Full motor dataset

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Tests and debug

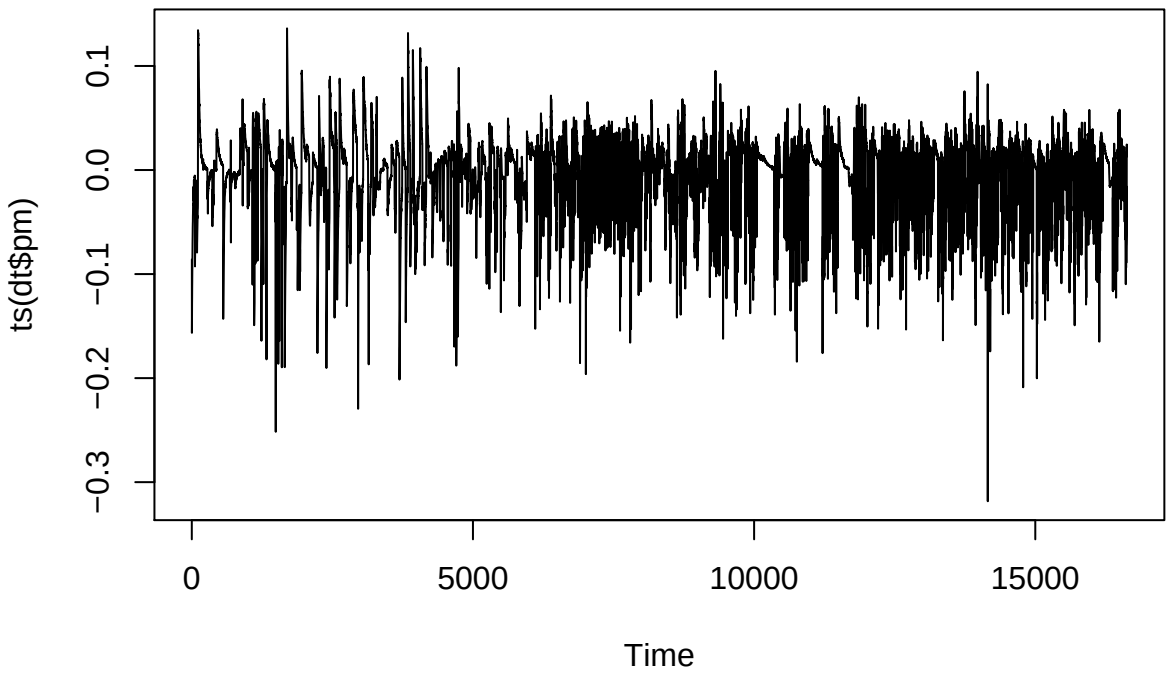
```
library(mtDBN)
library(data.table)
library(dbnR)
```

Test and debug chunks for the mtDBN model.

- First, model fitting:

```
setwd("C:/Users/Quesada/Downloads/archive")
dt <- data.table::fread("pmsm_temperature_data.csv") # 0.5 secs between rows
```

```
reduce_freq <- function(dt, obj_freq, curr_freq = 0.5){
  dt_res <- copy(dt)
  n_rows <- ceiling(obj_freq / curr_freq)
  obj_rows <- seq(1, dim(dt_res)[1], n_rows)
  idx_vec <- as.vector(sapply(obj_rows, function(x, times){rep(x,times)}, times=n_rows))[1:dim(dt_res)[
  dt_res[, idx := idx_vec]
  dt_res <- dt_res[, lapply(.SD, mean), by=c("idx","profile_id")]
  dt_res[, idx := NULL]

  return(dt_res)
}

filter_same_cycle <- function(f_dt, size, id_var){
  cond <- Reduce(function(acu, x){paste0(acu, " & ", id_var, "_t_0 == ", id_var, "_t_", x)}, seq_len(si
                 init = paste0(id_var, "_t_0 == ", id_var, "_t_1"))
  return(f_dt[eval(parse(text=cond))])
}

shift_diff_dt <- function(dt, obj_cols, id_col = NULL){
  dt[, (obj_cols) := lapply(.SD, function(x){c(x[1:(length(x)-1)] - x[2:length(x)],NA)}), .SDcols = obj
  dt <- dt[1:(dim(dt)[1]-1)]
  if(!is.null(id_col))
    dt <- dt[get(id_col) == shift(get(id_col), -1)]
}

dt[, torque := NULL]
dt <- reduce_freq(dt, 30, 0.5)
obj_vars <- c("stator_yoke", "stator_winding", "stator_tooth", "pm")
dt <- shift_diff_dt(dt, obj_vars, id_col = "profile_id")
plot(ts(dt$pm))
```




```
pred_vars <- names(dt)[!(names(dt) %in% obj_vars)]
test_id <- c(65, 72)
dt_train <- dt[!(profile_id %in% test_id)]
dt_test <- dt[profile_id %in% test_id]

size <- 3
id_var <- "profile_id"

f_dt_train <- dbnR::fold_dt(dt_train, size)
f_dt_train <- filter_same_cycle(f_dt_train, size, id_var)
del_vars <- names(f_dt_train)[grepl(id_var, names(f_dt_train))]
f_dt_train[, (del_vars) := NULL]
f_dt_test <- dbnR::fold_dt(dt_test, size)
f_dt_test <- filter_same_cycle(f_dt_test, size, id_var)
f_dt_test[, (del_vars) := NULL]
dt_train[, profile_id := NULL]
dt_test[, profile_id := NULL]
```

```
model_net <- dbnR::learn_dbn_struc(dt_train, size, method = "psoho", f_dt = f_dt_train, n_it = 50, n_in
```

```
##   |                                                                      |
```

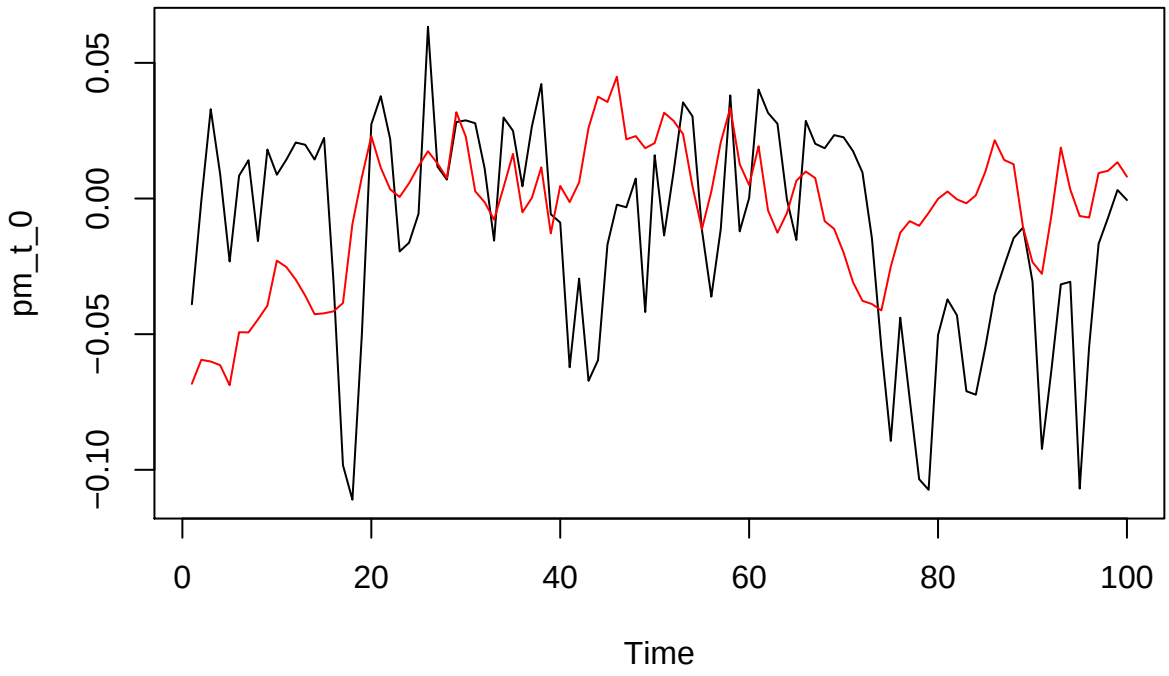
```
model_fit <- dbnR::fit_dbn_params(model_net, f_dt_train)
model <- mtDBN::mtDBN$new()
model$fit_model(dt_train, size, method = "psoho", obj_var = "pm", min_ind = 80, max_depth = 6, f_dt = f
```

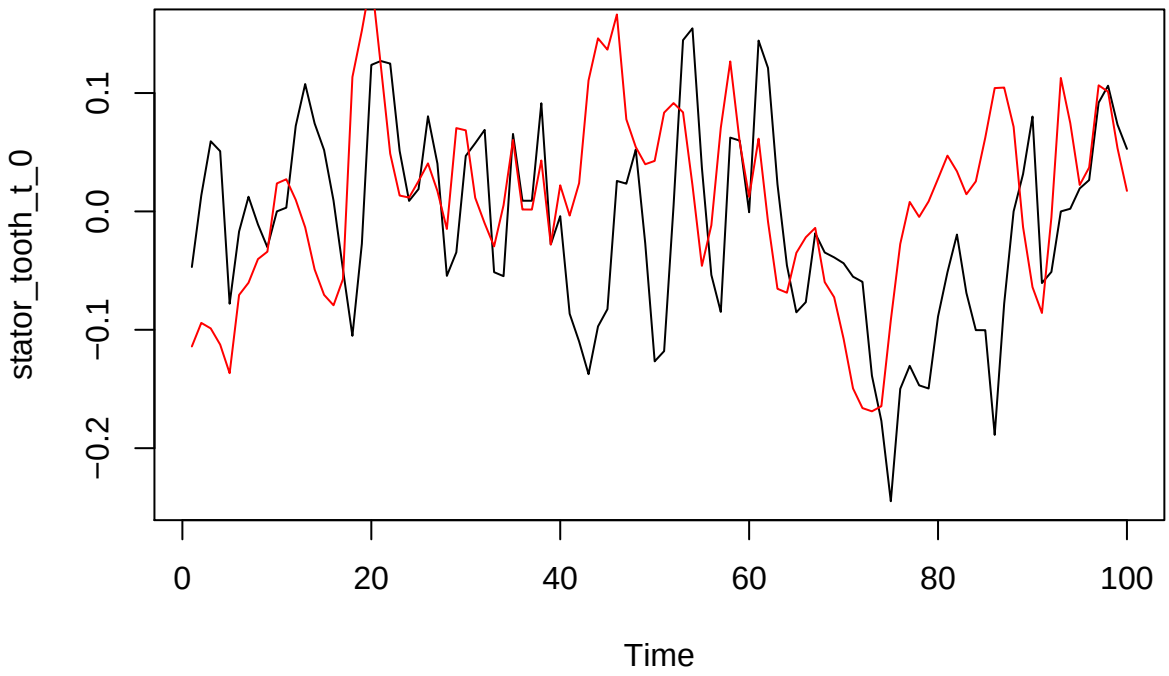
```
##   |                                                                      |
```

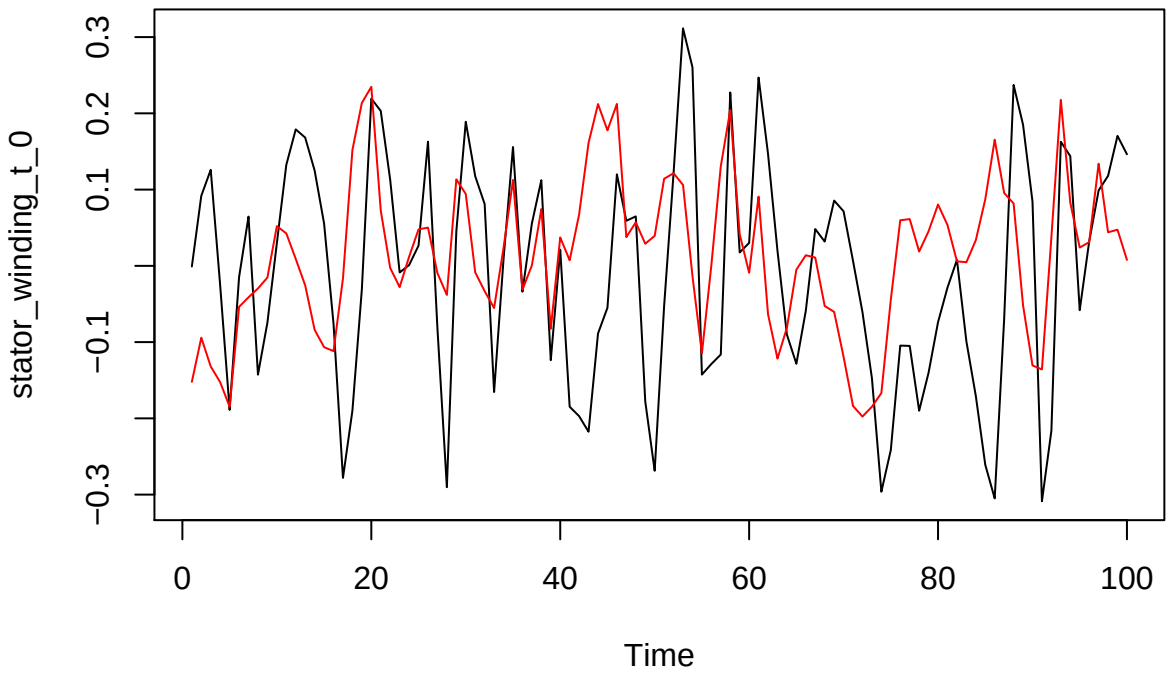
- Second, forecasting

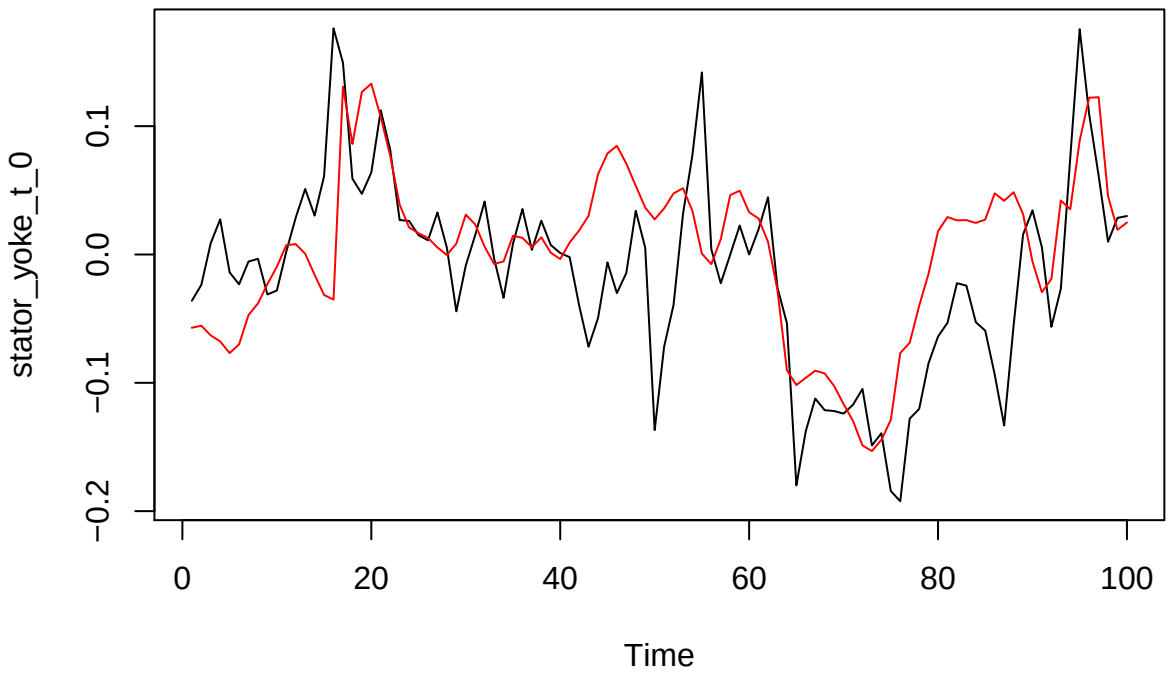
```
ini <- 50
len <- 100

obj_vars <- c("pm_t_0", "stator_tooth_t_0", "stator_winding_t_0", "stator_yoke_t_0")
ev_vars <- c("ambient_t_0","coolant_t_0","u_d_t_0","u_q_t_0","motor_speed_t_0","i_d_t_0","i_q_t_0")
res_net <- dbnR::forecast_ts(f_dt_test, model_fit, 3, obj_vars = obj_vars, ini = ini, len = len, prov_e
```

```
## Time difference of -0.6026661 secs
## [1] The average MAE per execution is:
## [1] pm_t_0: 0.037
## [1] stator_tooth_t_0: 0.0785
## [1] stator_winding_t_0: 0.1311
## [1] stator_yoke_t_0: 0.047
```

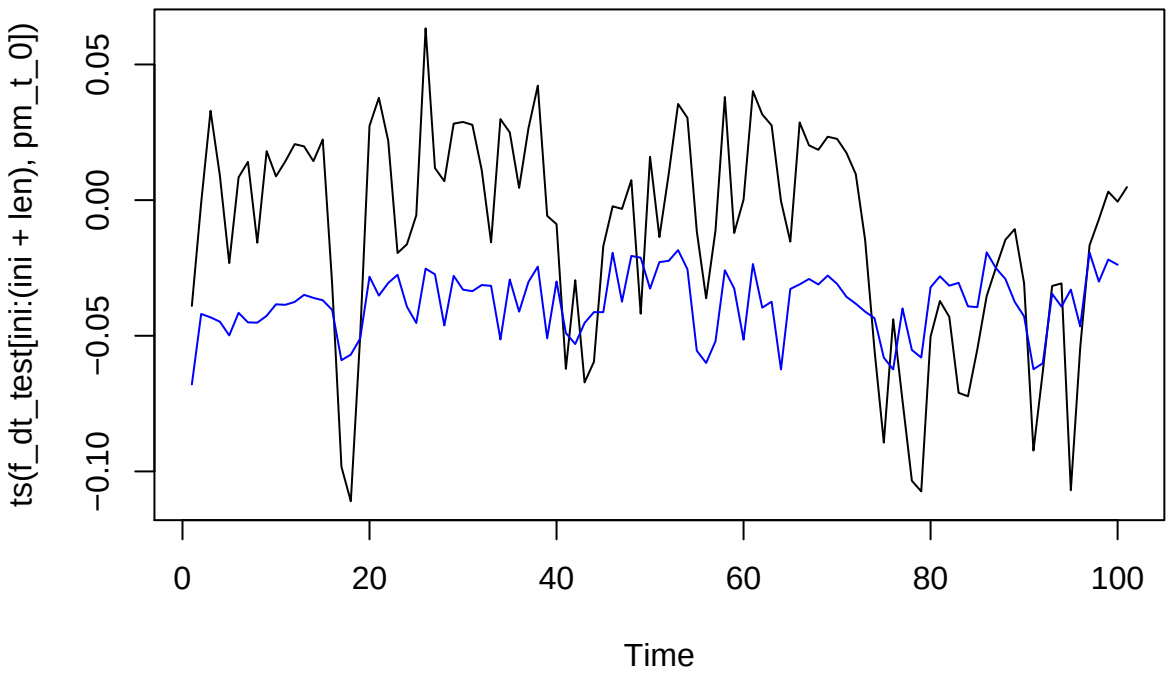



stator_tooth_t_0
0.1
0.0
−0.1
−0.2
0
20
40
60
80
100
Time

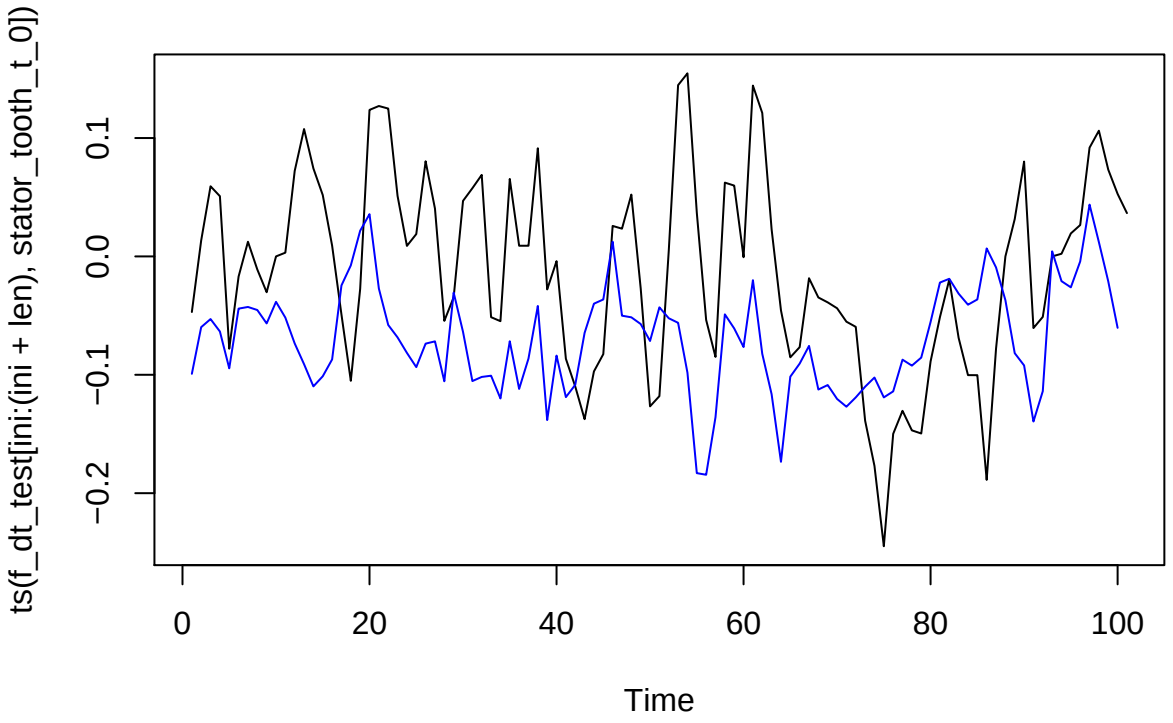

stator_winding_t_0
−0.3
−0.1
0.1
0.2
0.3
0
20
40
60
80
100
Time



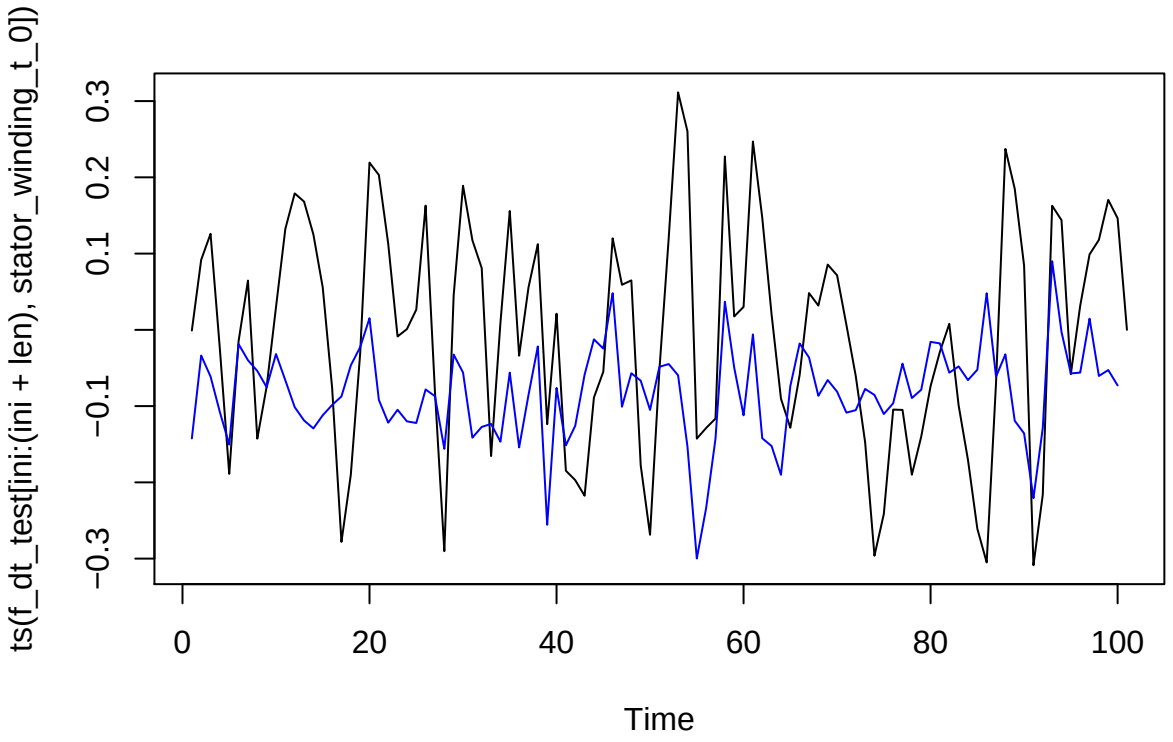

```
res <- model$forecast_ts(f_dt_test, obj_vars, ini = ini, len = len, prov_ev = ev_vars)

plot(ts(f_dt_test[ini:(ini+len),pm_t_0]))
lines(res$pm_t_0, col = "blue")
```



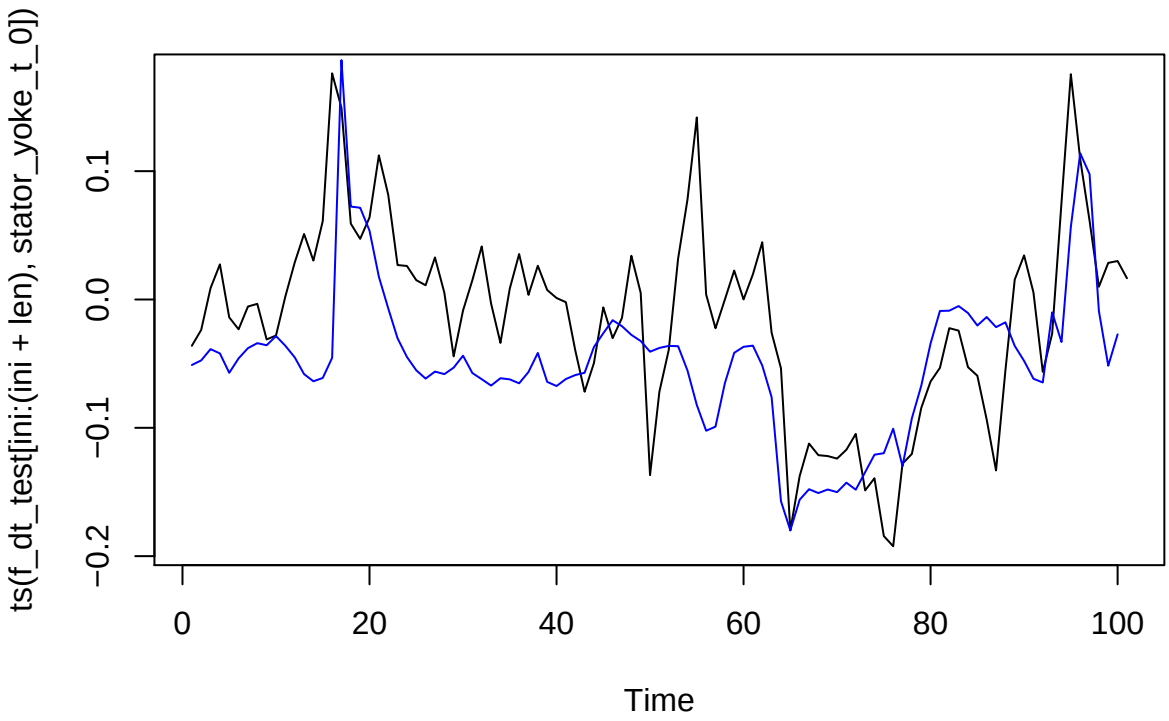

```
plot(ts(f_dt_test[ini:(ini+len), stator_tooth_t_0]))
lines(res$stator_tooth_t_0, col = "blue")
```




```
plot(ts(f_dt_test[ini:(ini+len), stator_winding_t_0]))
lines(res$stator_winding_t_0, col = "blue")
```




```
plot(ts(f_dt_test[ini:(ini+len),stator_yoke_t_0]))
lines(res$stator_yoke_t_0, col = "blue")
```


ts(f_dt_test[ini:(ini + len), stator_yoke_t_0])
−0.2
−0.1
0.0
0.1
0
20
40
60
80
100
Time