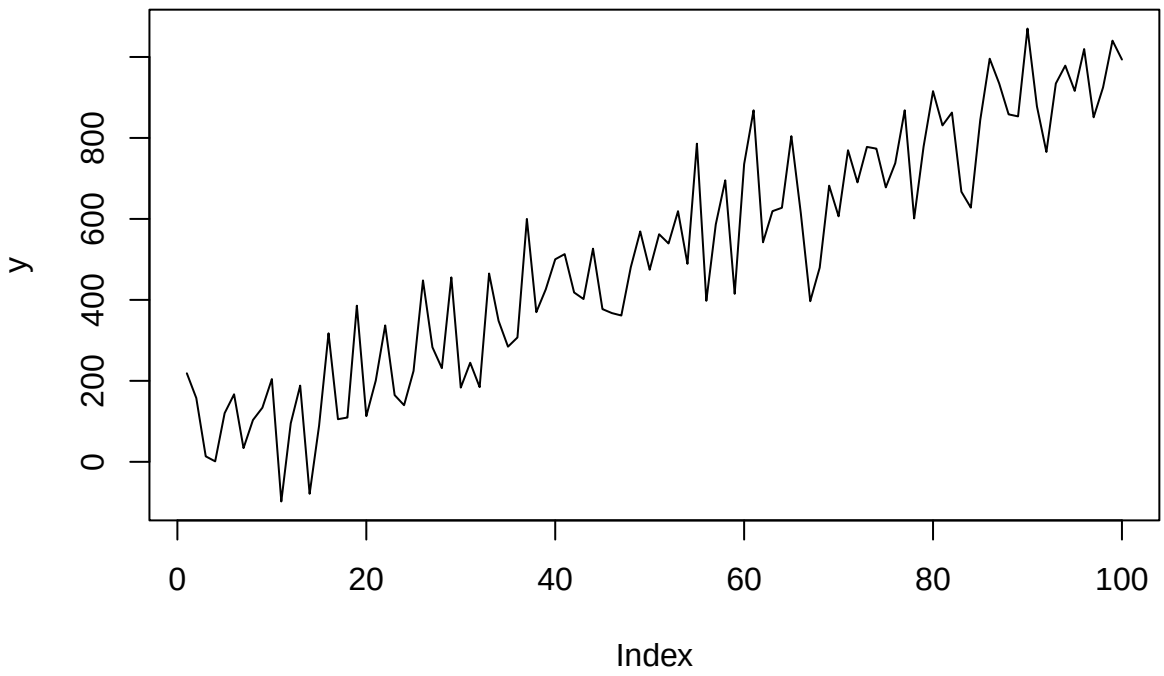
Nov03

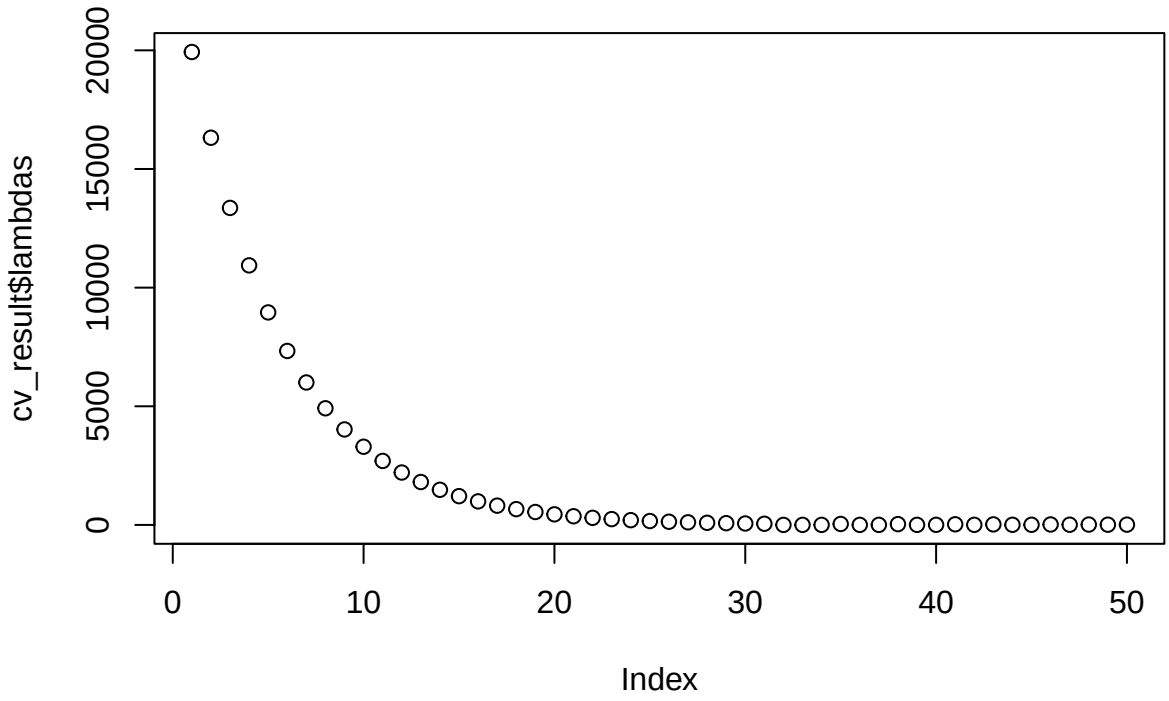
2022-11-04

Gradient descent

```
source("../model/pls/ridge.R")
set.seed(11121)

dat_length = 100
sd = 100
lambda = 2

x <- 1:dat_length
y <- 10*x + rnorm(dat_length, 0, sd = sd)

plot(y, type = "l")
```



```
cv_result <- CV(x, y)
plot(cv_result$lambdas)
```




```
lambda = cv_result$lambdas[1]
```

```
fit_close <- get_r(x, y, lambda=lambda)
```

```
obj <- function(r, x, y, lambda){
  return(sum((y-r*x)^2) + lambda*sum(diff(r)^2))
}

result = nlm(obj, rep(1, dat_length), x = x, y = y, lambda = lambda)
```

```
lambda
```

```
## [1] 19930.37
```

```
get_loss(x, y, fit_close, lambda)
```

```
## [1] 98256.15
```

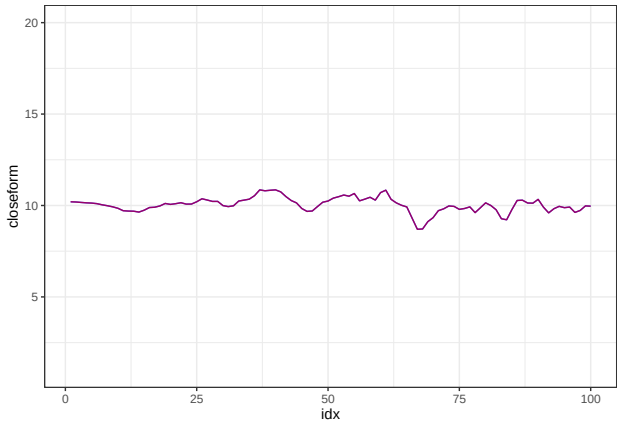
```
get_loss(x, y, result$estimate, lambda)
```

```
## [1] 98255.82
```

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.4.0      v purrr   0.3.5
## v tibble  3.1.8      v dplyr   1.0.10
## v tidyr   1.2.1      v stringr 1.4.1
## v readr   2.1.3      v forcats 0.5.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
ggplot(data=data.frame(idx=1:dat_length, closeform = fit_close, gd = result$estimate), aes(x=idx))+
  geom_line(aes(x=idx,y=closeform), color = "blue")+
  geom_line(aes(x=idx,y=fit_close), color = "red", alpha = 0.6)+
  theme_bw()+
  ylim(c(1,20))
```



Quick CV function

```
quick_cv <- function(w, y, lambda){
  dat_length = length(y)
  W = diag(w)
  D = build_D(dat_length)
  I = diag(rep(1, dat_length))

  H = W %*% solve(t(W)%*%W + lambda*t(D)%*%D) %*% t(W)

  E <- (I-H)%*%Y
  B <- (1- diag(H))^2

  mean(E/B)

}
```