Agregador_Formulas

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1. Functions

```r
source("R/Extract.r") #load stimsons "extract" function (downloaded from internet)
observations <- wcalcdiagnosticsQ <-  wcalcdiagnosticsM <- list()
```

1.1. Function to identify months that used data from more than one president

```r
my.drop <- function(xx){
  xx$drop.wcalcM <- xx$drop.wcalcQ <-  F  #indicator for whether to drop

#Drop months after last obs and prior to first obs
  for (i in levels(xx$PresidentS)){
    firstmonth <- min(which(xx$PresidentS==i))
    firstpop <- min(which(is.na(xx$Positive)==F&xx$PresidentS==i))
    lastmonth <- max(which(xx$PresidentS==i))
    lastpop <- max(which(is.na(xx$Positive)==F&xx$PresidentS==i))
    if(firstmonth<firstpop){xx$drop.wcalcM[firstmonth:(firstpop-1)] <- T}
    if(lastpop<lastmonth){xx$drop.wcalcM[(lastpop+1):lastmonth] <- T}
  }
  months.to.drop <- xx$M[xx$drop.wcalcM] #this is final
  #For quarters, drop after last obs, prior to first obs and
  #those with two presidents
  Qpost <- unique(xx$Q[xx$drop.wcalcM]) #refine this later
  tmp <- daply(xx,.(Q),function(x){sum(is.na(x$Positive))})
  QNA <- names(tmp[tmp==3]) #quarters with no data
  tmp <- daply(xx,.(Q),function(x){length(unique(x$PresidentS[is.na(x$Positive)==F]))})
  Q2P <- names(tmp[tmp==2]) #quarters With DATA from two presidents
  quarters.do.drop <- union(intersect(Qpost,QNA),Q2P)
  #out <- list(M=months.to.drop,Q=quarters.do.drop)
  xx$drop.wcalcQ[is.element(xx$Q,quarters.do.drop)] <- T
  ## The line below might seem strange, but it doesn't make sense to keep
  ## monthly observations of Q for months that have been dropped
  ## this is specially a problem for transition between presidents
  xx$drop.wcalcQ[is.element(xx$M,months.to.drop)] <- T
  cat('Should drop WCALC estimates for the following months:\n')
  print(months.to.drop)
  cat('and quarters:\n')
  print(quarters.do.drop)
  return(xx)
}
```

1.2. Functions for aggregating monthly data

```
obsM <- function(d){nrow(d)}
institutesM <- function(d){length(unique(d$Institute))}
instituteM <- function(d){if(length(unique(d$Institute))==1){
  as.character(d$Institute[1])}else{"_Multiple"}}

my.averageM <- function(x,drop.series=NULL){
  if(is.null(drop.series)==F){  x <- subset(x,Institute!=drop.series)}
  tmp <- ddply(x, "M", c("popM","obsM","institutesM"))
  tmp2 <- ddply(x, "M", c("instituteM","presUsed"))
  out <- merge(tmp,tmp2,by="M",all=T)
  return(out)
}

popM <- function(d){#simple aggregation
  ifelse(is.nan(mean(d$Positive,na.rm=T)),NA,mean(d$Positive,na.rm=T))}
popM <- function(x){#for when there is more than one president in the same term
  if(length(unique(x$PresidentS))==1){
    ifelse(is.nan(mean(x$Positive,na.rm=T)),NA,mean(x$Positive,na.rm=T))
  }else{#if more than one president, use incoming
    to.keep <- which(x$PresidentS==x$PresidentS[nrow(x)])
    ifelse(is.nan(mean(x$Positive[to.keep],na.rm=T)),NA,mean(x$Positive[to.keep],
                                                             na.rm=T))
  }}

presUsed <- function(d){if(length(unique(d$PresidentS))==1){#use incoming president
  as.character(d$PresidentS[1])}else{as.character(d$PresidentS[nrow(d)])}}

dateUsed <- function(d){ #if no observation, use start of quarter,
  if(is.na(max(d$date))){
    out <- gsub("-1","-02-15",d$Q)
    out <- gsub("-2","-05-15",out)
    out <- gsub("-3","-08-15",out)
    out <- gsub("-4","-11-15",out)
  }else{
    out <- max(d$date)
  }
  return(out)}

dateUsed <- function(d){max(d$date)}

my.averageQ <- function(x,drop.series=NULL){
  if(is.null(drop.series)==F){  x <- subset(x,Institute!=drop.series)}
  tmp <- ddply(x, "Q", c("popM",
                         "obsM","institutesM"))
  tmp2 <- ddply(x, "Q", c("instituteM","presUsed"))
  tmp3 <- ddply(x, "Q", c("dateUsed"))
  out <- merge(merge(tmp,tmp2,by="Q",all=T),tmp3,by="Q",all=T)
  names(out)<-gsub("M","Q",names(out))
  return(out)
}
```

2. Setting

2.1. Create empty dataframe for merging results later

```
#### Merge estimates into d dataset for plotting ####
Ms <- expand.grid(1980:2017,sprintf("%02.0f", 1:12))
Ms <- sort(paste(Ms[,1],Ms[,2],sep="-"))
Qs <- gsub("-01|-02|-03","-1"
           ,gsub("-04|-05|-06","-2"
                 ,gsub("-07|-08|-09","-3"
                       ,gsub("-10|-11|-12","-4",Ms))))
MQ <- data.frame(M=Ms,Q=Qs)
```

2.2. Define a month

```
m1 <- 365/12
```

3. Prepare data from stimsons' wcalc

```
load("R/popularity_raw_BR.RData")
### The simple averaging approach ##################
ms <- my.averageM(d)  #by month
qs <- my.averageQ(d)  #by quarter

#For WCalc, start by saving the info of which pres to use into data
#this is to make sure only "incoming" presidents are used when
#there are more than one per time period
#this should not affect monthly latent estimates
#but definitely affects quarterly

d <- merge(d,subset(ms,select=c(M,presUsed)),by="M",all.x=T)
d$useM <- d$PresidentS==d$presUsed

d$Varname <-  gsub("\\s","",d$Institute)
d$Date <- d$date
d$Index <- d$Positive
```

```
ds <- subset(d,select=c(Varname,Date,Index,PresidentS,Q,M,useM))

cat("Observation by pollster in dataset\n")
```

```
## Observation by pollster in dataset
```

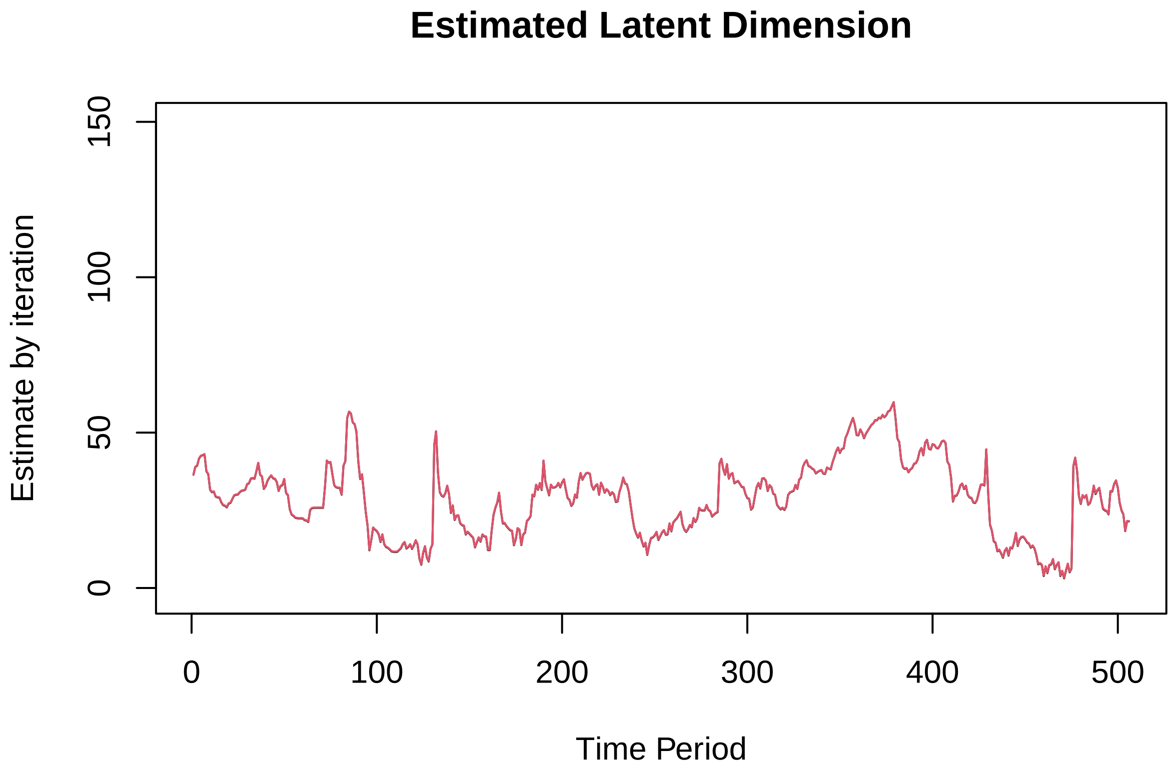
```
print(table(ds$Varname))
```

```
## 
##        Atlas    Datafolha DataPoder360       Gallup        IBOPE        IBPAD 
##           14          205           40           63          171            7 
## IdeiaBigData       IPESPE        IPSOS          MDA    Offerwise       Parana 
##           71           40           45           30            6            5 
##       Quaest       Sensus          Vox 
##            7           76           46
```

3.1. WCALC Monthly

```
useM <- which(ds$useM==T)
wcalc.Mraw <- extract(varname=ds$Varname[useM]
                      ,date=ds$Date[useM]
                      ,index=ds$Index[useM]
                      ,ncases=NULL,
                      unit="M")
```

```
## [1] "Estimation report:"
## [1] "Period: 1979 5  to 2021 6 506  time points"
## [1] "Number of series:  15"
## [1] "Number of usable series:  15"
## [1] "Exponential smoothing:  TRUE"
## [1] "Iteration history: Dimension  1"
## [1] " "
## [1] "Iter Convergence Criterion Reliability Alphaf Alphab"
```



```
## [1] "1         0.0168     0.001      0.934 0.7286 0.8317"
## [1] "2         0.0023     0.001      0.934 0.728 0.8343"
## [1] "3         3e-04     0.001      0.935 0.7278 0.8344"
## [1] " "
## [1] "Eigen Estimate  1.27  of possible  1.35"
## [1] "  Percent Variance Explained:  93.57"
## [1] " "
## [1] "Final Weighted Average Metric:  Mean:  28.97  St. Dev:  11.85"
```

```
wcalcdiagnosticsM[["brazil"]] <- summary(wcalc.Mraw)
```

```
## Variable Loadings and Descriptive Information: Dimension 1
## Variable Name Cases Loading    Mean  Std Dev
##         Atlas    14    0.6370 28.00000  4.21307
##     Datafolha   172    0.9851 33.44448 18.68127
##  DataPoder360    24    0.9743 22.04167 13.43341
##        Gallup    63    0.9902 32.66667 17.33608
##         IBOPE   142    0.9855 36.55540 18.18718
##         IBPAD     6   -0.6322 34.66667  3.27652
##  IdeiaBigData    28    0.9439 33.73214  5.95891
##        IPESPE    31    0.9740 29.12903 11.10287
##         IPSOS    45    0.9770  5.55556  5.00469
##           MDA    28    0.9711 25.45714 16.70788
##     Offerwise     6    0.0196 33.95000  2.17390
##        Parana     5    0.8724 35.50000  2.08135
##        Quaest      5    0.7513 24.80000  3.65513
##        Sensus     71    0.9929 41.80000 17.24610
##           Vox     45    0.9789 24.13333 13.45214
```

```r
wcalc.M <- data.frame(M=gsub("\\.","-",wcalc.Mraw$period,perl=T)
                      ,latentM=wcalc.Mraw$latent1)
wcalc.M$M <- gsub("-1$","-10",wcalc.M$M )


### Merge WCALC, and averaging estimates:
### Raw estimates no longer saved (look at raw file, instead)
dm <- merge(ms,wcalc.M,by=c("M"),all=T)


### Fill in missing presidents names (for those months for which we had not data)
### This is based on dates, so first impute day of month for missing observations
### For mnth, take center of month, doesn't matter because never two presidents
dm$date  <- as.Date(paste(dm$M ,"-15",sep=""))

#Enter the dates of presidencies#######
pres.dates <- c(
  as.Date(c(
    "1979-03-15",#start of Figueiredo, prior to start of data
    "1985-03-15",#start of Sarney
    "1990-03-15",#start of collor
    "1992-10-02",#start of Franco
    "1995-01-01",#start of FHC
    "2003-01-01",#start of Lula
    "2011-01-01",#start of Dilma
    "2016-08-31",#start of Temer
    "2019-01-01"#start of Bolsonaro
  )),Sys.Date())

dm$PresidentS <- dm$presUsed
missing.pres <- dm$PresidentS[is.na(dm$PresidentS)]
missing.dates <- dm$date[is.na(dm$PresidentS)]
dm$PresidentS[is.na(dm$PresidentS)] <- ifelse(
  missing.dates<pres.dates[2],"FIGUEIREDO", ifelse(missing.dates>=pres.dates[2]&missing.dates<pres.dates

dm$PresidentS <- factor(dm$PresidentS,levels=c("FIGUEIREDO","SARNEY","COLLOR","FRANCO"
                                  ,"CARDOSO","LULA","DILMA","TEMER","BOLSONARO"))


## This is the same for both datasets (record presidents that finished term, etc)
elected.pres <- levels(dm$PresidentS)[-c(1,2,4)]
concluded.pres <- levels(dm$PresidentS)[-c(3,7)]

### Add linear interpolations for average approach
### We do this by president so as not interpolate at end and start
### At end and start, repeat first or last obser
allpres <- levels(dm$PresidentS)
dm$popM.li <- NA
for(pp in allpres){
  l <- min(which(is.na(dm$popM)==F&dm$PresidentS==pp))
  h<- max(which(is.na(dm$popM)==F&dm$PresidentS==pp))
  dm$popM.li[l:h] <- data.frame(dm$popM[l:h],
          approx(dm$popM[l:h],method = "linear", n = length(dm$popM[l:h])))$y

  hh <-  max(which(dm$PresidentS==pp))
  ll <-  min(which(dm$PresidentS==pp))
  if(hh>h){#if there is missing at the end of term, impute average of last values
    # (and project in LatenM)
    dm$popM.li[(h+1):hh]<-mean(dm$popM.li[(h-2):h])
    m.to.fill <- length((h+1):hh) ##and for LatentM->linearly project from last 3 points
    dm$latentM[(h+1):hh]<-approx(dm$latentM[(h-2):h],n=(3+m.to.fill))$y[-c(1:3)]
  }
  if(ll<l){#if there is missing at  start of term, impute average of first values
    dm$popM.li[ll:(l-1)]<-mean(dm$popM.li[l:(l+1)])
    dm$latentM[ll:(l-1)]<-mean(dm$latentM[l:(l+1)])}
}

#Compute the counter for months in the term for each observation
dm$minterm <- round(as.numeric(dm$date-pres.dates[as.numeric(dm$PresidentS)])/m1,1)

#Honey moon indicator, but only for elected presidents
dm$hm <- ifelse(dm$minterm<=4 &
                  is.element(dm$PresidentS,elected.pres),T,F)
dm$hmc <- ifelse(dm$minterm<=6 &
                   is.element(dm$PresidentS,elected.pres),abs(dm$minterm-6),0)


#Compute months left in term
dm$mleft <- round(
  ifelse(as.numeric(dm$PresidentS)==max(as.numeric(dm$PresidentS)),
         NA,#last president, can't compute months left in term
         as.numeric(pres.dates[1+as.numeric(dm$PresidentS)]-dm$date)/m1),1)

#Compute lame duck indicator
dm$ld <- ifelse(is.na(dm$mleft),F, #last president is NA
                dm$mleft<=4&is.element(dm$PresidentS,concluded.pres))
```

3.2. Summary statistics

```
load("R/popularity_raw_BR.RData")
load("R/popularity_raw_bolsonaro_BR.RData")

Nall <- nrow(dd)

d <- subset(d,President!="Figueiredo")
dm <- subset(dm,PresidentS!="FIGUEIREDO")
Nused <- sum(is.na(d$Positive)!=T) #total number of raw observations used
Npollsters <- length(unique(d$Institute))
Nmonths <- nrow(dm) #months spanned by the monthly dataset
Nmonthsdata <- nrow(ms) #months in which there was some observation
Nimp <- sum(is.na(dm$popM))
```

```
N1 <- min(dm$M)
NN <- max(dm$M)

obs <- data.frame(Nall,Nused,Npollsters,Nmonths,Nimp
                  ,First=N1,Last=NN)

obs<-list(summary=obs,by.pollster=as.matrix(table(ds$Varname)))
save(obs,file="DATA/obs_BR.RData")
write.csv(obs,'DATA/obs_BR-M.csv')
```

3.3. Save the datasets

```
dm <- subset(dm,select=c(date,M,PresidentS,minterm,hm,hmc,ld,
                         popM,popM.li,latentM,instituteM))
dm$term <- as.character(dm$PresidentS)
dm$term[which(dm$date>as.Date("1999-01-01")&dm$PresidentS=="CARDOSO")] <- "CARDOSO II"
dm$term[which(dm$date>as.Date("2007-01-01")&dm$PresidentS=="LULA")] <- "LULA II"
dm$term[which(dm$date>as.Date("2015-01-01")&dm$PresidentS=="DILMA")] <- "DILMA II"
dm$country<-"Brazil"
save(dm,file="DATA/data_BR-M.RData")
write.csv(dm,'DATA/data_BR-M.csv')

cat("\nCorrelation between MONTHLY linear imputed and Wcalc:\n")
```

```
##
## Correlation between MONTHLY linear imputed and Wcalc:
```

```
print(cor.test(dm$popM.li,dm$latentM))
```

```
##
##  Pearson's product-moment correlation
##
## data:  dm$popM.li and dm$latentM
## t = 115.34, df = 434, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.9808070 0.9867923
## sample estimates:
##       cor
## 0.9840762
```

4. Plotting

4.1. Merge estimates into d dataset for plotting

```
d <- merge(d,subset(dm,select=c(M,popM.li,latentM)),by="M",all=T)
d  <- d[order(d$M),]#make sure data are ordered
```

```r
save(d,file="DATA/data_BR-D.RData")
write.csv(d,'DATA/data_BR-D.csv')

## Save popularity at election time
elec.date <- as.Date(c("1988-11-15","1989-11-15","1990-03-10",
                       "1992-10-03","1994-10-03","1996-10-03",
                       "1998-10-04","2000-10-01","2002-10-06",
                       "2004-10-03","2006-10-01",
                       "2008-10-05","2010-10-03",
                       "2012-10-07","2014-10-05","2016-10-01",
                       "2018-10-07"))
pop.elec <- data.frame(matrix(NA,nrow=2,ncol=length(elec.date),
                              dimnames=list(c("popM.li","latentM"),
                                            c(as.character(elec.date)))))
#popularity of presidents close to election

for(i in 1:length(elec.date)){
  pop.elec[1,i] <- d$popM.li[which.min(abs(as.numeric(d$date-elec.date[i])))]
  pop.elec[2,i] <- d$latentM[which.min(abs(as.numeric(d$date-elec.date[i])))]
}
pop.elec <- t(pop.elec)
save(pop.elec,file="DATA/data_BR_elections.RData")
write.csv(pop.elec,'DATA/data_BR-elections.csv')
```

4.2. Plot

```r
pdf(file="FIGURES/fig-popBR.pdf",width=8,height=6)
par(mar=c(2.5,5.5,.5,.5))
min.y<-0
max.y<-100
plot(d$date, d$Positive,type="n"
     ,ylab="Approval or Popularity"
     ,xlab="",bty="n",
     cex.axis=1.2,cex.lab=1.2,ylim=c(min.y,max.y))
polygon(x=c(min(d$date),pres.dates[1],pres.dates[1],min(d$date)),
        y=c(min.y,min.y,max.y,max.y),border=NA,col=gray(0.9))
for(i in seq(2,length(pres.dates),by=2)){
  polygon(x=c(pres.dates[i],pres.dates[i+1],pres.dates[i+1],pres.dates[i]),
          y=c(min.y,min.y,max.y,max.y),border=NA,col=gray(0.9)) }

points(d$date,d$popM,pch=".",cex=2)
alt <- -1
for(i in levels(d$PresidentS)){
  text(mean(d$date[d$PresidentS==i],na.rm=T),max.y-2,labels=i,cex=0.6,pos=2+alt)
  lines(d$date[which(d$PresidentS==i)],d$latentM[which(d$PresidentS==i)],col=gray(0))
  lines(d$date[which(d$PresidentS==i)],d$popM.li[which(d$PresidentS==i)],col=1,lty=3)
  alt <- alt * -1 #to alternate position of name
}
legend(x="bottomright"
       ,legend=c("Raw Data Point","Average (Monthly)","Latent Estimate (Monthly)",
                 "Latent Estimate (Quarterly)")
       ,cex=0.8
       ,lty=c(NA,3,1,1)
       ,col=c(1,gray(0),gray(0),gray(.5))
       ,pch=c(".",NA,NA,NA),pt.cex=4,bty="n")
#abline(h=33,lty=2)
abline(v=c(as.Date("1994-10-01"),
           as.Date("1998-10-01"),
           as.Date("2002-10-01"),
           as.Date("2006-10-01"),
           as.Date("2010-10-01"),
           as.Date("2014-10-01"),
           as.Date("2018-10-01")))
```