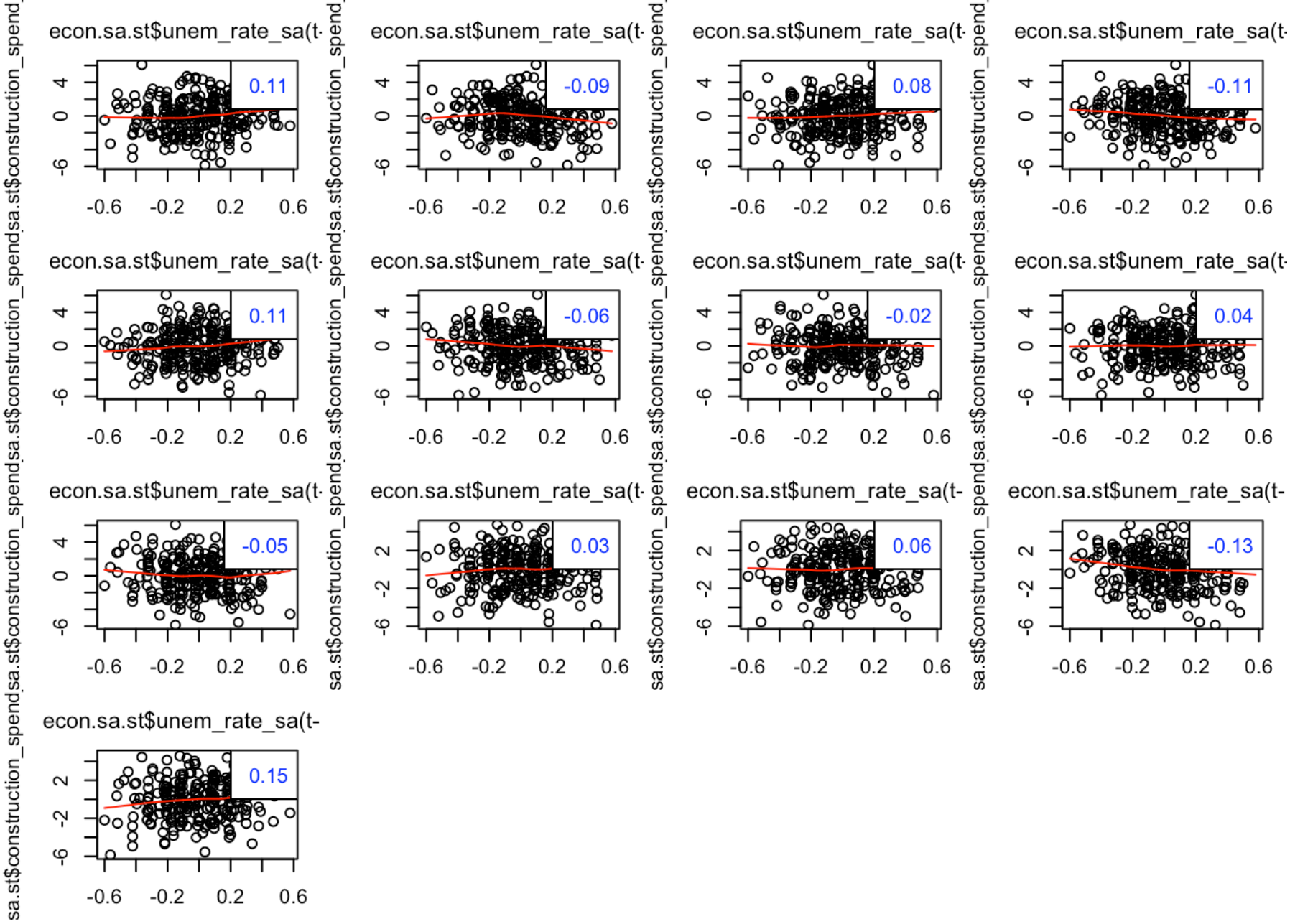
```
lag2.plot(econ.sa.st$unem_rate_sa, econ.sa.st$manufacturers_new_orders_sa, max.lag =
12) ## Lag 4?
```



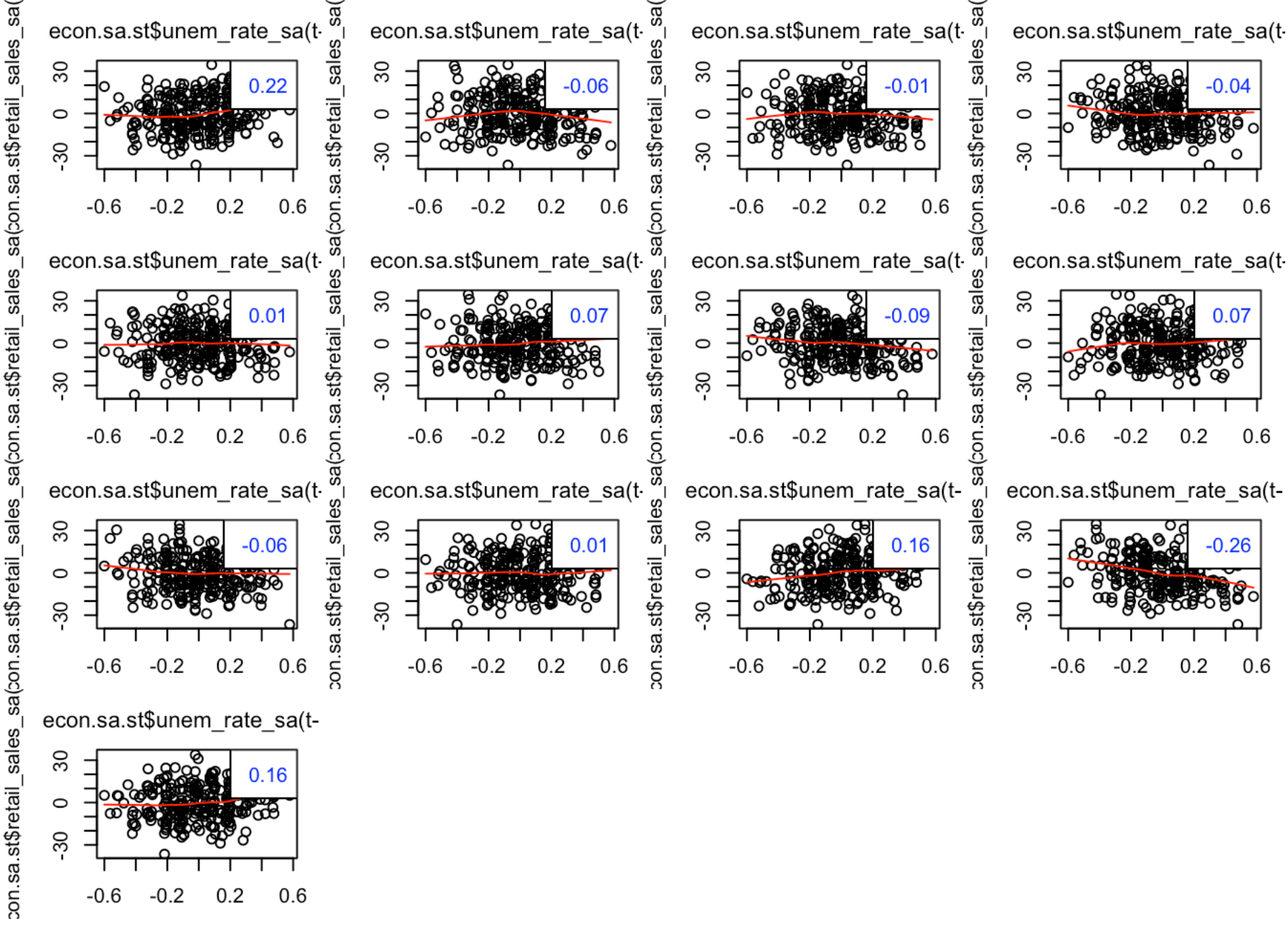

```
lag2.plot(econ.sa.st$unem_rate_sa, econ.sa.st$house_price_sa, max.lag = 12)
## Lag 5?
```



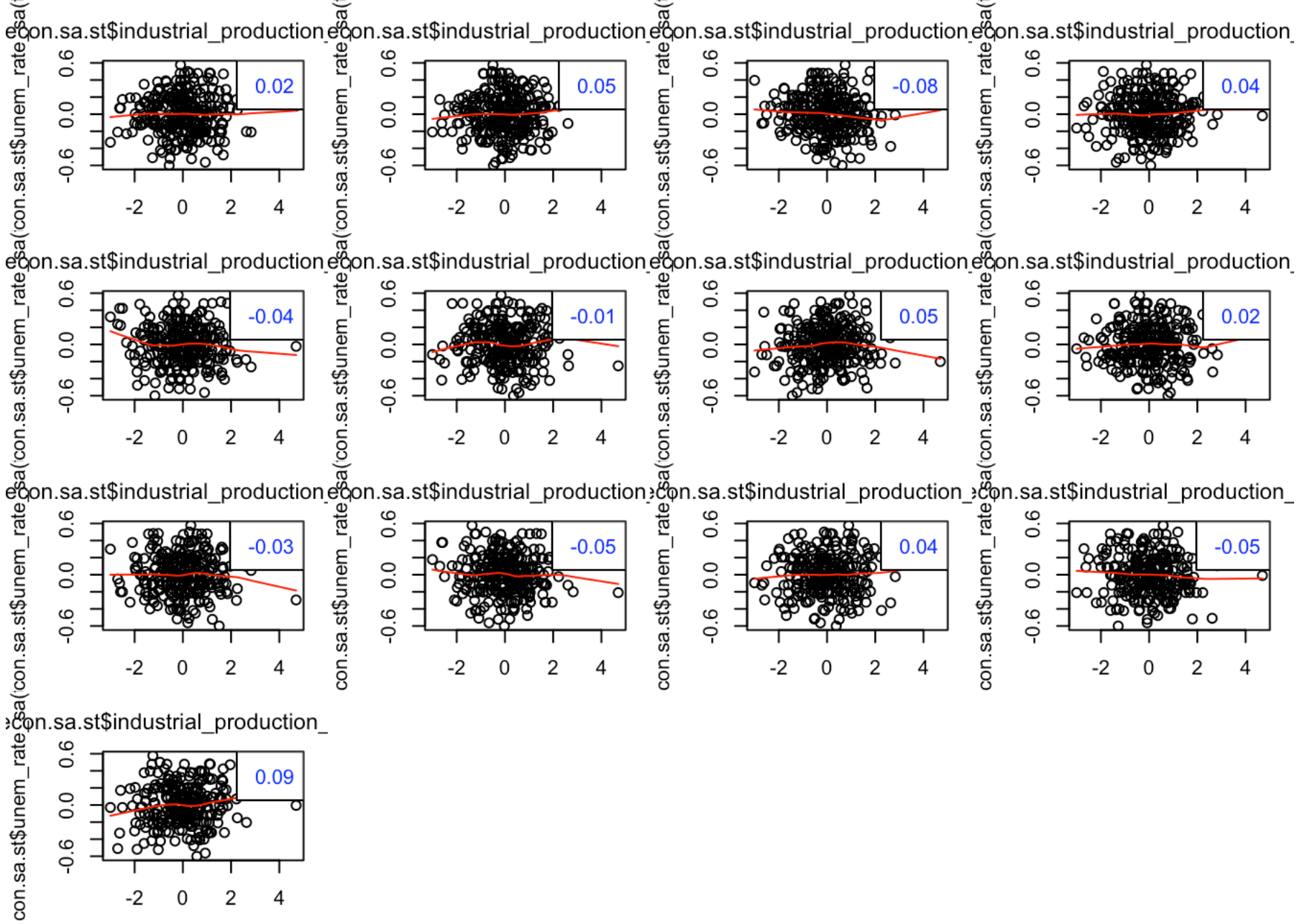

```
lag2.plot(econ.sa.st$unem_rate_sa, econ.sa.st$construction_spend_sa, max.lag = 12)
## No real lag, setting to 3
```



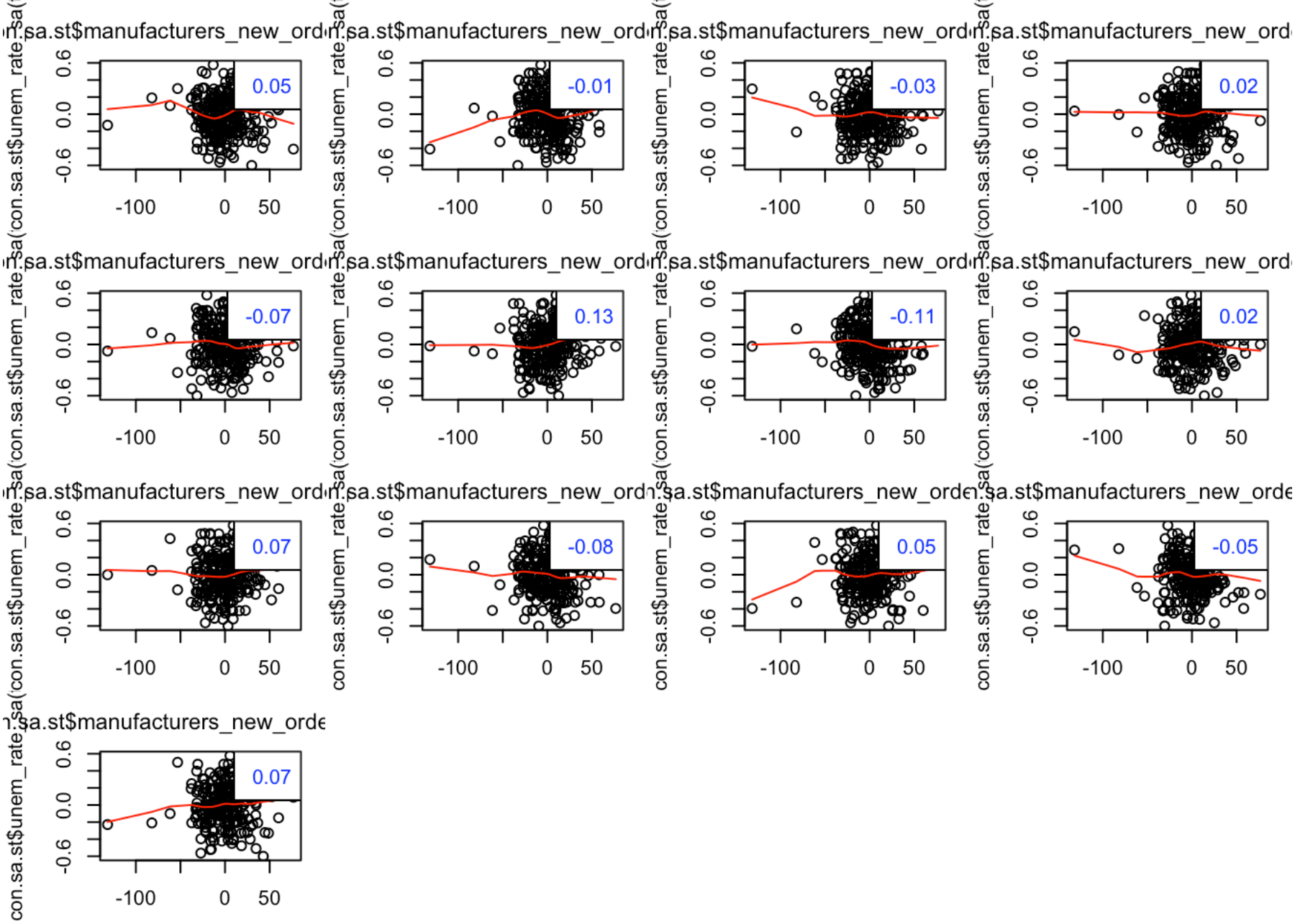

```
lag2.plot(econ.sa.st$unem_rate_sa, econ.sa.st$retail_sales_sa, max.lag = 12)
## No real lag, setting to 0
```



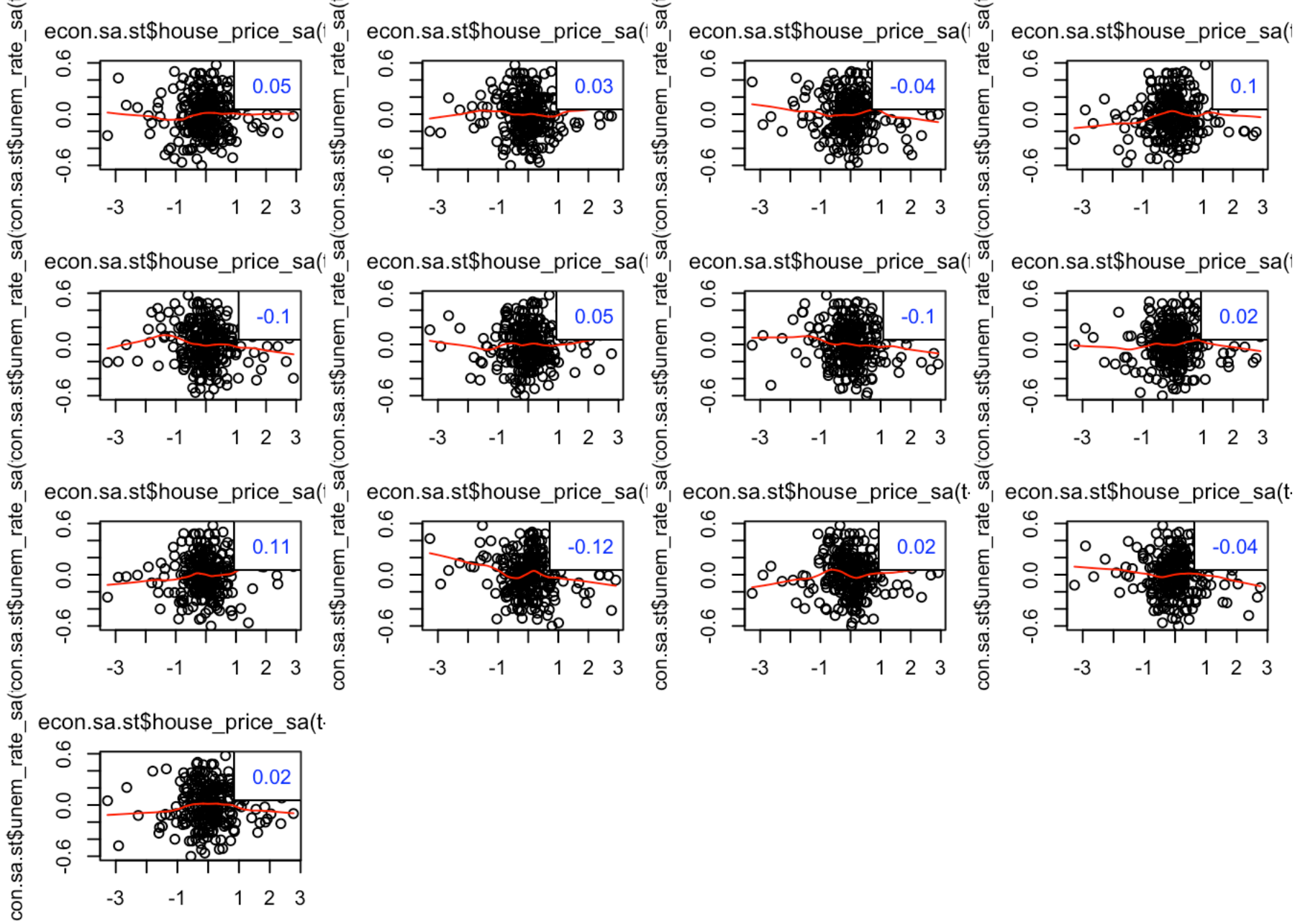

```
## Not really going in this direction, but does unemployment lead other metrics?
lag2.plot(econ.sa.st$industrial_production_sa, econ.sa.st$unem_rate_sa, max.lag = 12)
## No
```



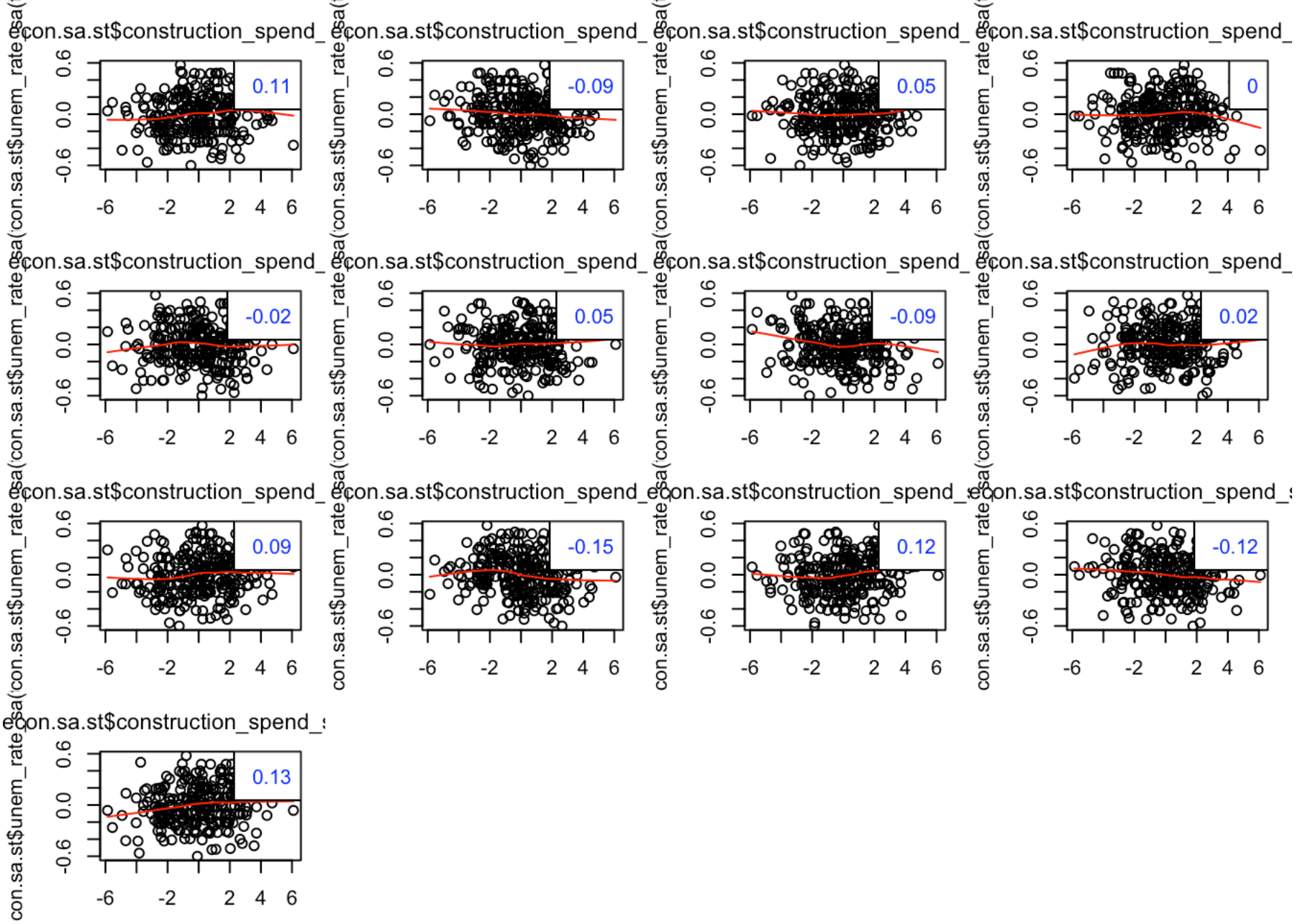

```
lag2.plot(econ.sa.st$manufacturers_new_orders_sa, econ.sa.st$unem_rate_sa, max.lag =
12) ## No
```



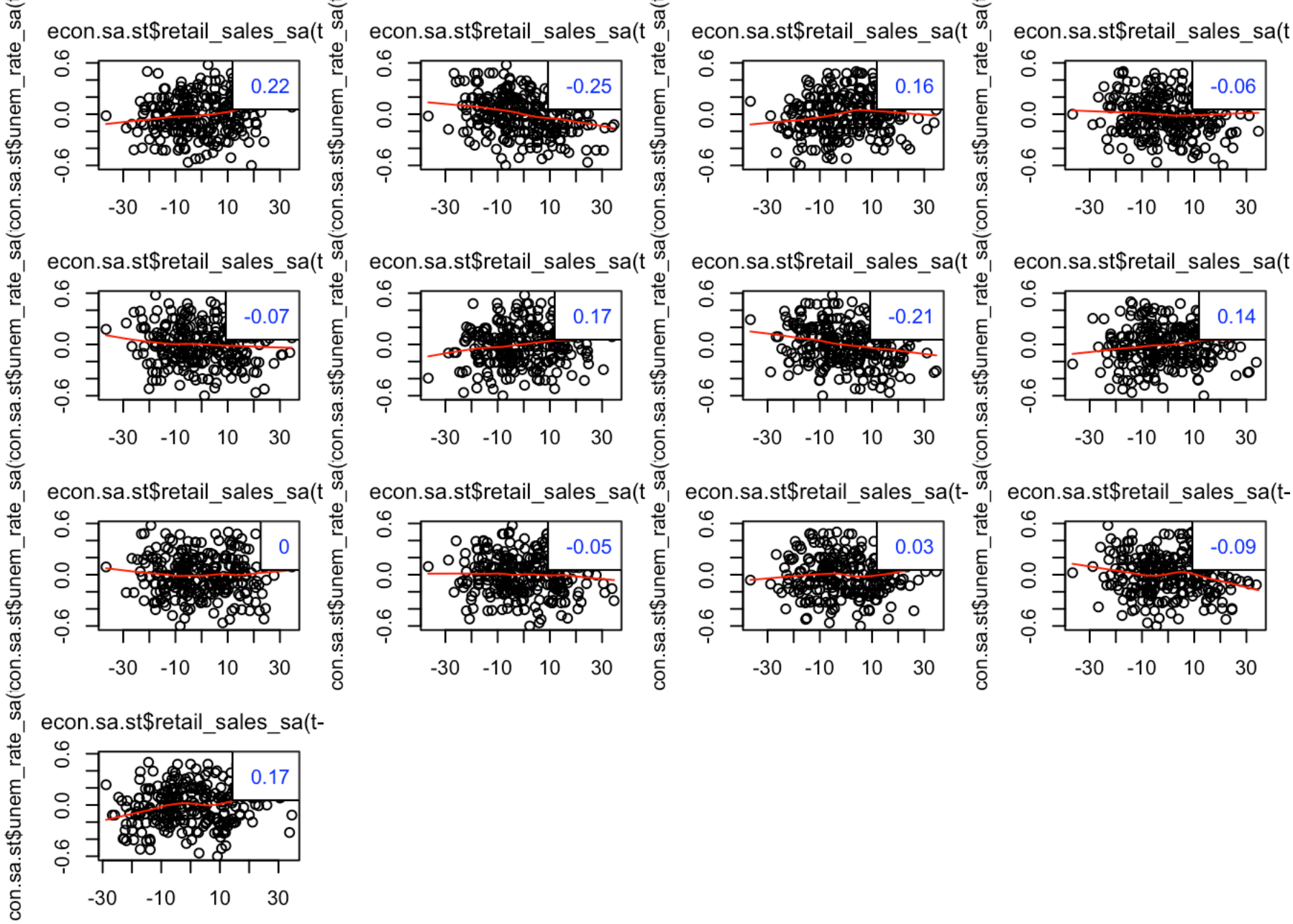

```
lag2.plot(econ.sa.st$house_price_sa, econ.sa.st$unem_rate_sa, max.lag = 12)
## Leading 8,9?
```




```
lag2.plot(econ.sa.st$construction_spend_sa, econ.sa.st$unem_rate_sa, max.lag = 12)
## Leading 9-12?
```

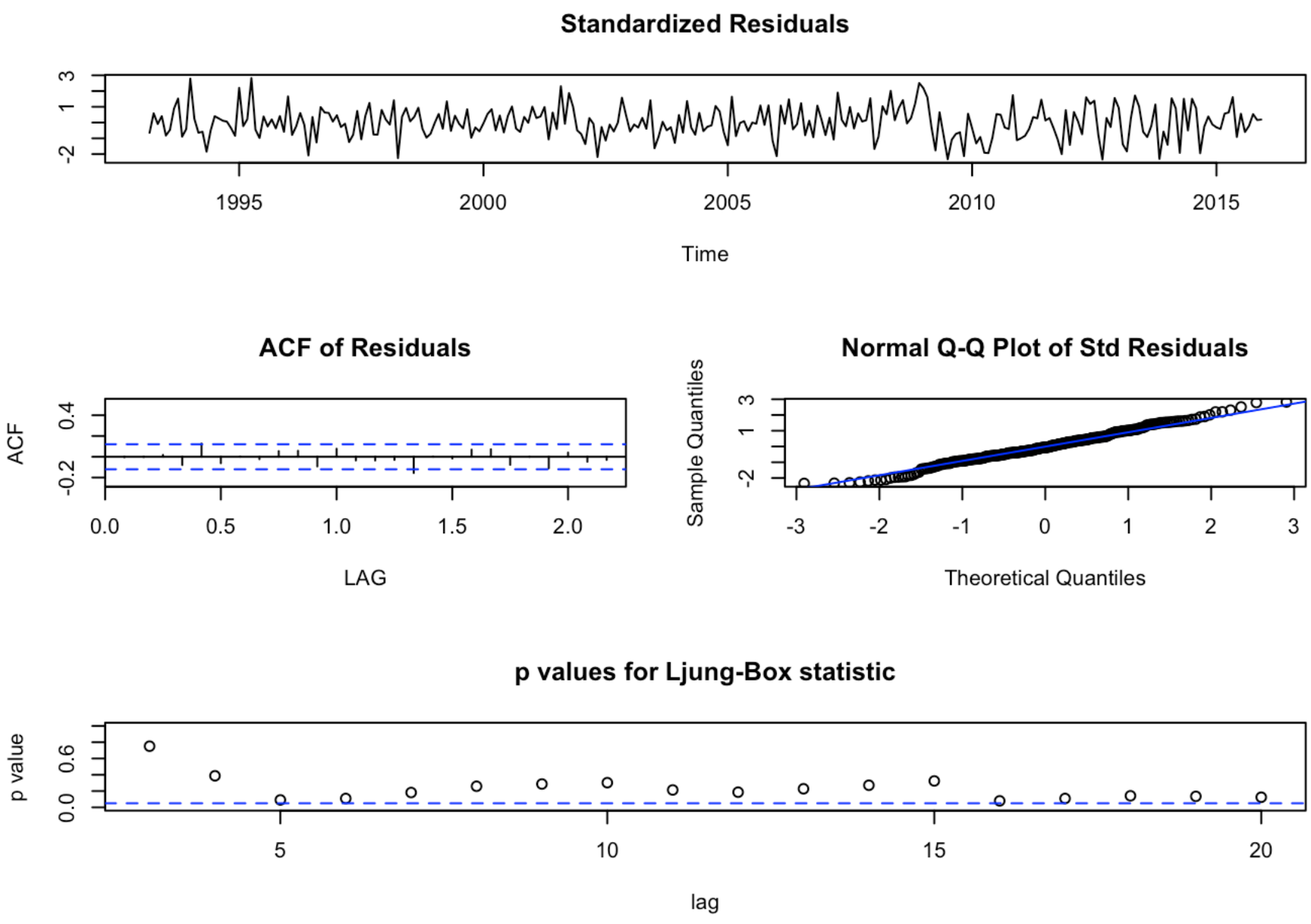



```
lag2.plot(econ.sa.st$retail_sales_sa, econ.sa.st$unem_rate_sa, max.lag = 12)
## Leading 1,6?
```



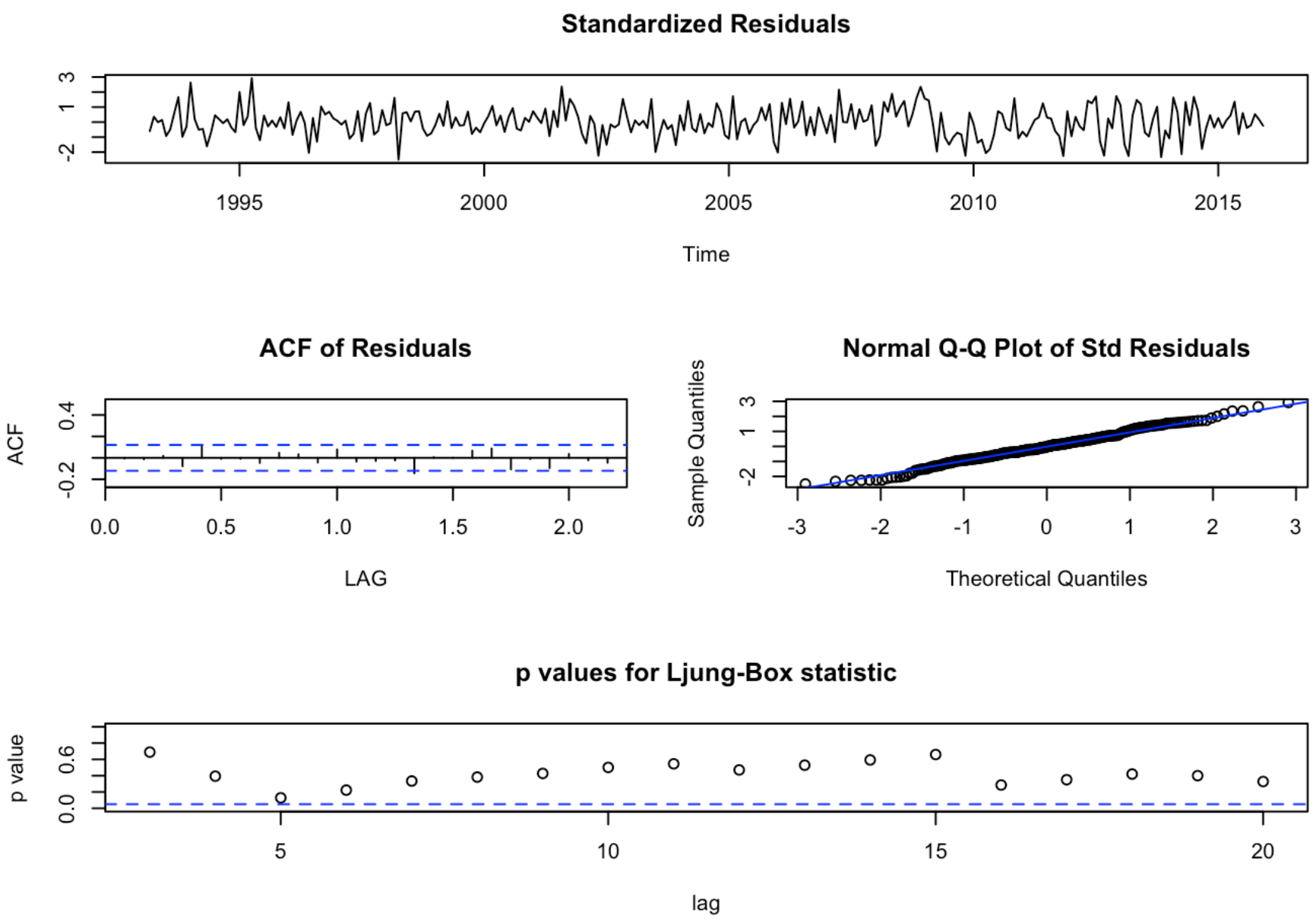

```
econ.sa.lag = ts.intersect(
  unem_rate_sa = econ.sa.st$unem_rate_sa,
  industrial_production_sa = lag(econ.sa.st$industrial_production_sa, -2),
  manufacturers_new_orders_sa = lag(econ.sa.st$manufacturers_new_orders_sa, -4),
  house_price_sa = lag(econ.sa.st$house_price_sa, -5),
  construction_spend_sa = lag(econ.sa.st$construction_spend_sa, -3),
  retail_sales_sa = lag(econ.sa.st$retail_sales_sa, -0),
  dframe = TRUE
)


mdl1 = sarima(xdata = econ.sa.st$unem_rate_sa, p = 1, d = 0, q = 1)
## No xRegs
```

```
## initial  value -1.454783
## iter   2 value -1.756310
## iter   3 value -1.799011
## iter   4 value -1.806977
## iter   5 value -1.807510
## iter   6 value -1.813206
## iter   7 value -1.815653
## iter   8 value -1.815979
## iter   9 value -1.816000
## iter  10 value -1.816046
## iter  11 value -1.816061
## iter  12 value -1.816061
## iter  12 value -1.816061
## iter  12 value -1.816061
## final  value -1.816061
## converged
## initial  value -1.817248
## iter   2 value -1.817269
## iter   3 value -1.817288
## iter   4 value -1.817310
## iter   5 value -1.817312
## iter   5 value -1.817312
## iter   5 value -1.817312
## final  value -1.817312
## converged
```



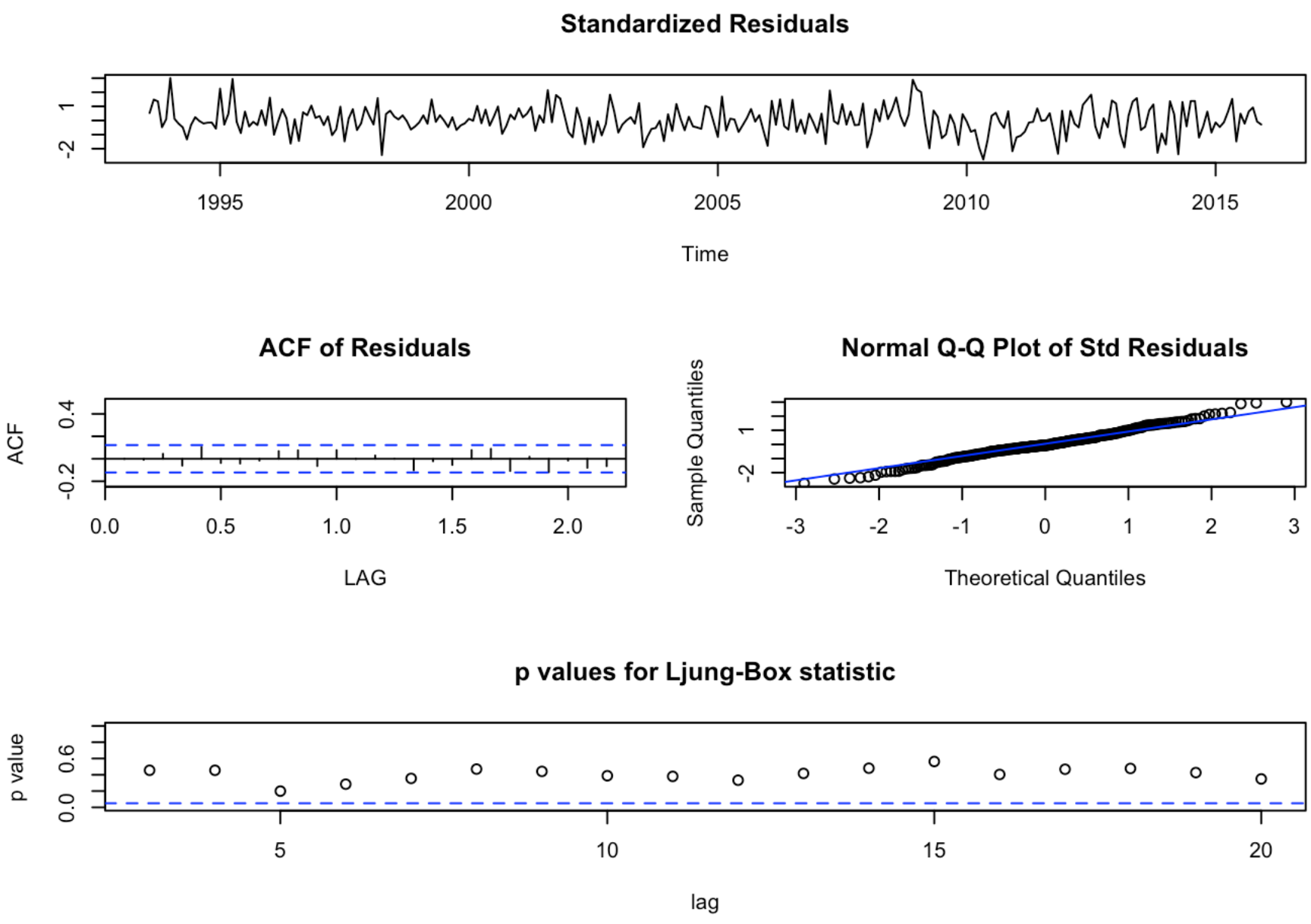

```
mdl2 = sarima(xdata = econ.sa.st$unem_rate_sa, p = 1, d = 0, q = 1, xreg = econ.sa.st
[, 2:7])   ## No lag xRegs
```

```
## initial  value -1.489968
## iter   2 value -1.771610
## iter   3 value -1.814852
## iter   4 value -1.821196
## iter   5 value -1.828702
## iter   6 value -1.833042
## iter   7 value -1.834643
## iter   8 value -1.836178
## iter   9 value -1.836957
## iter  10 value -1.837177
## iter  11 value -1.837205
## iter  12 value -1.837217
## iter  13 value -1.837218
## iter  14 value -1.837218
## iter  15 value -1.837218
## iter  15 value -1.837218
## iter  15 value -1.837218
## final  value -1.837218
## converged
## initial  value -1.837184
## iter   2 value -1.837196
## iter   3 value -1.837218
## iter   4 value -1.837227
## iter   5 value -1.837235
## iter   6 value -1.837236
## iter   7 value -1.837237
## iter   7 value -1.837237
## iter   7 value -1.837237
## final  value -1.837237
## converged
```




```
mdl3 = sarima(xdata = econ.sa.lag$unem_rate_sa, p = 1, d = 0, q = 1, xreg = econ.sa.l
ag[, 2:6]) ## Lagged xRegs
```

```
## initial  value -1.477882
## iter   2 value -1.767357
## iter   3 value -1.828587
## iter   4 value -1.833027
## iter   5 value -1.850503
## iter   6 value -1.857390
## iter   7 value -1.857900
## iter   8 value -1.858920
## iter   9 value -1.859178
## iter  10 value -1.859290
## iter  11 value -1.859329
## iter  12 value -1.859333
## iter  13 value -1.859335
## iter  14 value -1.859335
## iter  15 value -1.859335
## iter  15 value -1.859335
## iter  15 value -1.859335
## final  value -1.859335
## converged
## initial  value -1.861077
## iter   2 value -1.861149
## iter   3 value -1.861574
## iter   4 value -1.861965
## iter   5 value -1.862158
## iter   6 value -1.862189
## iter   7 value -1.862194
## iter   8 value -1.862195
## iter   9 value -1.862195
## iter   9 value -1.862195
## iter   9 value -1.862195
## final  value -1.862195
## converged
```




```
#### Model Comparison
##
## Model 1: {AIC: -2.617} {BIC: -3.578} *** Best BIC
## Model 2: {AIC: -2.613} {BIC: -3.495}
## Model 3: {AIC: -2.672} {BIC: -3.565} *** Best AIC
##
#### Model 3 Pvalues
##
##                              Estimate     SE  t.value Pvalue
## ar1                           -0.2176 0.0672  -3.2387   .001 ***
## ma1                           -0.8835 0.0411 -21.4938  <.001 ***
## intercept                      0.0001 0.0009   0.1447   .886
## industrial_production_sa      -0.0500 0.0132  -3.7763  <.001 ***
## manufacturers_new_orders_sa   -0.0005 0.0007  -0.6516   .523
## house_price_sa                -0.0413 0.0122  -3.3765  <.001 ***
## construction_spend_sa          0.0120 0.0067   1.7902   .091
## retail_sales_sa                0.0027 0.0013   2.1645   .044 ***
```