FAO Detrending Analysis

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```r
# --- ----- --- ----- --- ----- --- ----- --- ----- ---
# Basic code setup
# --- ----- --- ----- --- ----- --> ----- --- ----- ---


# Load necessary packages

Packages <- c("dplyr","tidyverse","FAOSTAT","smooth",
              "abind","stringr","Metrics",
              "RColorBrewer","ggthemes","ggplot2",
              "ggpubr","wesanderson","kableExtra")

lapply(Packages, library, character.only = TRUE)

# --- ----- --- ----- --- ----- --- ----- --- ----- ---
# Read and pre-process data
# --- ----- --- ----- --- ----- --- ----- --- ----- ---


inp.folder <- "Data/"

data.fao.code <- "QC" # FAO Dataset code for crop production data

countries <- c("Morocco","United States of America","Germany")
count.code <- c(143,231,79) #codes of the three countries in the FAO dataset



#-------------------------------------
# The next two lines download and save data from FAO.
# If the data are already downloaded, comment these lines

#data.fao.bulk <- get_faostat_bulk(data.fao.code,inp.folder)
#saveRDS(data.fao.bulk, paste0(inp.folder,data.fao.code,"_all_data.rds"))
#-------------------------------------

# Read data saved in folder, pre-process
production_crops <- readRDS(paste0(inp.folder,data.fao.code,"_all_data.rds")) %>%
  filter(area_code %in% count.code,
         element == "Yield",
         item == "Wheat") %>%
  dplyr::select(area,year,value) %>%
  mutate(type = "FAO data")

fig1 <- ggline(resultstable,
               x = "year",
```
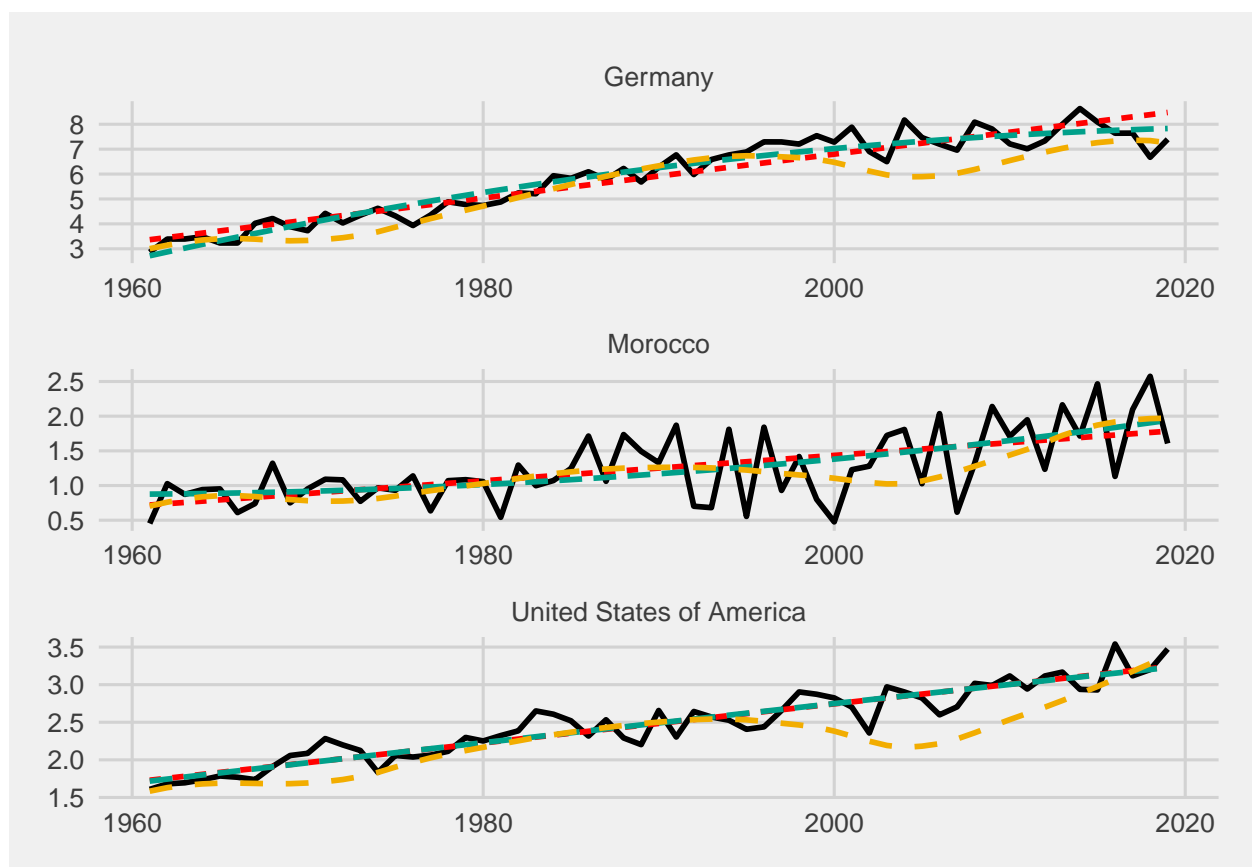
```
             y = "value",
             color = "type",
             plot_type = "l",
             facet.by = "area",
             nrow=3,
             scales = "free",
             size = 1.0,
             linetype = "type",
             xlab = "Year",
             ylab = "Yield (ton/ha)") +
  theme_fivethirtyeight() +
  color_palette(c("#000000",wes_palette("Darjeeling1",3))) +
  theme(legend.title = element_blank(), legend.position = "botton")

plot(fig1)
```

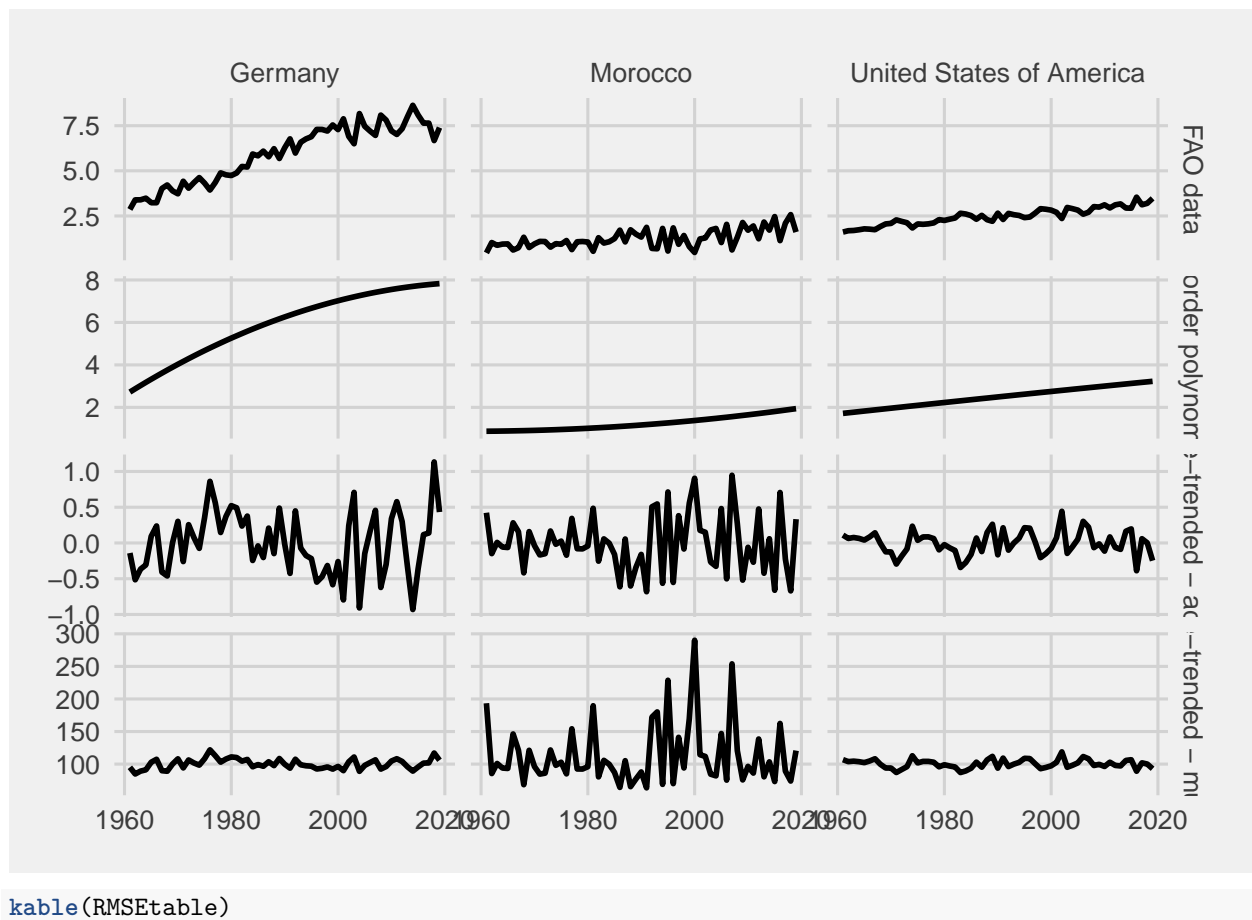

```
fig2 <- ggline(detrended.tab ,
             x = "year",
             y = "value",
             plot_type = "l",
             facet.by = c("type","area"),
             scales = "free",
             size = 1.0) + theme_fivethirtyeight()

plot(fig2)
```

```
kable(RMSEtable)
```

	Linear regression	2-order polynomial	Loess f=0.9
Morocco	0.4057627	0.3990320	0.4132280
United States of America	0.1636212	0.1635190	0.3935963
Germany	0.5287394	0.4329664	0.9357898