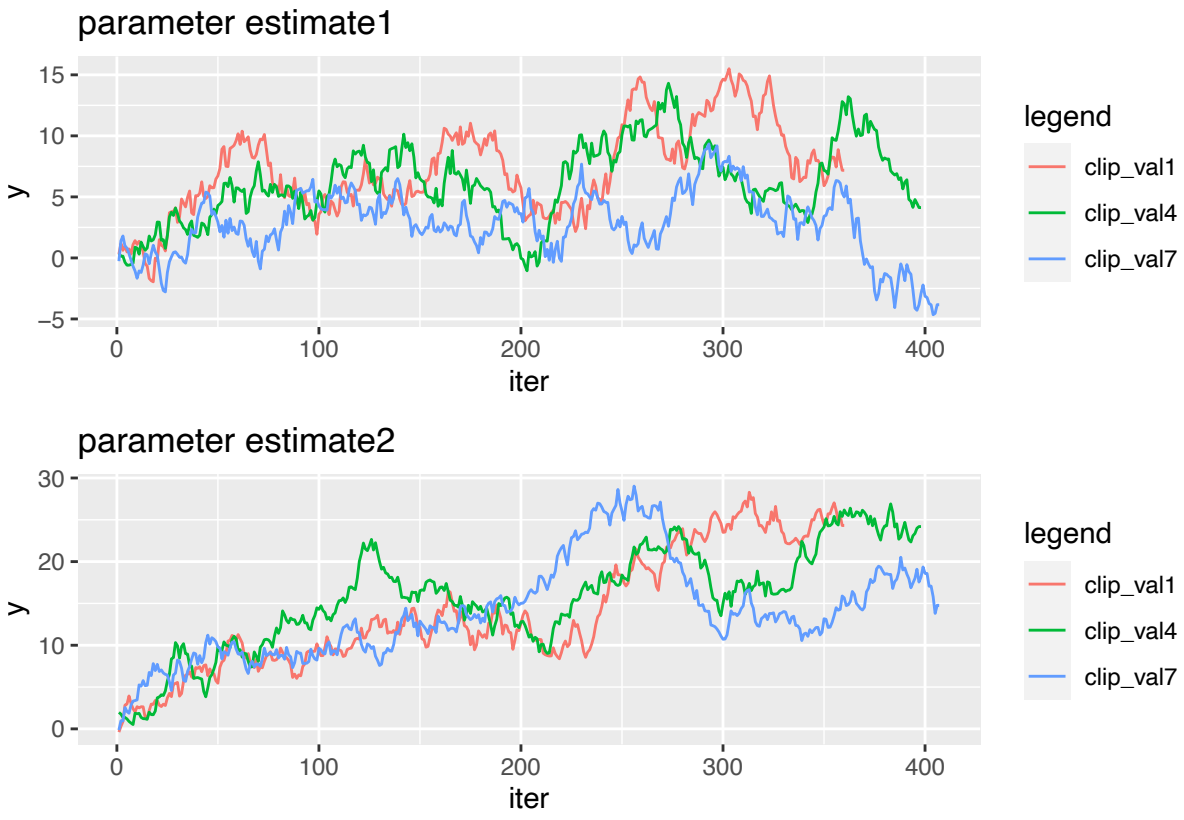
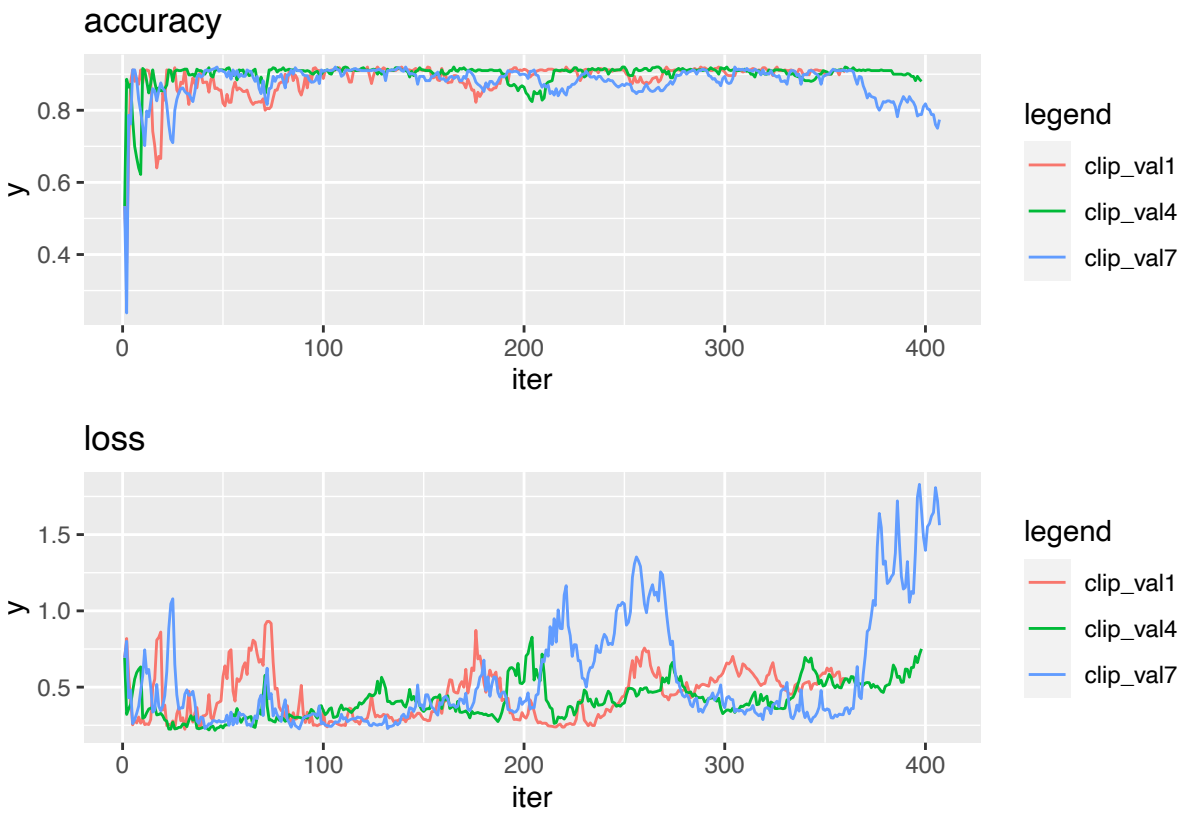
truncation levels - gradient sensitivity

```
rho <-  dp_to_zcdp(eps=.6, delta=1e-6)
wres1 <- wres2 <-  ares <- lres <- list()
names <- c()
for (clip_val in seq(1,7,3)){
  res <- agd(X, y, rho, init_val = c(0,0), eps_total=.6, delta=1e-6, obj_clip=2, grad_clip=clip_val)
  w_hist <- res$w_hist
  wres1 <- append(wres1, list(w_hist[,1]))
  wres2 <- append(wres2, list(w_hist[,2]))
  ares <- append(ares, list(res$acc_hist))
  lres <- append(lres, list(res$loss_hist))
  names <- c(names, paste("clip_val", clip_val, sep = ""))
}
names(wres1) <- names(wres2) <- names(ares) <- names(lres) <- names

visual <- function(dat, title){
  dat <- lapply(dat, function(x) cbind(x = seq_along(x), y = x))
  legend <- rep(names(dat), sapply(dat, nrow))
  dat <- as.data.frame(do.call("rbind", dat))
  dat$legend <- legend
  ggplot(dat, aes(x = x, y = y, colour = legend)) + geom_line() + labs(x = "iter", title = title)
}

visual(wres1, "parameter estimate1") / visual(wres2, "parameter estimate2")
```

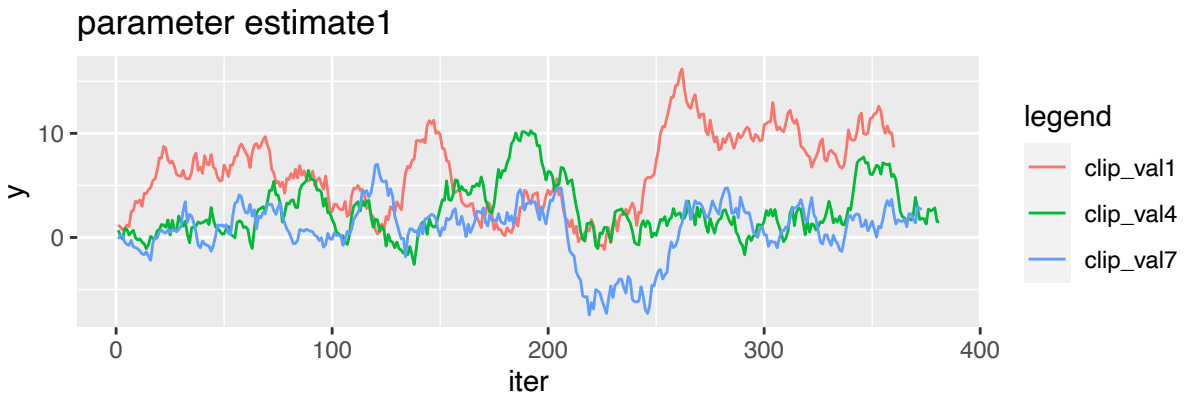


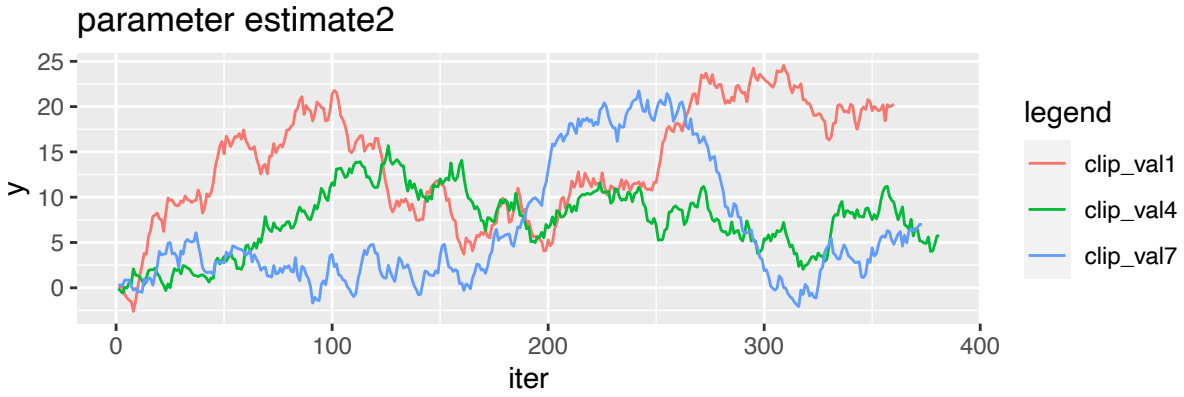

```
visual(ares, "accuracy") / visual(lres, "loss")
```



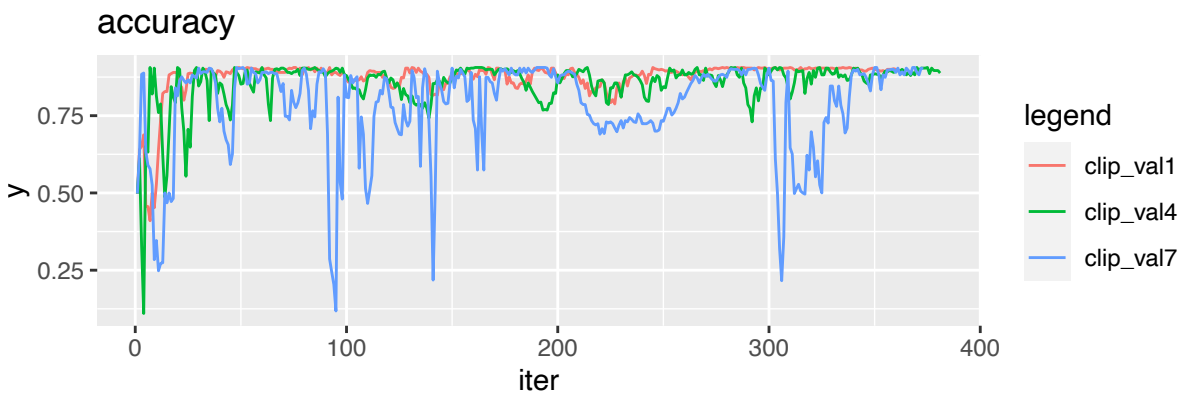
truncation levels - objective value sensitivity

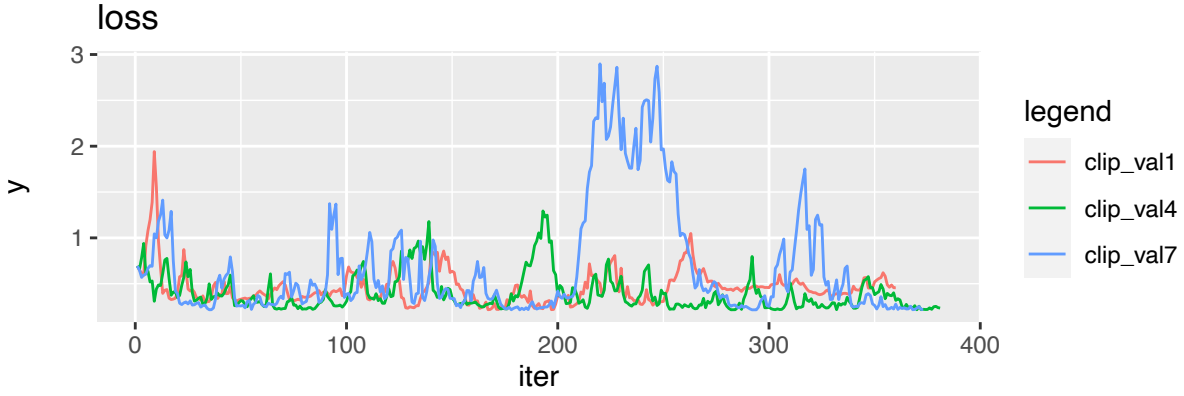
```
rho <-  dp_to_zcdp(eps=.6, delta=1e-6)
wres1 <- wres2 <-  ares <- lres <- list()
names <- c()
for (clip_val in seq(1,7,3)){
  res <- agd(X, y, rho, init_val = c(0,0), eps_total=.6, delta=1e-6, obj_clip=clip_val, grad_clip=2)
  w_hist <- res$w_hist
  wres1 <- append(wres1, list(w_hist[,1]))
  wres2 <- append(wres2, list(w_hist[,2]))
  ares <- append(ares, list(res$acc_hist))
  lres <- append(lres, list(res$loss_hist))
  names <- c(names, paste("clip_val", clip_val, sep = ""))
}
names(wres1) <- names(wres2) <- names(ares) <- names(lres) <- names

visual(wres1, "parameter estimate1") / visual(wres2, "parameter estimate2")
```





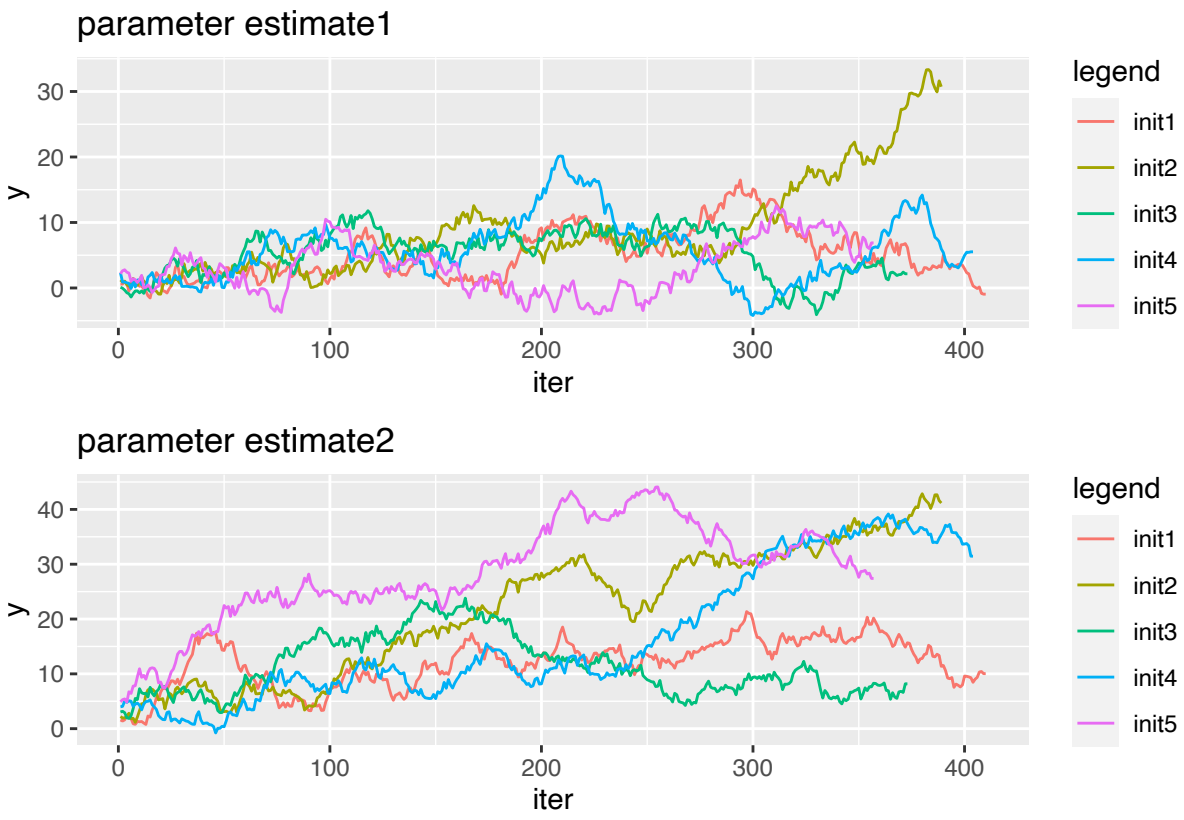

```
visual(ares, "accuracy") / visual(lres, "loss")
```



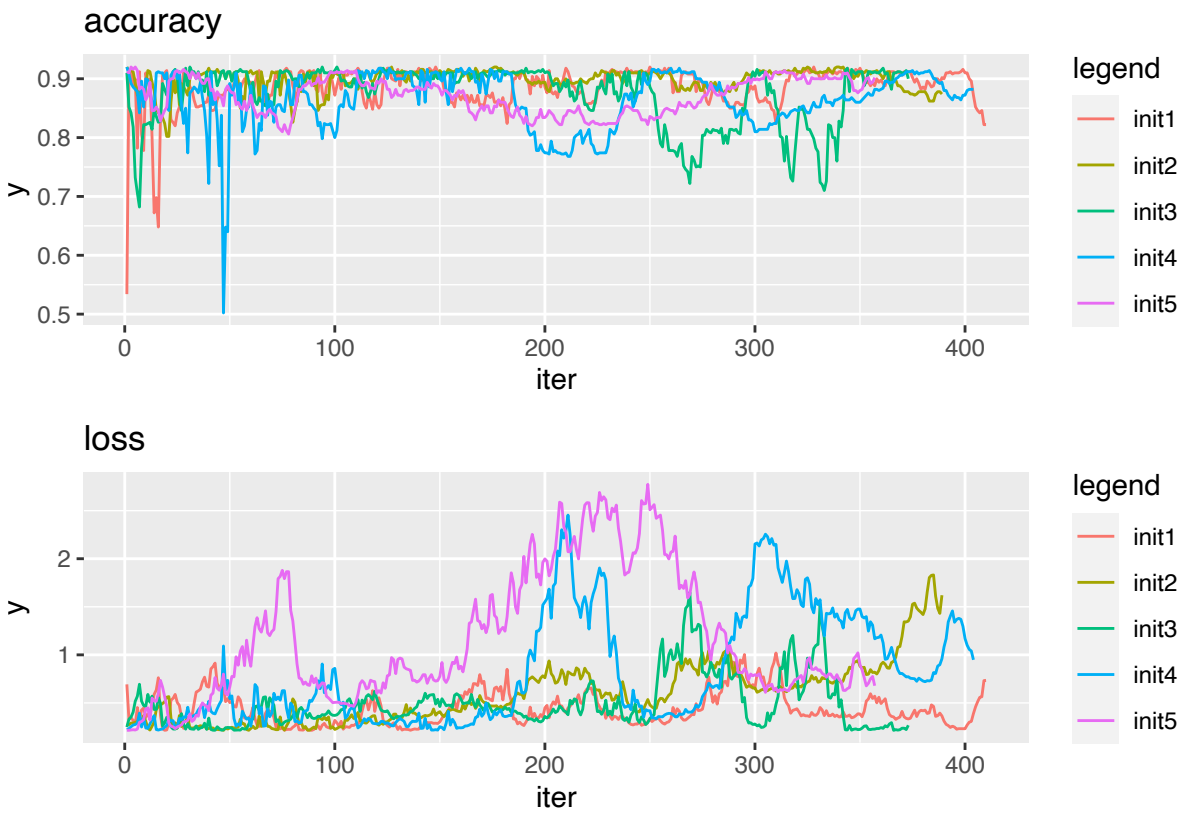


starting values

```
rho <-  dp_to_zcdp(eps=.6, delta=1e-6)
wres1 <- wres2 <-  ares <- lres <- list()
names <- c()
mat <- matrix(c(0,0,1,2,1,3,2,4,2,5), ncol = 2, byrow = T)
for (i in 1:nrow(mat)){
  res <- agd(X, y, rho, init_val = mat[i,], eps_total=.6, delta=1e-6, obj_clip=2, grad_clip=2)
  w_hist <- res$w_hist
  wres1 <- append(wres1, list(w_hist[,1]))
  wres2 <- append(wres2, list(w_hist[,2]))
  ares <- append(ares, list(res$acc_hist))
  lres <- append(lres, list(res$loss_hist))
  names <- c(names, paste("init", i, sep = ""))
}
names(wres1) <- names(wres2) <- names(ares) <- names(lres) <- names

visual(wres1, "parameter estimate1") / visual(wres2, "parameter estimate2")
```

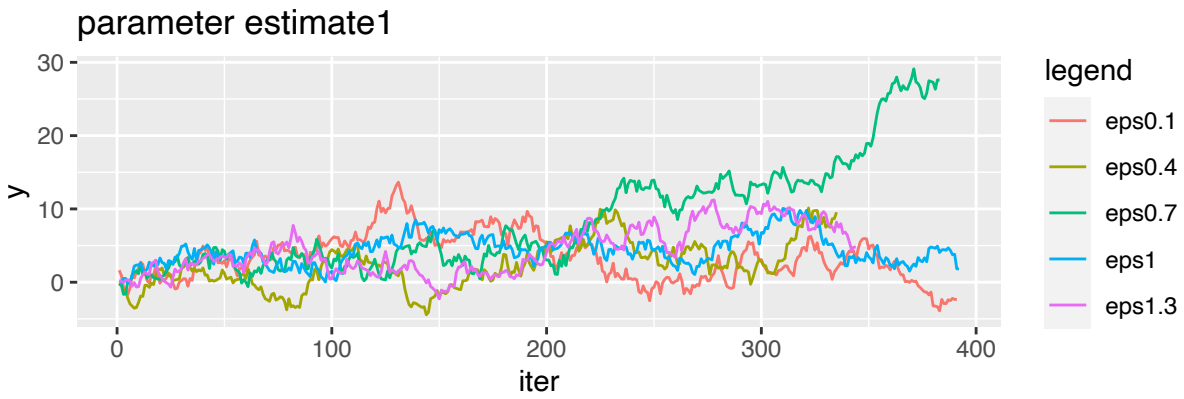


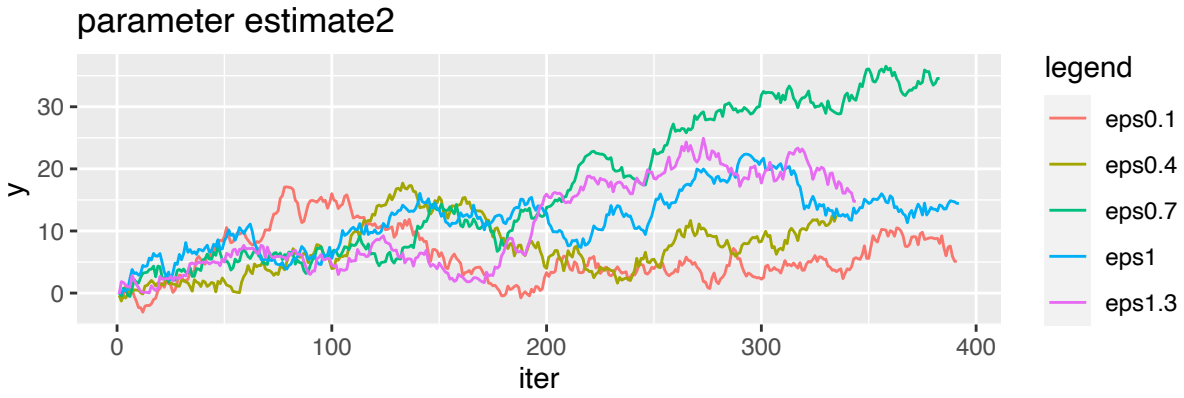

```
visual(ares, "accuracy") / visual(lres, "loss")
```


accuracy
0.9
0.8
0.7
0.6
0.5
y
0
100
200
300
400
iter
legend
init1
init2
init3
init4
init5
loss
2
1
y
0
100
200
300
400
iter
legend
init1
init2
init3
init4
init5

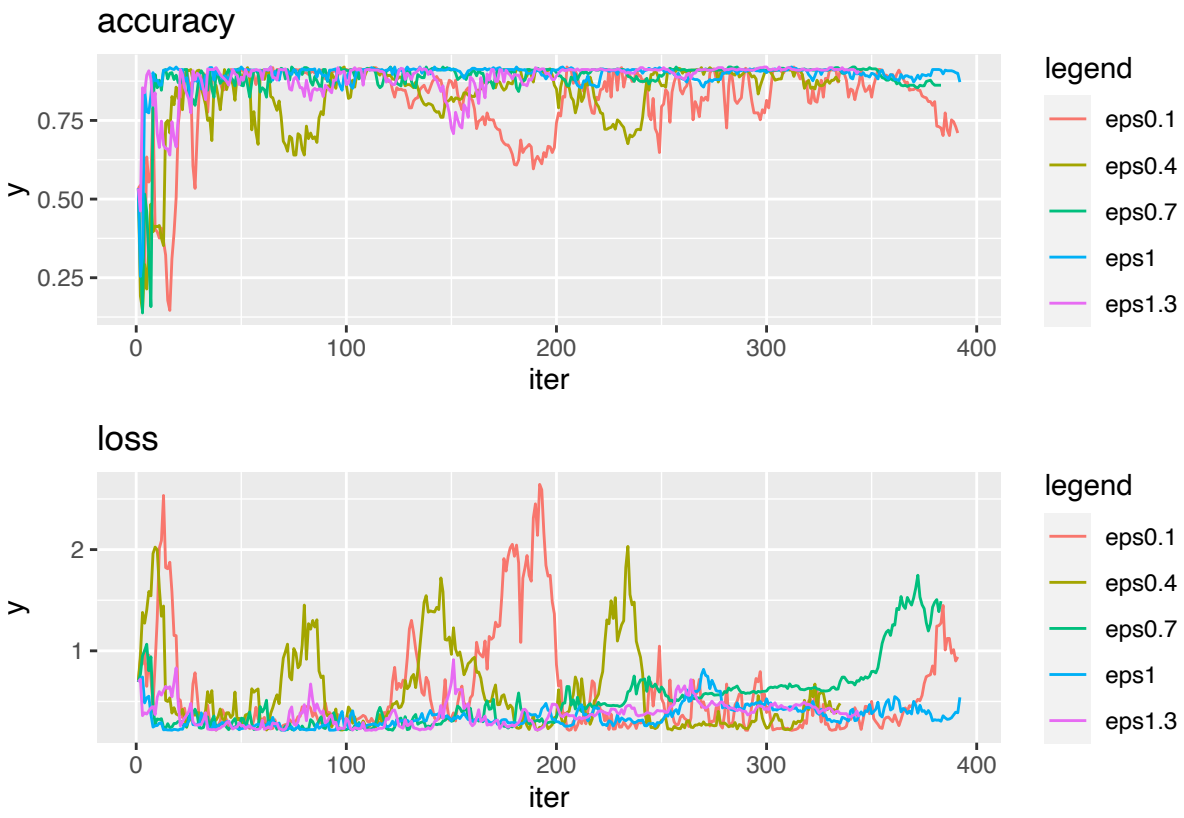
privacy budgets - epsilon

```
wres1 <- wres2 <-  ares <- lres <- list()
names <- c()
for (eps in seq(0.1, 1.3, 0.3)){
  res <- agd(X, y, dp_to_zcdp(eps=eps, delta=1e-6), init_val = c(0,0), eps_total=eps, delta=1e-6, obj_cl
  w_hist <- res$w_hist
  wres1 <- append(wres1, list(w_hist[,1]))
  wres2 <- append(wres2, list(w_hist[,2]))
  ares <- append(ares, list(res$acc_hist))
  lres <- append(lres, list(res$loss_hist))
  names <- c(names, paste("eps", eps, sep = ""))
}
names(wres1) <- names(wres2) <- names(ares) <- names(lres) <- names

visual(wres1, "parameter estimate1") / visual(wres2, "parameter estimate2")
```



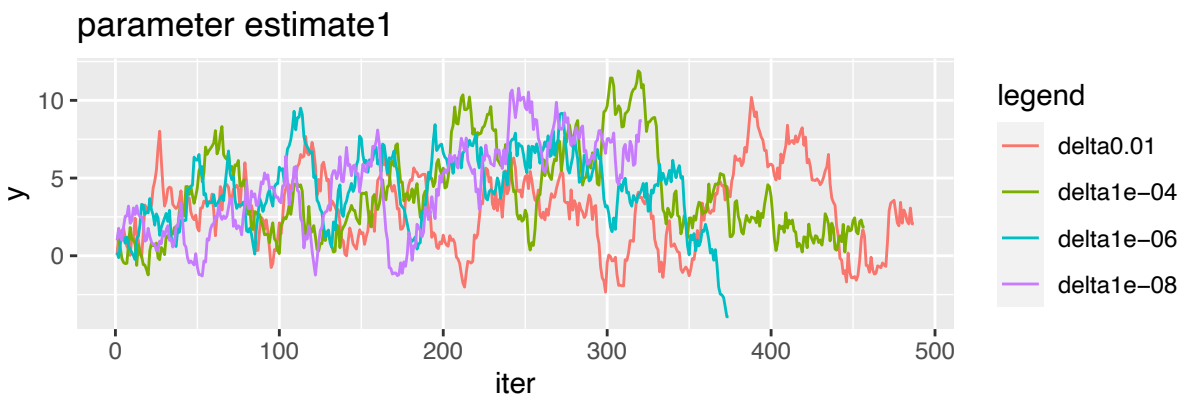


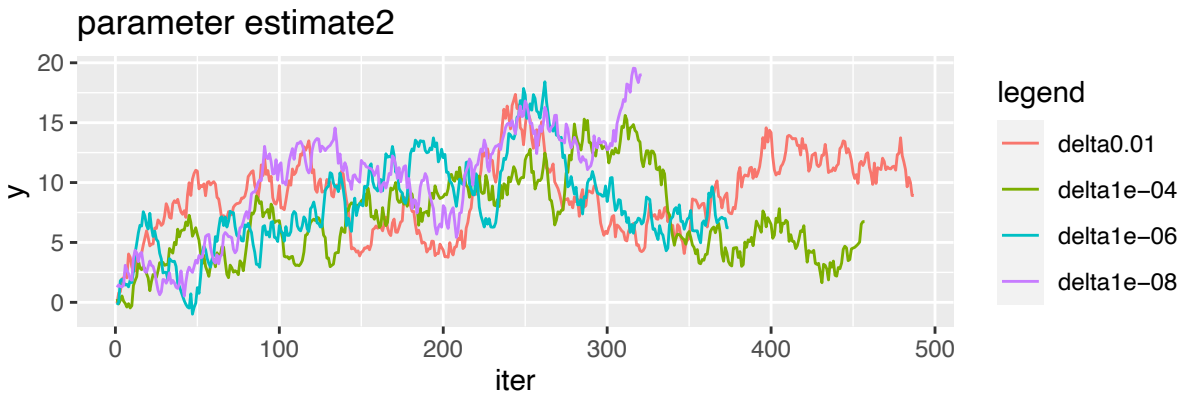

```
visual(ares, "accuracy") / visual(lres, "loss")
```


accuracy
0.75
0.50
0.25
y
0
100
200
300
400
iter
legend
eps0.1
eps0.4
eps0.7
eps1
eps1.3
loss
2
1
y
0
100
200
300
400
iter
legend
eps0.1
eps0.4
eps0.7
eps1
eps1.3

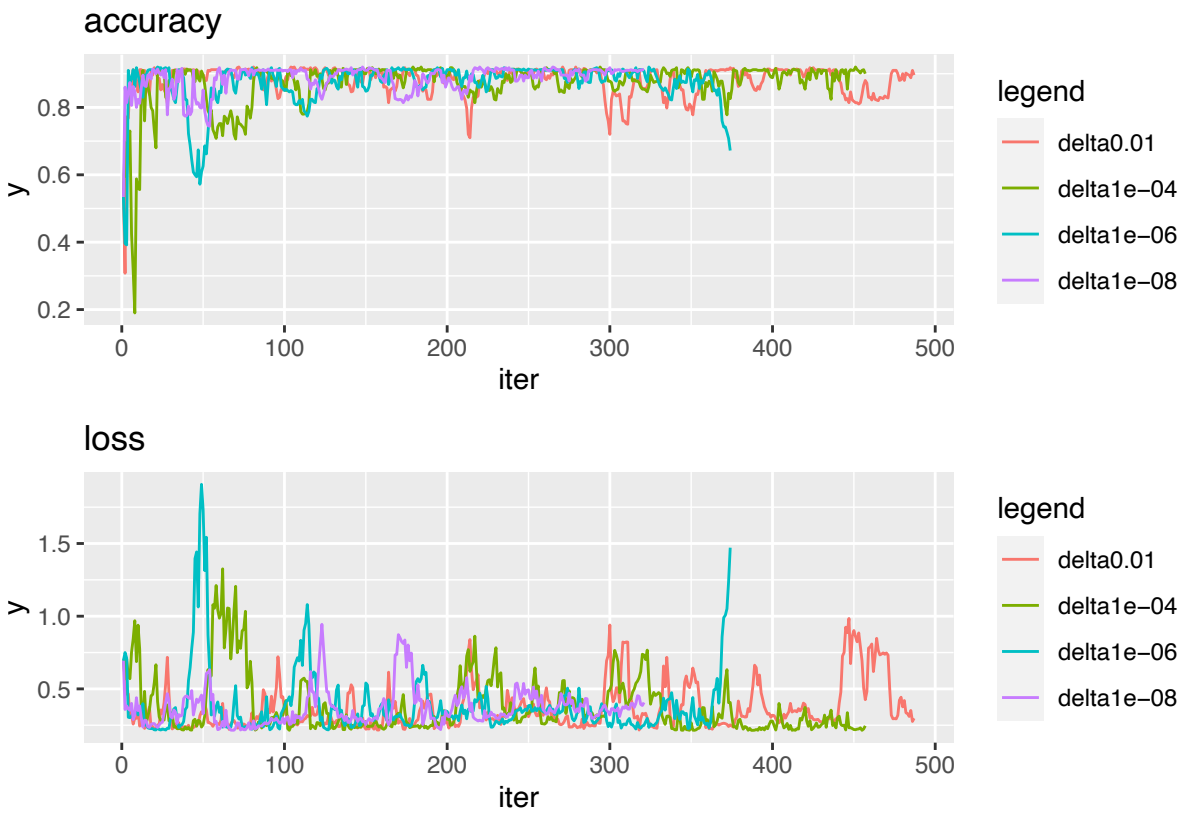
privacy budgets - delta

```
wres1 <- wres2 <-  ares <- lres <- list()
names <- c()
for (delta in c(1e-2, 1e-4, 1e-6, 1e-8)){
  res <- agd(X, y, dp_to_zcdp(eps=0.6, delta=delta), init_val = c(0,0), eps_total=0.6, delta=delta, obj
  w_hist <- res$w_hist
  wres1 <- append(wres1, list(w_hist[,1]))
  wres2 <- append(wres2, list(w_hist[,2]))
  ares <- append(ares, list(res$acc_hist))
  lres <- append(lres, list(res$loss_hist))
  names <- c(names, paste("delta", delta, sep = ""))
}
names(wres1) <- names(wres2) <- names(ares) <- names(lres) <- names

visual(wres1, "parameter estimate1") / visual(wres2, "parameter estimate2")
```



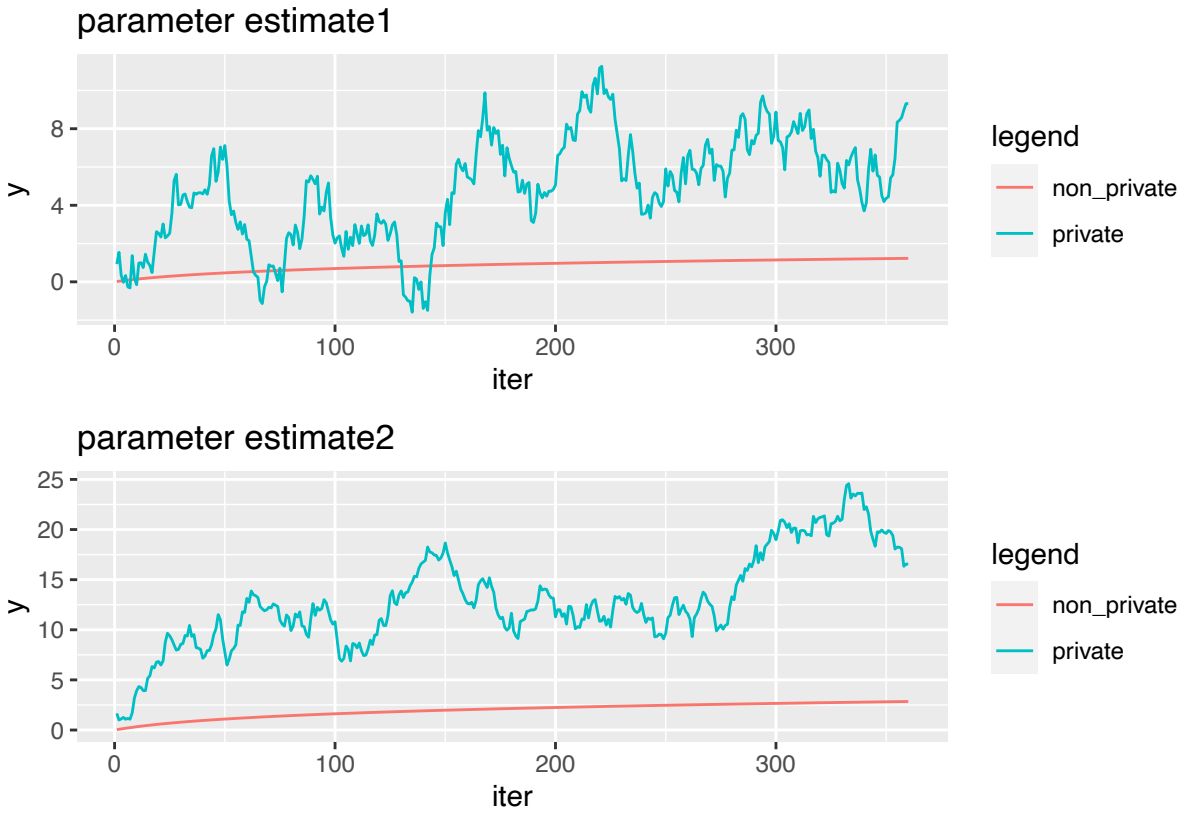



```
visual(ares, "accuracy") / visual(lres, "loss")
```

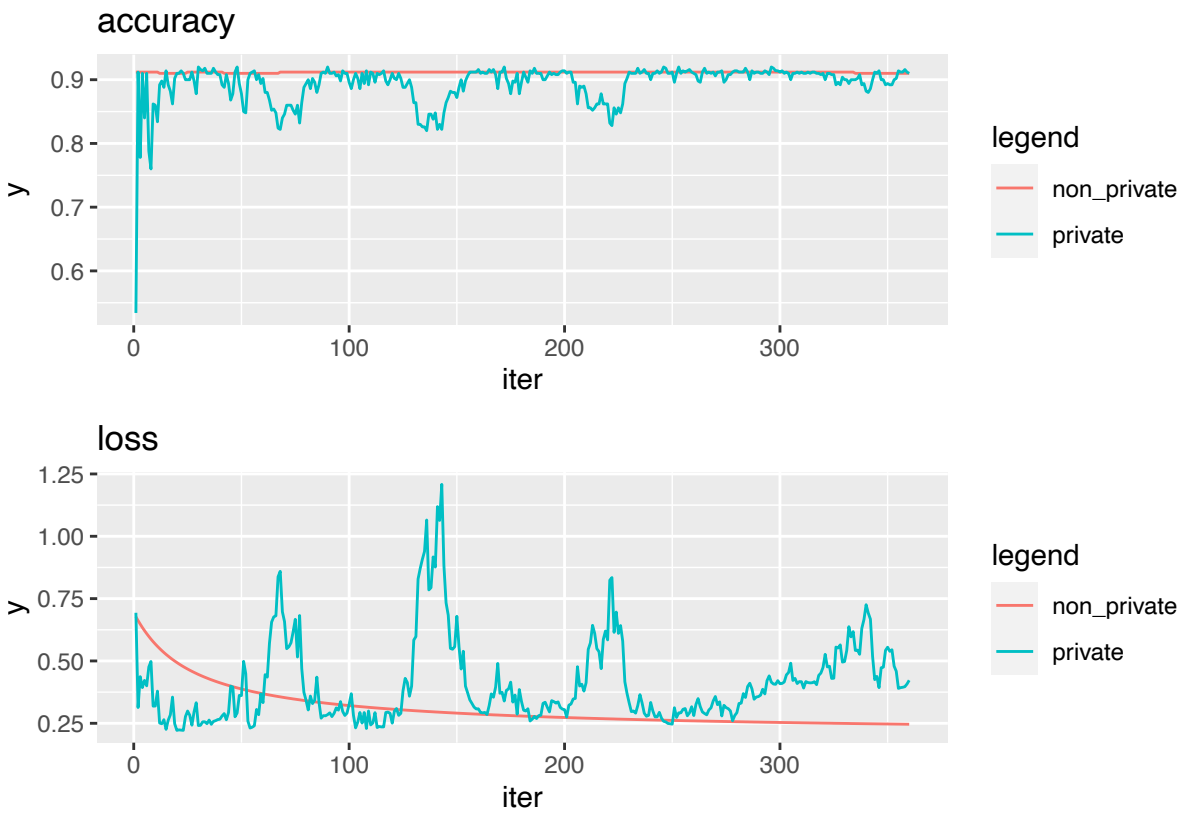

accuracy
y
0.8
0.6
0.4
0.2
0
100
200
300
400
500
iter
legend
delta0.01
delta1e−04
delta1e−06
delta1e−08
loss
y
1.5
1.0
0.5
0
100
200
300
400
500
iter
legend
delta0.01
delta1e−04
delta1e−06
delta1e−08

non-private vs private

```
rho <-  dp_to_zcdp(eps=1, delta=1e-6)
res <- agd(X, y, rho, init_val = c(0,0), eps_total=1, delta=1e-6, obj_clip=2, grad_clip=2)
names <- c("non_private", "private")
wres1 <- list(hist$w_hist[1:length(res$w_hist[,1]),1], res$w_hist[,1])
wres2 <- list(hist$w_hist[1:length(res$w_hist[,2]),2], res$w_hist[,2])
ares <- list(hist$a_hist[1:length(res$acc_hist)], res$acc_hist)
lres <- list(hist$l_hist[1:length(res$loss_hist)], res$loss_hist)
names(wres1) <- names(wres2) <- names(ares) <- names(lres) <- names

visual(wres1, "parameter estimate1") / visual(wres2, "parameter estimate2")
```




```
visual(ares, "accuracy") / visual(lres, "loss")
```


accuracy
0.9
0.8
0.7
0.6
y
0
100
200
300
iter
legend
non_private
private

loss
1.25
1.00
0.75
0.50
0.25
y
0
100
200
300
iter
legend
non_private
private