Data Generation for default models in MF-2dFDR

```
rm(list = ls())
source("~/Desktop/code_paper/final_fun.R")
```

Arguments of the function generate()

- n: the sample size
- m: the number of hypotheses
- confounding, s.strength, s.density: can be either of "weak", "medium" and "strong"
- response: can be either "continuous", "poisson", "binary" or "nb"
- covariate: can be either "binary" or "continuous"
- confounder: can be either "binary" or "continuous"

```
logit = function(x) exp(x)/ (1 + exp(x))
generate = function(n, m, delta = 0.2, confounding, s.strength,
                    s.density, response, covariate, confounder)
{
  if (confounding == "weak") {
    rho = 0.1
  }
  if (confounding == "moderate"){
    rho = 1
  }
  if (confounding == "strong"){
    rho = 1.5
  }

  ##Describing strength of signal
  if (s.strength == "weak") {
    l = 0.3
  }
  if (s.strength == "moderate") {
    l = 0.4
  }
  if (s.strength == "strong") {
    l = 0.5
  }

  ##Describing density of signal
  if(s.density == "weak"){
```

```
  p = 0.1
}
if(s.density == "moderate"){
  p = 0.2
}
if(s.density == "strong"){
  p = 0.3
}
r <- runif(m)
alpha <- if_else(r < (1- p), 0,
                 if_else(r < (1- p/2), runif(m, -l-delta, -l), runif(m, l,l+delta))
)
r <- runif(m)
beta <- if_else(r < (1- p), 0,
                if_else(r < (1- p/2), runif(m, -l-delta, -l), runif(m, l,l+delta))
)
tp <- abs(alpha) > 0
tn <- alpha == 0
## Generate X,Z
if (confounder == "continuous"){
  Z <- rnorm(n)

}else if(confounder == "binary"){
  Z = rbinom(n, 1, 0.7)
}else{
  stop(print("Outside the scope of the default model"))
}

if(covariate == "binary"){

 prob = exp(rho * Z)/(1 + exp(rho * Z))
 X <- rbinom(n, 1, prob)
}else if(covariate == "continuous"){
  X = rnorm(n, mean = rho*(Z))

}else{
  stop(print("Outside the scope of the Default model"))
}


##Generate Y
Y = matrix(nrow = m ,ncol = n)
if(response == "continuous"){
  for(j in 1:m)
  {
    Y[j,] <- alpha[j]*scale(X) + beta[j]*Z + rnorm(n)

  }
}else if(response == "poisson"){
  for(j in 1:m)
  {
    prob = exp(alpha[j]* scale(X)+ beta[j]*Z)
    Y[j,] = rpois(n, prob)
```

```
    }
  }else if(response == "nb"){
    for(j in 1:m)
    {

      Y[j,] = rnbinom(n, size = 3, mu = exp(alpha[j]* scale(X)+ beta[j]*Z))
    }
  }else if(response == "binary"){
    for(j in 1:m)
    {
      prob = sapply(alpha[j]* scale(X)+ beta[j]*Z, logit)
      Y[j,] = rbinom(n, 1, prob)
    }

  }else(stop(print("outside the scope of the default model")))


  return(list(X = X, Y = Y, Z = Z))

}
```

```
generate(10, 100, delta = 0.2, confounding = "weak",
         s.strength = "moderate", s.density = "strong",
         response = "binary", covariate = "binary",
         confounder = "continuous")
```

```
## $X
##  [1] 1 0 0 1 0 1 0 0 0 0
##
## $Y
##        [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
##   [1,]    0    1    1    0    0    1    1    0    1     1
##   [2,]    0    1    1    0    1    1    1    0    0     0
##   [3,]    0    0    1    0    0    0    1    0    0     0
##   [4,]    1    1    0    1    0    1    1    1    1     1
##   [5,]    1    1    1    1    1    1    0    0    1     1
##   [6,]    1    1    1    1    0    1    0    1    0     1
##   [7,]    1    1    1    1    1    0    1    0    0     1
##   [8,]    1    0    1    0    0    1    0    1    1     0
##   [9,]    1    1    0    0    1    1    0    0    1     1
##  [10,]    0    0    0    1    1    1    0    1    1     0
##  [11,]    1    1    1    0    1    1    0    0    1     1
##  [12,]    1    1    0    1    1    0    1    1    0     1
##  [13,]    0    0    0    1    0    1    0    1    1     1
##  [14,]    0    1    1    1    0    0    0    0    1     0
##  [15,]    0    0    0    0    0    0    1    1    0     1
##  [16,]    0    0    0    1    0    1    0    1    1     1
##  [17,]    0    0    1    1    1    1    1    0    0     0
##  [18,]    0    0    0    0    1    0    1    1    1     0
##  [19,]    1    1    1    0    0    0    1    0    1     1
##  [20,]    1    0    1    1    1    1    0    1    0     0
##  [21,]    0    1    1    1    0    0    0    1    1     1
##  [22,]    0    0    1    0    0    0    0    0    1     0
```

```
##  [23,]    0    0    1    0    0    0    1    1    1    0
##  [24,]    1    0    0    1    0    0    0    0    1    1
##  [25,]    0    1    1    1    1    0    1    1    0    0
##  [26,]    0    0    1    1    1    0    0    0    1    1
##  [27,]    1    1    0    0    1    1    0    1    1    1
##  [28,]    0    1    0    1    1    0    1    1    0    0
##  [29,]    1    1    0    0    0    0    1    1    0    0
##  [30,]    0    0    0    0    0    0    0    0    0    1
##  [31,]    0    1    1    1    0    0    1    0    1    0
##  [32,]    1    0    0    0    0    1    0    1    0    0
##  [33,]    0    1    1    1    0    1    1    1    0    0
##  [34,]    0    1    1    0    1    0    1    0    0    1
##  [35,]    0    0    0    0    1    1    1    0    1    0
##  [36,]    1    1    0    0    0    0    1    1    0    1
##  [37,]    1    0    1    0    0    1    0    0    1    0
##  [38,]    1    0    0    1    0    0    0    1    1    0
##  [39,]    1    0    0    0    1    0    0    0    0    1
##  [40,]    1    1    0    1    1    1    0    1    0    0
##  [41,]    1    0    1    0    0    1    1    0    0    1
##  [42,]    0    0    1    1    1    1    0    1    0    1
##  [43,]    0    0    1    1    1    0    0    0    0    0
##  [44,]    1    0    0    0    0    1    1    1    1    0
##  [45,]    1    0    1    1    1    1    1    1    0    0
##  [46,]    0    0    0    1    1    0    1    0    1    1
##  [47,]    1    0    0    1    0    1    0    1    0    0
##  [48,]    1    0    1    1    0    1    0    1    0    0
##  [49,]    0    1    1    0    0    0    0    1    1    0
##  [50,]    1    1    1    0    1    0    1    0    1    1
##  [51,]    0    1    1    0    0    1    1    1    1    0
##  [52,]    0    1    1    0    1    1    0    0    0    1
##  [53,]    0    1    1    0    0    1    1    1    1    1
##  [54,]    1    1    0    0    1    0    0    0    1    1
##  [55,]    0    1    1    0    0    0    0    1    1    0
##  [56,]    0    1    1    1    1    0    0    0    0    0
##  [57,]    1    1    1    0    0    1    0    1    1    1
##  [58,]    1    1    0    0    1    1    0    1    1    0
##  [59,]    0    1    0    1    1    1    1    1    0    0
##  [60,]    0    1    0    0    0    0    1    1    1    1
##  [61,]    1    1    0    1    0    0    1    1    0    1
##  [62,]    1    1    1    1    1    1    0    0    0    1
##  [63,]    1    0    0    1    1    0    1    1    1    0
##  [64,]    1    0    1    1    0    0    0    0    0    0
##  [65,]    0    0    1    1    0    0    0    1    1    0
##  [66,]    1    0    0    0    1    1    0    1    1    0
##  [67,]    0    1    0    0    0    1    0    1    0    1
##  [68,]    1    1    1    1    0    0    0    0    1    0
##  [69,]    1    1    0    1    1    1    0    1    0    1
##  [70,]    1    0    1    0    1    0    0    1    1    1
##  [71,]    0    0    0    1    0    0    1    1    0    0
##  [72,]    1    0    1    0    0    1    0    1    0    0
##  [73,]    1    0    1    0    1    0    1    0    0    1
##  [74,]    1    0    0    1    0    0    0    1    0    1
##  [75,]    1    0    1    0    0    1    1    0    0    1
##  [76,]    1    0    1    1    0    0    0    0    1    0
```

```
##  [77,]    1    0    1    1    0    0    0    1    0     1
##  [78,]    1    1    1    1    1    0    1    0    1     1
##  [79,]    1    1    1    1    1    1    0    1    1     1
##  [80,]    1    0    0    0    0    1    1    0    1     0
##  [81,]    1    0    1    1    0    1    0    0    0     0
##  [82,]    1    0    1    0    1    0    1    0    1     1
##  [83,]    0    0    1    1    1    0    0    0    1     0
##  [84,]    0    0    0    1    1    1    1    1    0     0
##  [85,]    0    0    0    1    0    0    1    1    1     1
##  [86,]    0    0    1    0    0    0    0    1    1     0
##  [87,]    1    0    1    1    0    1    0    1    0     0
##  [88,]    0    1    1    0    0    1    0    0    0     0
##  [89,]    0    1    1    1    0    0    0    0    0     0
##  [90,]    0    1    0    1    1    1    0    1    1     0
##  [91,]    0    0    1    1    0    0    0    0    0     1
##  [92,]    1    0    1    1    1    1    0    1    0     1
##  [93,]    1    0    0    1    0    1    1    0    1     1
##  [94,]    0    0    0    1    0    0    0    0    1     0
##  [95,]    1    0    0    0    1    1    1    0    1     0
##  [96,]    1    1    0    0    0    0    1    0    0     0
##  [97,]    0    0    1    1    0    0    0    1    1     1
##  [98,]    0    0    0    0    1    0    1    0    1     1
##  [99,]    0    1    0    1    0    1    1    0    0     0
## [100,]    1    0    0    0    0    1    1    0    1     0
##
## $Z
##  [1] -1.2400817 -0.6306961  0.2099058  1.5846694 -0.5425075 -0.5525376
##  [7] -1.4211158  0.8567726 -0.3700228 -0.7449946
```