Table 03 results

```r
library(forecTheta)
library(forecast)
source("src/stlar.R")
source("src/calMASEh.R")
source("src/mase_mdata.R")
source("src/monthly_mase_h1.R")
source("src/monthly_mase_h.R")
source("src/MASE_h1_rf_monthly.R")
source("src/monthly_mase_other.R")

library(Mcomp)
data(M3)
yearly_m3 <- subset(M3, "yearly")
quarterly_m3 <- subset(M3, "quarterly")
monthly_m3 <- subset(M3, "monthly")

data(M1)
yearly_m1 <- subset(M1, "yearly")
quarterly_m1 <- subset(M1, "quarterly")
monthly_m1 <- subset(M1, "monthly")
```

Yearly - M3

```r
M3Yunb_pred <- load("data/M1YPunb.rda")
M3Yrfu_h1_meanMASE <- calMASEh(M1YPunb, yearly_m3, 1)
M3Yrfu_h2_meanMASE <- calMASEh(M1YPunb, yearly_m3, 2)
M3Yrfu_h4_meanMASE <- calMASEh(M1YPunb, yearly_m3, 4)
M3Yrfu_h6_meanMASE <- calMASEh(M1YPunb, yearly_m3, 6)
M3Y_RFunbalanced <- c(mean(M3Yrfu_h1_meanMASE ), mean(M3Yrfu_h2_meanMASE ),
                      mean(M3Yrfu_h4_meanMASE ), mean(M3Yrfu_h6_meanMASE ))
names(M3Y_RFunbalanced) <- c("h=1", "h=1-2", "h=1-4", "h=1-6")
print(M3Y_RFunbalanced)
```

```
##      h=1     h=1-2    h=1-4    h=1-6
## 1.059539 1.418230 2.196478 2.846569
```

```r
### M3-yearly: RF-class priors results
M3Yunb_pred <- load("data/M1YPwrpsam.rda")
M3Yrfc_h1_meanMASE <- calMASEh(M1YPwrpsam, yearly_m3, 1)
M3Yrfc_h2_meanMASE <- calMASEh(M1YPwrpsam, yearly_m3, 2)
M3Yrfc_h4_meanMASE <- calMASEh(M1YPwrpsam, yearly_m3, 4)
M3Yrfc_h6_meanMASE <- calMASEh(M1YPwrpsam, yearly_m3, 6)
M3Y_RFclasspriors <- c(mean(M3Yrfc_h1_meanMASE ), mean(M3Yrfc_h2_meanMASE ),
                       mean(M3Yrfc_h4_meanMASE ), mean(M3Yrfc_h6_meanMASE ))
names(M3Y_RFclasspriors) <- c("h=1", "h=1-2", "h=1-4", "h=1-6")
print(M3Y_RFclasspriors)
```

```
##        h=1      h=1-2      h=1-4      h=1-6
## 1.029454 1.372930 2.136701 2.768100
```

M3-yearly: benchmark methods
```
MASEh1m3y <- lapply(yearly_m3,mase_mdata,h=1)
MASEh1_m3y <- do.call("rbind", MASEh1m3y) # Combine all dataframes into one
benchmark_h1y <- colMeans(MASEh1_m3y)
print(benchmark_h1y)
```

```
## auto.arima        ets         WN         RW        RWD      STLAR
##   1.113755   1.088017   6.543989   1.243180   1.031641   1.093984
##      Theta
##   1.121743
```

```
MASEh2m3y <- lapply(yearly_m3,mase_mdata,h=2)
MASEh2_m3y <- do.call("rbind", MASEh2m3y) # Combine all dataframes into one
benchmark_h2y <- colMeans(MASEh2_m3y)
print(benchmark_h2y)
```

```
## auto.arima        ets         WN         RW        RWD      STLAR
##   1.481043   1.440647   6.910432   1.676201   1.356547   1.466139
##      Theta
##   1.474479
```

```
MASEh4m3y <- lapply(yearly_m3,mase_mdata,h=4)
MASEh4_m3y <- do.call("rbind", MASEh4m3y) # Combine all dataframes into one
benchmark_h4y <- colMeans(MASEh4_m3y)
print(benchmark_h4y)
```

```
## auto.arima        ets         WN         RW        RWD      STLAR
##   2.277062   2.203387   7.480151   2.479699   2.054407   2.272899
##      Theta
##   2.181069
```

```
MASEh6m3y <- lapply(yearly_m3,mase_mdata,h=6)
MASEh6_m3y <- do.call("rbind", MASEh6m3y) # Combine all dataframes into one
benchmark_h6y <- colMeans(MASEh6_m3y)
print(benchmark_h6y)
```

```
## auto.arima        ets         WN         RW        RWD      STLAR
##   2.963824   2.859849   8.065091   3.171710   2.631783   2.952573
##      Theta
##   2.773963
```

Yearly - M1

```
### M1-yearly: RF-unbalanced results
M1Yunb_pred <- load("data/M3YPunb.rda")
M1Yrfu_h1_meanMASE <- calMASEh(M3YPunb, yearly_m1, 1)
M1Yrfu_h2_meanMASE <- calMASEh(M3YPunb, yearly_m1, 2)
M1Yrfu_h4_meanMASE <- calMASEh(M3YPunb, yearly_m1, 4)
M1Yrfu_h6_meanMASE <- calMASEh(M3YPunb, yearly_m1, 6)
M1Y_RFunbalanced <- c(mean(M1Yrfu_h1_meanMASE ), mean(M1Yrfu_h2_meanMASE ),
                      mean(M1Yrfu_h4_meanMASE ), mean(M1Yrfu_h6_meanMASE ))
names(M1Y_RFunbalanced) <- c("h=1", "h=1-2", "h=1-4", "h=1-6")
print(M1Y_RFunbalanced)
```

```
##       h=1      h=1-2      h=1-4      h=1-6
## 0.9674574 1.3947859 2.4194982 3.3738738
```

```
### M1-yearly: RF-class priors results
M1Yunb_pred <- load("data/M3YPwrpsam.rda")
M1Yrfc_h1_meanMASE <- calMASEh(M3YPwrpsam, yearly_m1, 1)
M1Yrfc_h2_meanMASE <- calMASEh(M3YPwrpsam, yearly_m1, 2)
M1Yrfc_h4_meanMASE <- calMASEh(M3YPwrpsam, yearly_m1, 4)
M1Yrfc_h6_meanMASE <- calMASEh(M3YPwrpsam, yearly_m1, 6)
M1Y_RFclasspriors <- c(mean(M1Yrfc_h1_meanMASE ), mean(M1Yrfc_h2_meanMASE ),
                       mean(M1Yrfc_h4_meanMASE ), mean(M1Yrfc_h6_meanMASE ))
names(M1Y_RFclasspriors) <- c("h=1", "h=1-2", "h=1-4", "h=1-6")
print(M1Y_RFclasspriors)
```

```
##      h=1      h=1-2      h=1-4      h=1-6
## 1.016454 1.400076 2.402419 3.334552
```

```
### M1-yearly: benchmark methods
MASEh1m1y <- lapply(yearly_m1,mase_mdata,h=1)
MASEh1_m1y <- do.call("rbind", MASEh1m1y) # Combine all dataframes into one
benchmark_h1ym1 <- colMeans(MASEh1_m1y)
print(benchmark_h1ym1)
```

```
## auto.arima         ets          WN          RW         RWD       STLAR
##   1.062849    1.123264    6.376936    1.350041    1.036631    1.095814
##      Theta
##   1.153633
```

```
MASEh2m1y <- lapply(yearly_m1,mase_mdata,h=2)
MASEh2_m1y <- do.call("rbind", MASEh2m1y) # Combine all dataframes into one
benchmark_h2ym1 <- colMeans(MASEh2_m1y)
print(benchmark_h2ym1)
```

```
## auto.arima         ets          WN          RW         RWD       STLAR
##   1.467538    1.585202    7.079360    1.997365    1.441617    1.511742
##      Theta
##   1.695363
```

```
MASEh4m1y <- lapply(yearly_m1,mase_mdata,h=4)
MASEh4_m1y <- do.call("rbind", MASEh4m1y) # Combine all dataframes into one
benchmark_h4ym1 <- colMeans(MASEh4_m1y)
print(benchmark_h4ym1)
```

```
## auto.arima        ets         WN         RW        RWD      STLAR
##   2.506662   2.720330   8.592893   3.504539   2.508285   2.553918
##      Theta
##   2.998649
```

```
MASEh6m1y <- lapply(yearly_m1,mase_mdata,h=6)
MASEh6_m1y <- do.call("rbind", MASEh6m1y) # Combine all dataframes into one
benchmark_h6ym1 <- colMeans(MASEh6_m1y)
print(benchmark_h6ym1)
```

```
## auto.arima        ets          WN         RW        RWD      STLAR
##   3.473598   3.771245  10.006127   4.893131   3.489743   3.516368
##      Theta
##   4.189472
```

Quartely - M3

```
### M3-quarterly: RF-unbalanced results
source("src/calMASEh_quarterly.R")
M3Qunb_pred <- load("data/M1QPunb.rda")
M3Qrfu_h1_meanMASE <- calMASEh_quarterly(M1QPunb, quarterly_m3, 1)
M3Qrfu_h4_meanMASE <- calMASEh_quarterly(M1QPunb, quarterly_m3, 4)
M3Qrfu_h6_meanMASE <- calMASEh_quarterly(M1QPunb, quarterly_m3, 6)
M3Qrfu_h8_meanMASE <- calMASEh_quarterly(M1QPunb, quarterly_m3, 8)
M3Q_RFunbalanced <- c(mean(M3Qrfu_h1_meanMASE ), mean(M3Qrfu_h4_meanMASE ),
                      mean(M3Qrfu_h6_meanMASE ), mean(M3Qrfu_h8_meanMASE ))
names(M3Q_RFunbalanced) <- c("h=1", "h=1-4", "h=1-6", "h=1-8")
print(M3Q_RFunbalanced)
```

```
##       h=1      h=1-4      h=1-6      h=1-8
## 0.5916467 0.8141176 0.9677576 1.1246827
```

```
### M3-quarterly: RF-class priors results
M3Qunb_pred <- load("data/M1QPwrpsam.rda")
M3Qrfc_h1_meanMASE <- calMASEh_quarterly(M1QPwrpsam, quarterly_m3, 1)
M3Qrfc_h4_meanMASE <- calMASEh_quarterly(M1QPwrpsam, quarterly_m3, 4)
M3Qrfc_h6_meanMASE <- calMASEh_quarterly(M1QPwrpsam, quarterly_m3, 6)
M3Qrfc_h8_meanMASE <- calMASEh_quarterly(M1QPwrpsam, quarterly_m3, 8)
M3Q_RFclasspriors <- c(mean(M3Qrfc_h1_meanMASE ), mean(M3Qrfc_h4_meanMASE ),
                       mean(M3Qrfc_h6_meanMASE ), mean(M3Qrfc_h8_meanMASE ))
names(M3Q_RFclasspriors) <- c("h=1", "h=1-2", "h=1-4", "h=1-6")
print(M3Q_RFclasspriors)
```

```
##       h=1      h=1-2      h=1-4      h=1-6
## 0.5932810 0.8184403 0.9749338 1.1349108
```

```
### M3-quarterly: benchmark methods
source("src/mase_quarterlyother.R")
mase_Otherm3quarterly <- lapply(quarterly_m3, mase_quarterlyOther)
MASEOtherm3quarterly <- do.call("rbind", mase_Otherm3quarterly) # Combine all dataframes into one
colMeans(MASEOtherm3quarterly)
```

```
##    ARIMA1    ARIMA4    ARIMA6    ARIMA8      ETS1      ETS4      ETS6
## 0.5850397 0.8481993 1.0177224 1.1892331 0.5582916 0.8220879 0.9926564
##      ETS8       WN1       WN4       WN6       WN8       RW1       RW4
## 1.1700812 3.2463262 3.5934358 3.6976795 3.8739076 1.1436032 1.1563948
##       RW6       RW8      RWD1      RWD4      RWD6      RWD8    STLAR1
## 1.3216624 1.4637107 1.2015074 1.1705820 1.3620817 1.4659635 0.6983574
##    STLAR4    STLAR6    STLAR8    Theta1    Theta4    Theta6    Theta8
## 1.2736073 1.5980721 1.9111833 0.6151330 0.8297711 0.9699017 1.1139504
##   snaive1   snaive4   snaive6   snaive8
## 1.1106206 1.0913835 1.3014168 1.4253438
```

Quarterly - M1

```
### M1-quarterly: RF-unbalanced results
M1Qunb_pred <- load("data/M3QPunb.rda")
M1Qrfu_h1_meanMASE <- calMASEh_quarterly(M3QPunb, quarterly_m1, 1)
M1Qrfu_h4_meanMASE <- calMASEh_quarterly(M3QPunb, quarterly_m1, 4)
M1Qrfu_h6_meanMASE <- calMASEh_quarterly(M3QPunb, quarterly_m1, 6)
M1Qrfu_h8_meanMASE <- calMASEh_quarterly(M3QPunb, quarterly_m1, 8)
M1Q_RFunbalanced <- c(mean(M1Qrfu_h1_meanMASE ), mean(M1Qrfu_h4_meanMASE ),
                      mean(M1Qrfu_h6_meanMASE ), mean(M1Qrfu_h8_meanMASE ))
names(M1Q_RFunbalanced) <- c("h=1", "h=1-4", "h=1-6", "h=1-8")
print(M1Q_RFunbalanced)
```

```
##       h=1     h=1-4     h=1-6     h=1-8
## 0.7428181 1.0803633 1.3529139 1.5713698
```

```
### M1-quarterly: RF-class priors results
M1Qwrp_pred <- load("data/M3QPwrpsam.rda")
M1Qrfc_h1_meanMASE <- calMASEh_quarterly(M3QPwrpsam, quarterly_m1, 1)
M1Qrfc_h4_meanMASE <- calMASEh_quarterly(M3QPwrpsam, quarterly_m1, 4)
M1Qrfc_h6_meanMASE <- calMASEh_quarterly(M3QPwrpsam, quarterly_m1, 6)
M1Qrfc_h8_meanMASE <- calMASEh_quarterly(M3QPwrpsam, quarterly_m1, 8)
M1Q_RFclasspriors <- c(mean(M1Qrfc_h1_meanMASE ), mean(M1Qrfc_h4_meanMASE ),
                       mean(M1Qrfc_h6_meanMASE ), mean(M1Qrfc_h8_meanMASE ))
names(M1Q_RFclasspriors) <- c("h=1", "h=1-4", "h=1-6", "h=1-8")
print(M1Q_RFclasspriors)
```

```
##       h=1     h=1-4     h=1-6     h=1-8
## 0.7569586 1.1181622 1.4006609 1.6172280
```

```
### M1-quarterly: benchmark methods
source("src/mase_quarterlyother.R")
mase_Otherm1quarterly <- lapply(quarterly_m1, mase_quarterlyOther)
MASEOtherm1quarterly <- do.call("rbind", mase_Otherm1quarterly) # Combine all dataframes into one
colMeans(MASEOtherm1quarterly)
```

```
##    ARIMA1    ARIMA4    ARIMA6    ARIMA8       ETS1       ETS4       ETS6
## 0.7800694 1.1690445 1.4957297 1.7392111 0.7798965 1.1147105 1.4248260
##      ETS8       WN1       WN4       WN6       WN8       RW1       RW4
## 1.6570305 3.9708454 4.2709260 4.4493269 4.6406767 0.9684352 1.3518370
##      RW6       RW8      RWD1      RWD4      RWD6      RWD8    STLAR1
## 1.6737171 1.9516970 0.9526582 1.2632775 1.5570731 1.8093900 0.9591170
##    STLAR4    STLAR6    STLAR8     Theta1     Theta4     Theta6     Theta8
## 1.6334378 2.0494169 2.4266954 0.7927151 1.1320210 1.4207370 1.6655195
##   snaive1   snaive4   snaive6   snaive8
## 1.5235055 1.5599973 1.8652805 2.0776323
```

Monthly - M3

```
### M3-monthly:  RF-unbalanced results
M3Munb_pred <- load("data/M1MPunb.rda")
M3Munb_h1 <- monthly_h1_rf(M1MPunb, monthly_m3)
M3Munb_h <- monthlyMASE_h(M1MPunb, monthly_m3)
M3M_RFunbalanced <- c(colMeans(M3Munb_h1), colMeans(M3Munb_h))
names(M3M_RFunbalanced) <- c("h=1", "h=1:6", "h=1-12", "h=1:18")
M3M_RFunbalanced
```

```
##       h=1     h=1:6    h=1-12    h=1:18
## 0.5990312 0.6828128 0.7592490 0.8723689
```

```
### M3-monthly: RF-class priors results
M3Mwrp_pred <- load("data/M1MPwrpsam.rda")
M3Mrfc_h1 <- monthly_h1_rf(M1MPwrpsam, monthly_m3)
M3Mrfc_h <- monthlyMASE_h(M1MPwrpsam, monthly_m3)
M3M_RFclasspriors <- c(colMeans(M3Mrfc_h1), colMeans(M3Mrfc_h))
names(M3M_RFclasspriors) <- c("h=1", "h=1:6", "h=1-12", "h=1:18")
M3M_RFclasspriors
```

```
##       h=1     h=1:6    h=1-12    h=1:18
## 0.5950922 0.6747221 0.7510178 0.8636659
```

```
### M3-monthly: benchmark methods
monthly_m3_h1_benchmark <- lapply(monthly_m3,monthly_mase_h1)
MASE_Other_m3monthly_h1 <- do.call("rbind", monthly_m3_h1_benchmark)
summary(MASE_Other_m3monthly_h1)
```

```
##      ARIMA1             ETS1                WN1                RW1
##  Min.   :0.0000   Min.   : 0.000008   Min.   :0.0066   Min.   : 0.0000
##  1st Qu.:0.1042   1st Qu.: 0.115682   1st Qu.:0.7799   1st Qu.: 0.1494
```

```
## Median  :0.3179   Median : 0.347439   Median :1.6069   Median : 0.4658
## Mean    :0.5460   Mean   : 0.548212   Mean   :2.0067   Mean   : 0.8407
## 3rd Qu.:0.7763   3rd Qu.: 0.759332   3rd Qu.:2.7674   3rd Qu.: 1.1568
## Max.    :8.8797   Max.   :10.414771   Max.   :9.7755   Max.   :15.0295
##       RWD1             STLAR1            Theta1
## Min.   : 0.001016   Min.   : 0.001596   Min.   :0.000866
## 1st Qu.: 0.139723   1st Qu.: 0.195538   1st Qu.:0.134007
## Median : 0.454314   Median : 0.424580   Median :0.348428
## Mean   : 0.838191   Mean   : 0.639051   Mean   :0.581237
## 3rd Qu.: 1.150344   3rd Qu.: 0.886071   3rd Qu.:0.814676
## Max.   :15.360400   Max.   :10.708380   Max.   :9.953817
##     snaive1
## Min.   :0.0000
## 1st Qu.:0.3561
## Median :0.7461
## Mean   :0.9489
## 3rd Qu.:1.2955
## Max.   :7.9135
```

```
monthly_m3_h_benchmark <- lapply(monthly_m3,MASEmonthlyOther)
MASEOtherm3monthly <- do.call("rbind", monthly_m3_h_benchmark )
colMeans(MASEOtherm3monthly)
```

```
##    ARIMA6    ARIMA12    ARIMA18       ETS6      ETS12      ETS18        WN6
## 0.6374286 0.7366563 0.8665590 0.6359911 0.7397374 0.8649338 2.0764816
##      WN12       WN18        RW6       RW12       RW18       RWD6      RWD12
## 2.1464063 2.2673458 0.9654077 1.0399652 1.1747588 0.9560610 1.0215596
##     RWD18     STLAR6    STLAR12    STLAR18     Theta6    Theta12    Theta18
## 1.1399991 0.8131637 1.0441850 1.2684495 0.6740120 0.7686367 0.8891230
##   snaive6  snaive12  snaive18
## 0.9655358 0.9872564 1.1460825
```

Monthly - M1

```
### M1-monthly:  RF-unbalanced results
M1Munb_pred <- load("data/M3MPunb.rda")
M1Munb_h1 <- monthly_h1_rf(M3MPunb, monthly_m1)
M1Munb_h <- monthlyMASE_h(M3MPunb, monthly_m1)
M1M_RFunbalanced <- c(colMeans(M1Munb_h1), colMeans(M1Munb_h))
names(M1M_RFunbalanced) <- c("h=1", "h=1:6", "h=1-12", "h=1:18")
M1M_RFunbalanced
```

```
##       h=1      h=1:6     h=1-12     h=1:18
## 0.6060072 0.7571125 0.9016192 1.0317206
```

```
### M1-monthly: RF-class priors results
M1Mwrp_pred <- load("data/M3MPwrpsam.rda")
M1Mrfc_h1 <- monthly_h1_rf(M3MPwrpsam, monthly_m1)
M1Mrfc_h <- monthlyMASE_h(M3MPwrpsam, monthly_m1)
M1M_RFclasspriors <- c(colMeans(M1Mrfc_h1), colMeans(M1Mrfc_h))
```

```r
names(M1M_RFclasspriors) <- c("h=1", "h=1:6", "h=1-12", "h=1:18")
M1M_RFclasspriors
```

```
##       h=1     h=1:6    h=1-12    h=1:18
## 0.6037834 0.7546528 0.9175844 1.0620832
```

```r
### M1-monthly: benchmark methods
monthly_m1_h1_benchmark <- lapply(monthly_m1,monthly_mase_h1)
MASE_Other_m1monthly_h1 <- do.call("rbind", monthly_m1_h1_benchmark)
colMeans(MASE_Other_m1monthly_h1)
```

```
##    ARIMA1      ETS1       WN1       RW1      RWD1    STLAR1    Theta1
## 0.6018209 0.5894862 1.9276686 1.0524682 1.0600567 0.6262129 0.6067650
##    snaive1
## 1.0648037
```

```r
monthly_m1_h_benchmark <- lapply(monthly_m1,MASEmonthlyOther)
MASE_Other_m1monthly_h <- do.call("rbind", monthly_m1_h_benchmark)
colMeans(MASE_Other_m1monthly_h)
```

```
##    ARIMA6   ARIMA12   ARIMA18      ETS6     ETS12     ETS18       WN6
## 0.7688329 0.9595572 1.1240594 0.7597859 0.9309536 1.0743311 2.0946945
##     WN12      WN18       RW6      RW12      RW18      RWD6     RWD12
## 2.1761562 2.2803451 1.2433833 1.3301589 1.4677891 1.2691970 1.3936383
##    RWD18    STLAR6   STLAR12   STLAR18    Theta6   Theta12   Theta18
## 1.5549790 0.9063133 1.1708136 1.3922372 0.7530504 0.9179991 1.0446930
##   snaive6  snaive12  snaive18
## 1.1069164 1.1355432 1.3144387
```

Ranking of Methods

```r
## Rank methods across all individual forecast horizons
source("src/rank.r")

#yearly_m3_rank
y_m3_unb <- rank_yearly_rf(M1YPunb, yearly_m3, h=6)
y_m3_rcp <- rank_yearly_rf(M1YPwrpsam, yearly_m3, h=6)
y_m3_benchmark <- rank_benchmark(yearly_m3, h=6, m=1)
y_m3_fcast <- rbind(y_m3_unb, y_m3_rcp)
y_m3_fcast <- rbind(y_m3_fcast, y_m3_benchmark)
y_m3_rank <- apply(y_m3_fcast, 2, rank)
rowMeans(y_m3_rank)
```

```
##   y_m3_unb   y_m3_rcp auto.arima       ets        WN        RW
##   3.833333   2.333333   6.666667  4.500000  9.000000  8.000000
##       RWD    STL_AR     Theta
##   1.166667  6.000000  3.500000
```

```
# yearly_m1_rank
y_m1_unb <- rank_yearly_rf(M3YPunb, yearly_m1, h=6)
y_m1_rcp <- rank_yearly_rf(M3YPwrpsam, yearly_m1, h=6)
y_m1_benchmark <- rank_benchmark(yearly_m1, h=6, m=1)
y_m1_fcast <- rbind(y_m1_unb, y_m1_rcp)
y_m1_fcast <- rbind(y_m1_fcast, y_m1_benchmark)
y_m1_rank <- apply(y_m1_fcast, 2, rank)
rowMeans(y_m1_rank)
```

```
##   y_m1_unb   y_m1_rcp auto.arima        ets         WN         RW
##   1.833333   1.166667   3.333333   6.000000   9.000000   8.000000
##        RWD     STL_AR      Theta
##   4.166667   4.500000   7.000000
```

```
# quarterly_m3_rank
q_m3_unb <- rank_seasonal_rf(M1QPunb, quarterly_m3, h=8, m=4)
q_m3_rcp <- rank_seasonal_rf(M1QPwrpsam, quarterly_m3, h=8, m=4)
q_m3_benchmark <- rank_benchmark(quarterly_m3, h=8, m=4)
q_m3_fcast <- rbind(q_m3_unb, q_m3_rcp)
q_m3_fcast <- rbind(q_m3_fcast, q_m3_benchmark)
q_m3_rank <- apply(q_m3_fcast, 2, rank)
rowMeans(q_m3_rank)
```

```
##   q_m3_unb   q_m3_rcp auto.arima        ets         WN         RW
##      2.250      3.125      4.750      3.750     10.000      7.000
##        RWD     STL_AR      Theta     snaive
##      6.500      8.375      2.500      6.750
```

```
# quarterly_m1_rank
q_m1_unb <- rank_seasonal_rf(M3QPunb, quarterly_m1, h=8, m=4)
q_m1_rcp <- rank_seasonal_rf(M3QPwrpsam, quarterly_m1, h=8, m=4)
q_m1_benchmark <- rank_benchmark(quarterly_m1, h=8, m=4)
q_m1_fcast <- rbind(q_m1_unb, q_m1_rcp)
q_m1_fcast <- rbind(q_m1_fcast, q_m1_benchmark)
q_m1_rank <- apply(q_m1_fcast, 2, rank)
rowMeans(q_m1_rank)
```

```
##   q_m1_unb   q_m1_rcp auto.arima        ets         WN         RW
##      1.000      2.625      5.250      3.000     10.000      7.500
##        RWD     STL_AR      Theta     snaive
##      5.375      8.625      3.875      7.750
```

```
# monthly_m3_rank
m_m3_unb <- rank_seasonal_rf(M1MPunb, monthly_m3, h=18, m=12)
m_m3_rcp <- rank_seasonal_rf(M1MPwrpsam, monthly_m3, h=18, m=12)
m_m3_benchmark <- rank_benchmark(monthly_m3, h=18, m=12)
m_m3_fcast <- rbind(m_m3_unb, m_m3_rcp)
m_m3_fcast <- rbind(m_m3_fcast, m_m3_benchmark)
m_m3_rank <- apply(m_m3_fcast, 2, rank)
rowMeans(m_m3_rank)
```

```
##    m_m3_unb    m_m3_rcp auto.arima        ets         WN         RW
##    3.222222    2.000000   2.833333   2.722222  10.000000   8.027778
##        RWD      STL_AR      Theta     snaive
##    6.888889    7.888889   4.222222   7.194444
```

```r
# monthly_m1_rank
m_m1_unb <- rank_seasonal_rf(M3MPunb, monthly_m1, h=18, m=12)
m_m1_rcp <- rank_seasonal_rf(M3MPwrpsam, monthly_m1, h=18, m=12)
m_m1_benchmark <- rank_benchmark(monthly_m1, h=18, m=12)
m_m1_fcast <- rbind(m_m1_unb, m_m1_rcp)
m_m1_fcast <- rbind(m_m1_fcast, m_m1_benchmark)
m_m1_rank <- apply(m_m1_fcast, 2, rank)
rowMeans(m_m1_rank)
```

```
##    m_m1_unb    m_m1_rcp auto.arima        ets         WN         RW
##    1.777778    2.833333   4.944444   3.444444  10.000000   7.250000
##        RWD      STL_AR      Theta     snaive
##    8.611111    7.388889   2.277778   6.472222
```