R Notebook

# Aviso Prévio:

Esse trabalho não apresenta análises, aqui está localizado o código usado, explicado e comentado do processo, as analises estão no docs. Trabalho também pode ser encontrado em https://github.com/hutner700/Trabalho-Final-Metodos-Econometricos

#### Instalando os Pacotes ####  
#install.packages("AER")  
#install.packages("Quandl")  
#install.packages("tidyverse")  
#install.packages("lmvar")  
#### Abrindo os pacotes ####  
library("AER")  
library("Quandl")  
library('TTR')  
library('quantmod')  
library('tidyverse')  
library("zoo")  
library("fBasics")  
library("lmvar")  
library("stargazer")  
library("lubridate")  
library("skedastic")  
library("fBasics")

# Dados

Primeiro importação da base de dados localizado no diretório, já preparada pelo arquivo “tratamentoDados.R” e dados fornecidos na pasta Dados

get\_close\_values\_from\_papers <- function(PAPER){  
 df\_intc <- getSymbols(PAPER,src='yahoo',auto.assign=FALSE,periodicity = "monthly",from="2001-12-01")  
 only\_close <- df\_intc[,4]  
 names(only\_close) <- "Close"  
 return(only\_close)  
}  
  
ibov <- get\_close\_values\_from\_papers("%5EBVSP")  
load("Dados/desemprego - 1980 a 2001.Rdata")  
load("Dados/desemprego - 2002 a 2022.Rdata")  
load("Dados/EconoDados.Rdata")  
load("Dados/FedFunds.Rdata")  
load("Dados/gap.Rdata")  
load("Dados/IPCA.Rdata")  
load("Dados/selic.Rdata")  
load("Dados/IGPM.Rdata")  
  
desemprego <- rbind(desemprego1,desemprego2)  
  
data <- zoo(data,order.by = rownames(data))  
  
desemprego <- zoo(desemprego,order.by = rownames(desemprego))  
colnames(desemprego) <- "desemprego"  
FedFunds <- zoo(FedFunds,order.by = rownames(FedFunds))  
colnames(FedFunds) <- "FedFunds"  
gap <- zoo(gap,order.by = rownames(gap))  
colnames(gap) <- "gap"  
ibov <- zoo(ibov,order.by = as.character(index(ibov)))  
colnames(ibov) <- "ibov"  
IPCA <- zoo(IPCA,order.by = rownames(IPCA))  
colnames(IPCA) <- "IPCA"  
selic <- zoo(selic,order.by = rownames(selic))  
colnames(selic) <- "Selic"  
  
IGPM <- zoo(igpm,order.by = rownames(igpm))  
  
baseDados <- cbind.zoo(data, desemprego, FedFunds, gap, ibov, IPCA, selic,IGPM)  
  
  
baseDados <- baseDados[index(baseDados) > as.Date("2001-12-01") & index(baseDados) < as.Date("2022-01-01")]  
  
  
save(baseDados, file = "Dados/final.Rdata")  
load("Dados/final.Rdata")

# Modelo trimestrais

Nessa hora começamos o modelo trimestral, aqui é a construção dos dados, importando do banco montado acima

primeiradiferencalog <- function(column){  
 index\_analisado <- index(column)  
 analisado <- as\_tibble(column)  
 analisado <- analisado%>%dplyr::mutate(growth\_lag1 = dplyr::lag(analisado))  
 colnames(analisado) <- c("esse","ultimo")  
 saida <- log(analisado[,'esse']/analisado[,'ultimo'])  
 saida <- zoo(saida)  
 index(saida) <- index\_analisado  
 return(saida)  
}  
  
  
baseDadosTrimestral <- baseDados[!is.na(baseDados[,'gap'])]  
  
#A primeira diferença do logaritmo do retorno real da bolsa de valores de São Paulo (RSR);  
ibov\_dif <- zoo(primeiradiferencalog(baseDadosTrimestral[,"ibov"]))  
  
#ibovespa de ontem  
ibov\_ontem <- ibov\_dif  
ibov\_ontem\_index <- index(ibov\_ontem)  
ibov\_ontem <- as\_tibble(ibov\_ontem)  
ibov\_ontem <- ibov\_ontem%>%dplyr::mutate(growth\_lag1 = dplyr::lag(ibov\_ontem))  
ibov\_ontem <- zoo(ibov\_ontem[,2],order.by = ibov\_ontem\_index)  
  
#a primeira diferença do logaritmo dos preços das Commodities (COM);  
commoditi\_dif <- zoo(primeiradiferencalog(baseDadosTrimestral[,5]))  
  
#a primeira diferença do logaritmo do desemprego: antiga Pesquisa Mensal do Emprego - PME/ IBGE-19(DES);  
desemprego\_dif <- zoo(primeiradiferencalog(baseDadosTrimestral[,"desemprego"]))  
  
#a primeira diferença do logaritmo do IGP (IGP);  
igp\_dif <- zoo(primeiradiferencalog(baseDadosTrimestral[,'1.IGPM']))  
  
#a primeira diferença do logaritmo do agregado monetário M1(M1)  
M1.1 <- zoo(primeiradiferencalog(baseDadosTrimestral[,1]))  
M1.2 <- zoo(primeiradiferencalog(baseDadosTrimestral[,2]))  
M1.3 <- zoo(primeiradiferencalog(baseDadosTrimestral[,3]))  
  
#a primeira diferença do logaritmo da produção física industrial dessazonalizada  
producao\_dif <- zoo(primeiradiferencalog(baseDadosTrimestral[,4]))  
  
# o logaritmo da taxa de juros dos EUA (EUA).  
juros\_log <- log(baseDadosTrimestral[,'FedFunds'])  
  
#o Relative Market Money Rate, construída através da diferença da taxa de juros e a média móvel de 12 meses para trás (RMM);  
RMM <- baseDadosTrimestral[,'FedFunds'] - rollmean(baseDadosTrimestral[,'FedFunds'],12)  
# GAP  
gap <- baseDadosTrimestral[,'gap']  
  
baseLimpa <- merge.zoo(ibov\_dif,commoditi\_dif,desemprego\_dif,igp\_dif, M1.1, M1.2, M1.3, producao\_dif, juros\_log,RMM,ibov\_ontem,gap)  
  
colnames(baseLimpa) <- c("IBOV\_dif","commoditi\_dif","desemprego\_dif","igp\_dif","Agreg\_Monetario1","Agreg\_Monetario2","Agreg\_Monetario3", "producao\_fisica\_industrial\_dif" ,"jurosEUA\_log" ,"RMM" ,"ibov\_ontem","gap")

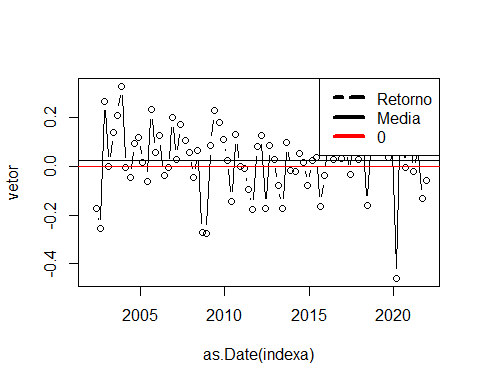
vendo a correlação entre os dados

cor(na.omit(baseLimpa))

## IBOV\_dif commoditi\_dif desemprego\_dif  
## IBOV\_dif 1.00000000 -0.02822844 -0.02908837  
## commoditi\_dif -0.02822844 1.00000000 -0.10645867  
## desemprego\_dif -0.02908837 -0.10645867 1.00000000  
## igp\_dif -0.17336139 0.38120442 -0.04403053  
## Agreg\_Monetario1 0.20035582 0.23852507 -0.76945930  
## Agreg\_Monetario2 0.21231027 0.22730281 -0.50693117  
## Agreg\_Monetario3 0.21233810 0.25485173 -0.74877552  
## producao\_fisica\_industrial\_dif 0.12401614 -0.09297886 0.54767926  
## jurosEUA\_log 0.18712581 -0.11189447 -0.07569296  
## RMM 0.11332241 -0.04328614 -0.08571523  
## ibov\_ontem -0.01631799 0.08299742 -0.04672636  
## gap -0.18841094 0.01586600 -0.23602189  
## igp\_dif Agreg\_Monetario1 Agreg\_Monetario2  
## IBOV\_dif -0.17336139 0.200355816 0.21231027  
## commoditi\_dif 0.38120442 0.238525067 0.22730281  
## desemprego\_dif -0.04403053 -0.769459298 -0.50693117  
## igp\_dif 1.00000000 0.077376647 0.07949385  
## Agreg\_Monetario1 0.07737665 1.000000000 0.61964600  
## Agreg\_Monetario2 0.07949385 0.619645996 1.00000000  
## Agreg\_Monetario3 0.09039208 0.966667270 0.79173314  
## producao\_fisica\_industrial\_dif -0.06662014 -0.666899322 -0.41373579  
## jurosEUA\_log -0.01769844 -0.002708446 0.12109814  
## RMM -0.00471900 -0.002490848 0.18621019  
## ibov\_ontem -0.07402297 -0.120344742 0.14968995  
## gap 0.09919597 -0.018038312 0.02600642  
## Agreg\_Monetario3 producao\_fisica\_industrial\_dif  
## IBOV\_dif 0.21233810 0.12401614  
## commoditi\_dif 0.25485173 -0.09297886  
## desemprego\_dif -0.74877552 0.54767926  
## igp\_dif 0.09039208 -0.06662014  
## Agreg\_Monetario1 0.96666727 -0.66689932  
## Agreg\_Monetario2 0.79173314 -0.41373579  
## Agreg\_Monetario3 1.00000000 -0.65422401  
## producao\_fisica\_industrial\_dif -0.65422401 1.00000000  
## jurosEUA\_log 0.01791971 0.06909537  
## RMM 0.05670809 0.05253811  
## ibov\_ontem -0.07132732 0.06875636  
## gap -0.01433561 0.05335653  
## jurosEUA\_log RMM ibov\_ontem  
## IBOV\_dif 0.187125808 0.113322410 -0.01631799  
## commoditi\_dif -0.111894469 -0.043286141 0.08299742  
## desemprego\_dif -0.075692956 -0.085715227 -0.04672636  
## igp\_dif -0.017698445 -0.004719000 -0.07402297  
## Agreg\_Monetario1 -0.002708446 -0.002490848 -0.12034474  
## Agreg\_Monetario2 0.121098136 0.186210192 0.14968995  
## Agreg\_Monetario3 0.017919711 0.056708093 -0.07132732  
## producao\_fisica\_industrial\_dif 0.069095366 0.052538108 0.06875636  
## jurosEUA\_log 1.000000000 0.471098273 0.35792052  
## RMM 0.471098273 1.000000000 0.25393577  
## ibov\_ontem 0.357920516 0.253935765 1.00000000  
## gap -0.112730017 0.144696191 0.10253793  
## gap  
## IBOV\_dif -0.18841094  
## commoditi\_dif 0.01586600  
## desemprego\_dif -0.23602189  
## igp\_dif 0.09919597  
## Agreg\_Monetario1 -0.01803831  
## Agreg\_Monetario2 0.02600642  
## Agreg\_Monetario3 -0.01433561  
## producao\_fisica\_industrial\_dif 0.05335653  
## jurosEUA\_log -0.11273002  
## RMM 0.14469619  
## ibov\_ontem 0.10253793  
## gap 1.00000000

Plotando o IBOV com media e o 0 em destaque:

vetor <- as.vector(baseLimpa[,'IBOV\_dif'])  
indexa <- index(baseLimpa[,'IBOV\_dif'])  
plot(as.Date(indexa),vetor,type="b")  
par(mfrow=c(1,1))  
abline(h=0,col="red")  
abline(h=mean(na.omit(vetor)),col="black")  
legend(x = "topright", # Position  
 legend = c("Retorno", "Media","0"), # Legend texts  
 lty = c(6, 1 , 1), # Line types  
 col = c("Black", "Black","Red"), # Line colors  
 lwd = 4)



Criando um modelo generalista para testar variáveis

model0TodosAgregados <- lm(IBOV\_dif ~ .,data=baseLimpa)  
summary(model0TodosAgregados)

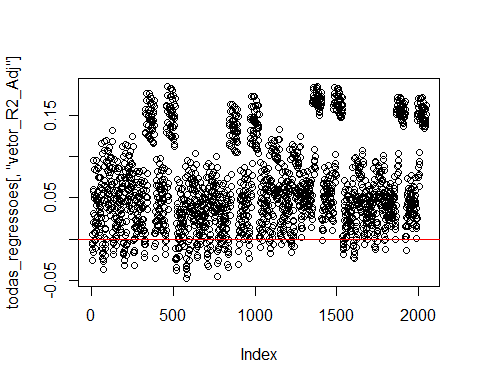
##   
## Call:  
## lm(formula = IBOV\_dif ~ ., data = baseLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.47205 -0.03436 0.02019 0.07169 0.22404   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.025949 0.028428 0.913 0.36519   
## commoditi\_dif -0.110809 0.241646 -0.459 0.64829   
## desemprego\_dif 0.234242 0.190470 1.230 0.22382   
## igp\_dif -1.450810 1.177287 -1.232 0.22288   
## Agreg\_Monetario1 2.287353 2.066869 1.107 0.27308   
## Agreg\_Monetario2 0.764711 0.849987 0.900 0.37208   
## Agreg\_Monetario3 -1.884723 2.848577 -0.662 0.51087   
## producao\_fisica\_industrial\_dif 0.636689 0.235269 2.706 0.00896 \*\*  
## jurosEUA\_log 0.009567 0.013035 0.734 0.46596   
## RMM 0.017359 0.035275 0.492 0.62452   
## ibov\_ontem -0.065387 0.140727 -0.465 0.64396   
## gap -0.475413 0.467492 -1.017 0.31348   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1229 on 57 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.2885, Adjusted R-squared: 0.1512   
## F-statistic: 2.101 on 11 and 57 DF, p-value: 0.03481

Nessa hora fiz uma simulação de modelos, basicamente foi simulado todos os modelos possíveis (2047) e armazenando o R2 Ajustado. Peguei o modelo com maior para dar sequência aos testes

variaveis\_possiveis <- colnames(baseLimpa)[-1]  
n <- length(variaveis\_possiveis)  
l <- rep(list(0:1), n)  
todas\_regressoes <- expand.grid(l)  
colnames(todas\_regressoes) <- variaveis\_possiveis  
todas\_regressoes <- todas\_regressoes[-1,]  
vetor\_R2\_Adj <- c()  
for (regre in 1:dim(todas\_regressoes)[1]){  
 variaveis <- variaveis\_possiveis[as.logical(as.vector(as.matrix(todas\_regressoes[regre,])))]  
 frm <- as.formula(paste0("IBOV\_dif", "~", paste(variaveis, collapse = " + ")))  
 reg <- lm(frm, data=baseLimpa)  
 R2 <- summary(reg)$adj.r.squared  
 vetor\_R2\_Adj <- c(vetor\_R2\_Adj, R2)  
}

Graficos do R2 ajustado, com destaque ao valor 0

todas\_regressoes <- cbind(todas\_regressoes, vetor\_R2\_Adj)  
  
plot(todas\_regressoes[,"vetor\_R2\_Adj"])  
abline(h=0,col="red")



Melhor regressão modelo maximizando R2 ajustado

## Melhor regressão modelo maximizando R2 ajustado  
melhor <- todas\_regressoes[which.max(todas\_regressoes[,"vetor\_R2\_Adj"]),]  
variaveis <- variaveis\_possiveis[as.logical(as.vector(as.matrix(melhor)))]  
variaveis <- variaveis[-7]  
frm <- as.formula(paste("IBOV\_dif","~", paste(variaveis,collapse = " + ") ,sep=""))  
reg <- lm(frm, data=baseLimpa)  
summary(reg)

##   
## Call:  
## lm(formula = frm, data = baseLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.42107 -0.05545 0.02770 0.07332 0.21198   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.03020 0.02356 1.282 0.20460   
## desemprego\_dif 0.30544 0.16692 1.830 0.07208 .   
## igp\_dif -1.76450 1.04396 -1.690 0.09601 .   
## Agreg\_Monetario1 1.13807 0.29861 3.811 0.00032 \*\*\*  
## producao\_fisica\_industrial\_dif 0.62717 0.22353 2.806 0.00670 \*\*   
## jurosEUA\_log 0.01460 0.01135 1.287 0.20302   
## RMM 0.01153 0.03255 0.354 0.72432   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1204 on 62 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.2573, Adjusted R-squared: 0.1854   
## F-statistic: 3.579 on 6 and 62 DF, p-value: 0.004138

Nessa hora, descobri que existe um modelo chamado forward/backward stepping model selection, fui testar fazer com de achar um modelo ótimo.

## Falhando com o forward / backward-stepping  
baseLimpafwbw <- coredata(baseLimpa)  
response <- baseLimpafwbw[,"IBOV\_dif"]  
baseLimpafwbw <- baseLimpafwbw[,-1]  
fit <- lm(response ~ ., as.data.frame(baseLimpafwbw), x = TRUE, y = TRUE)  
fwbw(fit,fun=AIC,fw=FALSE)

## $object  
##   
## Call:  
## stats::lm(formula = object$y ~ ., data = as.data.frame(as.matrix(X\_mu)),   
## x = TRUE, y = TRUE)  
##   
## Coefficients:  
## (Intercept) desemprego\_dif   
## 0.03156 0.29987   
## igp\_dif Agreg\_Monetario1   
## -1.76188 1.13308   
## producao\_fisica\_industrial\_dif jurosEUA\_log   
## 0.63013 0.01644   
##   
##   
## $fun  
## [1] -89.57119

regfwbw <- lm(IBOV\_dif ~ desemprego\_dif + igp\_dif + Agreg\_Monetario1 + producao\_fisica\_industrial\_dif + jurosEUA\_log,data=baseLimpa)  
summary(regfwbw)

##   
## Call:  
## lm(formula = IBOV\_dif ~ desemprego\_dif + igp\_dif + Agreg\_Monetario1 +   
## producao\_fisica\_industrial\_dif + jurosEUA\_log, data = baseLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.45051 -0.06204 0.03195 0.07152 0.28347   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.01831 0.02135 0.857 0.39405   
## desemprego\_dif 0.27533 0.16840 1.635 0.10636   
## igp\_dif -0.38270 0.64960 -0.589 0.55759   
## Agreg\_Monetario1 0.79775 0.26817 2.975 0.00397 \*\*  
## producao\_fisica\_industrial\_dif 0.27061 0.21315 1.270 0.20826   
## jurosEUA\_log 0.01116 0.01026 1.088 0.28011   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1327 on 73 degrees of freedom  
## (1 observation deleted due to missingness)  
## Multiple R-squared: 0.1269, Adjusted R-squared: 0.06714   
## F-statistic: 2.123 on 5 and 73 DF, p-value: 0.07219

Na hora que rodei com as variáveis que ele ensinou, o modelo foi pior ao que eu tinha, por isso foi descartado.

Tentei por hora até misturar os dois para ver se conseguia algo melhor, não consegui.

## Misturar os dois  
regfwbw2 <- lm(IBOV\_dif ~ desemprego\_dif + igp\_dif + Agreg\_Monetario1 + producao\_fisica\_industrial\_dif,data=baseLimpa)  
summary(regfwbw2)

##   
## Call:  
## lm(formula = IBOV\_dif ~ desemprego\_dif + igp\_dif + Agreg\_Monetario1 +   
## producao\_fisica\_industrial\_dif, data = baseLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.44606 -0.05464 0.01916 0.06795 0.27123   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.01183 0.02053 0.576 0.56627   
## desemprego\_dif 0.26555 0.16837 1.577 0.11902   
## igp\_dif -0.45281 0.64720 -0.700 0.48634   
## Agreg\_Monetario1 0.81334 0.26811 3.034 0.00333 \*\*  
## producao\_fisica\_industrial\_dif 0.29818 0.21190 1.407 0.16356   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1328 on 74 degrees of freedom  
## (1 observation deleted due to missingness)  
## Multiple R-squared: 0.1128, Adjusted R-squared: 0.06482   
## F-statistic: 2.352 on 4 and 74 DF, p-value: 0.06179

#Não gostei, o primeiro vai ser o modelo

Com isso a regressão mensal passou a ser a do melhor R2 encontrada na simulação

regGapMensal <- reg  
summary(regGapMensal)

##   
## Call:  
## lm(formula = frm, data = baseLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.42107 -0.05545 0.02770 0.07332 0.21198   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.03020 0.02356 1.282 0.20460   
## desemprego\_dif 0.30544 0.16692 1.830 0.07208 .   
## igp\_dif -1.76450 1.04396 -1.690 0.09601 .   
## Agreg\_Monetario1 1.13807 0.29861 3.811 0.00032 \*\*\*  
## producao\_fisica\_industrial\_dif 0.62717 0.22353 2.806 0.00670 \*\*   
## jurosEUA\_log 0.01460 0.01135 1.287 0.20302   
## RMM 0.01153 0.03255 0.354 0.72432   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1204 on 62 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.2573, Adjusted R-squared: 0.1854   
## F-statistic: 3.579 on 6 and 62 DF, p-value: 0.004138

Rodando um anova

anova(regGapMensal)

## Analysis of Variance Table  
##   
## Response: IBOV\_dif  
## Df Sum Sq Mean Sq F value Pr(>F)   
## desemprego\_dif 1 0.00102 0.001024 0.0706 0.791300   
## igp\_dif 1 0.03698 0.036976 2.5510 0.115310   
## Agreg\_Monetario1 1 0.10264 0.102636 7.0808 0.009907 \*\*  
## producao\_fisica\_industrial\_dif 1 0.13035 0.130345 8.9925 0.003898 \*\*  
## jurosEUA\_log 1 0.03851 0.038505 2.6565 0.108201   
## RMM 1 0.00182 0.001820 0.1255 0.724315   
## Residuals 62 0.89868 0.014495   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Vi algumas inconsistência, por isso fui testar modelo restrito só com variáveis significativas

ModeloIrrestrito <- lm(IBOV\_dif ~ desemprego\_dif + igp\_dif + Agreg\_Monetario1 + producao\_fisica\_industrial\_dif +  
 jurosEUA\_log + RMM,data=na.omit(baseLimpa))  
modeloRestrito <- lm(IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif,data=na.omit(baseLimpa))  
  
anova(modeloRestrito,ModeloIrrestrito)

## Analysis of Variance Table  
##   
## Model 1: IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif  
## Model 2: IBOV\_dif ~ desemprego\_dif + igp\_dif + Agreg\_Monetario1 + producao\_fisica\_industrial\_dif +   
## jurosEUA\_log + RMM  
## Res.Df RSS Df Sum of Sq F Pr(>F)  
## 1 66 1.01677   
## 2 62 0.89868 4 0.11809 2.0368 0.1002

Com isso o modelo restrito já pareceu melhor

anova(model0TodosAgregados)

## Analysis of Variance Table  
##   
## Response: IBOV\_dif  
## Df Sum Sq Mean Sq F value Pr(>F)   
## commoditi\_dif 1 0.00096 0.000964 0.0638 0.801438   
## desemprego\_dif 1 0.00126 0.001261 0.0835 0.773707   
## igp\_dif 1 0.03748 0.037482 2.4817 0.120713   
## Agreg\_Monetario1 1 0.10225 0.102250 6.7700 0.011792 \*   
## Agreg\_Monetario2 1 0.02264 0.022641 1.4991 0.225849   
## Agreg\_Monetario3 1 0.02082 0.020818 1.3783 0.245267   
## producao\_fisica\_industrial\_dif 1 0.12058 0.120580 7.9836 0.006496 \*\*  
## jurosEUA\_log 1 0.02298 0.022982 1.5216 0.222438   
## RMM 1 0.00077 0.000770 0.0510 0.822144   
## ibov\_ontem 1 0.00373 0.003725 0.2467 0.621350   
## gap 1 0.01562 0.015620 1.0342 0.313478   
## Residuals 57 0.86090 0.015103   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Ou seja, modelo Restrito foi melhor, ele passará a ser o nosso novo modelo E rodando um anova para a primeira regressão, com todas as variáveis, dava igualmente o resultado, ou seja, tudo foi “atoa”, podíamos ter só rodado um anova no teste inicial

modeloRestritoSemAlfa <- lm(IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif - 1 ,data=na.omit(baseLimpa))  
summary(modeloRestritoSemAlfa)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif -   
## 1, data = na.omit(baseLimpa))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.41887 -0.05094 0.01676 0.07506 0.22790   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario1 0.8298 0.2101 3.950 0.00019 \*\*\*  
## producao\_fisica\_industrial\_dif 0.7284 0.2176 3.347 0.00134 \*\*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1234 on 67 degrees of freedom  
## Multiple R-squared: 0.2008, Adjusted R-squared: 0.1769   
## F-statistic: 8.417 on 2 and 67 DF, p-value: 0.0005482

Por fim testamos tirar o alfa, pois segundo as finanças o retorno médio de um ativo tende a ser 0

anova(modeloRestrito,modeloRestritoSemAlfa)

## Analysis of Variance Table  
##   
## Model 1: IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif  
## Model 2: IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif -   
## 1  
## Res.Df RSS Df Sum of Sq F Pr(>F)  
## 1 66 1.0168   
## 2 67 1.0197 -1 -0.0028977 0.1881 0.6659

Melhorou o modelo.

regGapMensal <- modeloRestritoSemAlfa  
summary(regGapMensal)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif -   
## 1, data = na.omit(baseLimpa))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.41887 -0.05094 0.01676 0.07506 0.22790   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario1 0.8298 0.2101 3.950 0.00019 \*\*\*  
## producao\_fisica\_industrial\_dif 0.7284 0.2176 3.347 0.00134 \*\*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1234 on 67 degrees of freedom  
## Multiple R-squared: 0.2008, Adjusted R-squared: 0.1769   
## F-statistic: 8.417 on 2 and 67 DF, p-value: 0.0005482

Ou seja, com essas mudanças, a regressão dos dados mensais passou a ser o modelo restrito sem alfa

A partir daqui é uma sequência de testes, por terem sidos tratados no documento, não irei citar um a um

Reset

reset(regGapMensal)

##   
## RESET test  
##   
## data: regGapMensal  
## RESET = 0.47471, df1 = 2, df2 = 65, p-value = 0.6242

VIF

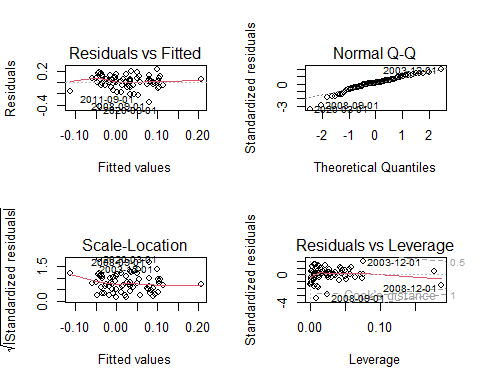
vif(regGapMensal)

## Warning in vif.default(regGapMensal): No intercept: vifs may not be sensible.

## Agreg\_Monetario1 producao\_fisica\_industrial\_dif   
## 1.654051 1.654051

Outliers

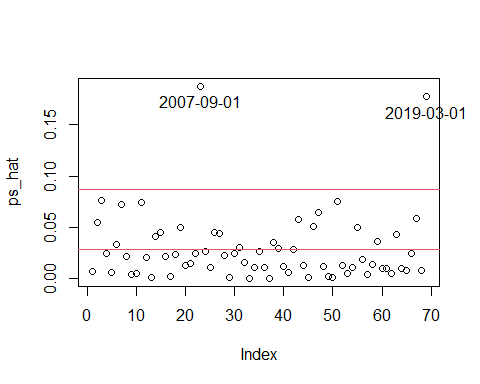
par(mfrow=c(2,2))  
plot(regGapMensal)



par(mfrow=c(1,1))

Vendo os valores que são 3x maior que a media

ps\_hat <- hatvalues(regGapMensal)  
plot(ps\_hat)  
abline(h=c(1,3)\*mean(ps\_hat), col=2)  
id <- which(ps\_hat>3 \* mean(ps\_hat))  
text(id, ps\_hat[id], index(baseLimpa)[id], pos=1, xpd=TRUE)



Testes de diagnóstico:

summary(influence.measures(regGapMensal))

## Potentially influential observations of  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif - 1, data = na.omit(baseLimpa)) :  
##   
## dfb.A\_M1 dfb.p\_\_\_ dffit cov.r cook.d hat   
## 2003-12-01 0.50 0.10 0.56\_\* 1.00 0.15 0.08   
## 2004-12-01 0.04 0.01 0.04 1.11\_\* 0.00 0.07   
## 2005-12-01 -0.13 -0.05 -0.14 1.11\_\* 0.01 0.07   
## 2008-09-01 -0.46 -0.41 -0.49 0.81\_\* 0.11 0.02   
## 2008-12-01 0.19 0.66 -0.72\_\* 1.19\_\* 0.25 0.19\_\*  
## 2013-12-01 0.00 -0.02 0.03 1.09\_\* 0.00 0.06   
## 2014-12-01 0.00 0.07 -0.09 1.10\_\* 0.00 0.06   
## 2015-12-01 0.00 -0.01 0.02 1.11\_\* 0.00 0.08   
## 2020-03-01 0.33 0.16 -0.34 0.71\_\* 0.05 0.01   
## 2020-06-01 0.24 0.15 0.24 1.24\_\* 0.03 0.18\_\*

teste de jarquebera Test

e <- resid(regGapMensal)  
jarqueberaTest(e)

##   
## Title:  
## Jarque - Bera Normalality Test  
##   
## Test Results:  
## STATISTIC:  
## X-squared: 18.6343  
## P VALUE:  
## Asymptotic p Value: 8.987e-05   
##   
## Description:  
## Thu Nov 24 22:46:35 2022 by user: diogo

Teste de Breusch-Pagan:

bptest(regGapMensal)

##   
## studentized Breusch-Pagan test  
##   
## data: regGapMensal  
## BP = 0.54321, df = 1, p-value = 0.4611

Teste de White

white(regGapMensal, interactions = TRUE)

## Intercept included in auxiliary design matrix

## # A tibble: 1 × 5  
## statistic p.value parameter method alternative  
## <dbl> <dbl> <dbl> <chr> <chr>   
## 1 4.17 0.526 5 White's Test greater

Teste de Goldfeld e Quandt

gqtest(regGapMensal, data=baseLimpa)

##   
## Goldfeld-Quandt test  
##   
## data: regGapMensal  
## GQ = 0.94248, df1 = 33, df2 = 32, p-value = 0.5672  
## alternative hypothesis: variance increases from segment 1 to 2

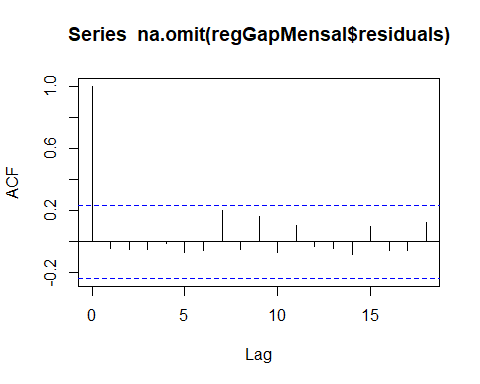
Matriz de covariância de White:

vcovHC(regGapMensal)

## Agreg\_Monetario1 producao\_fisica\_industrial\_dif  
## Agreg\_Monetario1 0.04200690 0.03036972  
## producao\_fisica\_industrial\_dif 0.03036972 0.04806397

Ver a correlação serial

acf(na.omit(regGapMensal$residuals), plot = T)

 Teste de Durbin-Watson

dwtest(regGapMensal)

##   
## Durbin-Watson test  
##   
## data: regGapMensal  
## DW = 2.0524, p-value = 0.6459  
## alternative hypothesis: true autocorrelation is greater than 0

Por fim foi feita uma tentativa de ver dummys de governo, não muito bem sucedida

indexBase <- index(baseLimpa)  
dummys <- matrix(0,nrow = length(indexBase))  
rownames(dummys) <- indexBase  
dummys <- cbind(dummys,0)  
colnames(dummys) <- c("Governo\_Esquerda","Governo\_Direita")  
dummys[rownames(dummys) > as.Date("2002-02-01") & rownames(dummys) < as.Date("2016-08-31"),"Governo\_Esquerda"] <- 1  
dummys[rownames(dummys) > as.Date("2016-08-31"),"Governo\_Direita"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaGoverno <- cbind(baseLimpa,dummys)  
modeloGoverno <- lm(IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif + Governo\_Esquerda + Governo\_Direita - 1  
 ,data=na.omit(baseLimpaGoverno))

Dummy pandemia, também não mt bem sucedida

indexBase <- index(baseLimpa)  
dummys <- matrix(0,nrow = length(indexBase))  
rownames(dummys) <- indexBase  
colnames(dummys) <- c("Pandemia")  
dummys[rownames(dummys) > as.Date("2020-03-01") & rownames(dummys) < as.Date("2021-01-01"),"Pandemia"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaPandemia <- cbind(baseLimpa,dummys)  
modeloPandemia <- lm(IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif + Pandemia - 1  
 ,data=na.omit(baseLimpaPandemia))  
summary(modeloPandemia)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif +   
## Pandemia - 1, data = na.omit(baseLimpaPandemia))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.42147 -0.04985 0.01856 0.07857 0.23496   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario1 0.77977 0.23290 3.348 0.00135 \*\*  
## producao\_fisica\_industrial\_dif 0.69497 0.22843 3.042 0.00337 \*\*  
## Pandemia 0.06972 0.13677 0.510 0.61194   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1241 on 66 degrees of freedom  
## Multiple R-squared: 0.2039, Adjusted R-squared: 0.1677   
## F-statistic: 5.636 on 3 and 66 DF, p-value: 0.001682

Tratando Outliers: Criterio: 2 ou mais sinalizações no testes de diagnosticos

indexBase <- index(baseLimpa)  
dummys <- matrix(0,nrow = length(indexBase))  
rownames(dummys) <- indexBase  
dummys <- cbind(dummys,0)  
colnames(dummys) <- c("2020-06-01","2008-12-01")  
dummys[rownames(dummys) == as.Date("2020-06-01"),"2020-06-01"] <- 1  
dummys[rownames(dummys) == as.Date("2008-12-01"),"2008-12-01"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaOutliers <- cbind(baseLimpa,dummys)  
baseLimpaOutliers <- na.omit(baseLimpaOutliers)  
modeloOutliers <- lm(IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif + baseLimpaOutliers[,"2020-06-01"]  
 + baseLimpaOutliers[,"2008-12-01"] - 1 ,data=baseLimpaOutliers)  
summary(modeloOutliers)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + producao\_fisica\_industrial\_dif +   
## baseLimpaOutliers[, "2020-06-01"] + baseLimpaOutliers[, "2008-12-01"] -   
## 1, data = baseLimpaOutliers)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.42250 -0.04951 0.02083 0.08264 0.23057   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario1 0.73059 0.23284 3.138 0.00256 \*\*  
## producao\_fisica\_industrial\_dif 0.54328 0.24706 2.199 0.03144 \*   
## baseLimpaOutliers[, "2020-06-01"] 0.08265 0.13568 0.609 0.54457   
## baseLimpaOutliers[, "2008-12-01"] -0.20830 0.13653 -1.526 0.13194   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1228 on 65 degrees of freedom  
## Multiple R-squared: 0.2315, Adjusted R-squared: 0.1842   
## F-statistic: 4.894 on 4 and 65 DF, p-value: 0.00164

stargazer(model0TodosAgregados,regGapMensal,modeloOutliers,type="text",  
 column.labels = c("Modelo Geral","Modelo Restrito","Modelo Restrito Sem Outliers"),  
 title = "GAP Trimestral")

##   
## GAP Trimestral  
## ==========================================================================================================  
## Dependent variable:   
## ------------------------------------------------------------------------  
## IBOV\_dif   
## Modelo Geral Modelo Restrito Modelo Restrito Sem Outliers  
## (1) (2) (3)   
## ----------------------------------------------------------------------------------------------------------  
## commoditi\_dif -0.111   
## (0.242)   
##   
## desemprego\_dif 0.234   
## (0.190)   
##   
## igp\_dif -1.451   
## (1.177)   
##   
## Agreg\_Monetario1 2.287 0.830\*\*\* 0.731\*\*\*   
## (2.067) (0.210) (0.233)   
##   
## Agreg\_Monetario2 0.765   
## (0.850)   
##   
## Agreg\_Monetario3 -1.885   
## (2.849)   
##   
## producao\_fisica\_industrial\_dif 0.637\*\*\* 0.728\*\*\* 0.543\*\*   
## (0.235) (0.218) (0.247)   
##   
## jurosEUA\_log 0.010   
## (0.013)   
##   
## RMM 0.017   
## (0.035)   
##   
## ibov\_ontem -0.065   
## (0.141)   
##   
## gap -0.475   
## (0.467)   
##   
## baseLimpaOutliers[, "2020-06-01"] 0.083   
## (0.136)   
##   
## baseLimpaOutliers[, "2008-12-01"] -0.208   
## (0.137)   
##   
## Constant 0.026   
## (0.028)   
##   
## ----------------------------------------------------------------------------------------------------------  
## Observations 69 69 69   
## R2 0.289 0.201 0.231   
## Adjusted R2 0.151 0.177 0.184   
## Residual Std. Error 0.123 (df = 57) 0.123 (df = 67) 0.123 (df = 65)   
## F Statistic 2.101\*\* (df = 11; 57) 8.417\*\*\* (df = 2; 67) 4.894\*\*\* (df = 4; 65)   
## ==========================================================================================================  
## Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

stargazer(model0TodosAgregados,regGapMensal,modeloOutliers,type="text")

##   
## ===================================================================================================  
## Dependent variable:   
## -----------------------------------------------------------------  
## IBOV\_dif   
## (1) (2) (3)   
## ---------------------------------------------------------------------------------------------------  
## commoditi\_dif -0.111   
## (0.242)   
##   
## desemprego\_dif 0.234   
## (0.190)   
##   
## igp\_dif -1.451   
## (1.177)   
##   
## Agreg\_Monetario1 2.287 0.830\*\*\* 0.731\*\*\*   
## (2.067) (0.210) (0.233)   
##   
## Agreg\_Monetario2 0.765   
## (0.850)   
##   
## Agreg\_Monetario3 -1.885   
## (2.849)   
##   
## producao\_fisica\_industrial\_dif 0.637\*\*\* 0.728\*\*\* 0.543\*\*   
## (0.235) (0.218) (0.247)   
##   
## jurosEUA\_log 0.010   
## (0.013)   
##   
## RMM 0.017   
## (0.035)   
##   
## ibov\_ontem -0.065   
## (0.141)   
##   
## gap -0.475   
## (0.467)   
##   
## baseLimpaOutliers[, "2020-06-01"] 0.083   
## (0.136)   
##   
## baseLimpaOutliers[, "2008-12-01"] -0.208   
## (0.137)   
##   
## Constant 0.026   
## (0.028)   
##   
## ---------------------------------------------------------------------------------------------------  
## Observations 69 69 69   
## R2 0.289 0.201 0.231   
## Adjusted R2 0.151 0.177 0.184   
## Residual Std. Error 0.123 (df = 57) 0.123 (df = 67) 0.123 (df = 65)   
## F Statistic 2.101\*\* (df = 11; 57) 8.417\*\*\* (df = 2; 67) 4.894\*\*\* (df = 4; 65)  
## ===================================================================================================  
## Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

# Modelo Mensal por replicação do GAP

Reconstruindo a base de dados para GAP não mensal

baseDadosMensalFill <- baseDados  
baseDadosMensalFill <- na.locf(baseDadosMensalFill)  
baseDadosMensalFill <- na.omit(baseDadosMensalFill)  
  
#A primeira diferença do logaritmo do retorno real da bolsa de valores de São Paulo (RSR);  
ibov\_dif <- zoo(primeiradiferencalog(baseDadosMensalFill[,"ibov"]))  
  
#ibovespa de ontem  
ibov\_ontem <- ibov\_dif  
ibov\_ontem\_index <- index(ibov\_ontem)  
ibov\_ontem <- as\_tibble(ibov\_ontem)  
ibov\_ontem <- ibov\_ontem%>%dplyr::mutate(growth\_lag1 = dplyr::lag(ibov\_ontem))  
ibov\_ontem <- zoo(ibov\_ontem[,2],order.by = ibov\_ontem\_index)  
  
#a primeira diferença do logaritmo dos preços das Commodities (COM);  
commoditi\_dif <- zoo(primeiradiferencalog(baseDadosMensalFill[,5]))  
colnames(baseDadosMensalFill)[5]

## [1] "Índice.de.Commodities"

#a primeira diferença do logaritmo do desemprego: antiga Pesquisa Mensal do Emprego - PME/ IBGE-19(DES);  
desemprego\_dif <- zoo(primeiradiferencalog(baseDadosMensalFill[,"desemprego"]))  
  
#a primeira diferença do logaritmo do IGP (IGP);  
igp\_dif <- zoo(primeiradiferencalog(baseDadosMensalFill[,'1.IGPM']))  
  
#a primeira diferença do logaritmo do agregado monetário M1(M1)  
M1.1 <- zoo(primeiradiferencalog(baseDadosMensalFill[,1]))  
M1.2 <- zoo(primeiradiferencalog(baseDadosMensalFill[,2]))  
M1.3 <- zoo(primeiradiferencalog(baseDadosMensalFill[,3]))  
colnames(baseDadosMensalFill)[c(1,2,3)]

## [1] "Papel.moeda.em.circulação" "Reservas.bancárias"   
## [3] "Base.monetária.restrita"

#a primeira diferença do logaritmo da produção física industrial dessazonalizada  
producao\_dif <- zoo(primeiradiferencalog(baseDadosMensalFill[,4]))  
  
# o logaritmo da taxa de juros dos EUA (EUA).  
juros\_log <- log(baseDadosMensalFill[,'FedFunds'])  
  
#o Relative Market Money Rate, construída através da diferença da taxa de juros e a média móvel de 12 meses para trás (RMM);  
RMM <- baseDadosMensalFill[,'FedFunds'] - rollmean(baseDadosMensalFill[,'FedFunds'],12)  
  
#gap  
gap <- baseDadosMensalFill[,'gap']  
  
baseDadosMensalFillLimpa <- merge.zoo(ibov\_dif,commoditi\_dif,desemprego\_dif,igp\_dif, M1.1, M1.2, M1.3, producao\_dif, juros\_log,RMM,ibov\_ontem,gap)  
  
colnames(baseDadosMensalFillLimpa) <- c("IBOV\_dif","commoditi\_dif","desemprego\_dif","igp\_dif","Agreg\_Monetario1","Agreg\_Monetario2","Agreg\_Monetario3",  
 "producao\_fisica\_industrial\_dif","jurosEUA\_log","RMM","ibov\_ontem","gap")

Correlação

cor(na.omit(baseDadosMensalFillLimpa))

## IBOV\_dif commoditi\_dif desemprego\_dif  
## IBOV\_dif 1.0000000000 -0.12536823 -0.0006254976  
## commoditi\_dif -0.1253682322 1.00000000 -0.1191571473  
## desemprego\_dif -0.0006254976 -0.11915715 1.0000000000  
## igp\_dif -0.0268439507 0.27945957 0.0073082044  
## Agreg\_Monetario1 0.1120274018 0.19386794 -0.6190209547  
## Agreg\_Monetario2 0.0804594113 0.07368604 -0.1942690383  
## Agreg\_Monetario3 0.1219127232 0.17254955 -0.5593157965  
## producao\_fisica\_industrial\_dif 0.0048188957 -0.01095344 0.2207348959  
## jurosEUA\_log 0.0563994844 -0.09628773 -0.0735683246  
## RMM -0.1281589552 -0.03979091 -0.0626476981  
## ibov\_ontem 0.1060521074 -0.07099775 -0.0371972526  
## gap -0.1374463798 -0.06784668 -0.1571444501  
## igp\_dif Agreg\_Monetario1 Agreg\_Monetario2  
## IBOV\_dif -0.026843951 0.112027402 0.08045941  
## commoditi\_dif 0.279459573 0.193867938 0.07368604  
## desemprego\_dif 0.007308204 -0.619020955 -0.19426904  
## igp\_dif 1.000000000 0.060349058 0.08685389  
## Agreg\_Monetario1 0.060349058 1.000000000 0.34073211  
## Agreg\_Monetario2 0.086853894 0.340732113 1.00000000  
## Agreg\_Monetario3 0.073448146 0.917732790 0.66634867  
## producao\_fisica\_industrial\_dif 0.001086623 -0.427980592 -0.03734617  
## jurosEUA\_log -0.095046819 0.012268499 0.03463877  
## RMM -0.003155480 -0.040396190 0.06114774  
## ibov\_ontem -0.078667719 0.008810398 0.07572848  
## gap -0.109631600 0.001793535 -0.05835512  
## Agreg\_Monetario3 producao\_fisica\_industrial\_dif  
## IBOV\_dif 0.121912723 0.004818896  
## commoditi\_dif 0.172549549 -0.010953439  
## desemprego\_dif -0.559315796 0.220734896  
## igp\_dif 0.073448146 0.001086623  
## Agreg\_Monetario1 0.917732790 -0.427980592  
## Agreg\_Monetario2 0.666348673 -0.037346170  
## Agreg\_Monetario3 1.000000000 -0.361719891  
## producao\_fisica\_industrial\_dif -0.361719891 1.000000000  
## jurosEUA\_log 0.020045898 0.022449161  
## RMM -0.009075138 0.090118586  
## ibov\_ontem 0.022713784 0.145675758  
## gap -0.022228091 -0.041300097  
## jurosEUA\_log RMM ibov\_ontem  
## IBOV\_dif 0.05639948 -0.128158955 0.106052107  
## commoditi\_dif -0.09628773 -0.039790907 -0.070997748  
## desemprego\_dif -0.07356832 -0.062647698 -0.037197253  
## igp\_dif -0.09504682 -0.003155480 -0.078667719  
## Agreg\_Monetario1 0.01226850 -0.040396190 0.008810398  
## Agreg\_Monetario2 0.03463877 0.061147744 0.075728477  
## Agreg\_Monetario3 0.02004590 -0.009075138 0.022713784  
## producao\_fisica\_industrial\_dif 0.02244916 0.090118586 0.145675758  
## jurosEUA\_log 1.00000000 0.288001688 0.112555568  
## RMM 0.28800169 1.000000000 0.046137568  
## ibov\_ontem 0.11255557 0.046137568 1.000000000  
## gap -0.07942791 0.115603614 -0.137052055  
## gap  
## IBOV\_dif -0.137446380  
## commoditi\_dif -0.067846680  
## desemprego\_dif -0.157144450  
## igp\_dif -0.109631600  
## Agreg\_Monetario1 0.001793535  
## Agreg\_Monetario2 -0.058355118  
## Agreg\_Monetario3 -0.022228091  
## producao\_fisica\_industrial\_dif -0.041300097  
## jurosEUA\_log -0.079427910  
## RMM 0.115603614  
## ibov\_ontem -0.137052055  
## gap 1.000000000

Modelo generalista

modelFillTodos <- lm(IBOV\_dif ~ .,data=baseDadosMensalFillLimpa)  
summary(modelFillTodos)

##   
## Call:  
## lm(formula = IBOV\_dif ~ ., data = baseDadosMensalFillLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.38566 -0.03353 -0.00392 0.04065 0.19840   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.007941 0.006345 1.251 0.2121   
## commoditi\_dif -0.290063 0.128466 -2.258 0.0250 \*  
## desemprego\_dif 0.101673 0.107519 0.946 0.3454   
## igp\_dif 0.023278 0.524551 0.044 0.9646   
## Agreg\_Monetario1 0.142242 0.720212 0.198 0.8436   
## Agreg\_Monetario2 -0.030909 0.251566 -0.123 0.9023   
## Agreg\_Monetario3 0.286318 0.945536 0.303 0.7623   
## producao\_fisica\_industrial\_dif 0.074382 0.076026 0.978 0.3290   
## jurosEUA\_log 0.003159 0.003262 0.968 0.3339   
## RMM -0.059562 0.029372 -2.028 0.0438 \*  
## ibov\_ontem 0.069969 0.067329 1.039 0.2999   
## gap -0.193911 0.134773 -1.439 0.1517   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06824 on 215 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.08903, Adjusted R-squared: 0.04242   
## F-statistic: 1.91 on 11 and 215 DF, p-value: 0.03939

Desta vez, já fui direto ao anova.

anova(modelFillTodos)

## Analysis of Variance Table  
##   
## Response: IBOV\_dif  
## Df Sum Sq Mean Sq F value Pr(>F)   
## commoditi\_dif 1 0.01727 0.0172740 3.7095 0.05542 .  
## desemprego\_dif 1 0.00027 0.0002701 0.0580 0.80992   
## igp\_dif 1 0.00009 0.0000932 0.0200 0.88765   
## Agreg\_Monetario1 1 0.02932 0.0293155 6.2953 0.01284 \*  
## Agreg\_Monetario2 1 0.00215 0.0021464 0.4609 0.49792   
## Agreg\_Monetario3 1 0.00003 0.0000290 0.0062 0.93714   
## producao\_fisica\_industrial\_dif 1 0.00573 0.0057312 1.2307 0.26850   
## jurosEUA\_log 1 0.00218 0.0021820 0.4686 0.49438   
## RMM 1 0.02374 0.0237418 5.0984 0.02495 \*  
## ibov\_ontem 1 0.00743 0.0074272 1.5949 0.20799   
## gap 1 0.00964 0.0096401 2.0701 0.15166   
## Residuals 215 1.00120 0.0046567   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Selecionando as variaveis que fizeram diferença

modelMensalSimples <- lm(IBOV\_dif ~ commoditi\_dif + RMM + Agreg\_Monetario1,data=baseDadosMensalFillLimpa)  
summary(modelMensalSimples)

##   
## Call:  
## lm(formula = IBOV\_dif ~ commoditi\_dif + RMM + Agreg\_Monetario1,   
## data = baseDadosMensalFillLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.38186 -0.04095 0.00048 0.04462 0.19779   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.010912 0.004711 2.316 0.0214 \*  
## commoditi\_dif -0.289227 0.122442 -2.362 0.0190 \*  
## RMM -0.054540 0.027638 -1.973 0.0497 \*  
## Agreg\_Monetario1 0.238483 0.115546 2.064 0.0402 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06837 on 223 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.05159, Adjusted R-squared: 0.03883   
## F-statistic: 4.044 on 3 and 223 DF, p-value: 0.007957

Melhorou a principio.

modelMensalSimplesSemAlfa <- lm(IBOV\_dif ~ Agreg\_Monetario1 + commoditi\_dif + RMM - 1 ,data=baseDadosMensalFillLimpa)  
summary(modelMensalSimplesSemAlfa)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + commoditi\_dif + RMM -   
## 1, data = baseDadosMensalFillLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.36845 -0.03078 0.00981 0.05288 0.20064   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario1 0.29537 0.11400 2.591 0.0102 \*  
## commoditi\_dif -0.25528 0.12274 -2.080 0.0387 \*  
## RMM -0.05270 0.02789 -1.889 0.0601 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06903 on 224 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.05371, Adjusted R-squared: 0.04103   
## F-statistic: 4.238 on 3 and 224 DF, p-value: 0.006151

Selecionando as variaveis que fizeram diferença, removendo o alfa pelo mesmo motivo da analise anterior.

stargazer(modelMensalSimples,modelMensalSimplesSemAlfa,type="text",title="Comparando Modelo com e sem Alfa gap mensal")

##   
## Comparando Modelo com e sem Alfa gap mensal  
## =================================================================  
## Dependent variable:   
## ---------------------------------------------  
## IBOV\_dif   
## (1) (2)   
## -----------------------------------------------------------------  
## commoditi\_dif -0.289\*\* -0.255\*\*   
## (0.122) (0.123)   
##   
## RMM -0.055\*\* -0.053\*   
## (0.028) (0.028)   
##   
## Agreg\_Monetario1 0.238\*\* 0.295\*\*   
## (0.116) (0.114)   
##   
## Constant 0.011\*\*   
## (0.005)   
##   
## -----------------------------------------------------------------  
## Observations 227 227   
## R2 0.052 0.054   
## Adjusted R2 0.039 0.041   
## Residual Std. Error 0.068 (df = 223) 0.069 (df = 224)   
## F Statistic 4.044\*\*\* (df = 3; 223) 4.238\*\*\* (df = 3; 224)  
## =================================================================  
## Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

O modelo mensal passou a ser o Sem o Alfa

modelMensalSimples <- modelMensalSimplesSemAlfa  
  
summary(modelMensalSimples)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + commoditi\_dif + RMM -   
## 1, data = baseDadosMensalFillLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.36845 -0.03078 0.00981 0.05288 0.20064   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario1 0.29537 0.11400 2.591 0.0102 \*  
## commoditi\_dif -0.25528 0.12274 -2.080 0.0387 \*  
## RMM -0.05270 0.02789 -1.889 0.0601 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06903 on 224 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.05371, Adjusted R-squared: 0.04103   
## F-statistic: 4.238 on 3 and 224 DF, p-value: 0.006151

Os testes, por serem os mesmos do modelo anterior, não será re-citado Teste reset

reset(modelMensalSimples)

##   
## RESET test  
##   
## data: modelMensalSimples  
## RESET = 0.03579, df1 = 2, df2 = 222, p-value = 0.9648

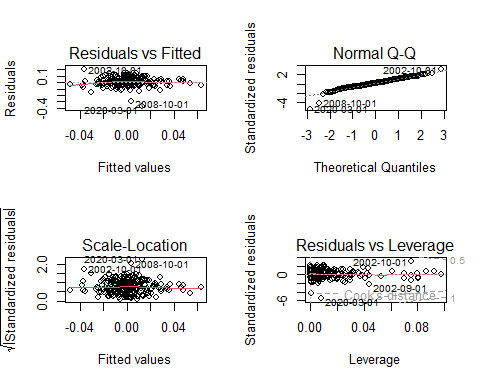
vif(modelMensalSimples)

## Warning in vif.default(modelMensalSimples): No intercept: vifs may not be  
## sensible.

## Agreg\_Monetario1 commoditi\_dif RMM   
## 1.054512 1.054603 1.002122

Graficos a serem analisados

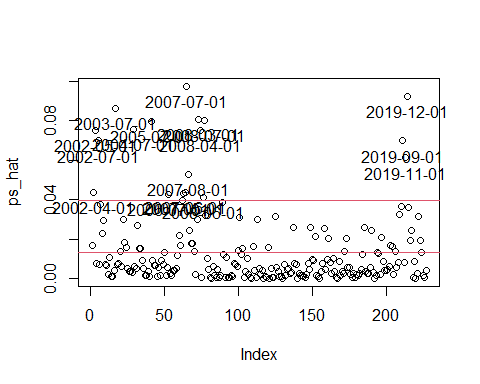
par(mfrow=c(2,2))  
plot(modelMensalSimples)



par(mfrow=c(1,1))

Elementos da diagonal de H:

ps\_hat <- hatvalues(modelMensalSimples)  
plot(ps\_hat)  
abline(h=c(1,3)\*mean(ps\_hat), col=2)  
id <- which(ps\_hat>3 \* mean(ps\_hat))  
text(id, ps\_hat[id], index(baseDadosMensalFillLimpa)[id], pos=1, xpd=TRUE)

 Testes de diagnóstico:

summary(influence.measures(modelMensalSimples))

## Potentially influential observations of  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario1 + commoditi\_dif + RMM - 1, data = baseDadosMensalFillLimpa) :  
##   
## dfb.A\_M1 dfb.cmm\_ dfb.RMM dffit cov.r cook.d hat   
## 2002-09-01 -0.02 -0.44 -0.21 -0.50\_\* 0.99 0.08 0.04\_\*  
## 2002-10-01 0.07 0.78 0.35 0.88\_\* 0.97 0.25 0.07\_\*  
## 2002-12-01 0.08 0.00 -0.02 0.09 1.09\_\* 0.00 0.07\_\*  
## 2003-02-01 0.05 -0.06 0.01 -0.07 1.05\_\* 0.00 0.04   
## 2003-12-01 0.22 -0.01 0.00 0.23 1.10\_\* 0.02 0.09\_\*  
## 2004-05-01 0.00 0.01 0.00 0.01 1.04\_\* 0.00 0.03   
## 2004-12-01 -0.05 0.02 0.00 -0.05 1.10\_\* 0.00 0.08\_\*  
## 2005-02-01 -0.11 -0.08 -0.04 0.16 0.96\_\* 0.01 0.01   
## 2005-12-01 0.07 0.02 0.00 0.08 1.10\_\* 0.00 0.08\_\*  
## 2006-01-01 -0.19 0.11 -0.07 0.22 0.96\_\* 0.02 0.01   
## 2006-12-01 0.07 -0.01 0.00 0.07 1.06\_\* 0.00 0.04\_\*  
## 2007-10-01 0.04 -0.04 0.30 0.31 1.03 0.03 0.04\_\*  
## 2007-11-01 -0.01 0.00 -0.05 -0.05 1.06\_\* 0.00 0.04\_\*  
## 2007-12-01 0.02 0.00 0.02 0.02 1.12\_\* 0.00 0.10\_\*  
## 2008-01-01 0.02 -0.03 -0.07 -0.08 1.07\_\* 0.00 0.05\_\*  
## 2008-08-01 -0.05 0.12 -0.22 -0.25 1.09\_\* 0.02 0.08\_\*  
## 2008-09-01 -0.04 -0.11 -0.32 -0.34 1.07\_\* 0.04 0.08\_\*  
## 2008-10-01 -0.09 -0.03 0.05 -0.12 0.79\_\* 0.00 0.00   
## 2008-11-01 -0.02 0.07 0.16 -0.17 1.05\_\* 0.01 0.04\_\*  
## 2008-12-01 -0.10 0.04 0.13 -0.17 1.10\_\* 0.01 0.08\_\*  
## 2009-01-01 -0.04 0.00 -0.09 0.09 1.04\_\* 0.00 0.03   
## 2009-04-01 0.02 -0.03 -0.03 0.04 0.96\_\* 0.00 0.00   
## 2009-12-01 -0.01 0.00 0.00 -0.01 1.05\_\* 0.00 0.04   
## 2010-12-01 0.01 0.00 0.00 0.01 1.05\_\* 0.00 0.03   
## 2011-12-01 -0.09 0.03 0.01 -0.09 1.04\_\* 0.00 0.03   
## 2012-12-01 0.08 -0.01 0.01 0.08 1.04\_\* 0.00 0.03   
## 2020-01-01 -0.01 0.01 0.05 0.05 1.05\_\* 0.00 0.04   
## 2020-02-01 0.01 0.00 -0.20 -0.21 1.08\_\* 0.01 0.07\_\*  
## 2020-03-01 0.04 0.43 0.28 -0.52\_\* 0.68\_\* 0.08 0.01   
## 2020-04-01 0.07 0.00 -0.19 0.20 1.07\_\* 0.01 0.06\_\*  
## 2020-05-01 0.12 0.13 -0.14 0.25 1.11\_\* 0.02 0.09\_\*  
## 2020-06-01 0.07 -0.06 -0.07 0.11 1.05\_\* 0.00 0.04   
## 2020-11-01 0.01 0.00 0.01 0.02 0.95\_\* 0.00 0.00   
## 2021-01-01 0.00 -0.01 0.00 -0.01 1.05\_\* 0.00 0.03

teste de Jarque-Bera:

e <- resid(modelMensalSimples)  
jarqueberaTest(e)

##   
## Title:  
## Jarque - Bera Normalality Test  
##   
## Test Results:  
## STATISTIC:  
## X-squared: 255.2294  
## P VALUE:  
## Asymptotic p Value: < 2.2e-16   
##   
## Description:  
## Thu Nov 24 22:46:37 2022 by user: diogo

Teste de Breusch-Pagan:

bptest(modelMensalSimples)

##   
## studentized Breusch-Pagan test  
##   
## data: modelMensalSimples  
## BP = 0.67602, df = 2, p-value = 0.7132

Teste de White

white(modelMensalSimples, interactions = TRUE)

## Intercept included in auxiliary design matrix

## # A tibble: 1 × 5  
## statistic p.value parameter method alternative  
## <dbl> <dbl> <dbl> <chr> <chr>   
## 1 11.6 0.235 9 White's Test greater

Teste de Goldfeld e Quandt

gqtest(modelMensalSimples, data=baseDadosMensalFillLimpa)

##   
## Goldfeld-Quandt test  
##   
## data: modelMensalSimples  
## GQ = 0.87296, df1 = 111, df2 = 110, p-value = 0.7619  
## alternative hypothesis: variance increases from segment 1 to 2

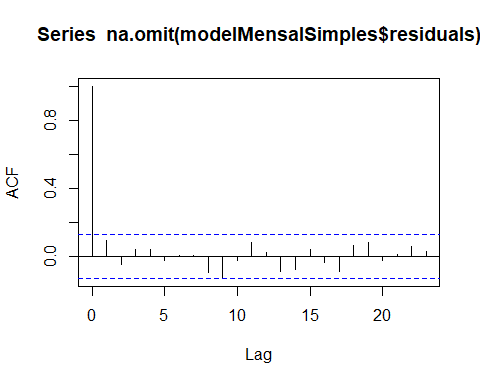
Matriz de covariância de White:

vcovHC(modelMensalSimples)

## Agreg\_Monetario1 commoditi\_dif RMM  
## Agreg\_Monetario1 0.0065357455 -0.000513005 0.0003710911  
## commoditi\_dif -0.0005130050 0.023665671 0.0013467042  
## RMM 0.0003710911 0.001346704 0.0007380318

Ver correlacao serial

acf(na.omit(modelMensalSimples$residuals), plot = T)

 Teste de Durbin-Watson

dwtest(modelMensalSimples)

##   
## Durbin-Watson test  
##   
## data: modelMensalSimples  
## DW = 1.7654, p-value = 0.038  
## alternative hypothesis: true autocorrelation is greater than 0

Dummys: Governos

indexBase <- index(baseDadosMensalFillLimpa)  
dummys <- matrix(0,nrow = length(indexBase),ncol=2)  
rownames(dummys) <- indexBase  
colnames(dummys) <- c("Governo\_Esquerda","Governo\_Direita")  
dummys[rownames(dummys) > as.Date("2002-02-01") & rownames(dummys) < as.Date("2016-08-31"),"Governo\_Esquerda"] <- 1  
dummys[rownames(dummys) > as.Date("2016-08-31"),"Governo\_Direita"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaGoverno <- cbind(baseDadosMensalFillLimpa,dummys)  
modeloGovernoGap <- lm(IBOV\_dif ~ commoditi\_dif + RMM + Agreg\_Monetario1 - 1 + Governo\_Esquerda + Governo\_Direita - 1  
 ,data=na.omit(baseLimpaGoverno))  
summary(modeloGovernoGap)

##   
## Call:  
## lm(formula = IBOV\_dif ~ commoditi\_dif + RMM + Agreg\_Monetario1 -   
## 1 + Governo\_Esquerda + Governo\_Direita - 1, data = na.omit(baseLimpaGoverno))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.38662 -0.04177 0.00052 0.04504 0.20025   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## commoditi\_dif -0.296396 0.123273 -2.404 0.0170 \*  
## RMM -0.054683 0.027682 -1.975 0.0495 \*  
## Agreg\_Monetario1 0.240836 0.115795 2.080 0.0387 \*  
## Governo\_Esquerda 0.009412 0.005405 1.741 0.0830 .  
## Governo\_Direita 0.015374 0.009150 1.680 0.0943 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06847 on 222 degrees of freedom  
## Multiple R-squared: 0.07729, Adjusted R-squared: 0.05651   
## F-statistic: 3.719 on 5 and 222 DF, p-value: 0.002976

Dummy pandemia

indexBase <- index(baseDadosMensalFillLimpa)  
dummys <- matrix(0,nrow = length(indexBase))  
rownames(dummys) <- indexBase  
colnames(dummys) <- c("Pandemia")  
dummys[rownames(dummys) > as.Date("2020-03-01") & rownames(dummys) < as.Date("2020-06-01"),"Pandemia"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaPandemia <- cbind(baseDadosMensalFillLimpa,dummys)  
modeloPandemia <- lm(IBOV\_dif ~ commoditi\_dif + RMM + Pandemia + Agreg\_Monetario1 - 1  
 ,data=na.omit(baseLimpaPandemia))  
summary(modeloPandemia)

##   
## Call:  
## lm(formula = IBOV\_dif ~ commoditi\_dif + RMM + Pandemia + Agreg\_Monetario1 -   
## 1, data = na.omit(baseLimpaPandemia))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.36841 -0.02971 0.00791 0.05419 0.20181   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## commoditi\_dif -0.27201 0.12348 -2.203 0.0286 \*  
## RMM -0.04293 0.02911 -1.475 0.1416   
## Pandemia 0.06115 0.05245 1.166 0.2449   
## Agreg\_Monetario1 0.27133 0.11576 2.344 0.0200 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06898 on 223 degrees of freedom  
## Multiple R-squared: 0.05944, Adjusted R-squared: 0.04257   
## F-statistic: 3.523 on 4 and 223 DF, p-value: 0.008222

tratando outliers:

indexBase <- index(baseDadosMensalFillLimpa)  
outliers <- c("2002-09-01","2002-10-01","2007-11-01","2007-12-01","2008-01-01","2008-08-01",  
 "2008-09-01","2008-11-01","2008-12-01")  
dummys <- matrix(0,nrow=length(indexBase),ncol=length(outliers))  
colnames(dummys) <- outliers  
rownames(dummys) <- indexBase  
for (i in outliers){  
 dummys[rownames(dummys) == i,i] <- 1  
}  
baseMensalFillSemOutliers <- cbind(baseDadosMensalFillLimpa,dummys)  
paste(outliers,collapse = ' + ')

## [1] "2002-09-01 + 2002-10-01 + 2007-11-01 + 2007-12-01 + 2008-01-01 + 2008-08-01 + 2008-09-01 + 2008-11-01 + 2008-12-01"

modeloSemOutliers <- lm(IBOV\_dif ~ commoditi\_dif + RMM + Agreg\_Monetario1 - 1 + baseMensalFillSemOutliers[,"2002-09-01"] +  
 baseMensalFillSemOutliers[,"2002-10-01"] + baseMensalFillSemOutliers[,"2007-11-01"] +  
 baseMensalFillSemOutliers[,"2007-12-01"] + baseMensalFillSemOutliers[,"2008-01-01"] +  
 baseMensalFillSemOutliers[,"2008-08-01"] + baseMensalFillSemOutliers[,"2008-09-01"] +  
 baseMensalFillSemOutliers[,"2008-11-01"] + baseMensalFillSemOutliers[,"2008-12-01"] ,data=baseMensalFillSemOutliers)  
summary(modeloSemOutliers)

##   
## Call:  
## lm(formula = IBOV\_dif ~ commoditi\_dif + RMM + Agreg\_Monetario1 -   
## 1 + baseMensalFillSemOutliers[, "2002-09-01"] + baseMensalFillSemOutliers[,   
## "2002-10-01"] + baseMensalFillSemOutliers[, "2007-11-01"] +   
## baseMensalFillSemOutliers[, "2007-12-01"] + baseMensalFillSemOutliers[,   
## "2008-01-01"] + baseMensalFillSemOutliers[, "2008-08-01"] +   
## baseMensalFillSemOutliers[, "2008-09-01"] + baseMensalFillSemOutliers[,   
## "2008-11-01"] + baseMensalFillSemOutliers[, "2008-12-01"],   
## data = baseMensalFillSemOutliers)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.36939 -0.02581 0.00935 0.05309 0.15426   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)  
## commoditi\_dif -0.303698 0.130399 -2.329 0.02079  
## RMM -0.044267 0.034457 -1.285 0.20028  
## Agreg\_Monetario1 0.311630 0.117636 2.649 0.00867  
## baseMensalFillSemOutliers[, "2002-09-01"] -0.152511 0.069723 -2.187 0.02979  
## baseMensalFillSemOutliers[, "2002-10-01"] 0.204811 0.071046 2.883 0.00434  
## baseMensalFillSemOutliers[, "2007-11-01"] -0.019259 0.070059 -0.275 0.78366  
## baseMensalFillSemOutliers[, "2007-12-01"] -0.001402 0.072183 -0.019 0.98452  
## baseMensalFillSemOutliers[, "2008-01-01"] -0.024752 0.070478 -0.351 0.72578  
## baseMensalFillSemOutliers[, "2008-08-01"] -0.065935 0.071442 -0.923 0.35709  
## baseMensalFillSemOutliers[, "2008-09-01"] -0.082961 0.071762 -1.156 0.24894  
## baseMensalFillSemOutliers[, "2008-11-01"] -0.053299 0.069959 -0.762 0.44698  
## baseMensalFillSemOutliers[, "2008-12-01"] -0.035108 0.071368 -0.492 0.62327  
##   
## commoditi\_dif \*   
## RMM   
## Agreg\_Monetario1 \*\*  
## baseMensalFillSemOutliers[, "2002-09-01"] \*   
## baseMensalFillSemOutliers[, "2002-10-01"] \*\*  
## baseMensalFillSemOutliers[, "2007-11-01"]   
## baseMensalFillSemOutliers[, "2007-12-01"]   
## baseMensalFillSemOutliers[, "2008-01-01"]   
## baseMensalFillSemOutliers[, "2008-08-01"]   
## baseMensalFillSemOutliers[, "2008-09-01"]   
## baseMensalFillSemOutliers[, "2008-11-01"]   
## baseMensalFillSemOutliers[, "2008-12-01"]   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06776 on 215 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.1249, Adjusted R-squared: 0.07603   
## F-statistic: 2.557 on 12 and 215 DF, p-value: 0.003514

stargazer(modelFillTodos,modelMensalSimples,modeloSemOutliers, type="text",column.labels = c("Modelo Completo",  
 "Modelo Simples",  
 "Modelo Simples Sem Outliers"))

##   
## ===================================================================================================================  
## Dependent variable:   
## -------------------------------------------------------------------------  
## IBOV\_dif   
## Modelo Completo Modelo Simples Modelo Simples Sem Outliers  
## (1) (2) (3)   
## -------------------------------------------------------------------------------------------------------------------  
## commoditi\_dif -0.290\*\* -0.255\*\* -0.304\*\*   
## (0.128) (0.123) (0.130)   
##   
## desemprego\_dif 0.102   
## (0.108)   
##   
## igp\_dif 0.023   
## (0.525)   
##   
## Agreg\_Monetario1 0.142 0.295\*\* 0.312\*\*\*   
## (0.720) (0.114) (0.118)   
##   
## Agreg\_Monetario2 -0.031   
## (0.252)   
##   
## Agreg\_Monetario3 0.286   
## (0.946)   
##   
## producao\_fisica\_industrial\_dif 0.074   
## (0.076)   
##   
## jurosEUA\_log 0.003   
## (0.003)   
##   
## baseMensalFillSemOutliers[, "2002-09-01"] -0.153\*\*   
## (0.070)   
##   
## baseMensalFillSemOutliers[, "2002-10-01"] 0.205\*\*\*   
## (0.071)   
##   
## baseMensalFillSemOutliers[, "2007-11-01"] -0.019   
## (0.070)   
##   
## baseMensalFillSemOutliers[, "2007-12-01"] -0.001   
## (0.072)   
##   
## baseMensalFillSemOutliers[, "2008-01-01"] -0.025   
## (0.070)   
##   
## baseMensalFillSemOutliers[, "2008-08-01"] -0.066   
## (0.071)   
##   
## baseMensalFillSemOutliers[, "2008-09-01"] -0.083   
## (0.072)   
##   
## baseMensalFillSemOutliers[, "2008-11-01"] -0.053   
## (0.070)   
##   
## baseMensalFillSemOutliers[, "2008-12-01"] -0.035   
## (0.071)   
##   
## RMM -0.060\*\* -0.053\* -0.044   
## (0.029) (0.028) (0.034)   
##   
## ibov\_ontem 0.070   
## (0.067)   
##   
## gap -0.194   
## (0.135)   
##   
## Constant 0.008   
## (0.006)   
##   
## -------------------------------------------------------------------------------------------------------------------  
## Observations 227 227 227   
## R2 0.089 0.054 0.125   
## Adjusted R2 0.042 0.041 0.076   
## Residual Std. Error 0.068 (df = 215) 0.069 (df = 224) 0.068 (df = 215)   
## F Statistic 1.910\*\* (df = 11; 215) 4.238\*\*\* (df = 3; 224) 2.557\*\*\* (df = 12; 215)   
## ===================================================================================================================  
## Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

# Mensal - Gap Linearizado

baseDadosMensalAprox <- baseDados  
baseDadosMensalAprox <- baseDadosMensalAprox[c(-1,-2),]  
gap <- baseDadosMensalAprox[,'gap']  
index\_gap <- index(baseDadosMensalAprox[,'gap'])  
gap <- na.approx(coredata(gap))  
gap <- zoo(gap,order.by = index\_gap)  
baseDadosMensalAprox$gap <- gap  
  
#A primeira diferença do logaritmo do retorno real da bolsa de valores de São Paulo (RSR);  
ibov\_dif <- zoo(primeiradiferencalog(baseDadosMensalAprox[,"ibov"]))  
  
#ibovespa de ontem  
ibov\_ontem <- ibov\_dif  
ibov\_ontem\_index <- index(ibov\_ontem)  
ibov\_ontem <- as\_tibble(ibov\_ontem)  
ibov\_ontem <- ibov\_ontem%>%dplyr::mutate(growth\_lag1 = dplyr::lag(ibov\_ontem))  
ibov\_ontem <- zoo(ibov\_ontem[,2],order.by = ibov\_ontem\_index)  
  
#a primeira diferença do logaritmo dos preços das Commodities (COM);  
commoditi\_dif <- zoo(primeiradiferencalog(baseDadosMensalAprox[,5]))  
colnames(baseDadosMensalAprox)[5]

## [1] "Índice.de.Commodities"

#a primeira diferença do logaritmo do desemprego: antiga Pesquisa Mensal do Emprego - PME/ IBGE-19(DES);  
desemprego\_dif <- zoo(primeiradiferencalog(baseDadosMensalAprox[,"desemprego"]))  
  
#a primeira diferença do logaritmo do IGP (IGP);  
igp\_dif <- zoo(primeiradiferencalog(baseDadosMensalAprox[,'1.IGPM']))  
  
#a primeira diferença do logaritmo do agregado monetário M1(M1)  
M1.1 <- zoo(primeiradiferencalog(baseDadosMensalAprox[,1]))  
M1.2 <- zoo(primeiradiferencalog(baseDadosMensalAprox[,2]))  
M1.3 <- zoo(primeiradiferencalog(baseDadosMensalAprox[,3]))  
colnames(baseDadosMensalAprox)[c(1,2,3)]

## [1] "Papel.moeda.em.circulação" "Reservas.bancárias"   
## [3] "Base.monetária.restrita"

#a primeira diferença do logaritmo da produção física industrial dessazonalizada  
producao\_dif <- zoo(primeiradiferencalog(baseDadosMensalAprox[,4]))  
  
# o logaritmo da taxa de juros dos EUA (EUA).  
juros\_log <- log(baseDadosMensalAprox[,'FedFunds'])  
  
#o Relative Market Money Rate, construída através da diferença da taxa de juros e a média móvel de 12 meses para trás (RMM);  
RMM <- baseDadosMensalAprox[,'FedFunds'] - rollmean(baseDadosMensalAprox[,'FedFunds'],12)  
# GAP  
gap <- baseDadosMensalAprox[,'gap']  
  
baseDadosMensalAproxLimpa <- merge.zoo(ibov\_dif,commoditi\_dif,desemprego\_dif,igp\_dif, M1.1, M1.2, M1.3, producao\_dif, juros\_log,RMM,ibov\_ontem,gap)  
  
colnames(baseDadosMensalAproxLimpa) <- c("IBOV\_dif","commoditi\_dif","desemprego\_dif","igp\_dif","Agreg\_Monetario1","Agreg\_Monetario2","Agreg\_Monetario3",  
 "producao\_fisica\_industrial\_dif","jurosEUA\_log","RMM","ibov\_ontem","gap")

Correlacao

cor(na.omit(baseDadosMensalAproxLimpa))

## IBOV\_dif commoditi\_dif desemprego\_dif  
## IBOV\_dif 1.0000000000 -0.12536823 -0.0006254976  
## commoditi\_dif -0.1253682322 1.00000000 -0.1191571473  
## desemprego\_dif -0.0006254976 -0.11915715 1.0000000000  
## igp\_dif -0.0268439507 0.27945957 0.0073082044  
## Agreg\_Monetario1 0.1120274018 0.19386794 -0.6190209547  
## Agreg\_Monetario2 0.0804594113 0.07368604 -0.1942690383  
## Agreg\_Monetario3 0.1219127232 0.17254955 -0.5593157965  
## producao\_fisica\_industrial\_dif 0.0048188957 -0.01095344 0.2207348959  
## jurosEUA\_log 0.0563994844 -0.09628773 -0.0735683246  
## RMM -0.1281589552 -0.03979091 -0.0626476981  
## ibov\_ontem 0.1060521074 -0.07099775 -0.0371972526  
## gap -0.1335677858 -0.04922061 -0.1759209318  
## igp\_dif Agreg\_Monetario1 Agreg\_Monetario2  
## IBOV\_dif -0.026843951 0.112027402 0.08045941  
## commoditi\_dif 0.279459573 0.193867938 0.07368604  
## desemprego\_dif 0.007308204 -0.619020955 -0.19426904  
## igp\_dif 1.000000000 0.060349058 0.08685389  
## Agreg\_Monetario1 0.060349058 1.000000000 0.34073211  
## Agreg\_Monetario2 0.086853894 0.340732113 1.00000000  
## Agreg\_Monetario3 0.073448146 0.917732790 0.66634867  
## producao\_fisica\_industrial\_dif 0.001086623 -0.427980592 -0.03734617  
## jurosEUA\_log -0.095046819 0.012268499 0.03463877  
## RMM -0.003155480 -0.040396190 0.06114774  
## ibov\_ontem -0.078667719 0.008810398 0.07572848  
## gap -0.073231046 -0.006726992 -0.03178762  
## Agreg\_Monetario3 producao\_fisica\_industrial\_dif  
## IBOV\_dif 0.121912723 0.004818896  
## commoditi\_dif 0.172549549 -0.010953439  
## desemprego\_dif -0.559315796 0.220734896  
## igp\_dif 0.073448146 0.001086623  
## Agreg\_Monetario1 0.917732790 -0.427980592  
## Agreg\_Monetario2 0.666348673 -0.037346170  
## Agreg\_Monetario3 1.000000000 -0.361719891  
## producao\_fisica\_industrial\_dif -0.361719891 1.000000000  
## jurosEUA\_log 0.020045898 0.022449161  
## RMM -0.009075138 0.090118586  
## ibov\_ontem 0.022713784 0.145675758  
## gap -0.020259099 -0.027203269  
## jurosEUA\_log RMM ibov\_ontem  
## IBOV\_dif 0.05639948 -0.128158955 0.106052107  
## commoditi\_dif -0.09628773 -0.039790907 -0.070997748  
## desemprego\_dif -0.07356832 -0.062647698 -0.037197253  
## igp\_dif -0.09504682 -0.003155480 -0.078667719  
## Agreg\_Monetario1 0.01226850 -0.040396190 0.008810398  
## Agreg\_Monetario2 0.03463877 0.061147744 0.075728477  
## Agreg\_Monetario3 0.02004590 -0.009075138 0.022713784  
## producao\_fisica\_industrial\_dif 0.02244916 0.090118586 0.145675758  
## jurosEUA\_log 1.00000000 0.288001688 0.112555568  
## RMM 0.28800169 1.000000000 0.046137568  
## ibov\_ontem 0.11255557 0.046137568 1.000000000  
## gap -0.06637024 0.153340932 -0.098690586  
## gap  
## IBOV\_dif -0.133567786  
## commoditi\_dif -0.049220610  
## desemprego\_dif -0.175920932  
## igp\_dif -0.073231046  
## Agreg\_Monetario1 -0.006726992  
## Agreg\_Monetario2 -0.031787622  
## Agreg\_Monetario3 -0.020259099  
## producao\_fisica\_industrial\_dif -0.027203269  
## jurosEUA\_log -0.066370236  
## RMM 0.153340932  
## ibov\_ontem -0.098690586  
## gap 1.000000000

Modelo Generalista

modelMensalAprox <- lm(IBOV\_dif ~ ., data= baseDadosMensalAproxLimpa)  
summary(modelMensalAprox)

##   
## Call:  
## lm(formula = IBOV\_dif ~ ., data = baseDadosMensalAproxLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.38441 -0.03370 -0.00287 0.04066 0.19816   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.007966 0.006386 1.247 0.2136   
## commoditi\_dif -0.286436 0.128496 -2.229 0.0268 \*  
## desemprego\_dif 0.101042 0.108294 0.933 0.3518   
## igp\_dif 0.055954 0.523438 0.107 0.9150   
## Agreg\_Monetario1 0.141042 0.720932 0.196 0.8451   
## Agreg\_Monetario2 -0.026520 0.251908 -0.105 0.9163   
## Agreg\_Monetario3 0.281511 0.946743 0.297 0.7665   
## producao\_fisica\_industrial\_dif 0.074238 0.076116 0.975 0.3305   
## jurosEUA\_log 0.003235 0.003265 0.991 0.3229   
## RMM -0.059065 0.029543 -1.999 0.0468 \*  
## ibov\_ontem 0.074809 0.067069 1.115 0.2659   
## gap -0.175399 0.137095 -1.279 0.2021   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.06831 on 215 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.08721, Adjusted R-squared: 0.04051   
## F-statistic: 1.867 on 11 and 215 DF, p-value: 0.04501

Anova

anova(modelMensalAprox)

## Analysis of Variance Table  
##   
## Response: IBOV\_dif  
## Df Sum Sq Mean Sq F value Pr(>F)   
## commoditi\_dif 1 0.01727 0.0172740 3.7021 0.05567 .  
## desemprego\_dif 1 0.00027 0.0002701 0.0579 0.81011   
## igp\_dif 1 0.00009 0.0000932 0.0200 0.88776   
## Agreg\_Monetario1 1 0.02932 0.0293155 6.2827 0.01293 \*  
## Agreg\_Monetario2 1 0.00215 0.0021464 0.4600 0.49835   
## Agreg\_Monetario3 1 0.00003 0.0000290 0.0062 0.93720   
## producao\_fisica\_industrial\_dif 1 0.00573 0.0057312 1.2283 0.26898   
## jurosEUA\_log 1 0.00218 0.0021820 0.4676 0.49481   
## RMM 1 0.02374 0.0237418 5.0882 0.02510 \*  
## ibov\_ontem 1 0.00743 0.0074272 1.5918 0.20844   
## gap 1 0.00764 0.0076376 1.6368 0.20214   
## Residuals 215 1.00320 0.0046661   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Um detalhe importante nesse modelo, pelo gap não ter se tornado significativo, ele se tornou um modelo mensal igual ao ultimo, por conta disso não vale a pena analisarmos novamente

# Modelo Semestral

baseSemestral <- baseDados  
baseSemestral <- baseSemestral[month(index(baseSemestral)) %in% c(12,6)]  
  
#A primeira diferença do logaritmo do retorno real da bolsa de valores de São Paulo (RSR);  
ibov\_dif <- zoo(primeiradiferencalog(baseSemestral[,"ibov"]))  
  
#ibovespa de ontem  
ibov\_ontem <- ibov\_dif  
ibov\_ontem\_index <- index(ibov\_ontem)  
ibov\_ontem <- as\_tibble(ibov\_ontem)  
ibov\_ontem <- ibov\_ontem%>%dplyr::mutate(growth\_lag1 = dplyr::lag(ibov\_ontem))  
ibov\_ontem <- zoo(ibov\_ontem[,2],order.by = ibov\_ontem\_index)  
  
#a primeira diferença do logaritmo dos preços das Commodities (COM);  
commoditi\_dif <- zoo(primeiradiferencalog(baseSemestral[,5]))  
colnames(baseSemestral)[5]

## [1] "Índice.de.Commodities"

#a primeira diferença do logaritmo do desemprego: antiga Pesquisa Mensal do Emprego - PME/ IBGE-19(DES);  
desemprego\_dif <- zoo(primeiradiferencalog(baseSemestral[,"desemprego"]))  
  
#a primeira diferença do logaritmo do IGP (IGP);  
igp\_dif <- zoo(primeiradiferencalog(baseSemestral[,'1.IGPM']))  
  
#a primeira diferença do logaritmo do agregado monetário M1(M1)  
M1.1 <- zoo(primeiradiferencalog(baseSemestral[,1]))  
M1.2 <- zoo(primeiradiferencalog(baseSemestral[,2]))  
M1.3 <- zoo(primeiradiferencalog(baseSemestral[,3]))  
colnames(baseSemestral)[c(1,2,3)]

## [1] "Papel.moeda.em.circulação" "Reservas.bancárias"   
## [3] "Base.monetária.restrita"

#a primeira diferença do logaritmo da produção física industrial dessazonalizada  
producao\_dif <- zoo(primeiradiferencalog(baseSemestral[,4]))  
  
# o logaritmo da taxa de juros dos EUA (EUA).  
juros\_log <- log(baseSemestral[,'FedFunds'])  
  
#o Relative Market Money Rate, construída através da diferença da taxa de juros e a média móvel de 12 meses para trás (RMM);  
RMM <- baseSemestral[,'FedFunds'] - rollmean(baseSemestral[,'FedFunds'],12)  
# GAP  
gap <- baseSemestral[,'gap']  
  
baseSemestralLimpa <- merge.zoo(ibov\_dif,commoditi\_dif,desemprego\_dif,igp\_dif, M1.1, M1.2, M1.3, producao\_dif, juros\_log,RMM,ibov\_ontem,gap)  
  
colnames(baseSemestralLimpa) <- c("IBOV\_dif","commoditi\_dif","desemprego\_dif","igp\_dif","Agreg\_Monetario1","Agreg\_Monetario2","Agreg\_Monetario3",  
 "producao\_fisica\_industrial\_dif","jurosEUA\_log","RMM","ibov\_ontem","gap")

Correlação

cor(na.omit(baseSemestralLimpa))

## IBOV\_dif commoditi\_dif desemprego\_dif  
## IBOV\_dif 1.00000000 0.06726289 -0.07770253  
## commoditi\_dif 0.06726289 1.00000000 -0.29957587  
## desemprego\_dif -0.07770253 -0.29957587 1.00000000  
## igp\_dif -0.23892292 0.35640258 -0.02417832  
## Agreg\_Monetario1 0.18590492 0.30449766 -0.83272260  
## Agreg\_Monetario2 0.59063636 0.28016408 -0.70610516  
## Agreg\_Monetario3 0.29054137 0.32140549 -0.84343040  
## producao\_fisica\_industrial\_dif 0.24366125 -0.25325916 0.59670112  
## jurosEUA\_log 0.41656697 -0.12997958 -0.07242125  
## RMM 0.35479230 0.06742896 -0.07051774  
## ibov\_ontem -0.20138855 0.02165950 -0.01497556  
## gap -0.12096321 0.04636297 -0.33950222  
## igp\_dif Agreg\_Monetario1 Agreg\_Monetario2  
## IBOV\_dif -0.238922919 0.18590492 0.59063636  
## commoditi\_dif 0.356402577 0.30449766 0.28016408  
## desemprego\_dif -0.024178316 -0.83272260 -0.70610516  
## igp\_dif 1.000000000 0.02488461 -0.03947508  
## Agreg\_Monetario1 0.024884611 1.00000000 0.73580645  
## Agreg\_Monetario2 -0.039475078 0.73580645 1.00000000  
## Agreg\_Monetario3 0.009272404 0.98590917 0.83534260  
## producao\_fisica\_industrial\_dif -0.080699479 -0.75764343 -0.35622559  
## jurosEUA\_log -0.032944934 0.06761824 0.28168658  
## RMM -0.057067288 0.04714270 0.28894799  
## ibov\_ontem 0.049283977 -0.10396207 0.01636222  
## gap 0.173678722 0.09645989 0.06595995  
## Agreg\_Monetario3 producao\_fisica\_industrial\_dif  
## IBOV\_dif 0.290541366 0.24366125  
## commoditi\_dif 0.321405493 -0.25325916  
## desemprego\_dif -0.843430397 0.59670112  
## igp\_dif 0.009272404 -0.08069948  
## Agreg\_Monetario1 0.985909168 -0.75764343  
## Agreg\_Monetario2 0.835342599 -0.35622559  
## Agreg\_Monetario3 1.000000000 -0.70976768  
## producao\_fisica\_industrial\_dif -0.709767685 1.00000000  
## jurosEUA\_log 0.116425826 0.11306247  
## RMM 0.114914978 0.09322530  
## ibov\_ontem -0.076830140 0.10295510  
## gap 0.089919182 0.13119217  
## jurosEUA\_log RMM ibov\_ontem gap  
## IBOV\_dif 0.41656697 0.35479230 -0.20138855 -0.12096321  
## commoditi\_dif -0.12997958 0.06742896 0.02165950 0.04636297  
## desemprego\_dif -0.07242125 -0.07051774 -0.01497556 -0.33950222  
## igp\_dif -0.03294493 -0.05706729 0.04928398 0.17367872  
## Agreg\_Monetario1 0.06761824 0.04714270 -0.10396207 0.09645989  
## Agreg\_Monetario2 0.28168658 0.28894799 0.01636222 0.06595995  
## Agreg\_Monetario3 0.11642583 0.11491498 -0.07683014 0.08991918  
## producao\_fisica\_industrial\_dif 0.11306247 0.09322530 0.10295510 0.13119217  
## jurosEUA\_log 1.00000000 0.70865776 0.33352450 -0.14649913  
## RMM 0.70865776 1.00000000 0.33777848 0.11616738  
## ibov\_ontem 0.33352450 0.33777848 1.00000000 0.13087360  
## gap -0.14649913 0.11616738 0.13087360 1.00000000

Modelo generalista

modelSemestral0 <- lm(IBOV\_dif ~ ., data= baseSemestralLimpa)  
  
summary(modelSemestral0)

##   
## Call:  
## lm(formula = IBOV\_dif ~ ., data = baseSemestralLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.15455 -0.05327 -0.02609 0.05157 0.15483   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.07911 0.04795 1.650 0.11731   
## commoditi\_dif 0.25847 0.24946 1.036 0.31466   
## desemprego\_dif 0.42511 0.19629 2.166 0.04485 \*   
## igp\_dif -1.49359 0.92618 -1.613 0.12523   
## Agreg\_Monetario1 -5.14014 3.29861 -1.558 0.13759   
## Agreg\_Monetario2 -0.73312 1.12652 -0.651 0.52389   
## Agreg\_Monetario3 7.57932 4.50298 1.683 0.11061   
## producao\_fisica\_industrial\_dif 1.02960 0.37651 2.735 0.01412 \*   
## jurosEUA\_log 0.04874 0.02278 2.139 0.04720 \*   
## RMM -0.02331 0.03190 -0.731 0.47491   
## ibov\_ontem -0.33236 0.10961 -3.032 0.00752 \*\*  
## gap 0.24601 0.84223 0.292 0.77375   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.09553 on 17 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.8406, Adjusted R-squared: 0.7375   
## F-statistic: 8.152 on 11 and 17 DF, p-value: 8.307e-05

Anova

anova(modelSemestral0)

## Analysis of Variance Table  
##   
## Response: IBOV\_dif  
## Df Sum Sq Mean Sq F value Pr(>F)   
## commoditi\_dif 1 0.00440 0.00440 0.4826 0.496615   
## desemprego\_dif 1 0.00354 0.00354 0.3882 0.541526   
## igp\_dif 1 0.07468 0.07468 8.1838 0.010826 \*   
## Agreg\_Monetario1 1 0.04152 0.04152 4.5500 0.047790 \*   
## Agreg\_Monetario2 1 0.47686 0.47686 52.2533 1.411e-06 \*\*\*  
## Agreg\_Monetario3 1 0.00288 0.00288 0.3161 0.581321   
## producao\_fisica\_industrial\_dif 1 0.09772 0.09772 10.7074 0.004492 \*\*   
## jurosEUA\_log 1 0.02392 0.02392 2.6208 0.123870   
## RMM 1 0.00868 0.00868 0.9511 0.343102   
## ibov\_ontem 1 0.08340 0.08340 9.1388 0.007668 \*\*   
## gap 1 0.00078 0.00078 0.0853 0.773752   
## Residuals 17 0.15514 0.00913   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Modelo só com variaveis significantes

modelSemestral <- lm(IBOV\_dif ~ igp\_dif + Agreg\_Monetario1 + Agreg\_Monetario2 + producao\_fisica\_industrial\_dif + ibov\_ontem,  
 data=baseSemestralLimpa)  
  
summary(modelSemestral)

##   
## Call:  
## lm(formula = IBOV\_dif ~ igp\_dif + Agreg\_Monetario1 + Agreg\_Monetario2 +   
## producao\_fisica\_industrial\_dif + ibov\_ontem, data = baseSemestralLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.38358 -0.08358 -0.00613 0.09302 0.43959   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.04692 0.04309 1.089 0.284325   
## igp\_dif -0.68830 0.80023 -0.860 0.396119   
## Agreg\_Monetario1 0.70273 0.29432 2.388 0.023033 \*   
## Agreg\_Monetario2 0.40106 0.24153 1.661 0.106581   
## producao\_fisica\_industrial\_dif 1.33415 0.36394 3.666 0.000886 \*\*\*  
## ibov\_ontem -0.20772 0.14380 -1.444 0.158324   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1638 on 32 degrees of freedom  
## (2 observations deleted due to missingness)  
## Multiple R-squared: 0.3837, Adjusted R-squared: 0.2875   
## F-statistic: 3.985 on 5 and 32 DF, p-value: 0.006361

Modelo só com variaveis significantes do anova

modelSemestral2 <- lm(IBOV\_dif ~ desemprego\_dif + producao\_fisica\_industrial\_dif + jurosEUA\_log + ibov\_ontem,  
 data=baseSemestralLimpa)  
summary(modelSemestral2)

##   
## Call:  
## lm(formula = IBOV\_dif ~ desemprego\_dif + producao\_fisica\_industrial\_dif +   
## jurosEUA\_log + ibov\_ontem, data = baseSemestralLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.37691 -0.07095 -0.01853 0.06944 0.39316   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.12930 0.03166 4.085 0.000265 \*\*\*  
## desemprego\_dif -0.32608 0.16283 -2.003 0.053493 .   
## producao\_fisica\_industrial\_dif 0.85635 0.32949 2.599 0.013871 \*   
## jurosEUA\_log 0.06022 0.01823 3.304 0.002303 \*\*   
## ibov\_ontem -0.40901 0.14564 -2.808 0.008301 \*\*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1581 on 33 degrees of freedom  
## (2 observations deleted due to missingness)  
## Multiple R-squared: 0.4079, Adjusted R-squared: 0.3362   
## F-statistic: 5.684 on 4 and 33 DF, p-value: 0.001356

Modelo generalista sem alfa

modelSemestral0SemAlfa <- lm(IBOV\_dif ~ . -1, data= baseSemestralLimpa)  
  
summary(modelSemestral0SemAlfa)

##   
## Call:  
## lm(formula = IBOV\_dif ~ . - 1, data = baseSemestralLimpa)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.131502 -0.044017 0.007865 0.064900 0.161701   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## commoditi\_dif 0.097568 0.240345 0.406 0.689566   
## desemprego\_dif 0.393132 0.204465 1.923 0.070483 .   
## igp\_dif -0.442879 0.703949 -0.629 0.537164   
## Agreg\_Monetario1 -5.247318 3.452151 -1.520 0.145878   
## Agreg\_Monetario2 -0.988690 1.167983 -0.846 0.408391   
## Agreg\_Monetario3 8.162295 4.698955 1.737 0.099461 .   
## producao\_fisica\_industrial\_dif 1.359145 0.334092 4.068 0.000722 \*\*\*  
## jurosEUA\_log 0.026793 0.019359 1.384 0.183284   
## RMM 0.001364 0.029495 0.046 0.963633   
## ibov\_ontem -0.288085 0.111240 -2.590 0.018493 \*   
## gap -0.478379 0.752351 -0.636 0.532879   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1 on 18 degrees of freedom  
## (11 observations deleted due to missingness)  
## Multiple R-squared: 0.8275, Adjusted R-squared: 0.7221   
## F-statistic: 7.851 on 11 and 18 DF, p-value: 7.71e-05

Comparação

stargazer(modelSemestral0,modelSemestral0SemAlfa,modelSemestral,modelSemestral2,type="text",title="Comparando Modelos Semestrais",  
 column.labels = c("Modelo 0","Modelo 0 Sem Alfa","Modelo pelo Anova","Modelo Var. Significativas"))

##   
## Comparando Modelos Semestrais  
## =============================================================================================================================  
## Dependent variable:   
## ----------------------------------------------------------------------------------------------  
## IBOV\_dif   
## Modelo 0 Modelo 0 Sem Alfa Modelo pelo Anova Modelo Var. Significativas  
## (1) (2) (3) (4)   
## -----------------------------------------------------------------------------------------------------------------------------  
## commoditi\_dif 0.258 0.098   
## (0.249) (0.240)   
##   
## desemprego\_dif 0.425\*\* 0.393\* -0.326\*   
## (0.196) (0.204) (0.163)   
##   
## igp\_dif -1.494 -0.443 -0.688   
## (0.926) (0.704) (0.800)   
##   
## Agreg\_Monetario1 -5.140 -5.247 0.703\*\*   
## (3.299) (3.452) (0.294)   
##   
## Agreg\_Monetario2 -0.733 -0.989 0.401   
## (1.127) (1.168) (0.242)   
##   
## Agreg\_Monetario3 7.579 8.162\*   
## (4.503) (4.699)   
##   
## producao\_fisica\_industrial\_dif 1.030\*\* 1.359\*\*\* 1.334\*\*\* 0.856\*\*   
## (0.377) (0.334) (0.364) (0.329)   
##   
## jurosEUA\_log 0.049\*\* 0.027 0.060\*\*\*   
## (0.023) (0.019) (0.018)   
##   
## RMM -0.023 0.001   
## (0.032) (0.029)   
##   
## ibov\_ontem -0.332\*\*\* -0.288\*\* -0.208 -0.409\*\*\*   
## (0.110) (0.111) (0.144) (0.146)   
##   
## gap 0.246 -0.478   
## (0.842) (0.752)   
##   
## Constant 0.079 0.047 0.129\*\*\*   
## (0.048) (0.043) (0.032)   
##   
## -----------------------------------------------------------------------------------------------------------------------------  
## Observations 29 29 38 38   
## R2 0.841 0.828 0.384 0.408   
## Adjusted R2 0.738 0.722 0.287 0.336   
## Residual Std. Error 0.096 (df = 17) 0.100 (df = 18) 0.164 (df = 32) 0.158 (df = 33)   
## F Statistic 8.152\*\*\* (df = 11; 17) 7.851\*\*\* (df = 11; 18) 3.985\*\*\* (df = 5; 32) 5.684\*\*\* (df = 4; 33)   
## =============================================================================================================================  
## Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Decidi não alterar o modelo e ir com um semestral sem alfa.

modelSemestral <- modelSemestral0SemAlfa

Teste reset - Erros normalizados com media 0

reset(modelSemestral)

##   
## RESET test  
##   
## data: modelSemestral  
## RESET = 0.43766, df1 = 2, df2 = 16, p-value = 0.653

vif(modelSemestral)

## Warning in vif.default(modelSemestral): No intercept: vifs may not be sensible.

## commoditi\_dif desemprego\_dif   
## 1.408111 5.487461   
## igp\_dif Agreg\_Monetario1   
## 1.858877 737.034187   
## Agreg\_Monetario2 Agreg\_Monetario3   
## 65.521930 1153.919452   
## producao\_fisica\_industrial\_dif jurosEUA\_log   
## 3.619480 3.008738   
## RMM ibov\_ontem   
## 2.833518 1.250356   
## gap   
## 1.889118

Criando um modelo tentando reduzir o vif, bem sucedido, sacrifiquei R2 para ganhar significancia.

modelSemestralSemInflacaoDeVariavel <- lm(IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif -1, data=na.omit(baseSemestralLimpa))  
summary(modelSemestralSemInflacaoDeVariavel)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif -   
## 1, data = na.omit(baseSemestralLimpa))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.28175 -0.08161 -0.02895 0.08417 0.27009   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario3 1.3078 0.2535 5.159 1.99e-05 \*\*\*  
## producao\_fisica\_industrial\_dif 1.5212 0.3218 4.726 6.35e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1359 on 27 degrees of freedom  
## Multiple R-squared: 0.5223, Adjusted R-squared: 0.4869   
## F-statistic: 14.76 on 2 and 27 DF, p-value: 4.661e-05

Rodando para ver se corrigi o VIF

modelSemestral <- modelSemestralSemInflacaoDeVariavel  
vif(modelSemestral)

## Warning in vif.default(modelSemestral): No intercept: vifs may not be sensible.

## Agreg\_Monetario3 producao\_fisica\_industrial\_dif   
## 1.819238 1.819238

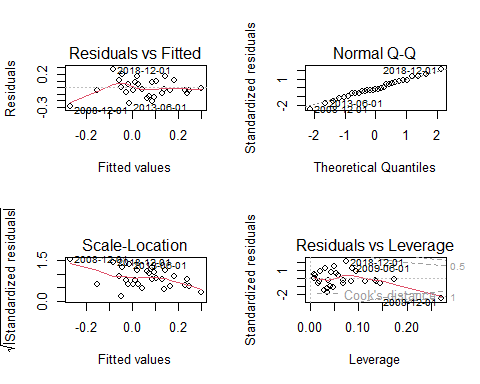
Um anova.

anova(modelSemestral)

## Analysis of Variance Table  
##   
## Response: IBOV\_dif  
## Df Sum Sq Mean Sq F value Pr(>F)   
## Agreg\_Monetario3 1 0.13260 0.13260 7.1825 0.01239 \*   
## producao\_fisica\_industrial\_dif 1 0.41242 0.41242 22.3390 6.354e-05 \*\*\*  
## Residuals 27 0.49848 0.01846   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Graficos a serem analisados

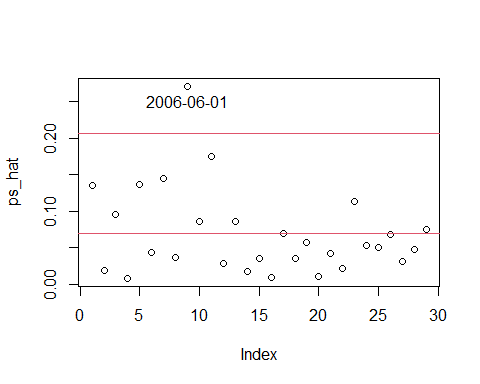
par(mfrow=c(2,2))  
plot(modelSemestral)



par(mfrow=c(1,1))

Elementos da diagonal de H:

ps\_hat <- hatvalues(modelSemestral)  
plot(ps\_hat)  
abline(h=c(1,3)\*mean(ps\_hat), col=2)  
id <- which(ps\_hat>3 \* mean(ps\_hat))  
text(id, ps\_hat[id], index(baseSemestralLimpa)[id], pos=1, xpd=TRUE)



Testes de diagnóstico:

summary(influence.measures(modelSemestral))

## Potentially influential observations of  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif - 1, data = na.omit(baseSemestralLimpa)) :  
##   
## dfb.A\_M3 dfb.p\_\_\_ dffit cov.r cook.d hat   
## 2004-12-01 -0.11 -0.07 -0.11 1.24\_\* 0.01 0.14   
## 2006-12-01 -0.12 -0.06 -0.12 1.24\_\* 0.01 0.14   
## 2008-12-01 0.71 1.58\_\* -1.64\_\* 0.90 1.10\_\* 0.27\_\*  
## 2009-12-01 -0.05 -0.04 -0.05 1.31\_\* 0.00 0.17

teste de Jarque-Bera:

e <- resid(modelSemestral)  
jarqueberaTest(e)

##   
## Title:  
## Jarque - Bera Normalality Test  
##   
## Test Results:  
## STATISTIC:  
## X-squared: 0.2198  
## P VALUE:  
## Asymptotic p Value: 0.8959   
##   
## Description:  
## Thu Nov 24 22:46:40 2022 by user: diogo

Teste de Breusch-Pagan:

bptest(modelSemestral)

##   
## studentized Breusch-Pagan test  
##   
## data: modelSemestral  
## BP = 7.4162, df = 1, p-value = 0.006464

Teste de White

white(modelSemestral, interactions = TRUE)

## Intercept included in auxiliary design matrix

## # A tibble: 1 × 5  
## statistic p.value parameter method alternative  
## <dbl> <dbl> <dbl> <chr> <chr>   
## 1 12.4 0.0293 5 White's Test greater

Teste de Goldfeld e Quandt

gqtest(modelSemestral, data=baseSemestralLimpa)

##   
## Goldfeld-Quandt test  
##   
## data: modelSemestral  
## GQ = 1.5391, df1 = 13, df2 = 12, p-value = 0.2315  
## alternative hypothesis: variance increases from segment 1 to 2

Erros padrão de White

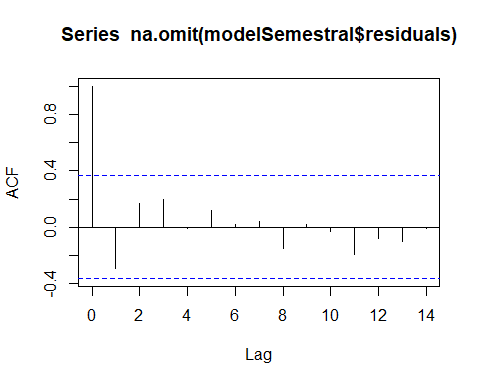
Matriz de covariância de White:

vcovHC(modelSemestral)

## Agreg\_Monetario3 producao\_fisica\_industrial\_dif  
## Agreg\_Monetario3 0.04791295 0.09221479  
## producao\_fisica\_industrial\_dif 0.09221479 0.28132155

Ver correlacao serial

acf(na.omit(modelSemestral$residuals), plot = T)



dwtest(modelSemestral)

##   
## Durbin-Watson test  
##   
## data: modelSemestral  
## DW = 2.4118, p-value = 0.9328  
## alternative hypothesis: true autocorrelation is greater than 0

Dummys: Governos

indexBase <- index(baseSemestralLimpa)  
length(indexBase)

## [1] 40

dummys <- matrix(0,nrow = length(indexBase),ncol=2)  
rownames(dummys) <- indexBase  
colnames(dummys) <- c("Governo\_Esquerda","Governo\_Direita")  
dummys[rownames(dummys) > as.Date("2002-02-01") & rownames(dummys) < as.Date("2016-08-31"),"Governo\_Esquerda"] <- 1  
dummys[rownames(dummys) > as.Date("2016-08-31"),"Governo\_Direita"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaGoverno <- cbind(baseSemestralLimpa,dummys)  
modeloGovernoGap <- lm(IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif - 1 + Governo\_Esquerda + Governo\_Direita - 1  
 ,data=na.omit(baseLimpaGoverno))  
summary(modeloGovernoGap)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif -   
## 1 + Governo\_Esquerda + Governo\_Direita - 1, data = na.omit(baseLimpaGoverno))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.232480 -0.067526 -0.002859 0.109720 0.197158   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario3 1.42317 0.28209 5.045 3.32e-05 \*\*\*  
## producao\_fisica\_industrial\_dif 1.65011 0.33414 4.938 4.37e-05 \*\*\*  
## Governo\_Esquerda -0.03571 0.03067 -1.164 0.255   
## Governo\_Direita 0.07929 0.06009 1.320 0.199   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1327 on 25 degrees of freedom  
## Multiple R-squared: 0.5778, Adjusted R-squared: 0.5103   
## F-statistic: 8.554 on 4 and 25 DF, p-value: 0.0001714

Dummy pandemia

indexBase <- index(baseSemestralLimpa)  
dummys <- matrix(0,nrow = length(indexBase))  
rownames(dummys) <- indexBase  
colnames(dummys) <- c("Pandemia")  
dummys[rownames(dummys) > as.Date("2020-03-01") & rownames(dummys) < as.Date("2022-1-01"),"Pandemia"] <- 1  
dummys <- zoo(dummys,order.by = rownames(dummys))  
baseLimpaPandemia <- cbind(baseSemestralLimpa,dummys)  
modeloPandemia <- lm(IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif - 1 + Pandemia  
 ,data=na.omit(baseLimpaPandemia))  
summary(modeloPandemia)

##   
## Call:  
## lm(formula = IBOV\_dif ~ Agreg\_Monetario3 + producao\_fisica\_industrial\_dif -   
## 1 + Pandemia, data = na.omit(baseLimpaPandemia))  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.28175 -0.08161 -0.02895 0.08417 0.27009   
##   
## Coefficients: (1 not defined because of singularities)  
## Estimate Std. Error t value Pr(>|t|)   
## Agreg\_Monetario3 1.3078 0.2535 5.159 1.99e-05 \*\*\*  
## producao\_fisica\_industrial\_dif 1.5212 0.3218 4.726 6.35e-05 \*\*\*  
## Pandemia NA NA NA NA   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1359 on 27 degrees of freedom  
## Multiple R-squared: 0.5223, Adjusted R-squared: 0.4869   
## F-statistic: 14.76 on 2 and 27 DF, p-value: 4.661e-05