Results

MAPE Cross validation results of remainders cycle1, cycle2, and cycle3

```
##                    [,1]     [,2]      [,3]
## Window LOOCV 0.7303158 0.899521 0.6977499
## 12 step      0.9804064 1.383797 0.9397779
```

Reject null hypothesis that Gas prices are not granger caused by Electricity prices

```
## Granger causality test
##
## Model 1: VAR_elecp ~ Lags(VAR_elecp, 1:5) + Lags(gasp, 1:5)
## Model 2: VAR_elecp ~ Lags(VAR_elecp, 1:5)
##   Res.Df Df      F Pr(>F)
## 1    407
## 2    412 -5 0.1555 0.9783

## Granger causality test
##
## Model 1: gasp ~ Lags(gasp, 1:5) + Lags(VAR_elecp, 1:5)
## Model 2: gasp ~ Lags(gasp, 1:5)
##   Res.Df Df      F  Pr(>F)
## 1    407
## 2    412 -5 2.7394 0.01896 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

MAPE Testing results model comparisons

```
##         Mod1    Auto Arima          ETS Holt-Winters  Combination
VAR
##    0.2414583    0.6949208    0.8705170    0.4591887    0.5475208    0.7157
810
```

Forward 2020 forecasts from February 2020

```
##            Jan       Feb       Mar       Apr       May       Jun       Jul
## 2020           0.1340804 0.1336859 0.1333080 0.1345800 0.1382781 0.1387831
## 2021 0.1331084
##            Aug       Sep       Oct       Nov       Dec
## 2020 0.1381448 0.1378254 0.1343304 0.1322127 0.1324894
## 2021
```

Forward 2020 GARCH variance forecasts from February 2020

```
##                 T+1        T+2        T+3        T+4        T+5        T+6
## Jan 2020 0.01467005 0.01465912 0.01464818 0.01463726 0.01462635 0.01461544
##                 T+7        T+8        T+9       T+10       T+11       T+12
## Jan 2020 0.01460454 0.01459365 0.01458277 0.0145719 0.01456103 0.01455018
```