Test if I got t-likelihood correct.

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March 11, 2016

Abstract

Some checks on the t-liklihood implementation in `succotashr`

Load in `succotashr`.

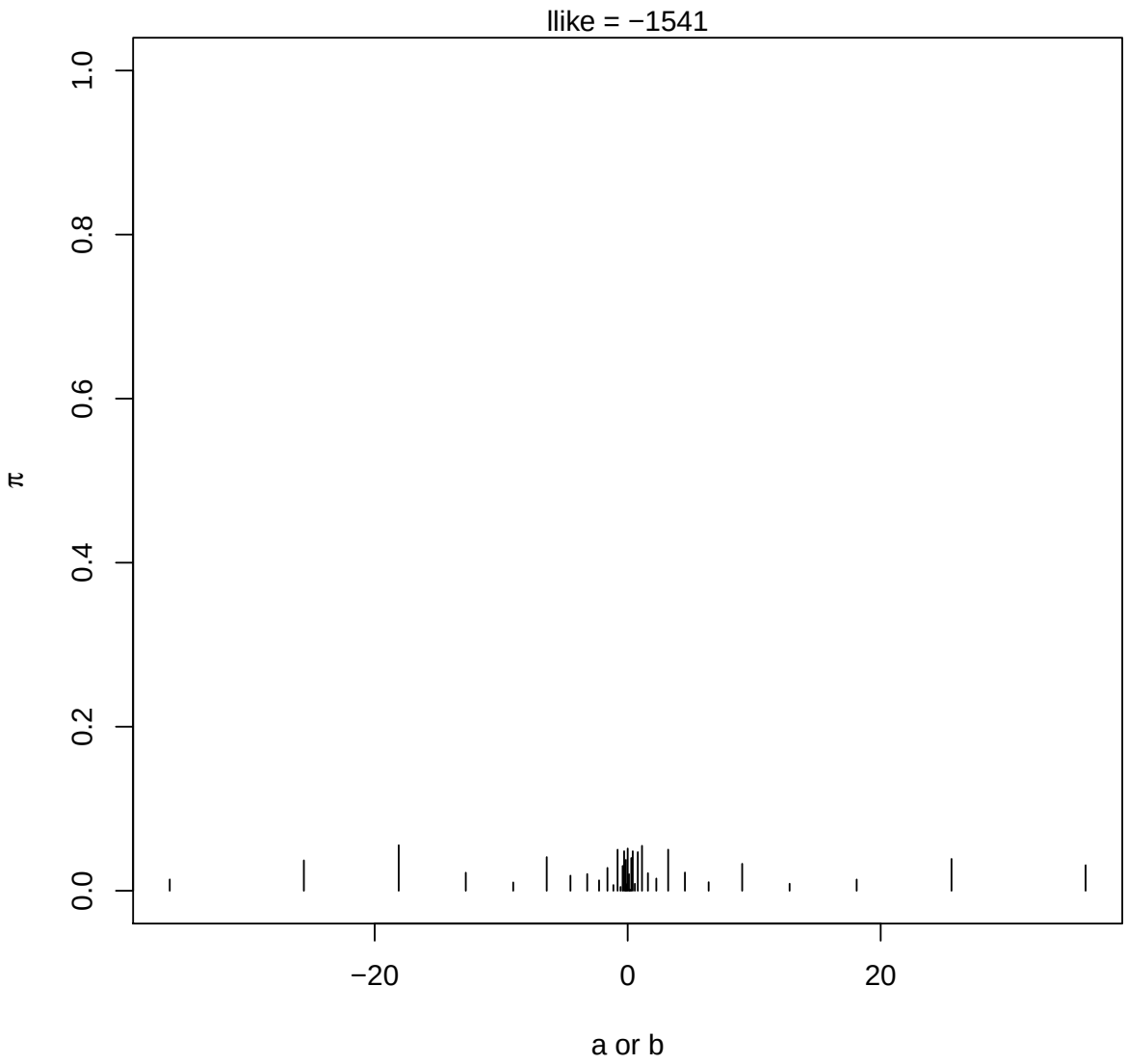
```
library(succotashr)
```

Generate some t-data.

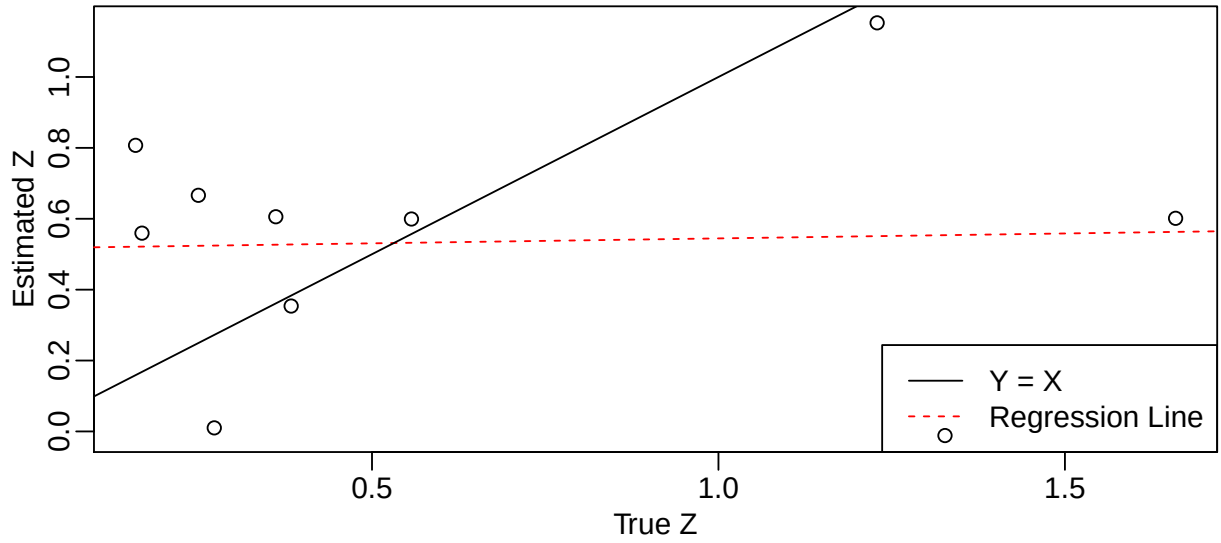
```
set.seed(851)
p <- 500 ## number of covariates
k <- 10 ## number of confounders
pi_vals <- c(0.5, 0.5) ## true mixing proportions
tau_seq <- c(0, 5) ## true mixing standard devations
beta <- draw_beta(pi_vals = pi_vals, tau_seq = tau_seq, p = p)
alpha <- abs(matrix(rnorm(p * k), nrow = p))
Z <- abs(matrix(rnorm(k), ncol = 1))
sig_diag <- rep(1, length = p) ## true variances
df <- 4
E <- matrix(rt(p, df = df), ncol = 1) * sqrt(sig_diag)
Y <- beta + alpha %*% Z + E
```

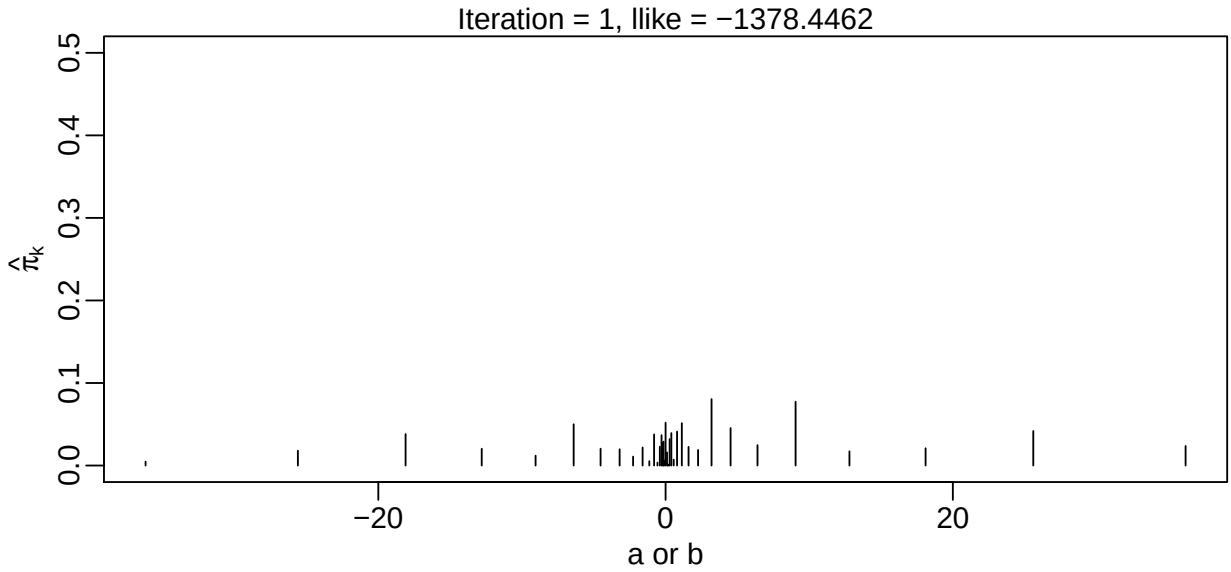
1. The log-likelihood increases at each iteration.
2. Z is estimated pretty accurately when given the true alpha and true Σ.
3. π_0 is accurately estimated when given the true α and true Σ.

```
## True Z just given for checks, not used in actual SUCCOTASH.
succ_out <- t_uniform_succ_given_alpha(Y = Y, alpha = alpha,
                                       sig_diag = sig_diag,
                                       nu = df, true_Z = Z,
                                       em_itermax = 200)
```

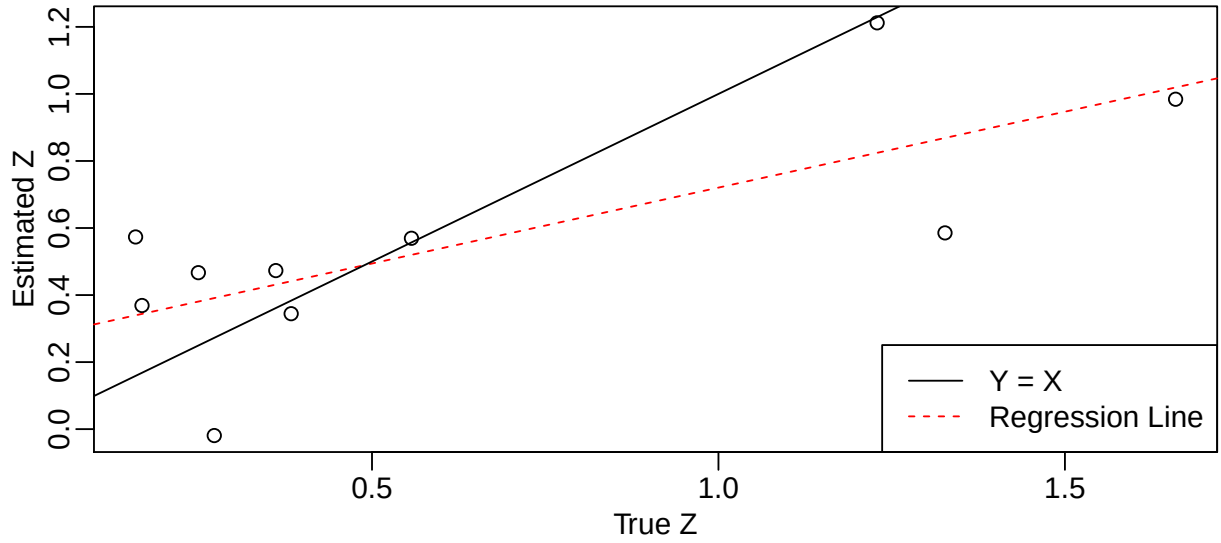


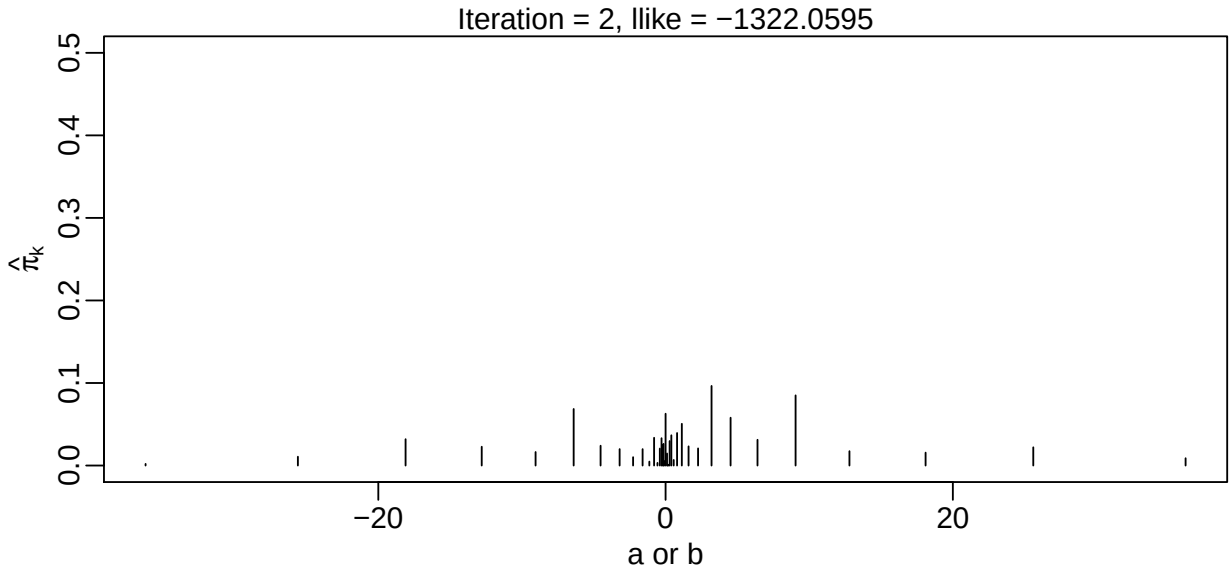

```
##  Iter = 1
## ldiff = 0.1057
## zdiff = 3.481
```



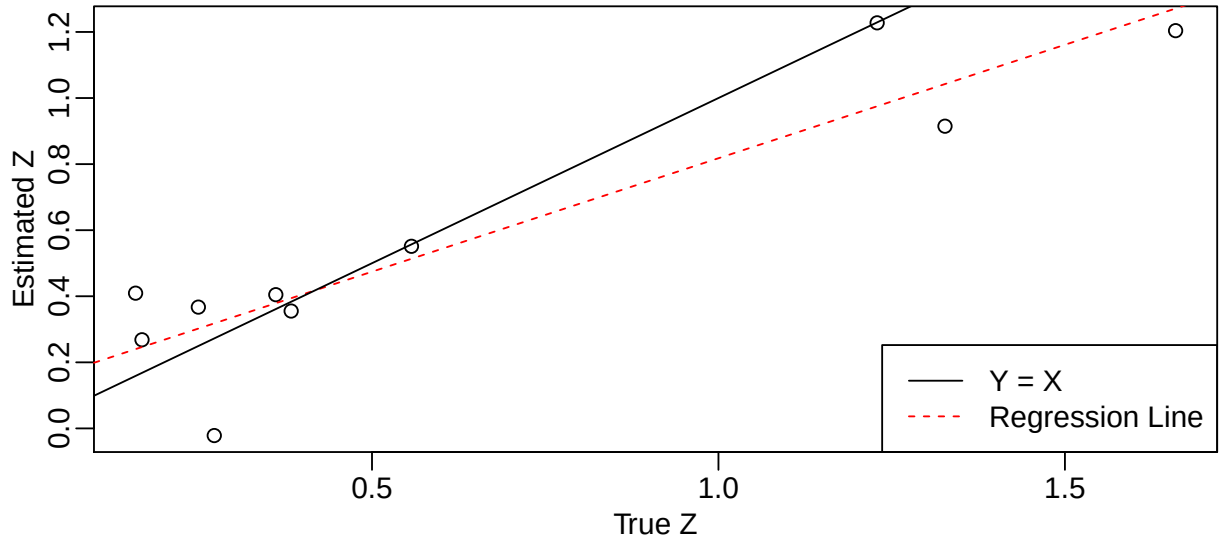


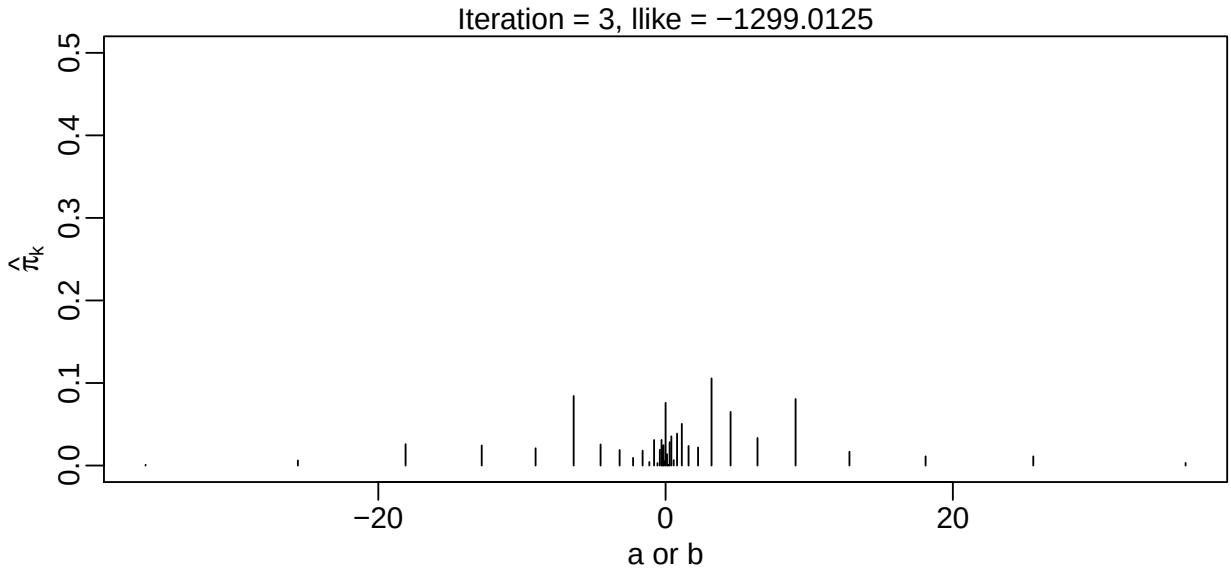

```
##  Iter = 2
## ldiff = 0.04091
## zdiff = 1.864
```



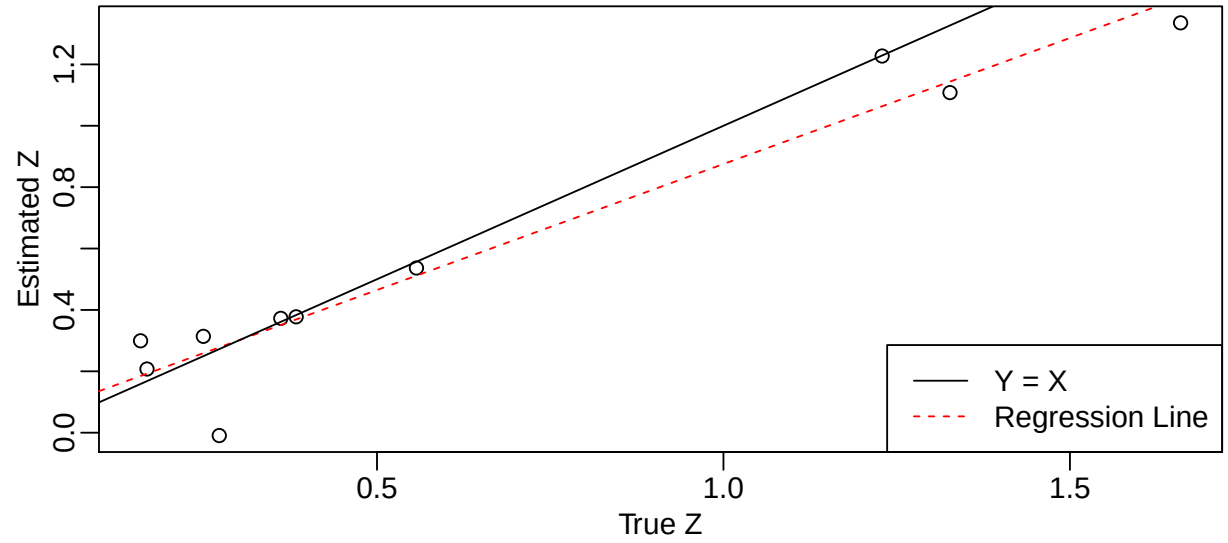


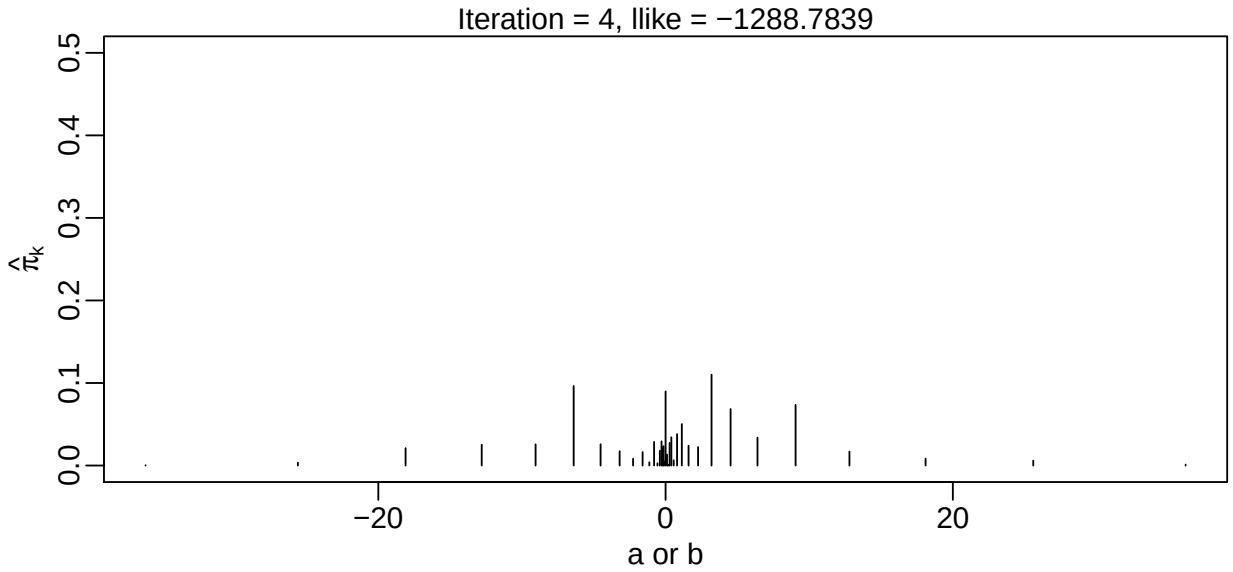

```
##  Iter = 3
## ldiff = 0.01743
## zdiff = 1.029
```



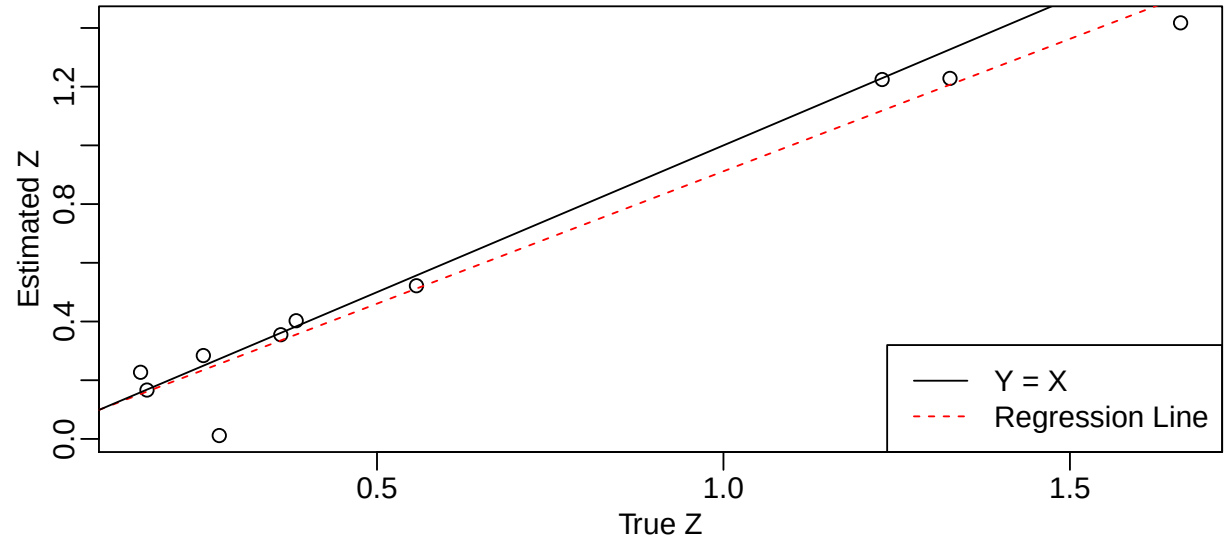


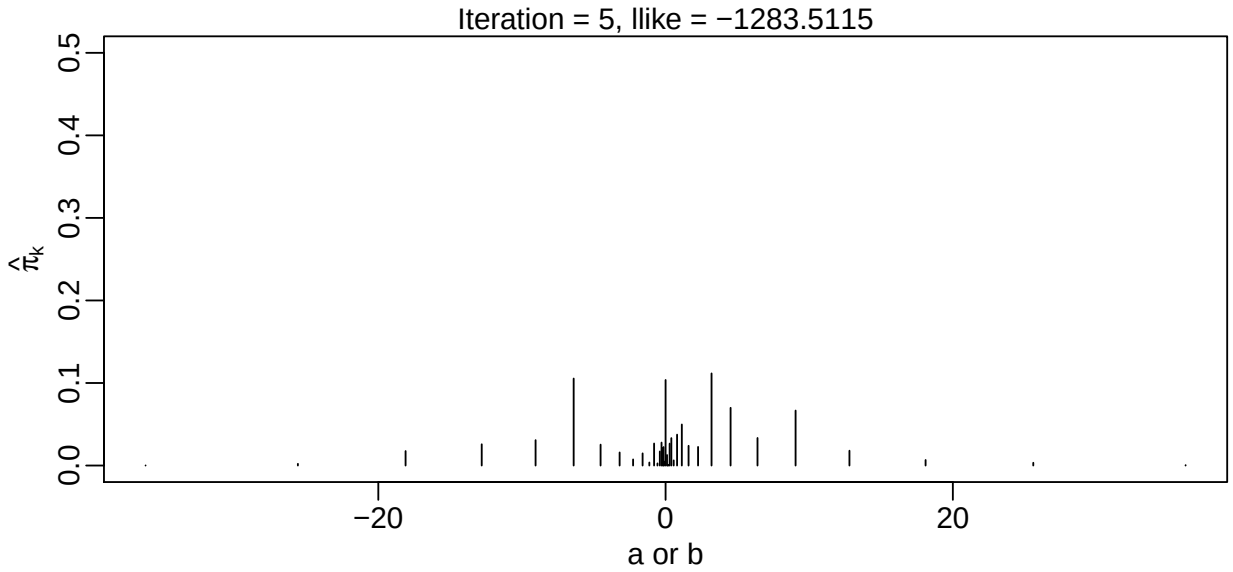

```
##  Iter = 4
## ldiff = 0.007874
## zdiff = 0.6306
```



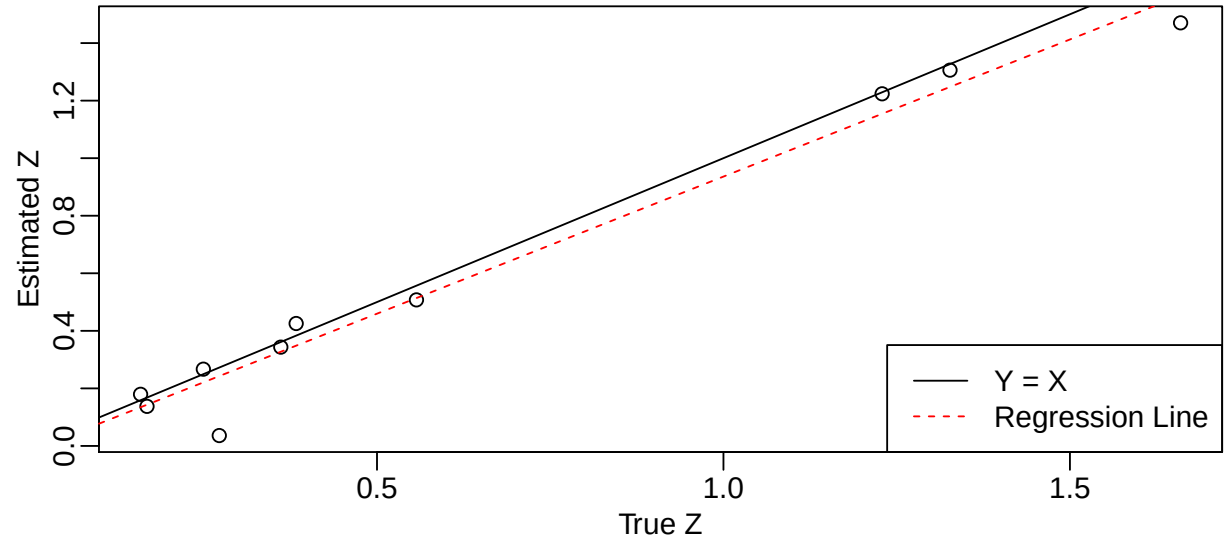


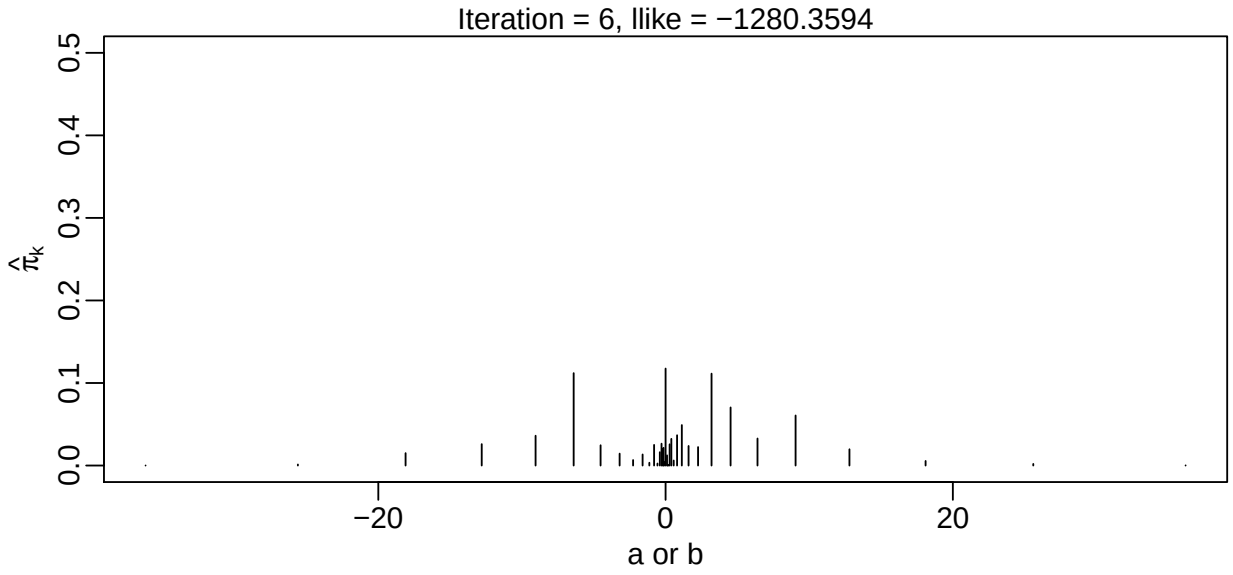

```
##  Iter = 5
## ldiff = 0.004091
## zdiff = 0.4263
```



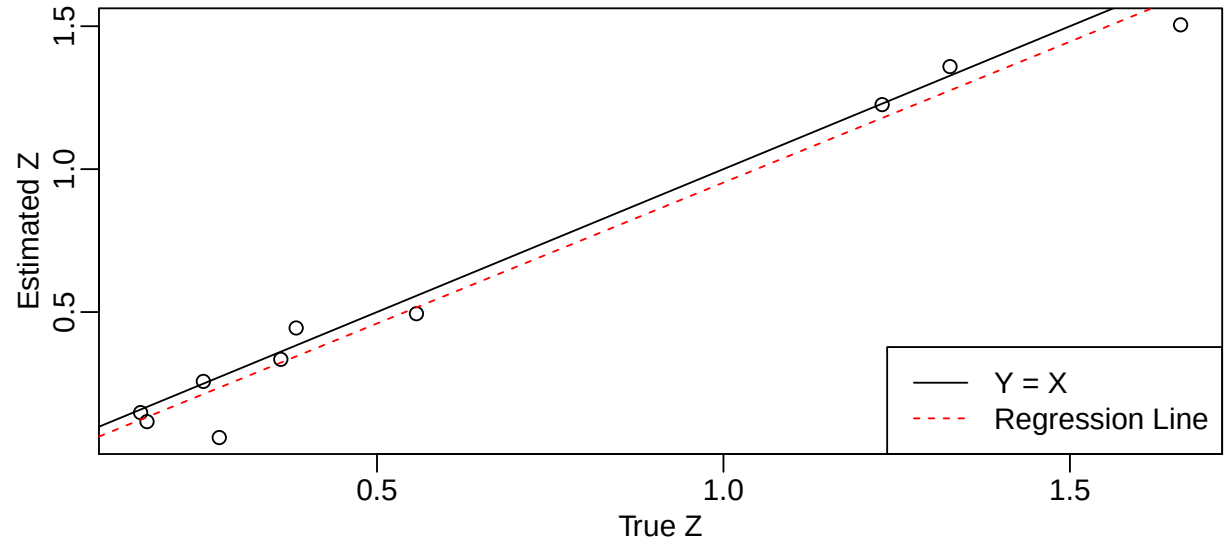


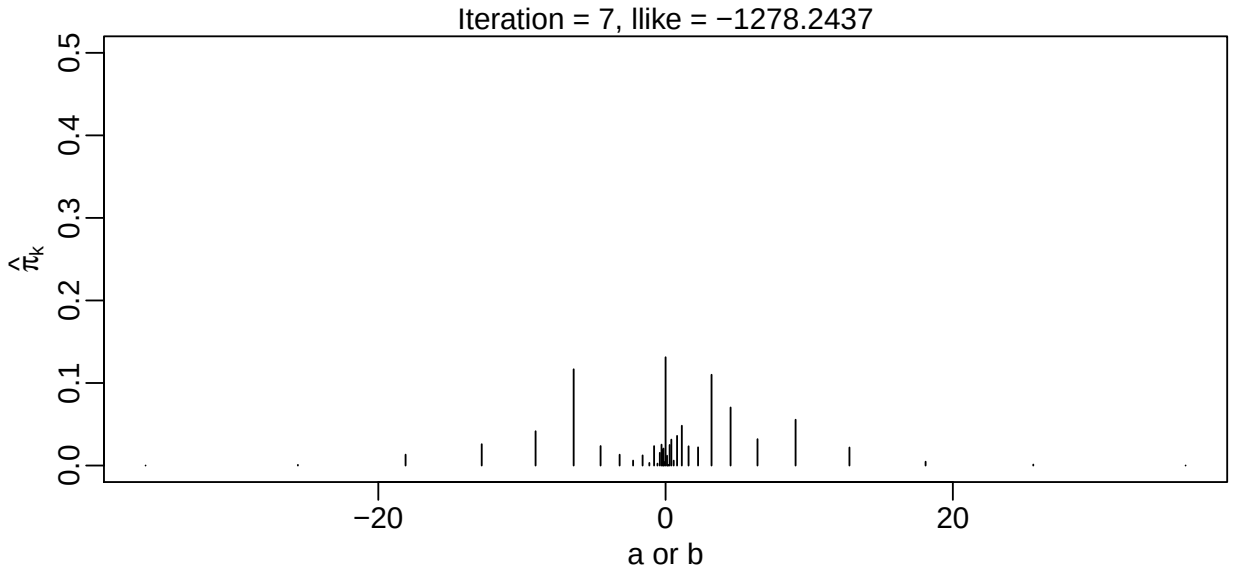

```
##  Iter = 6
## ldiff = 0.002456
## zdiff = 0.2985
```



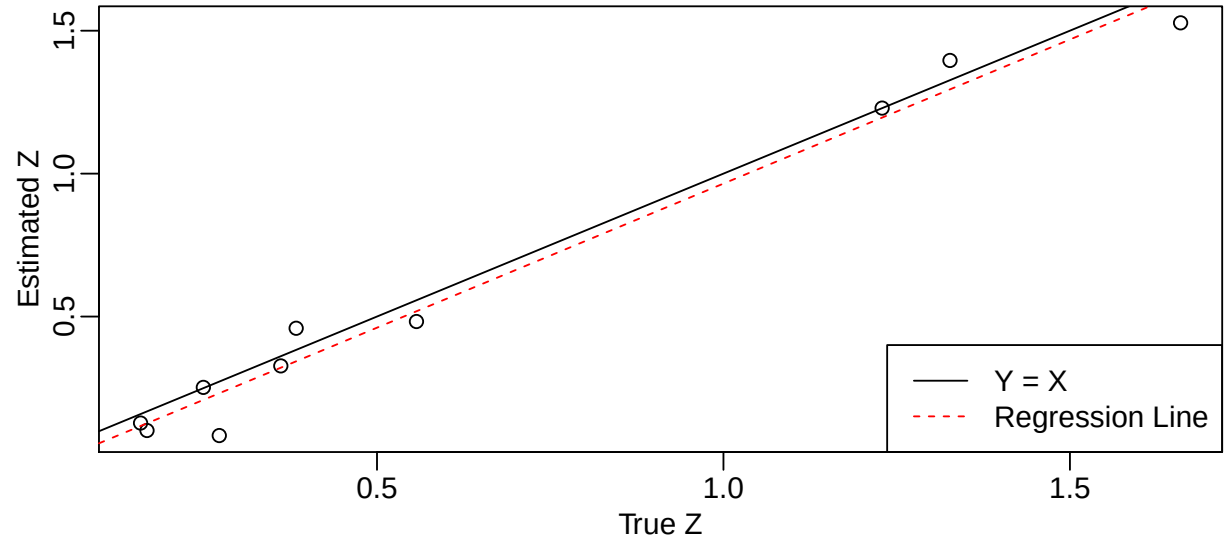


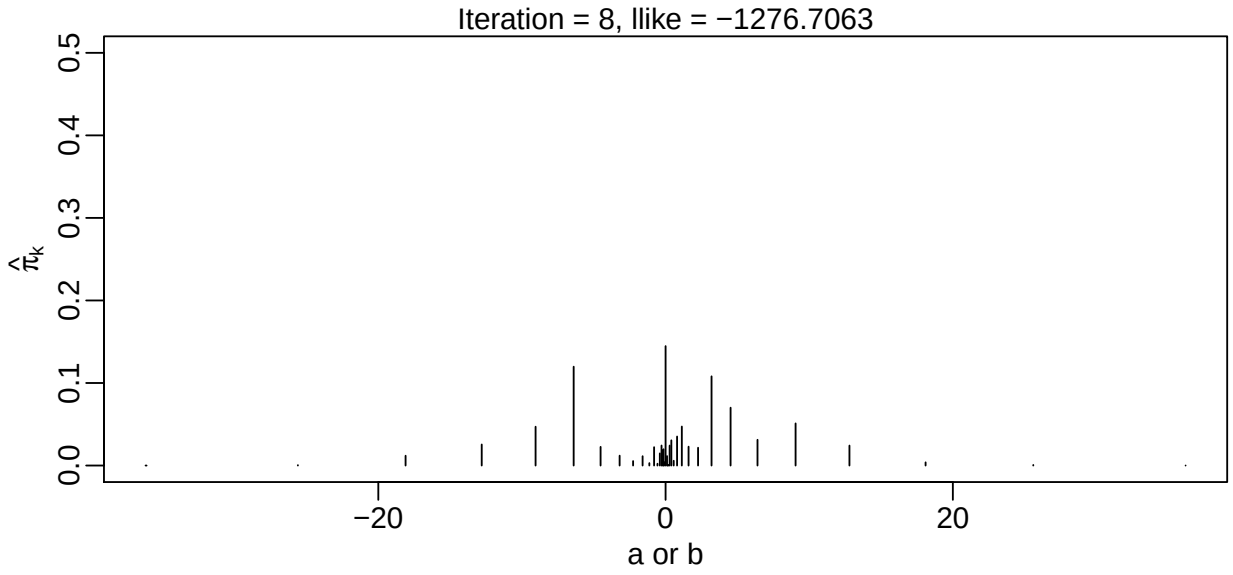

```
##  Iter = 7
## ldiff = 0.001652
## zdiff = 0.2169
```



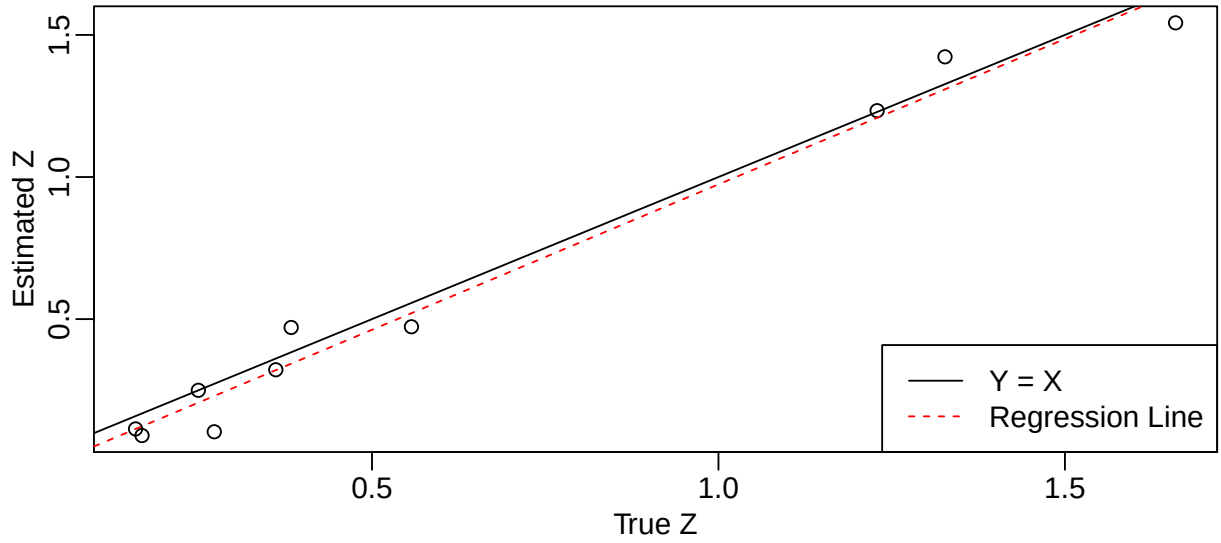


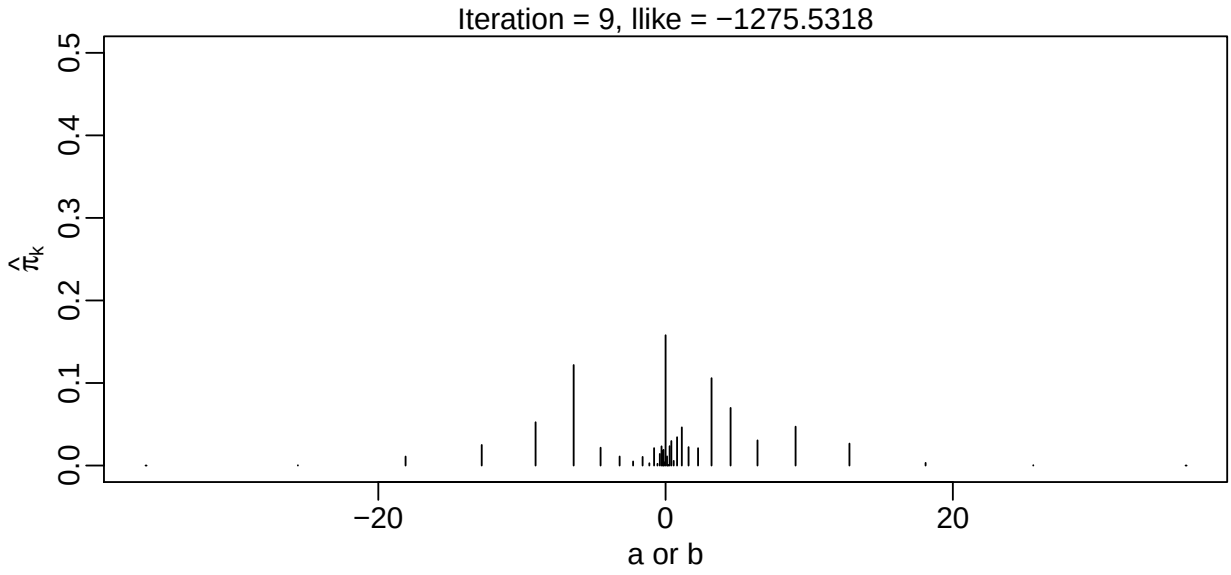

```
##  Iter = 8
## ldiff = 0.001203
## zdiff = 0.1608
```



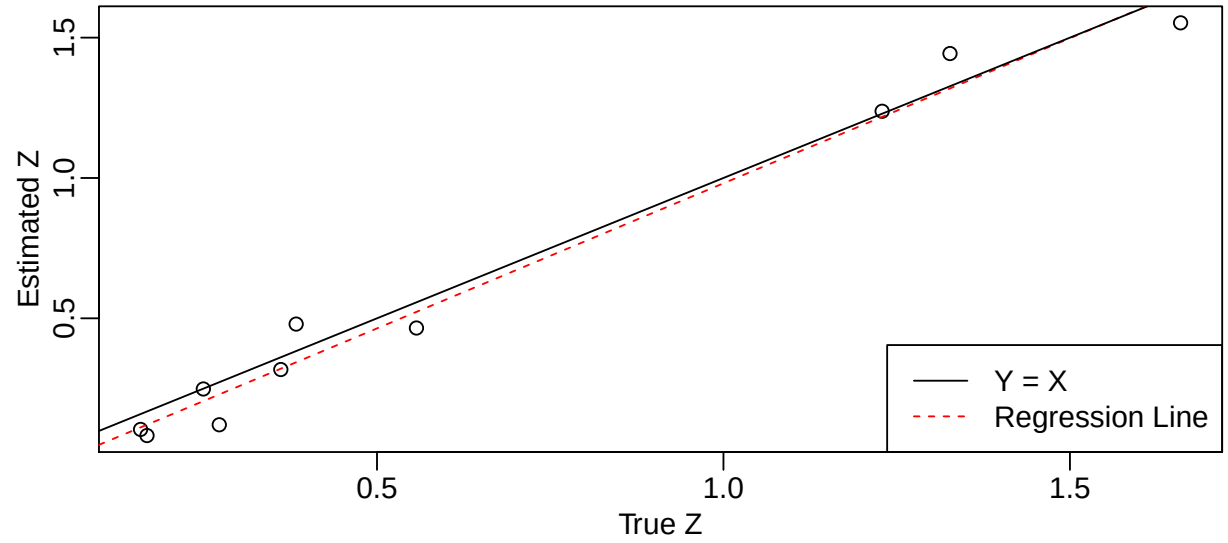


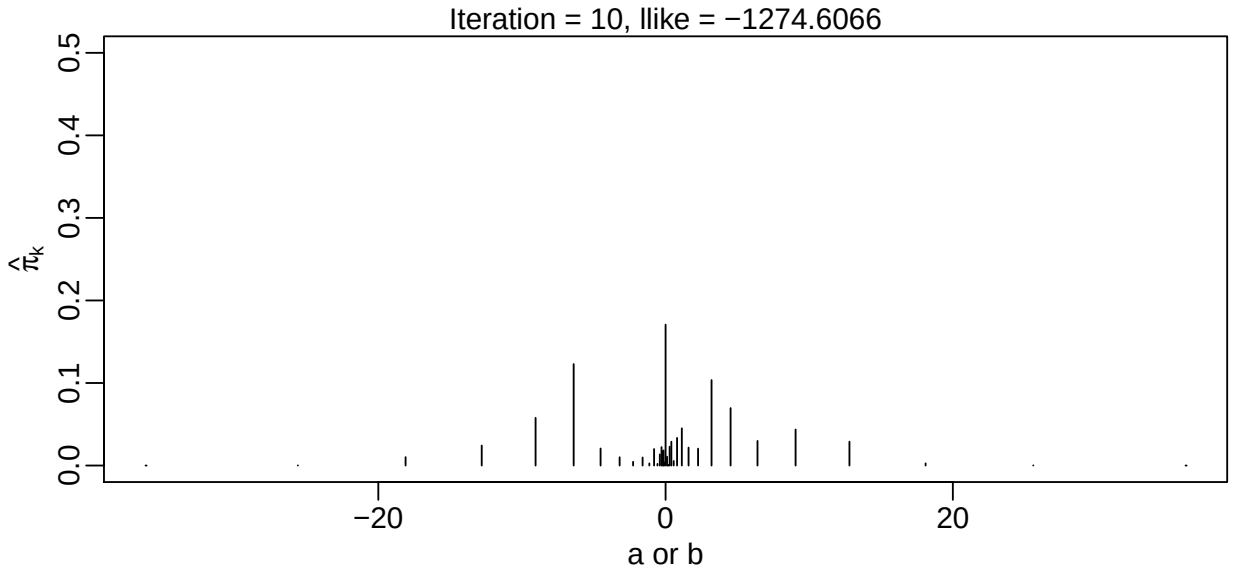

```
##  Iter = 9
## ldiff = 0.0009199
## zdiff = 0.1205
```



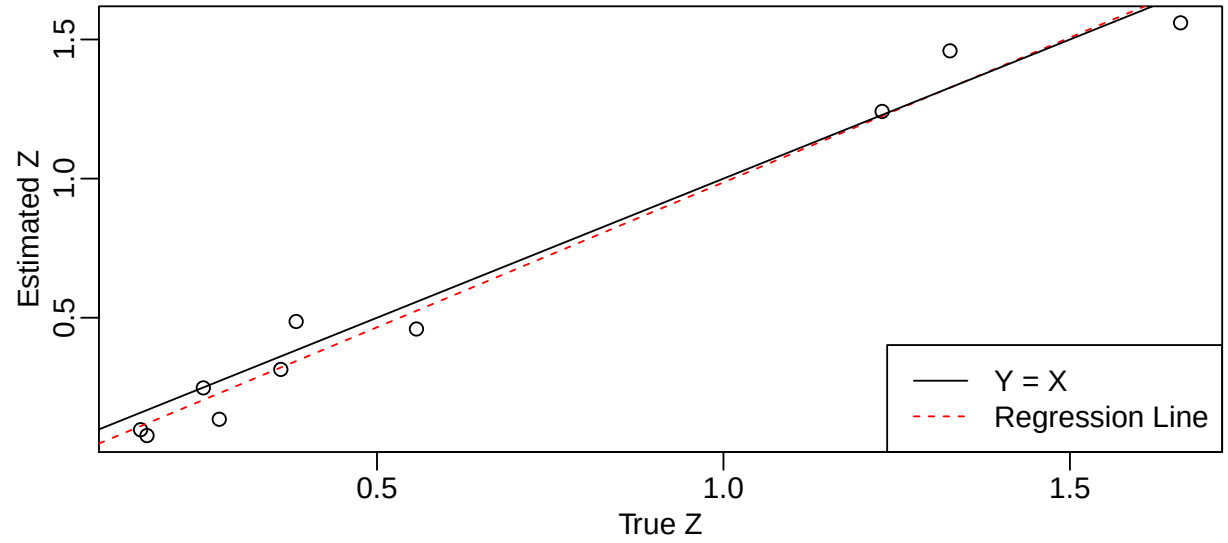


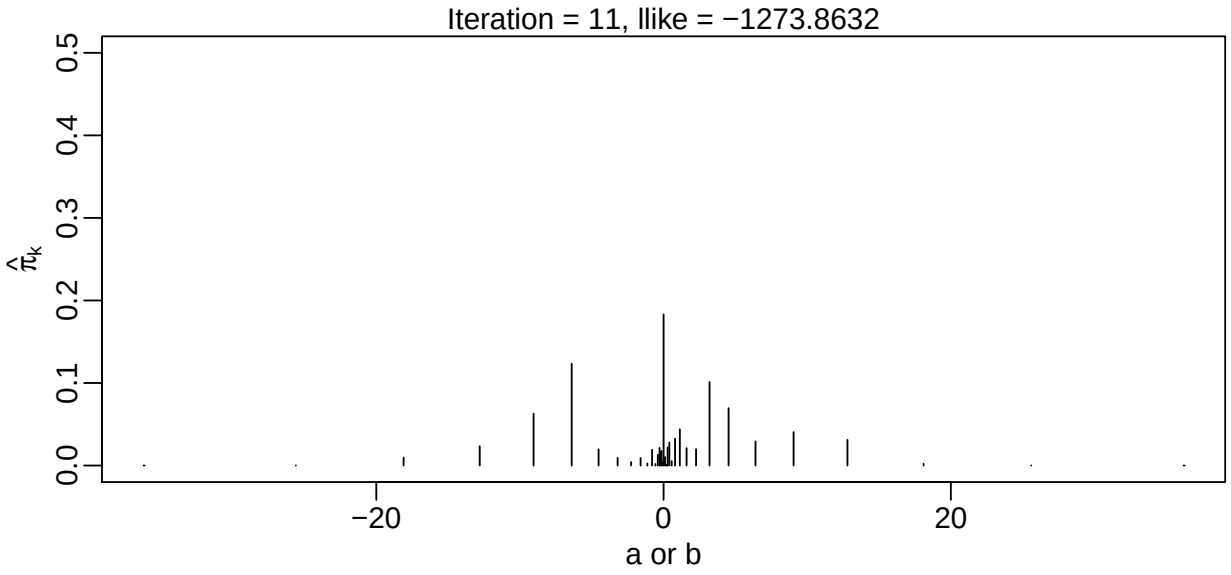

```
##  Iter = 10
## ldiff = 0.0007254
## zdiff = 0.0914
```



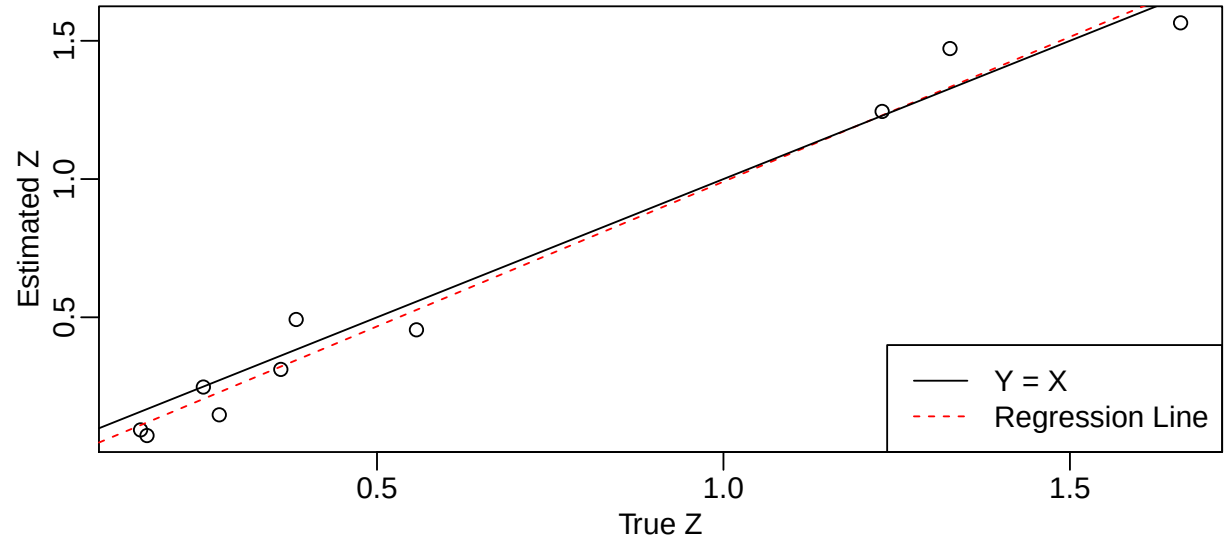


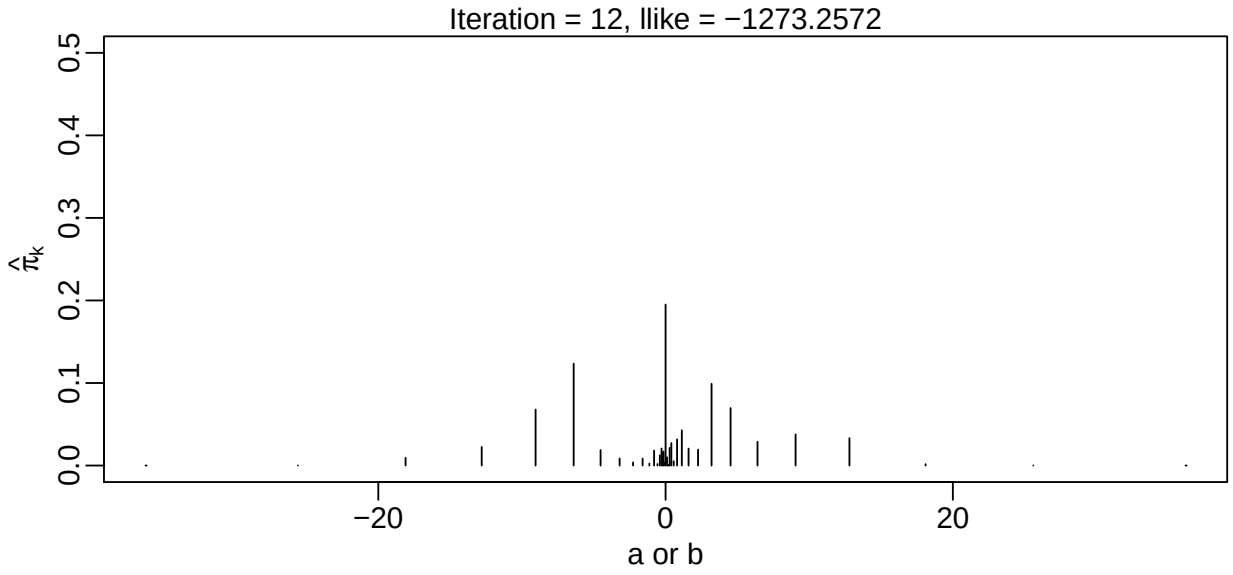

```
##  Iter = 11
## ldiff = 0.0005832
## zdiff = 0.07023
```



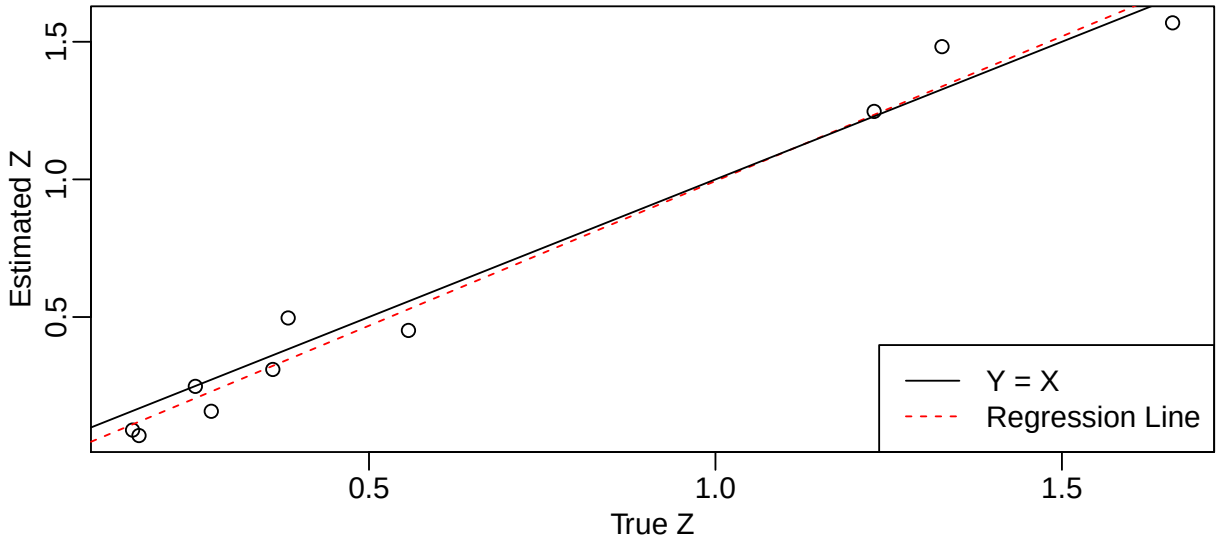


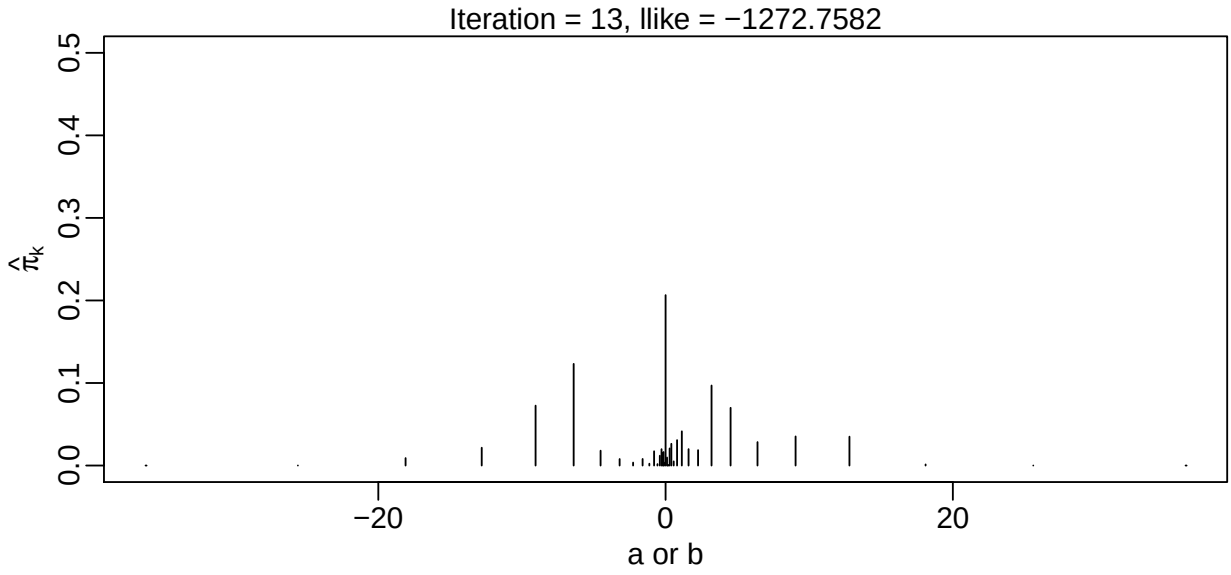

```
##  Iter = 12
## ldiff = 0.0004757
## zdiff = 0.05484
```



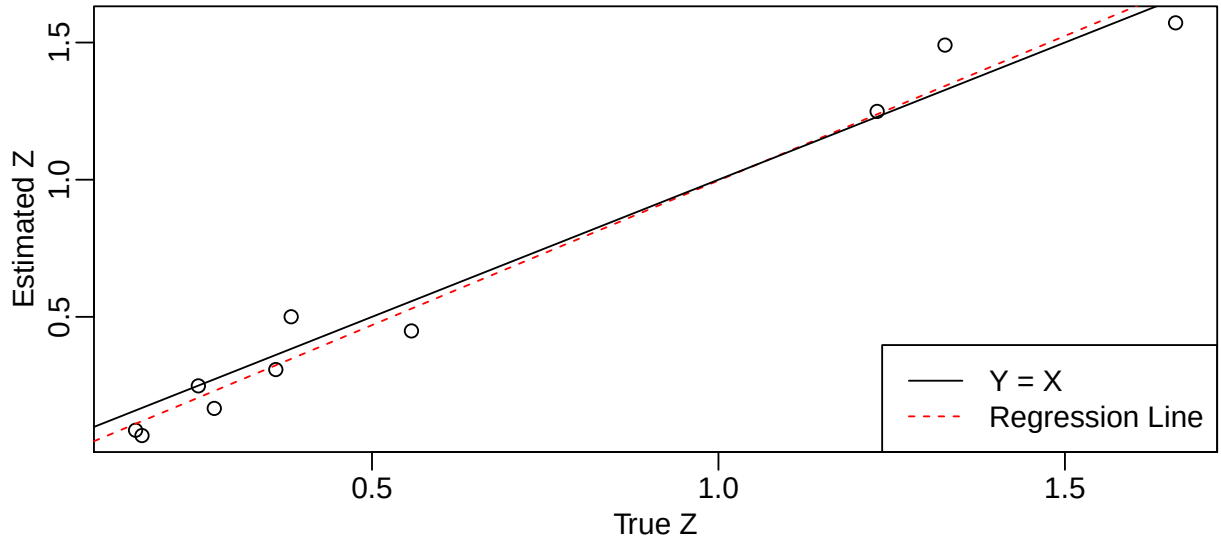


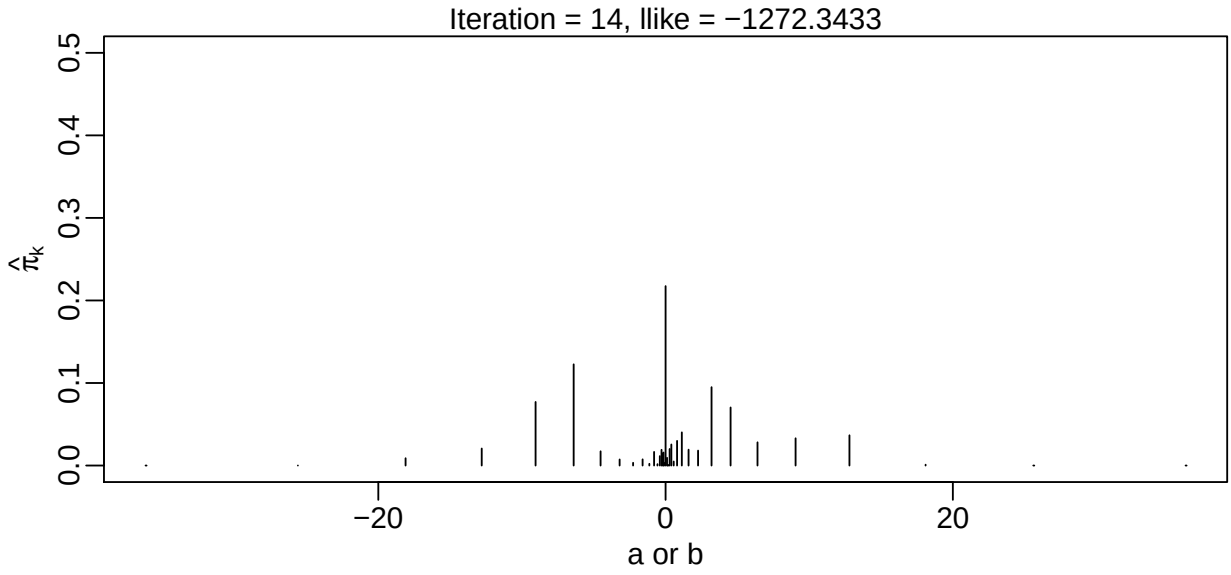

```
##  Iter = 13
## ldiff = 0.0003919
## zdiff = 0.04377
```



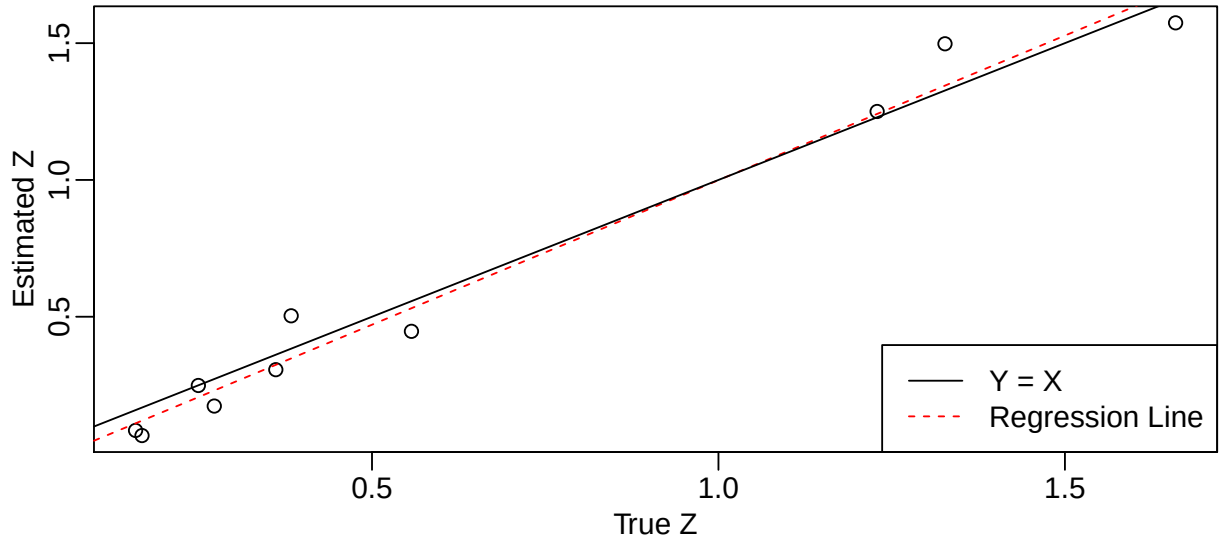


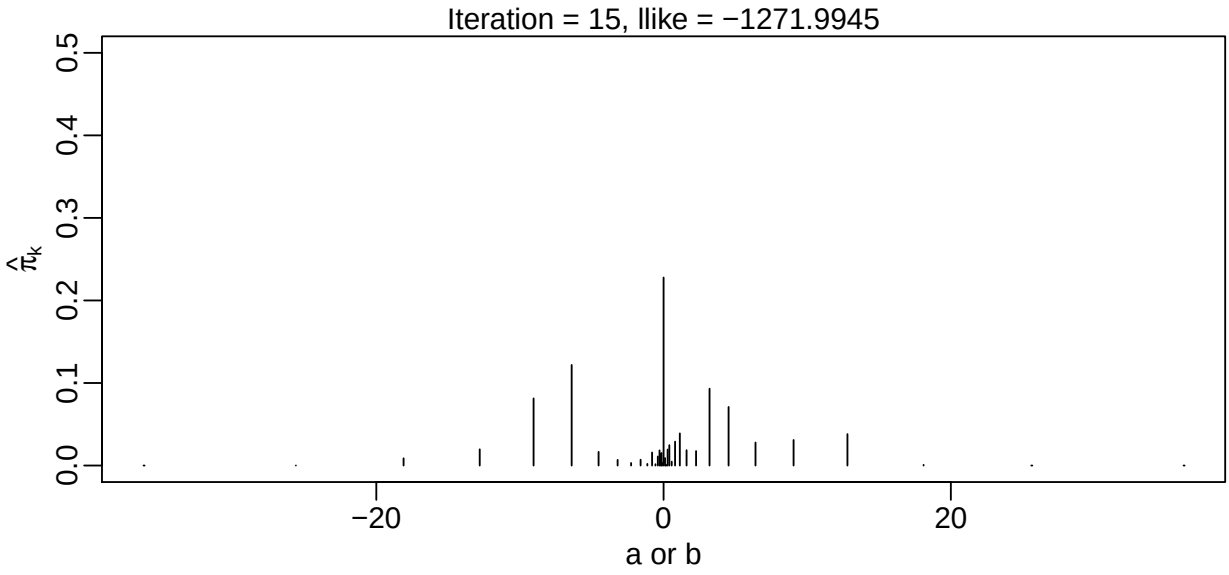

```
##  Iter = 14
## ldiff = 0.000326
## zdiff = 0.03499
```



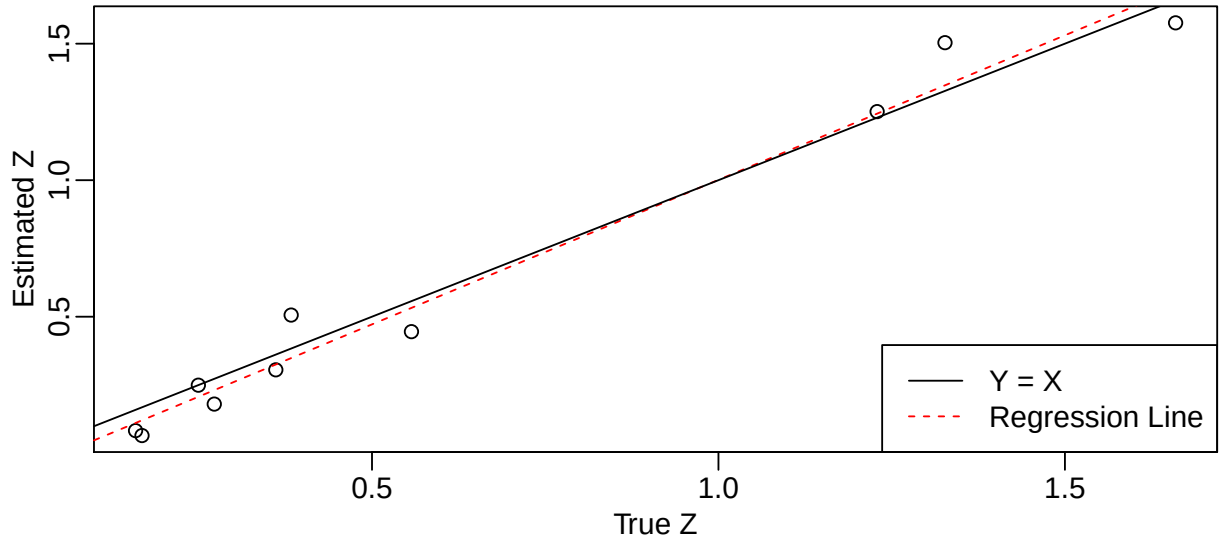


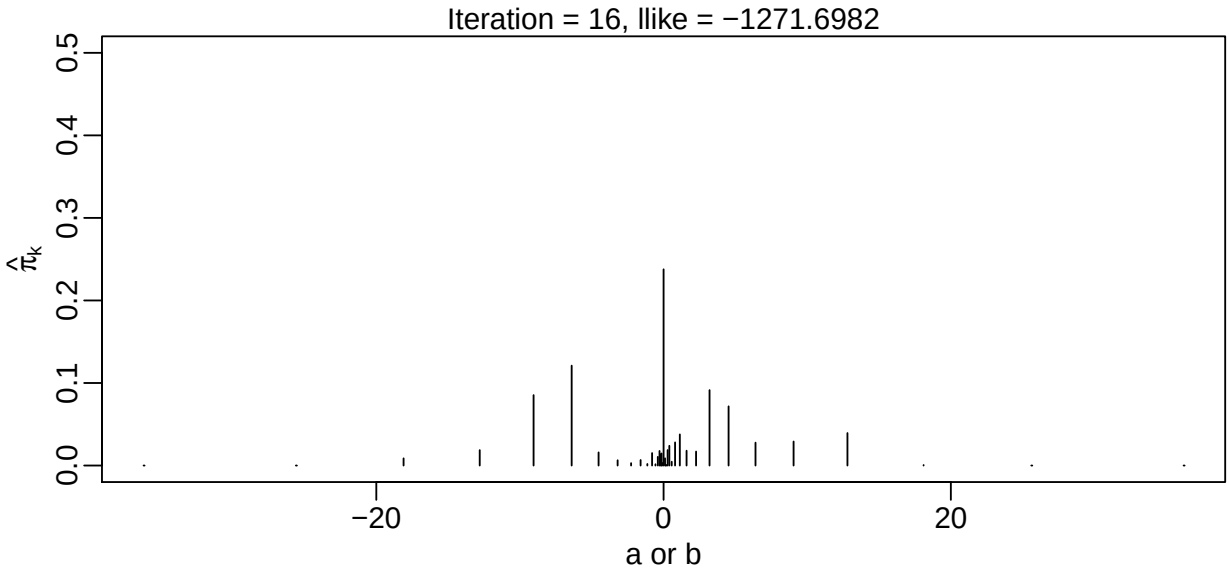

```
##  Iter = 15
## ldiff = 0.0002742
## zdiff = 0.0287
```



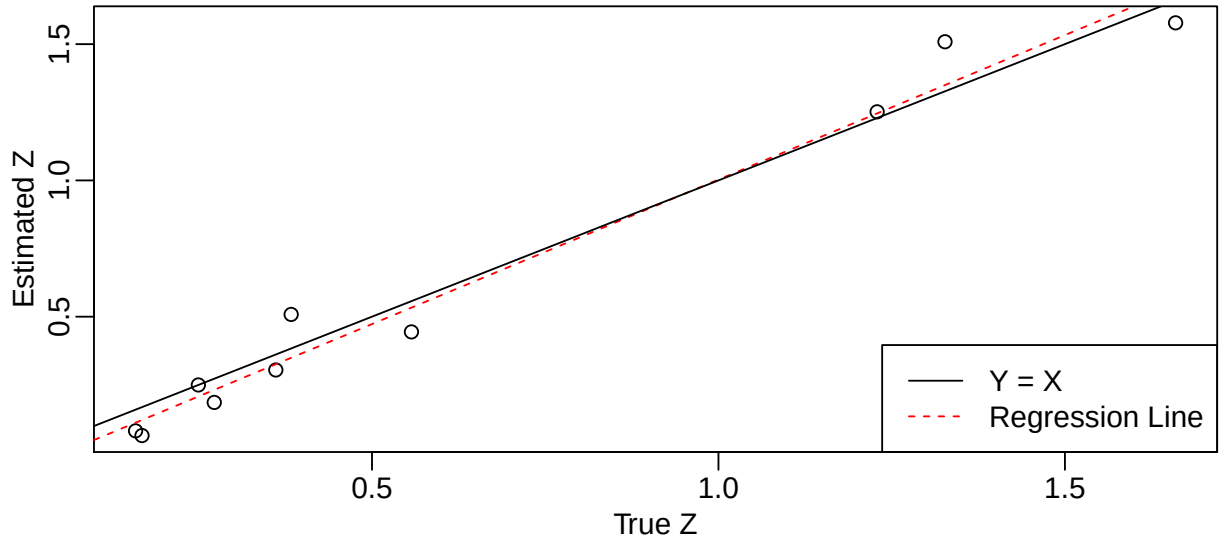


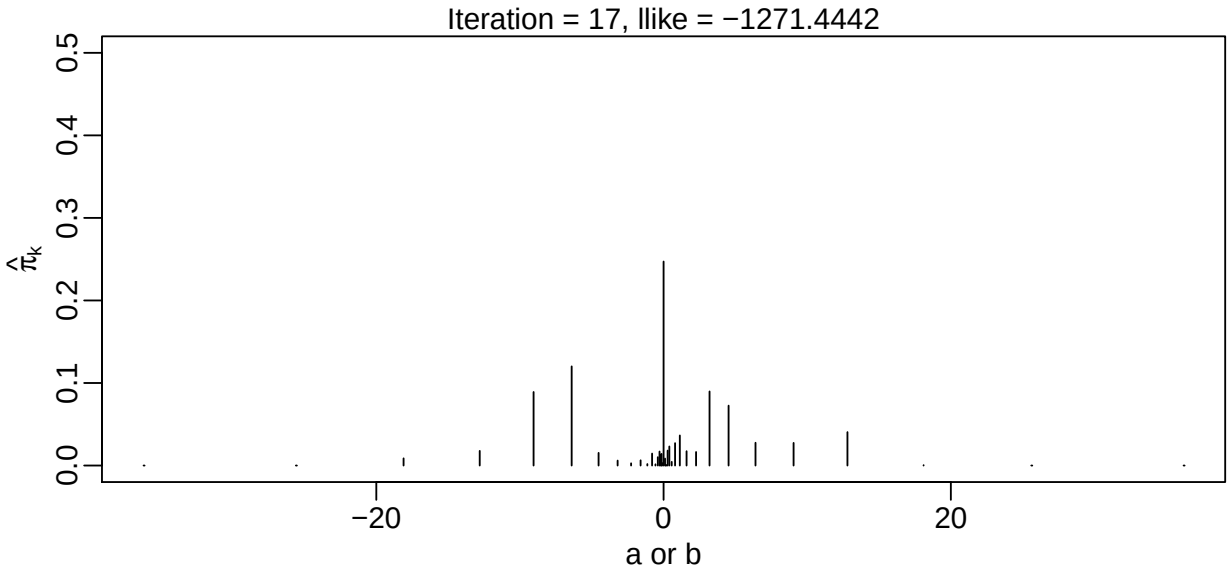

```
##  Iter = 16
## ldiff = 0.0002329
## zdiff = 0.02373
```



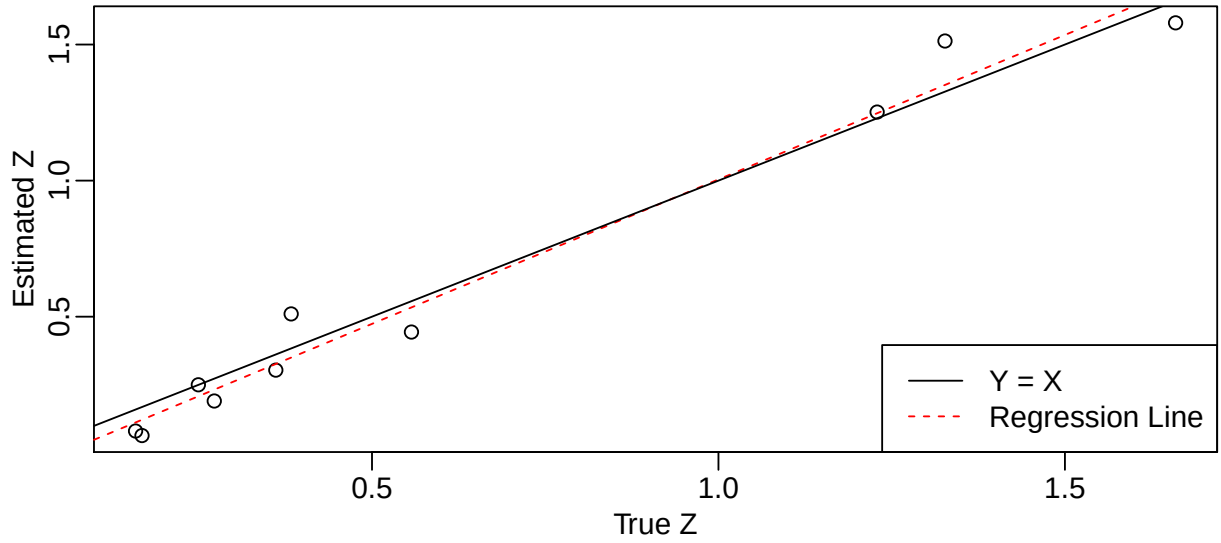


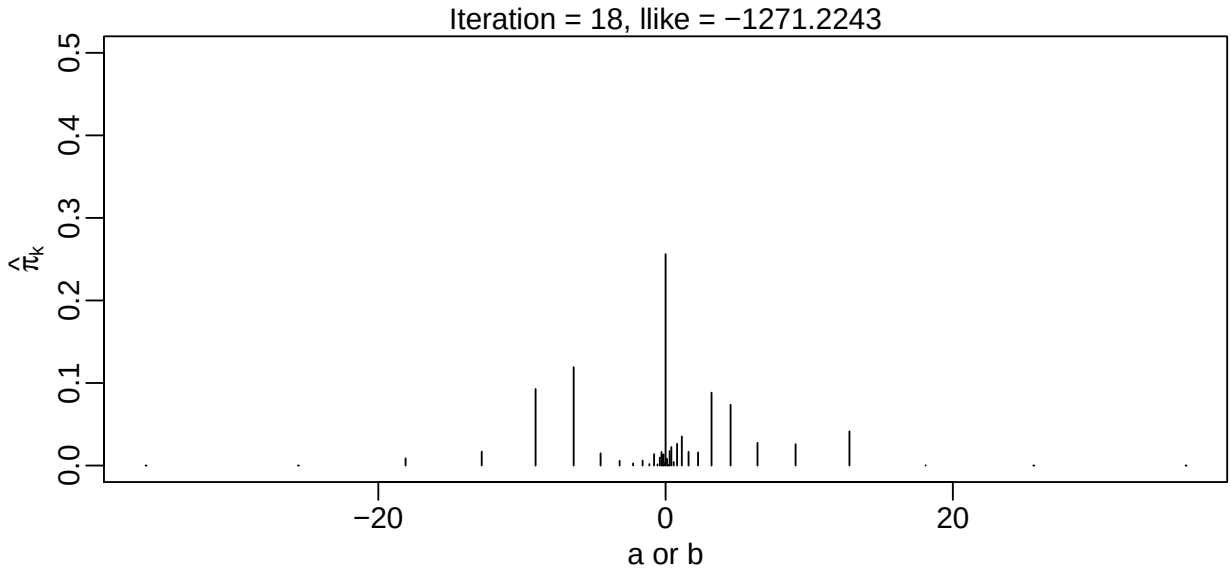

```
##  Iter = 17
## ldiff = 0.0001997
## zdiff = 0.01988
```



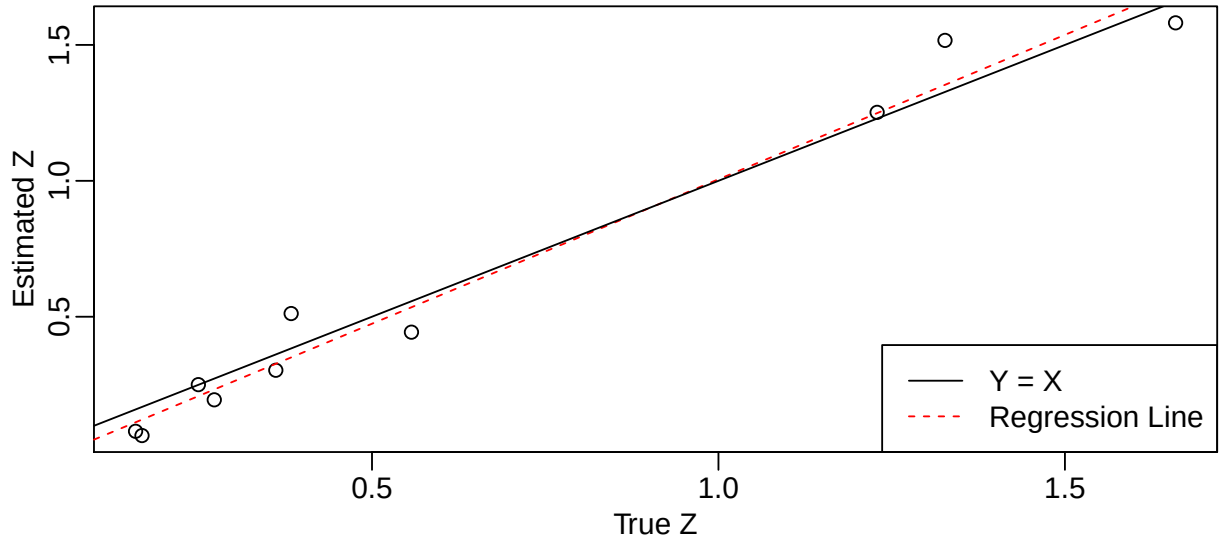


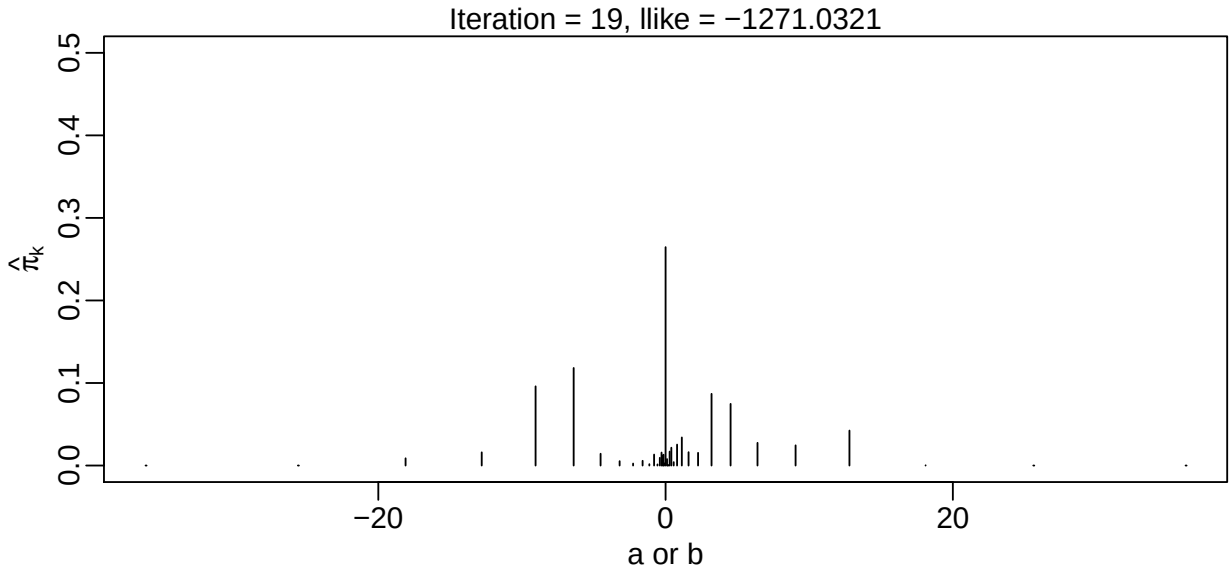

```
##  Iter = 18
## ldiff = 0.0001729
## zdiff = 0.01644
```



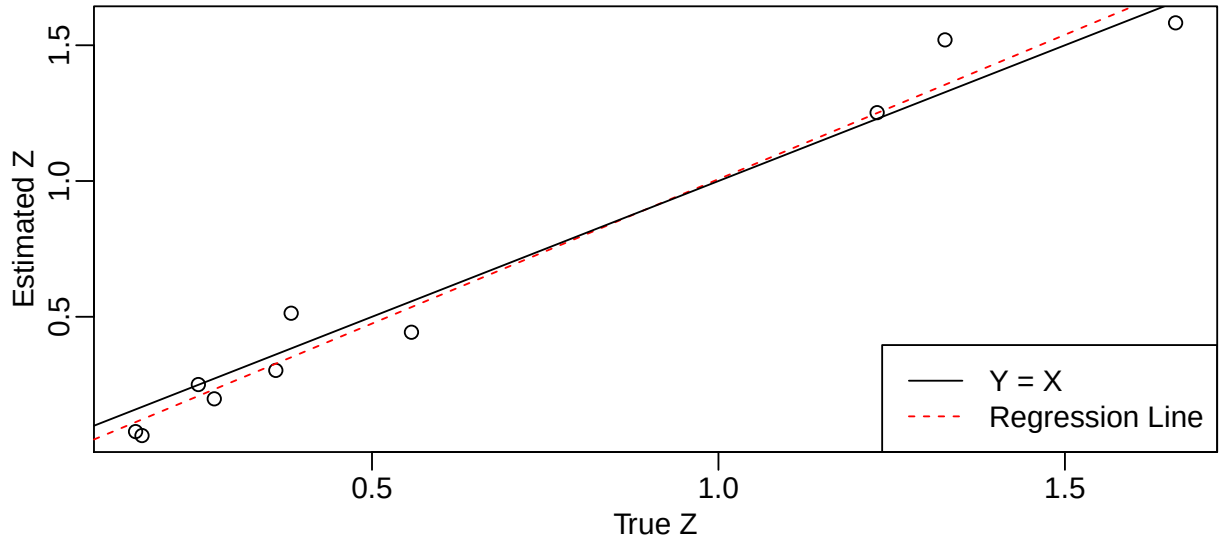


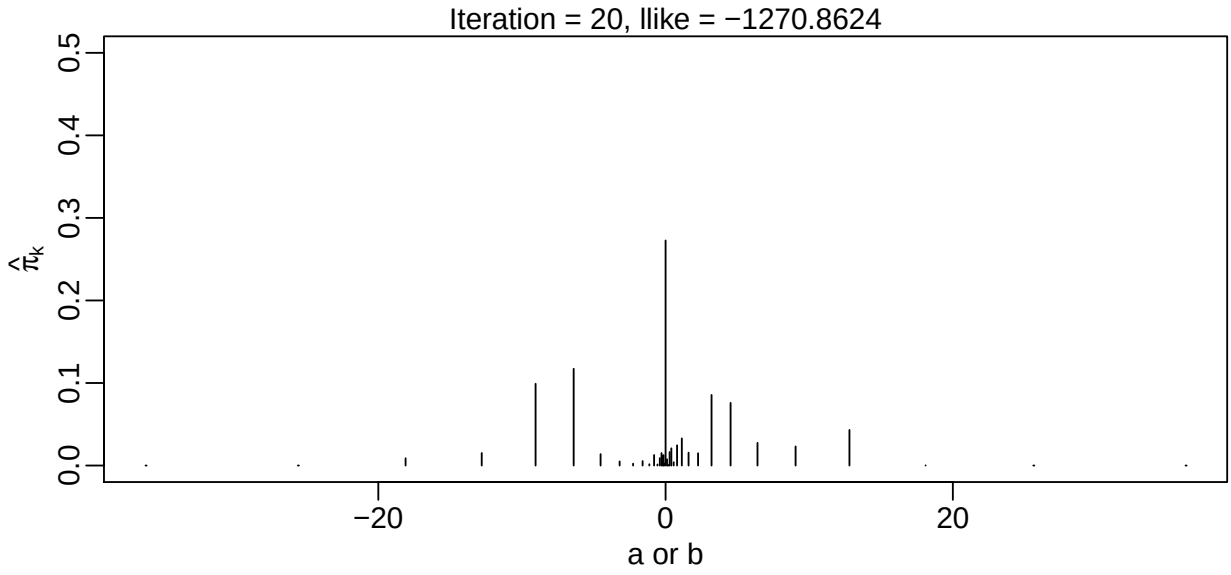

```
##  Iter = 19
## ldiff = 0.0001512
## zdiff = 0.01384
```



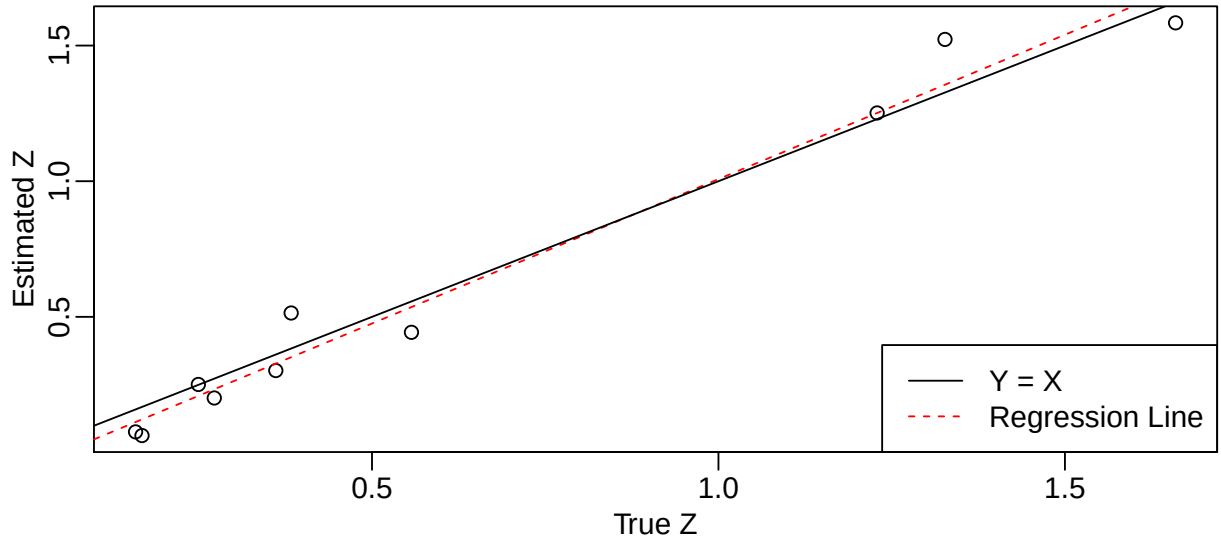


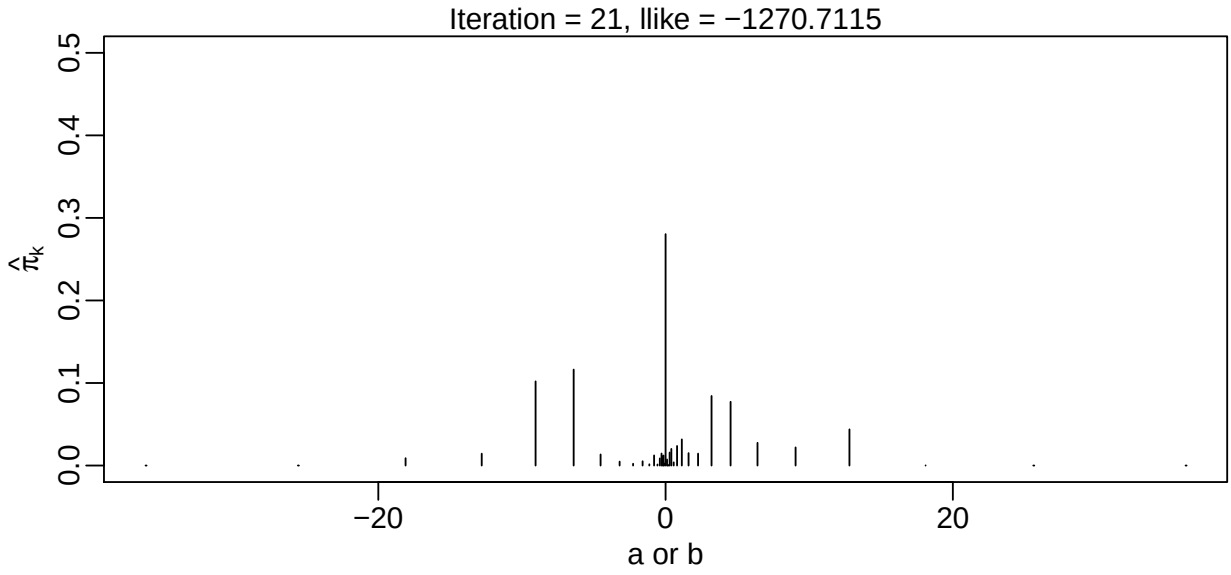

```
##  Iter = 20
## ldiff = 0.0001335
## zdiff = 0.01195
```



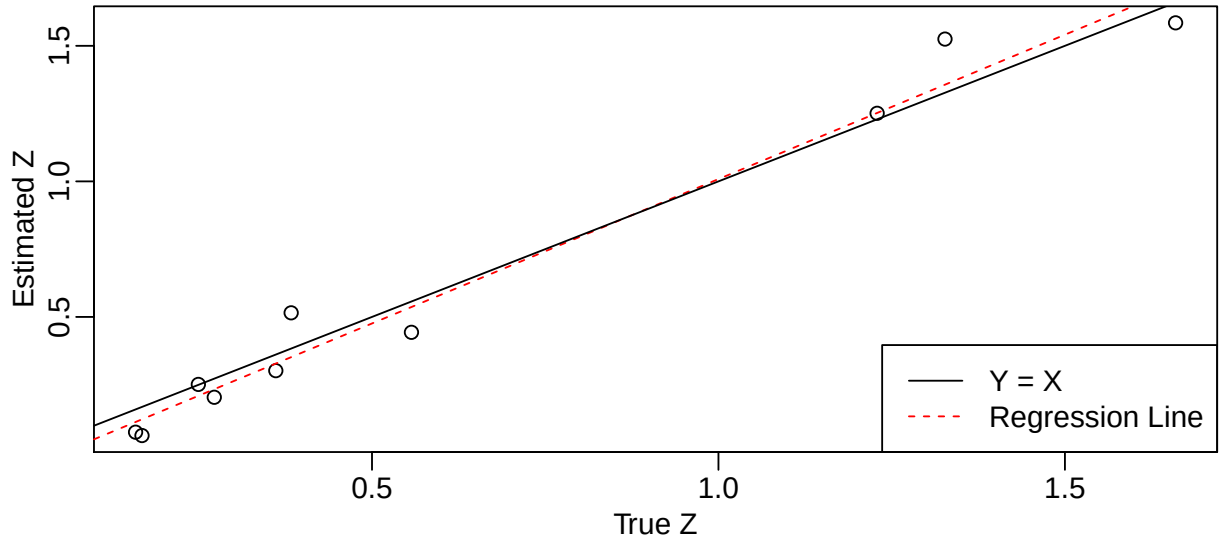


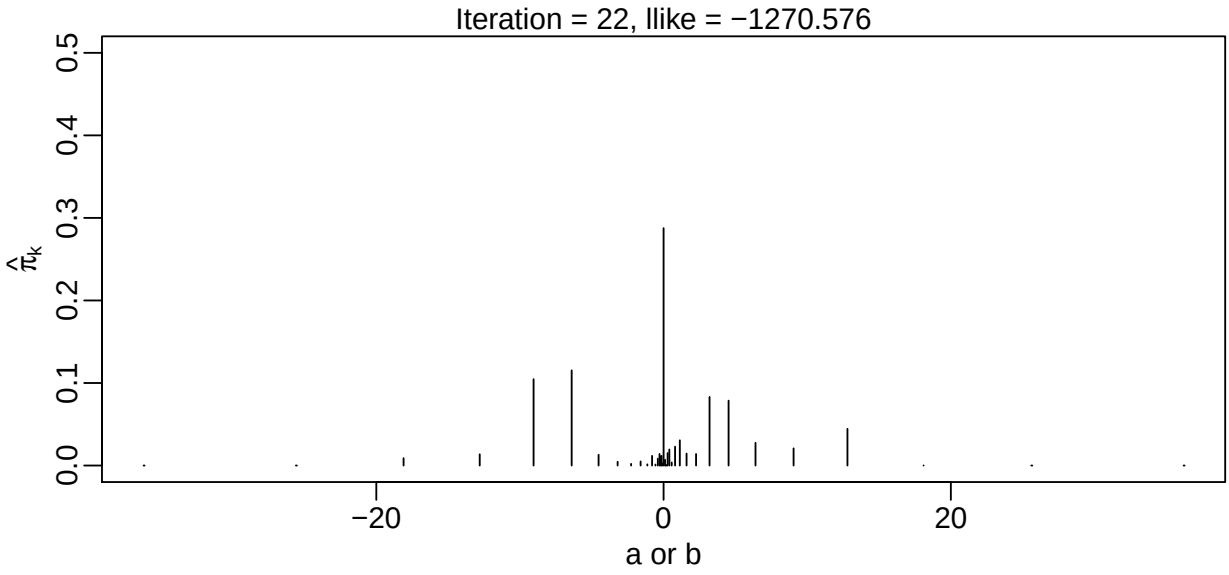

```
##  Iter = 21
## ldiff = 0.0001188
## zdiff = 0.01043
```



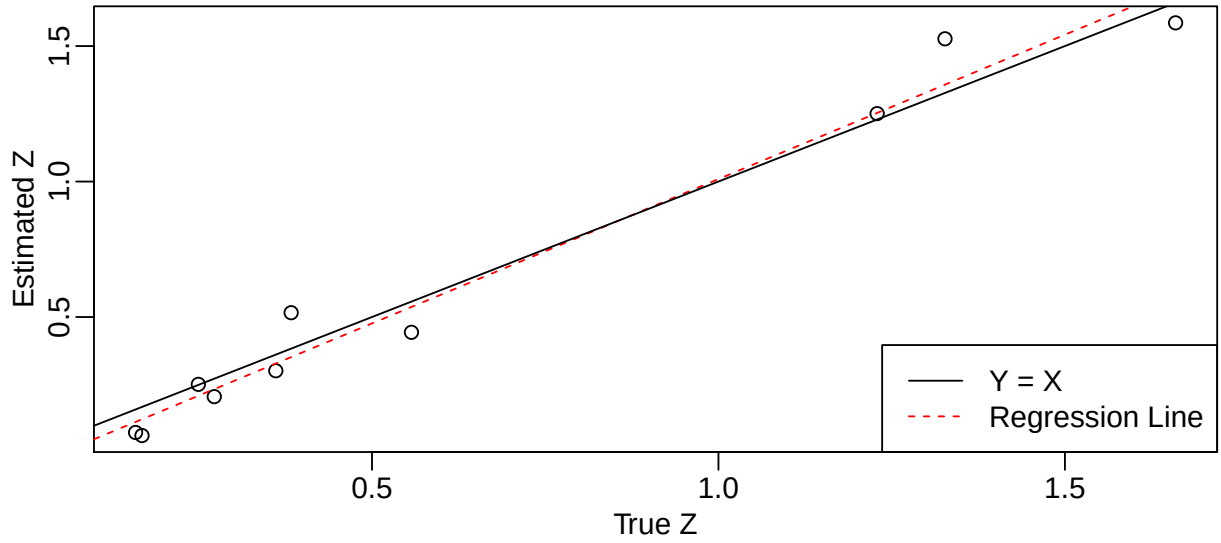


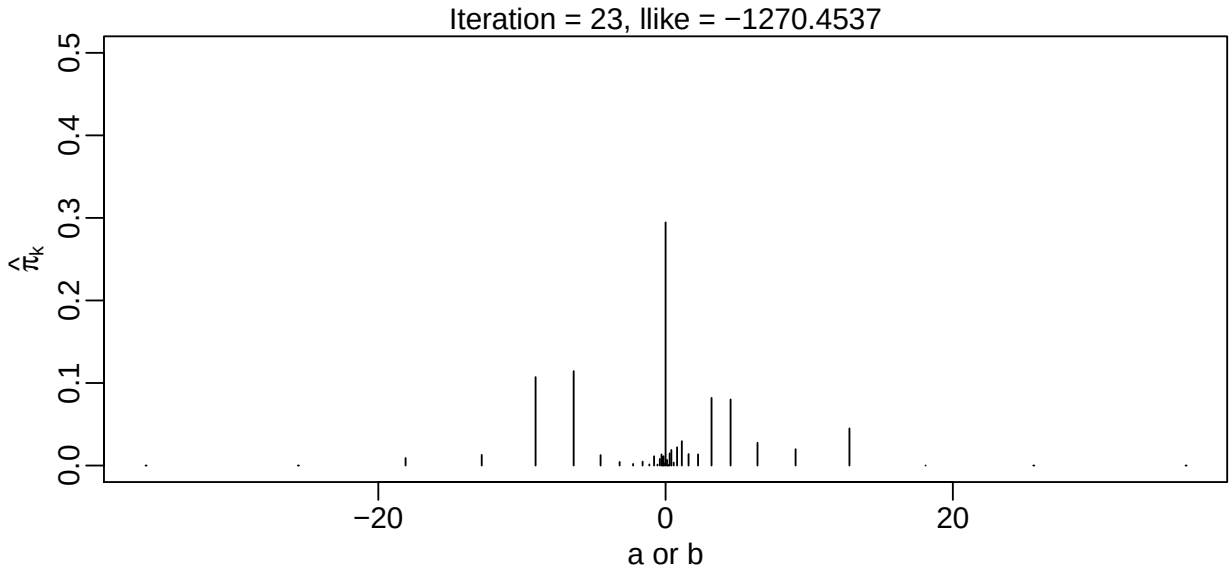

```
##  Iter = 22
## ldiff = 0.0001066
## zdiff = 0.009411
```



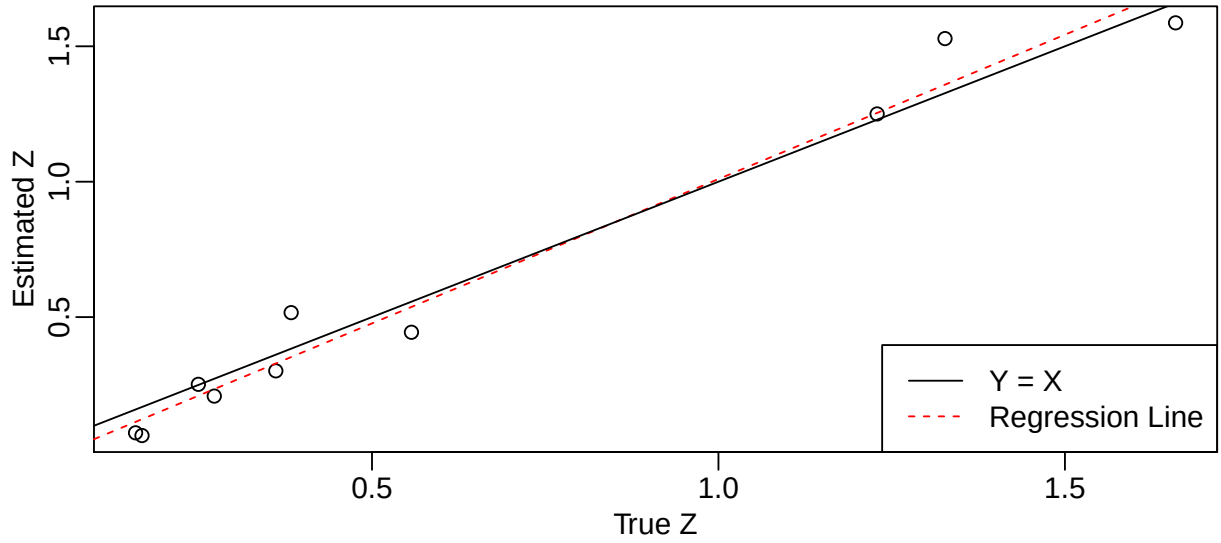


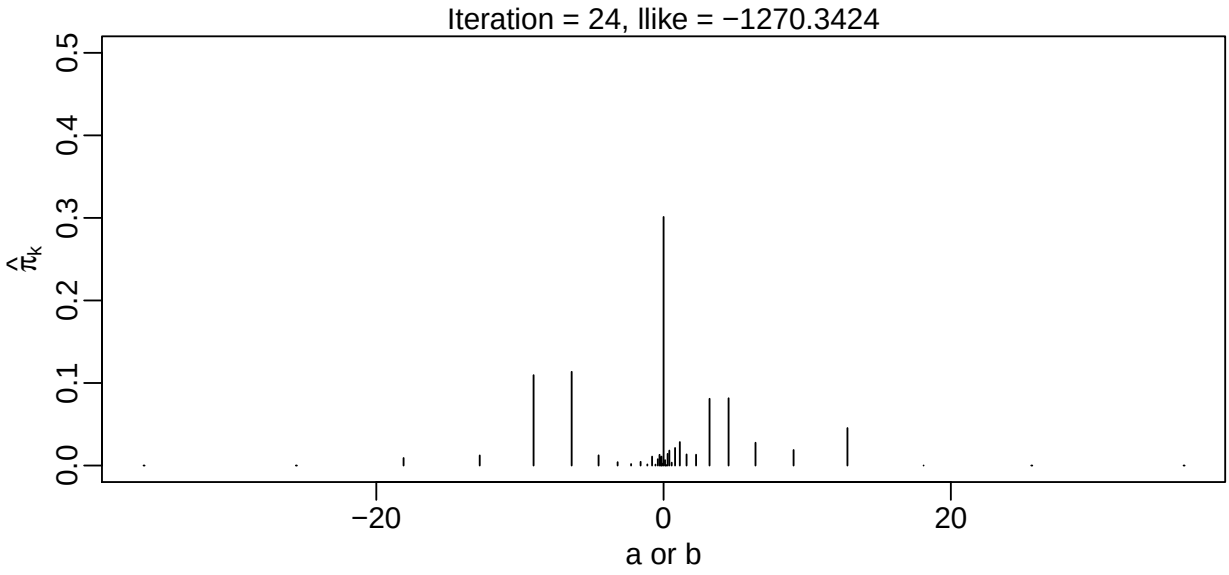

```
##  Iter = 23
## ldiff = 9.631e-05
## zdiff = 0.008579
```



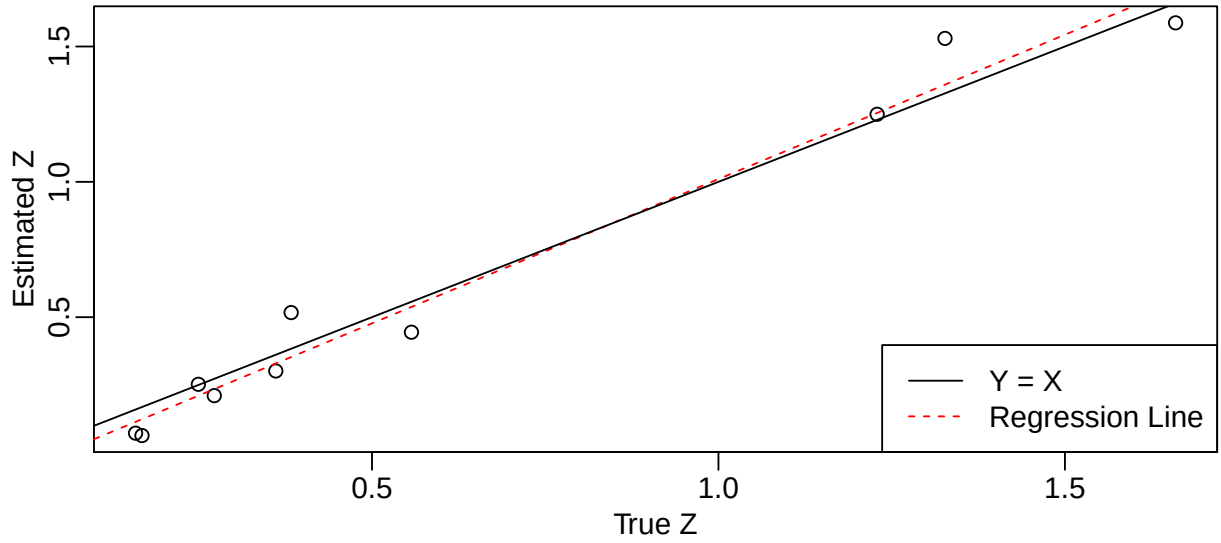


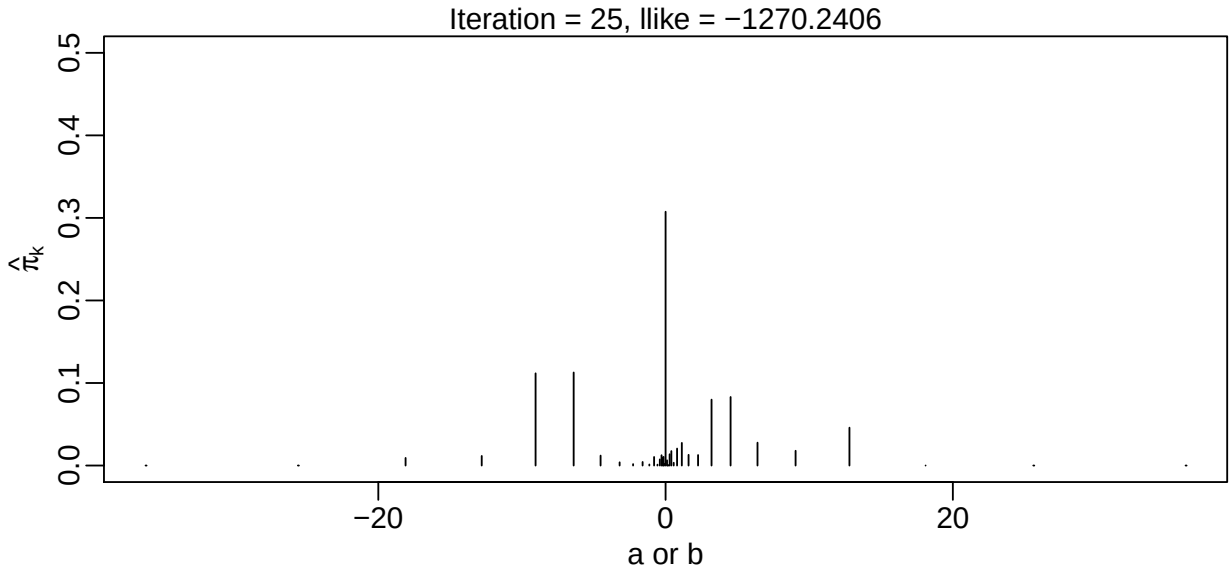

```
##  Iter = 24
## ldiff = 8.761e-05
## zdiff = 0.007902
```



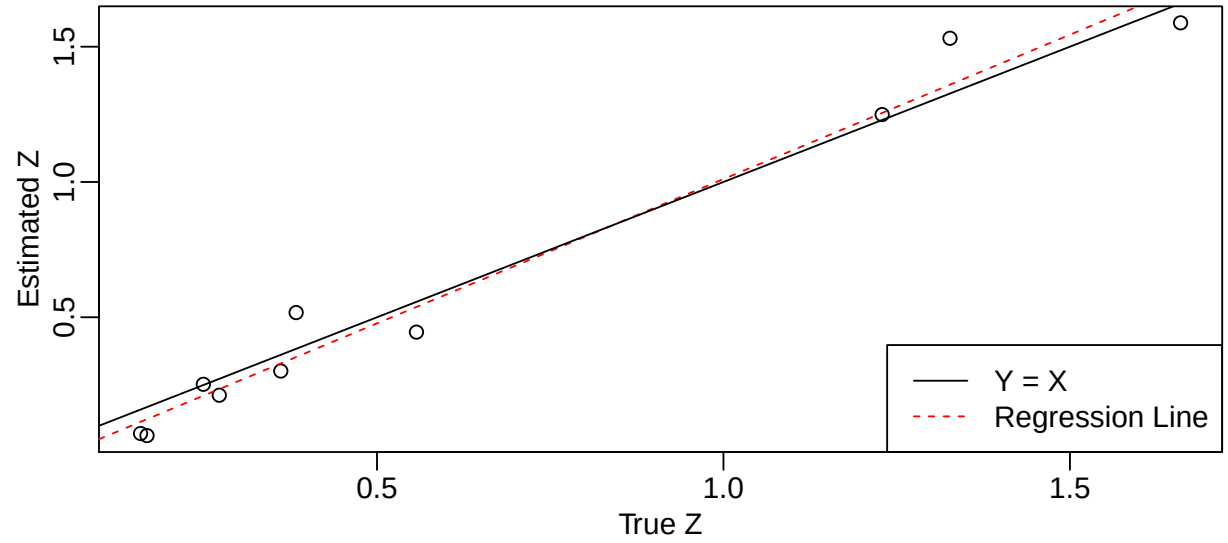


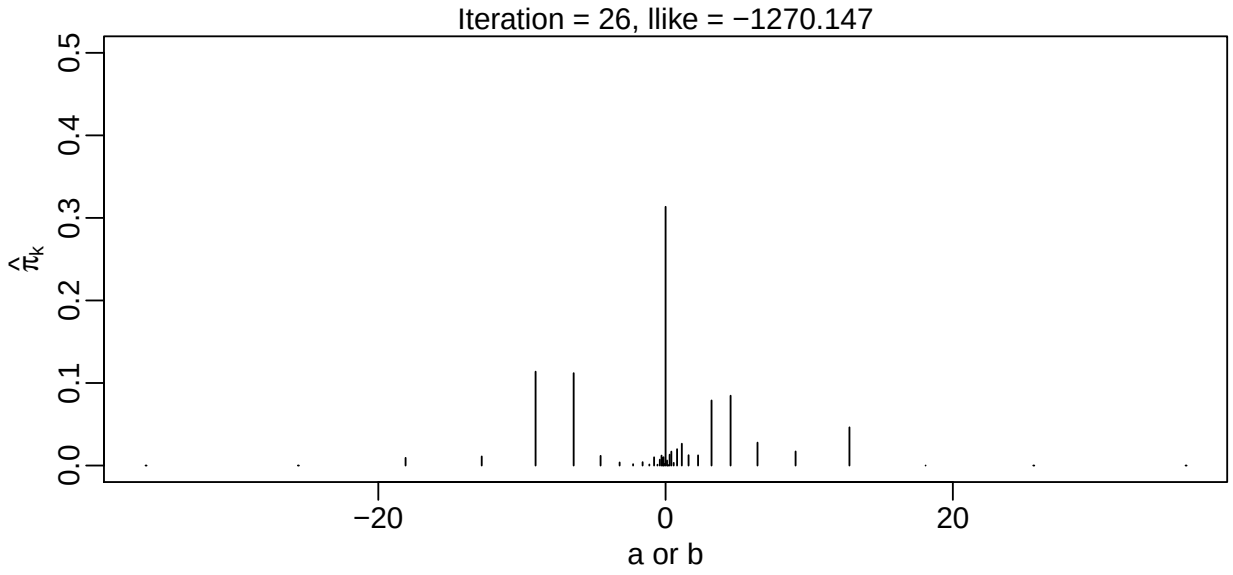

```
##  Iter = 25
## ldiff = 8.013e-05
## zdiff = 0.007279
```



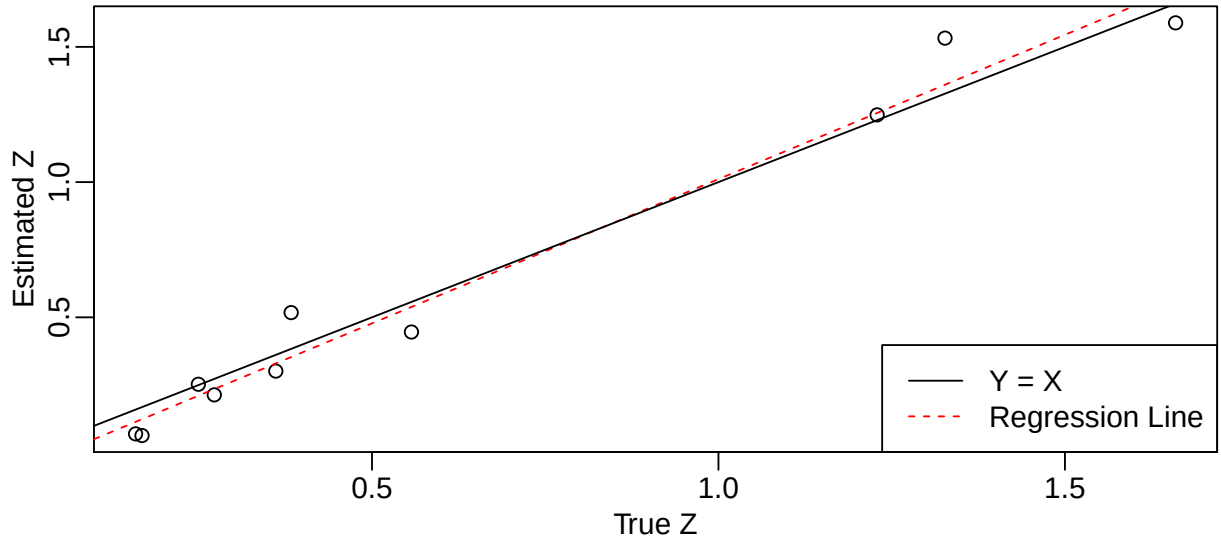


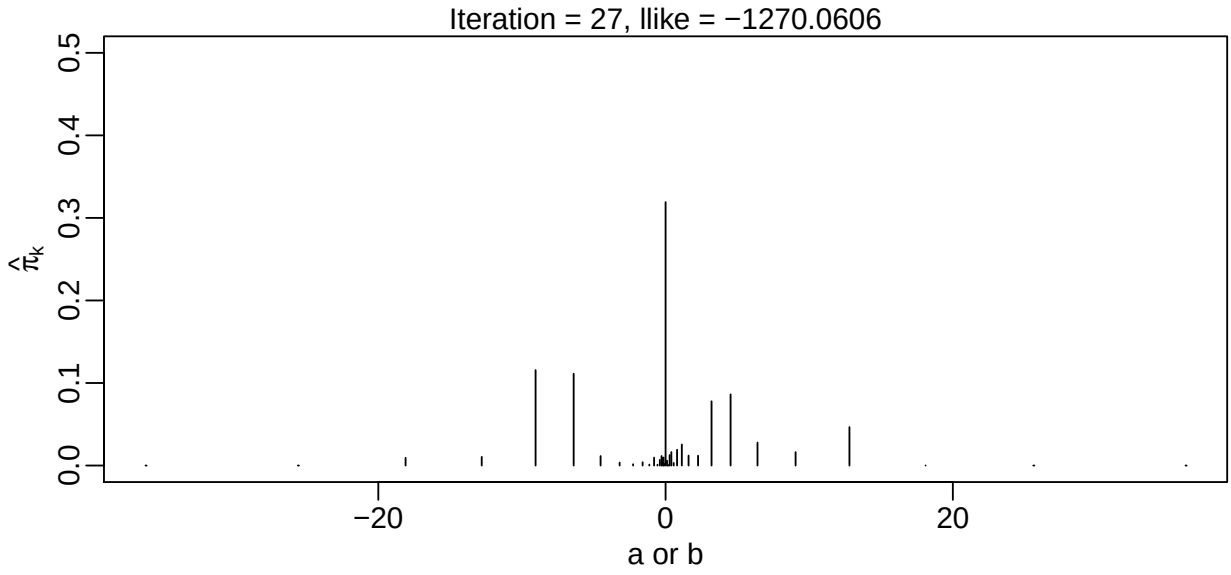

```
##  Iter = 26
## ldiff = 7.366e-05
## zdiff = 0.006722
```



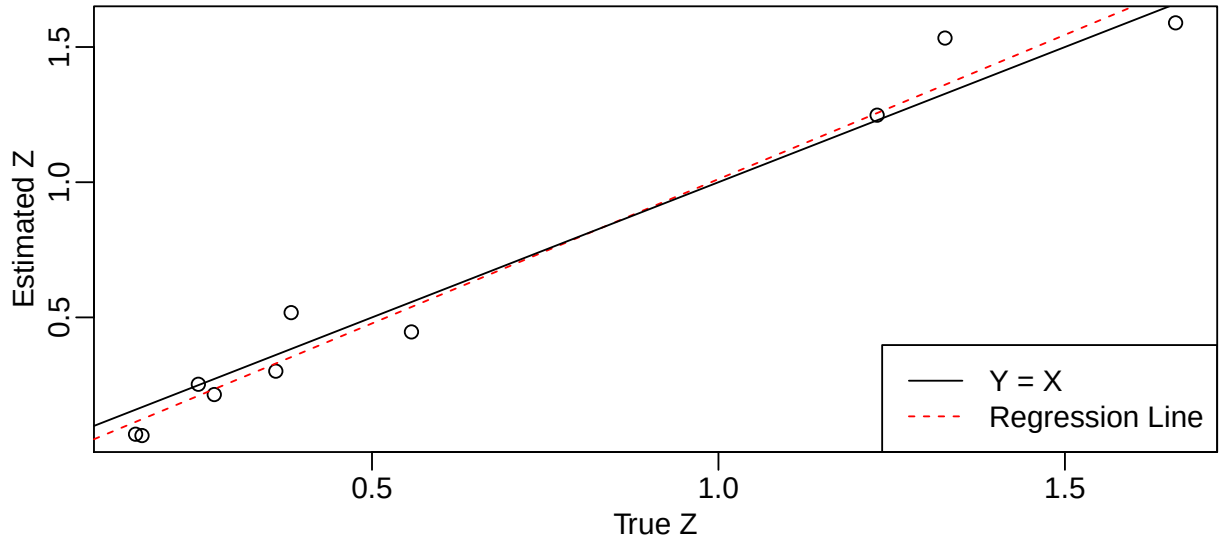


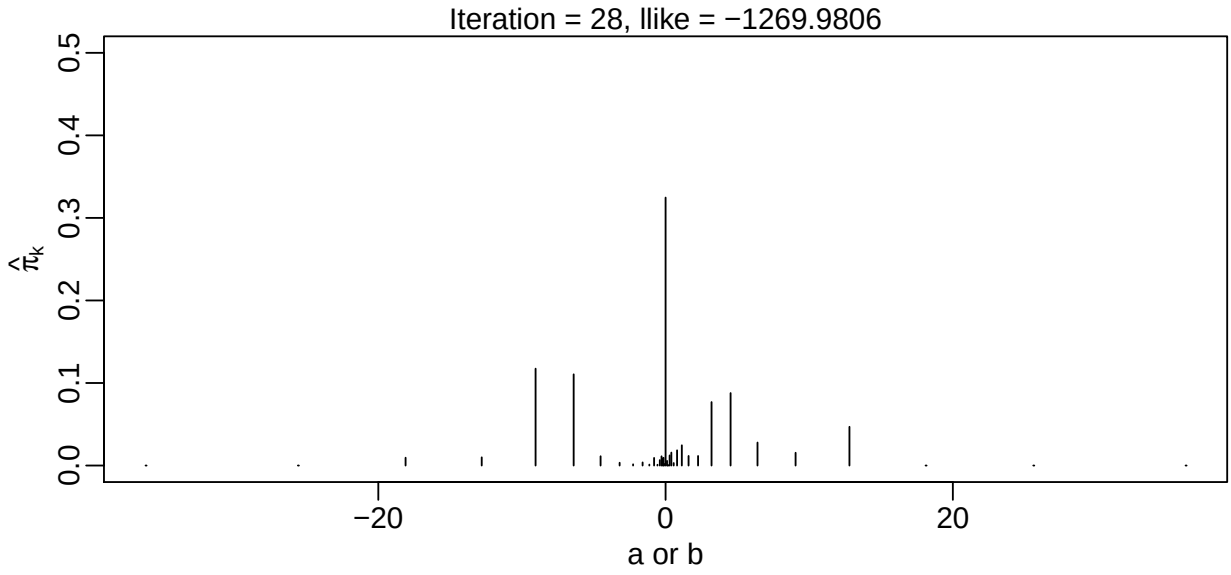

```
##  Iter = 27
## ldiff = 6.801e-05
## zdiff = 0.006221
```



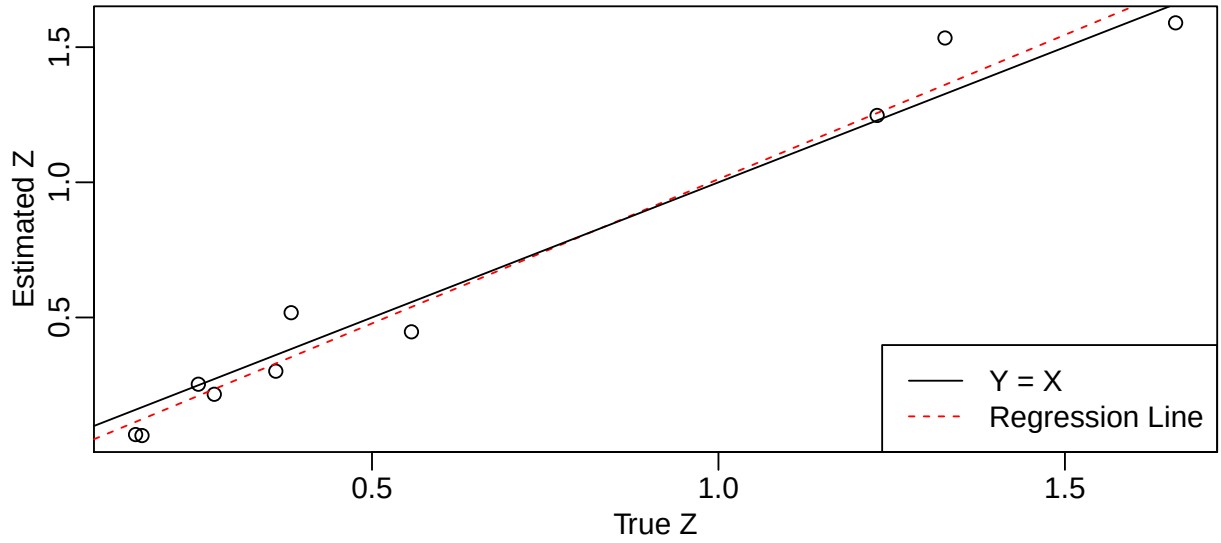


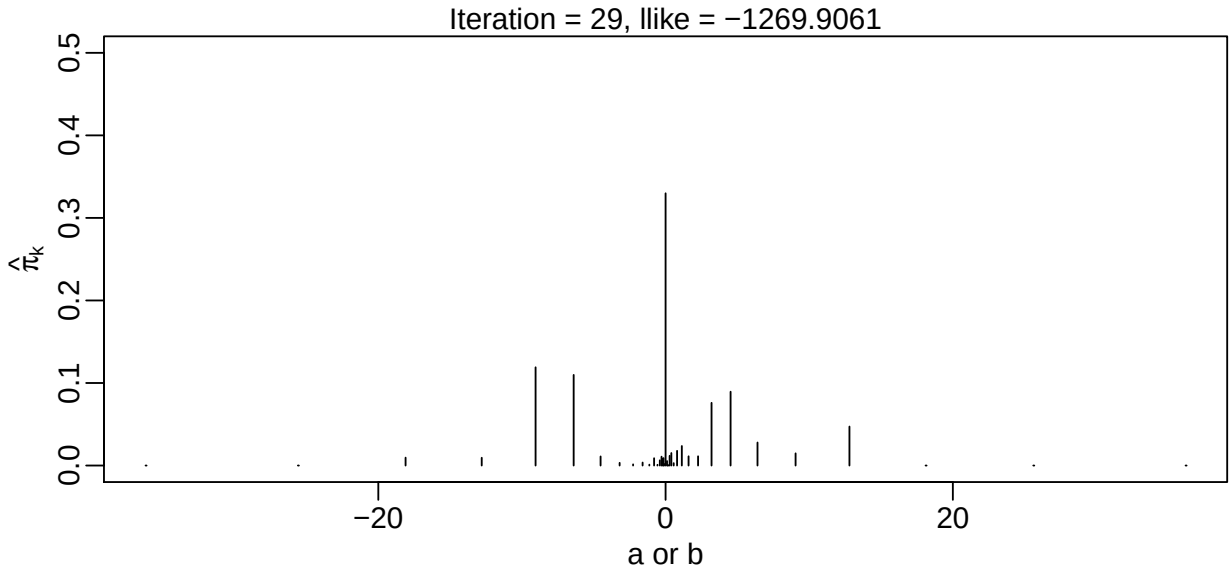

```
##  Iter = 28
## ldiff = 6.303e-05
## zdiff = 0.005818
```



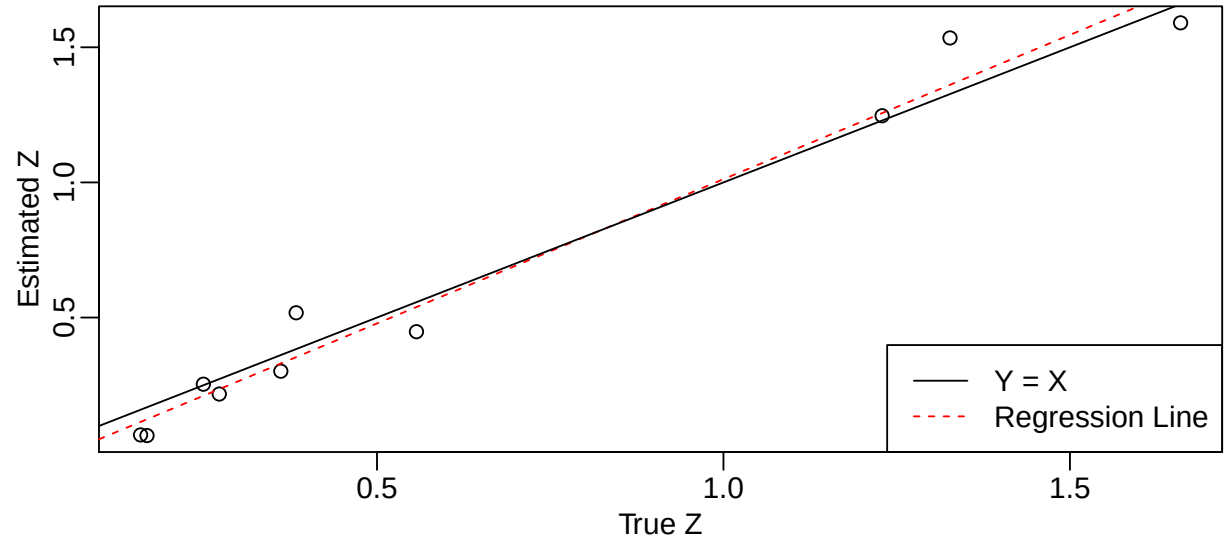


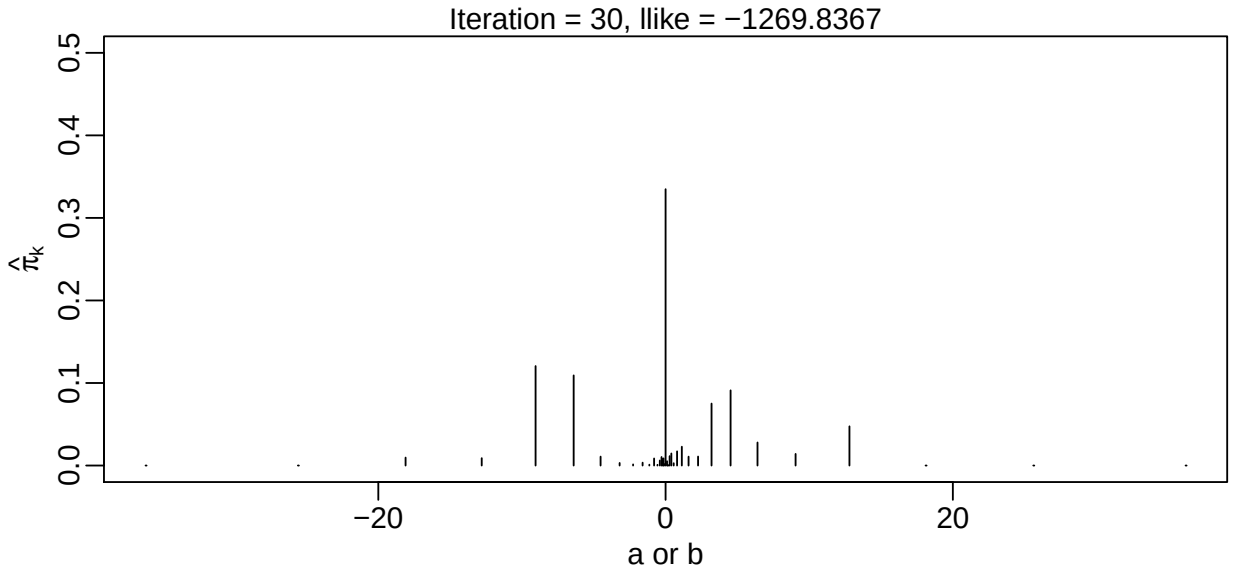

```
##  Iter = 29
## ldiff = 5.861e-05
## zdiff = 0.005559
```



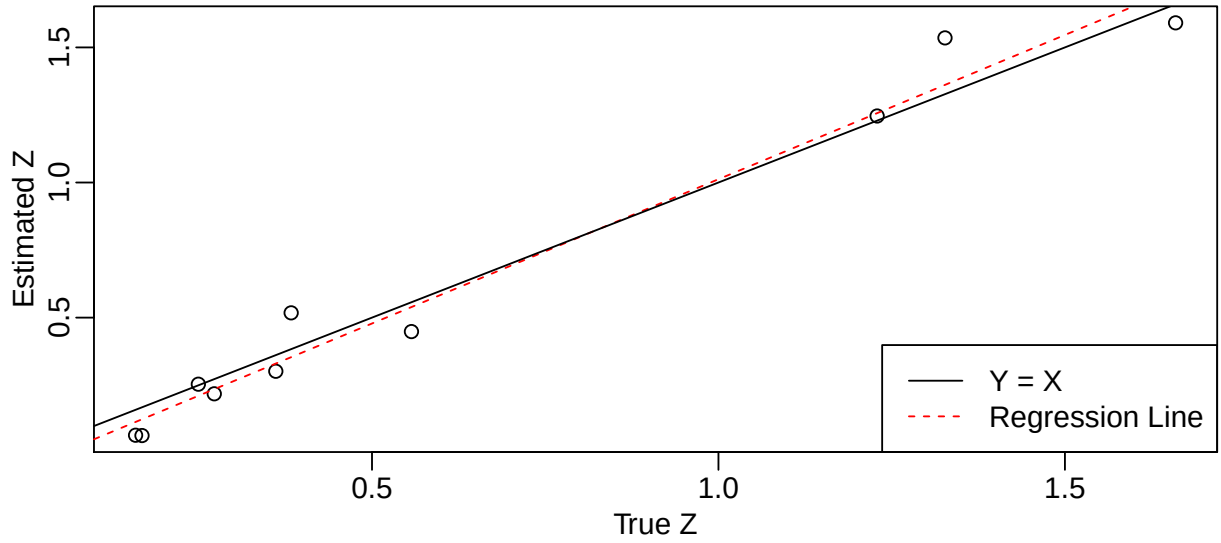


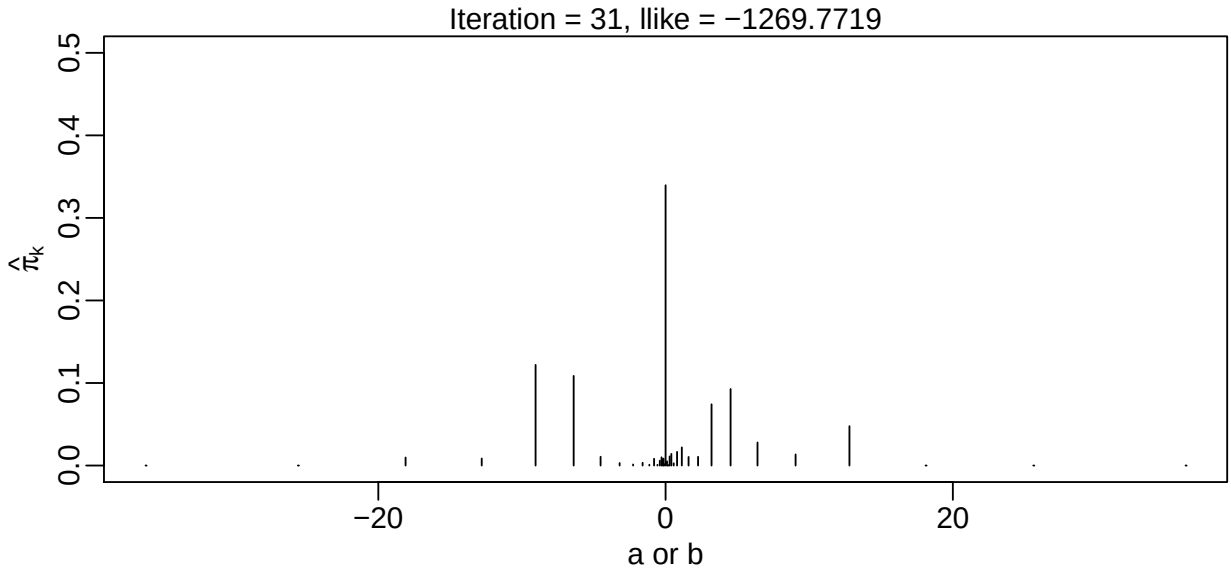

```
##  Iter = 30
## ldiff = 5.465e-05
## zdiff = 0.005229
```



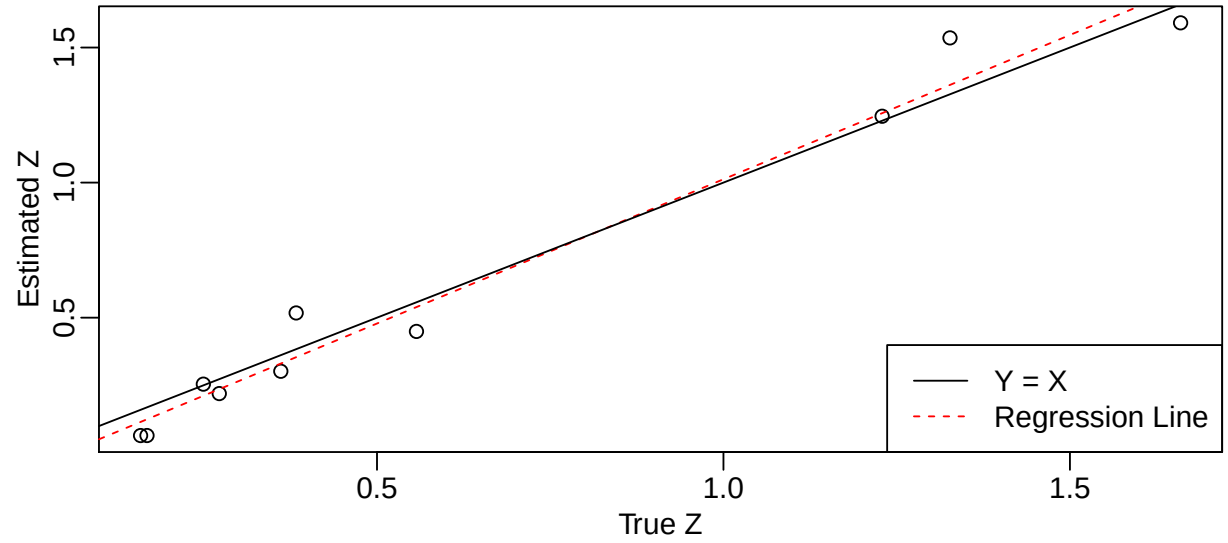


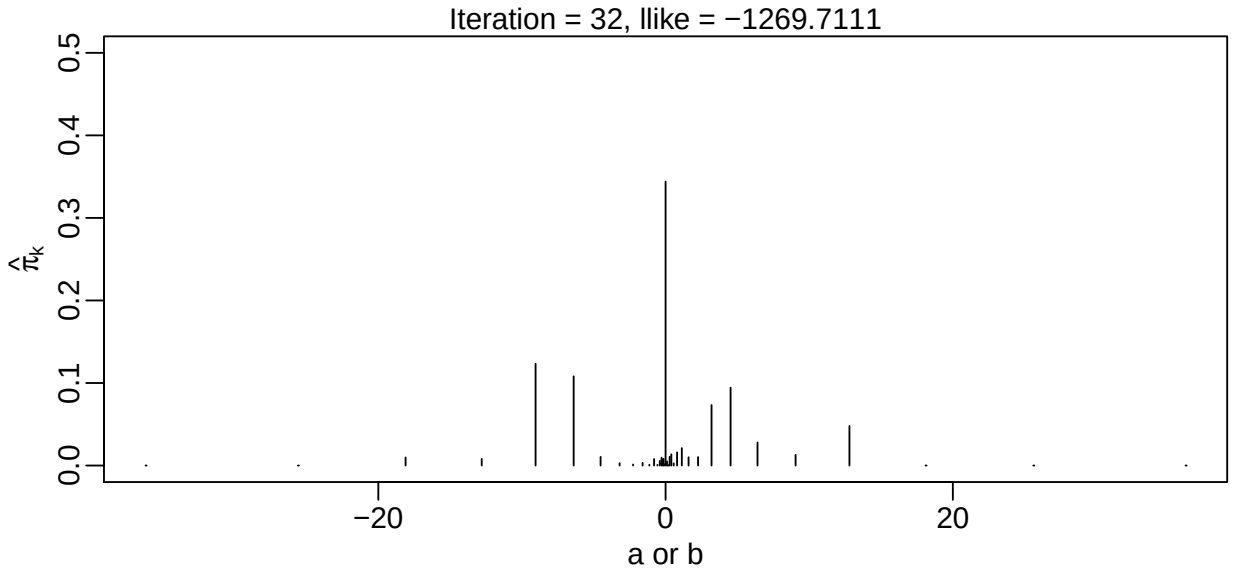

```
##  Iter = 31
## ldiff = 5.109e-05
## zdiff = 0.005024
```



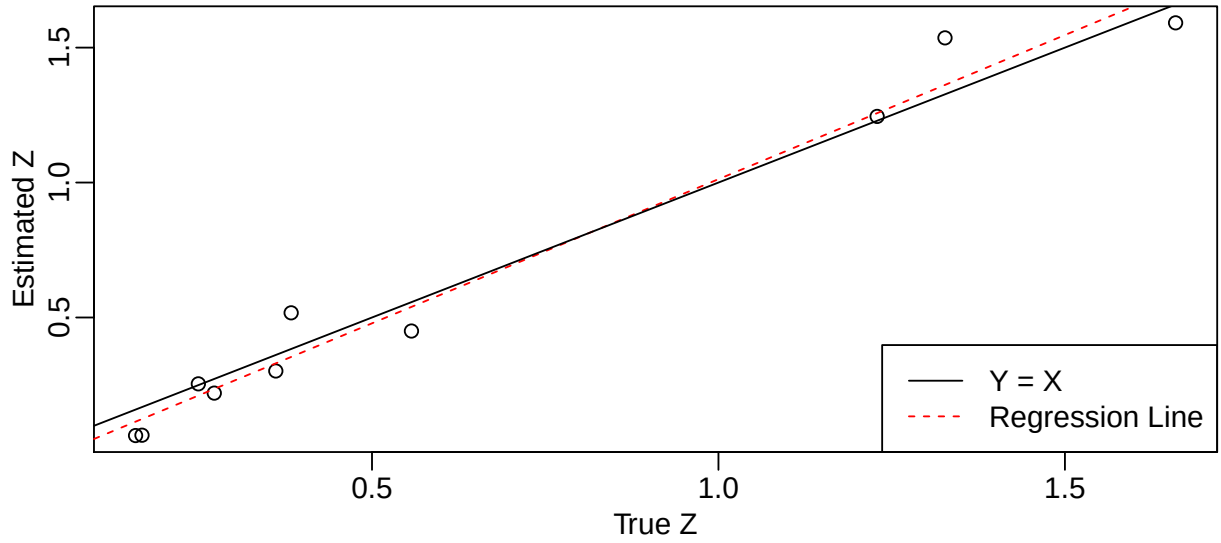


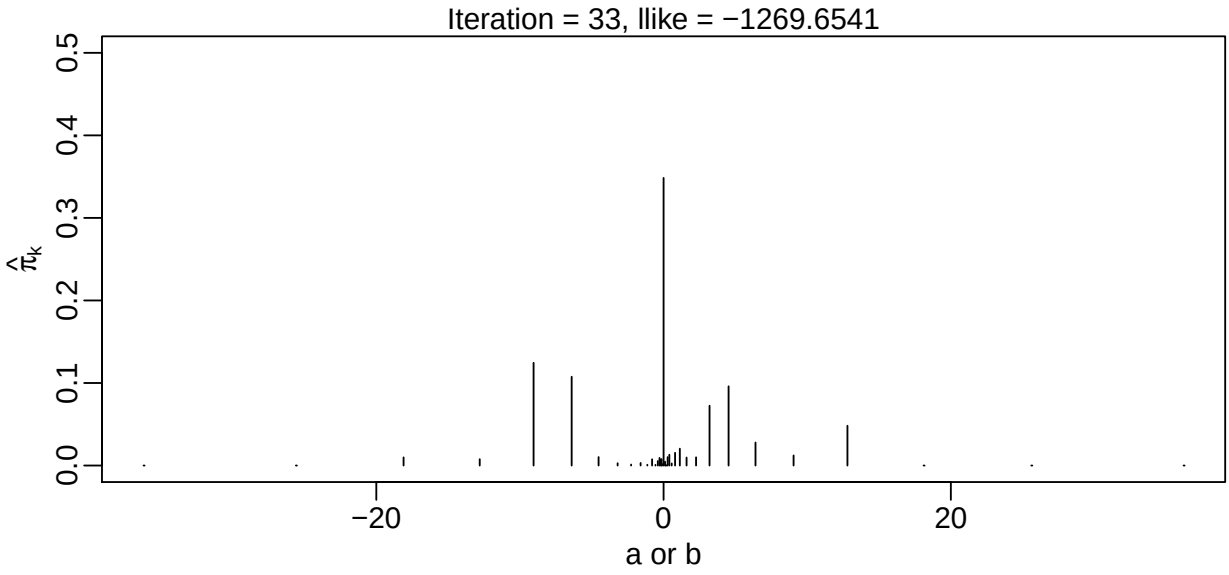

```
##  Iter = 32
## ldiff = 4.786e-05
## zdiff = 0.004835
```



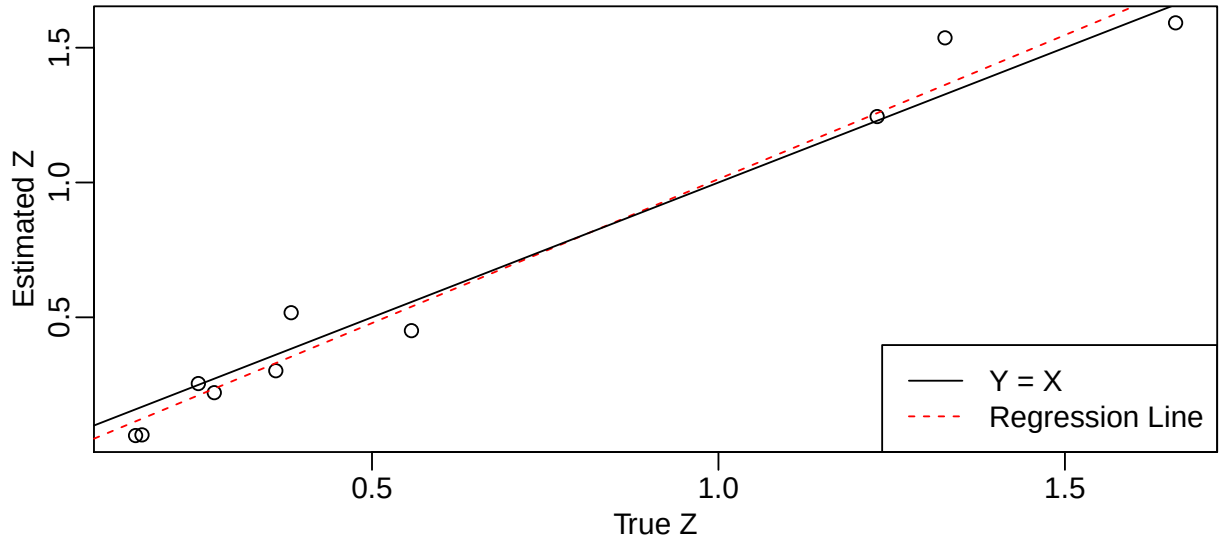


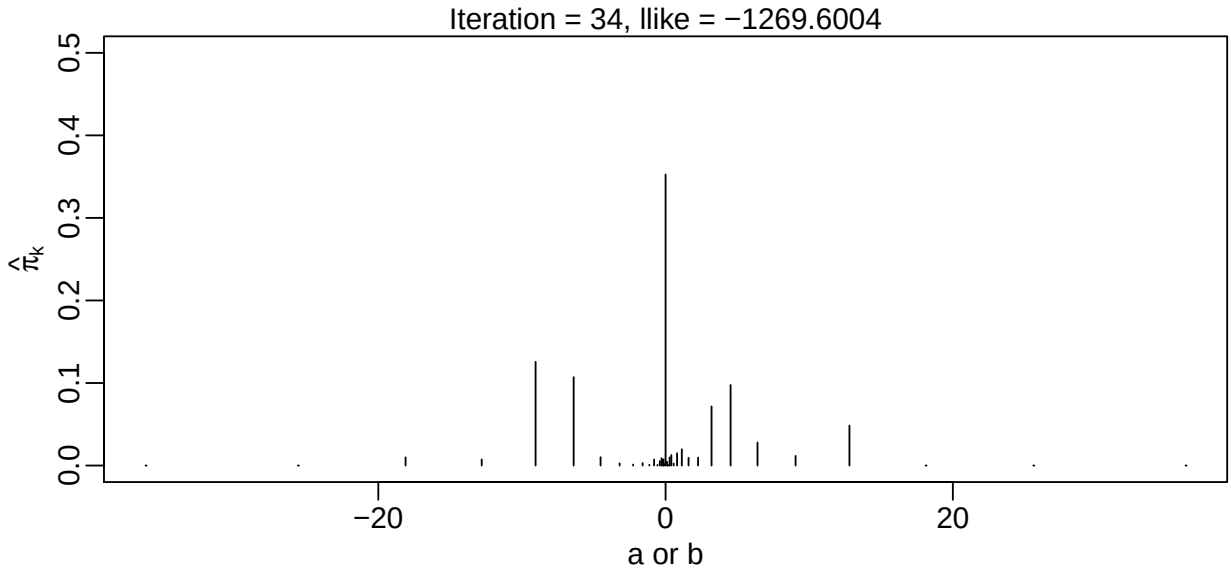

```
##  Iter = 33
## ldiff = 4.492e-05
## zdiff = 0.004659
```



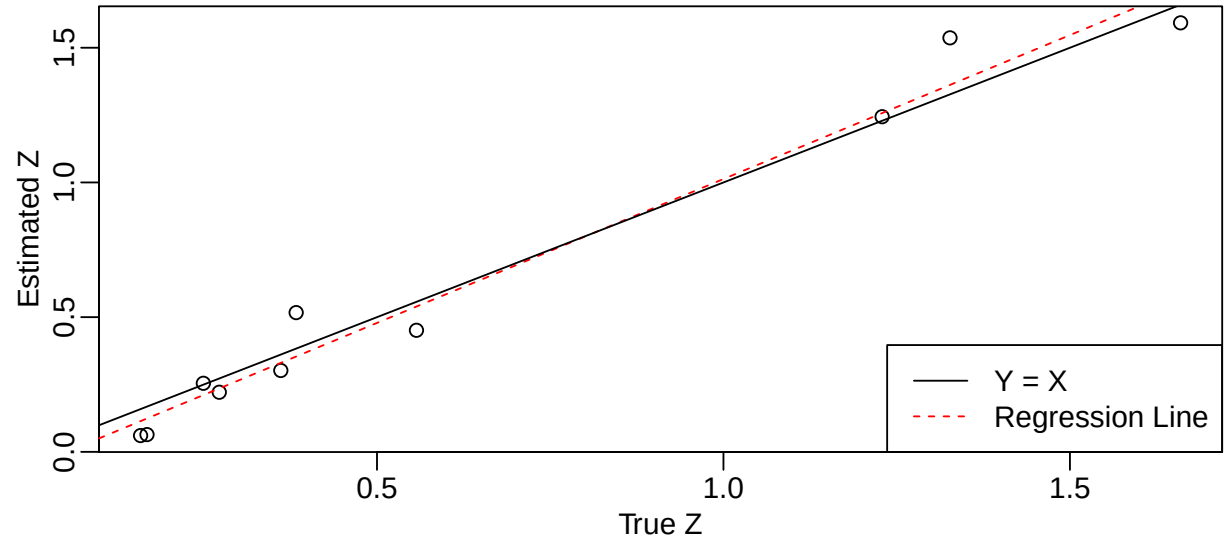


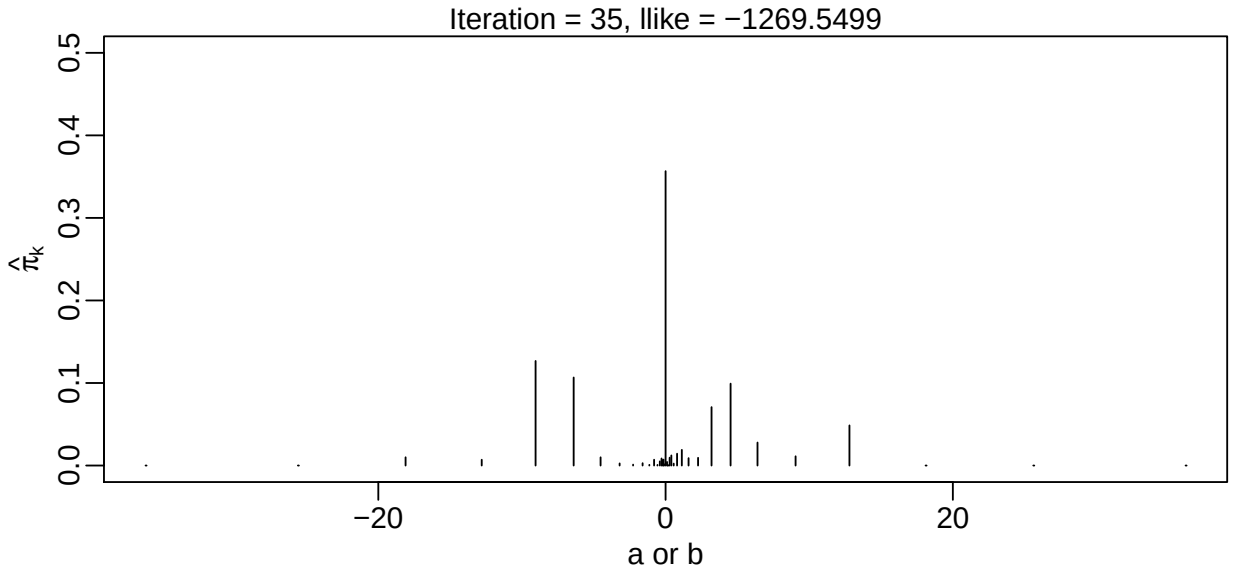

```
##  Iter = 34
## ldiff = 4.224e-05
## zdiff = 0.004492
```



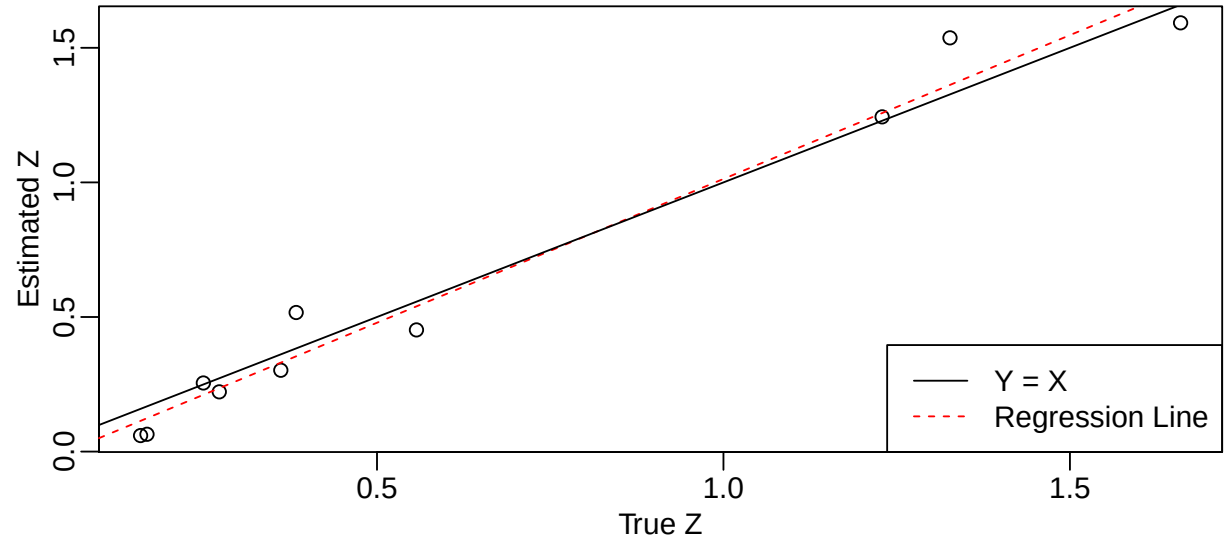


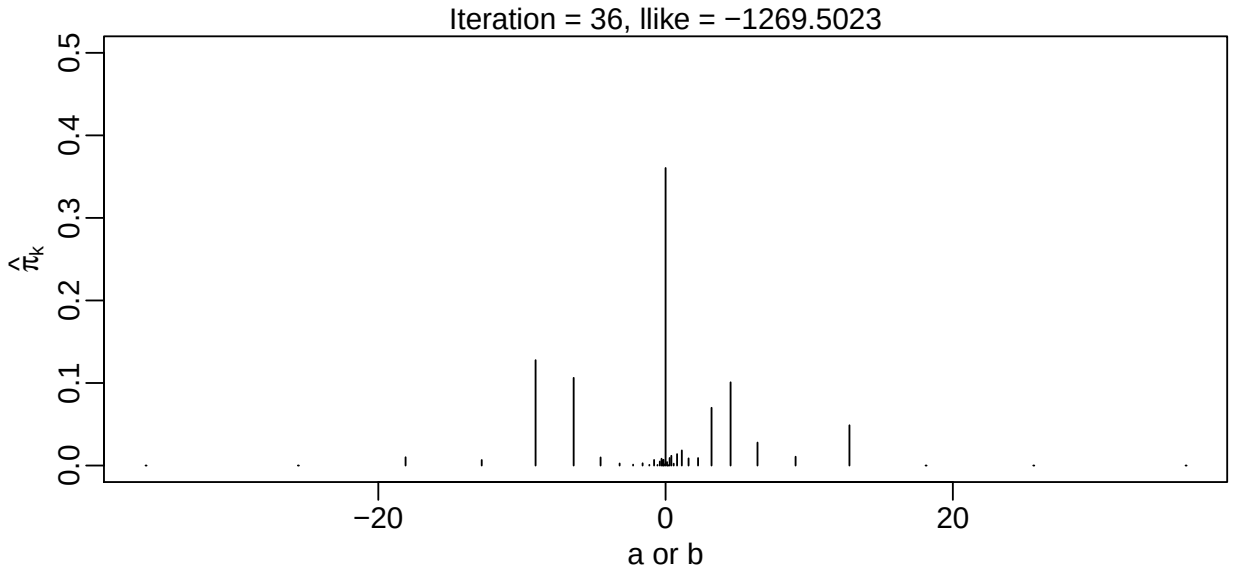

```
##  Iter = 35
## ldiff = 3.978e-05
## zdiff = 0.00433
```



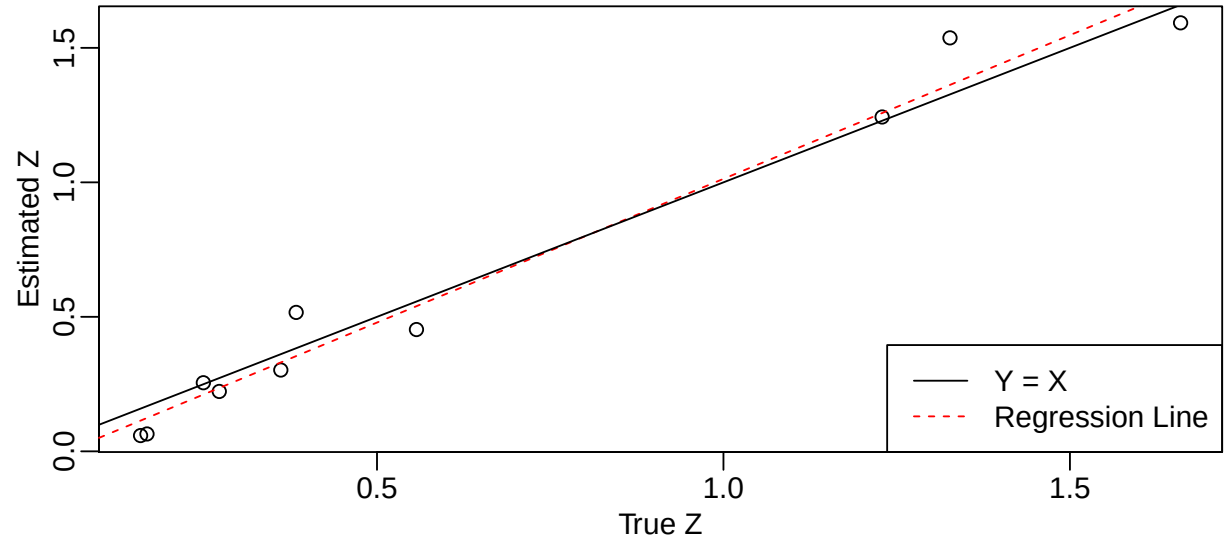


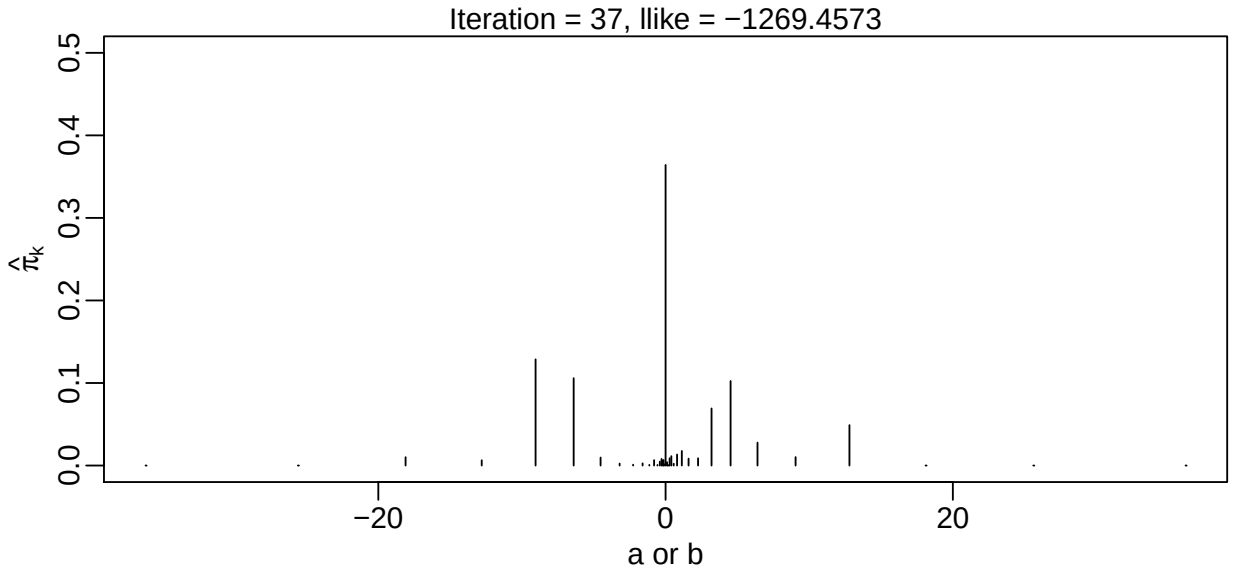

```
##  Iter = 36
## ldiff = 3.752e-05
## zdiff = 0.004172
```



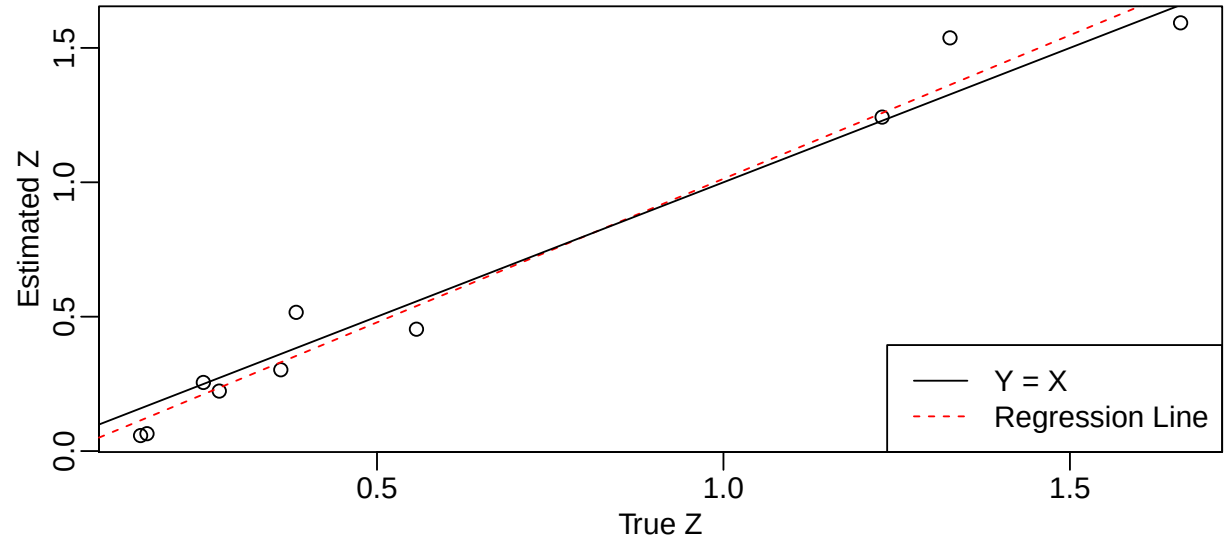


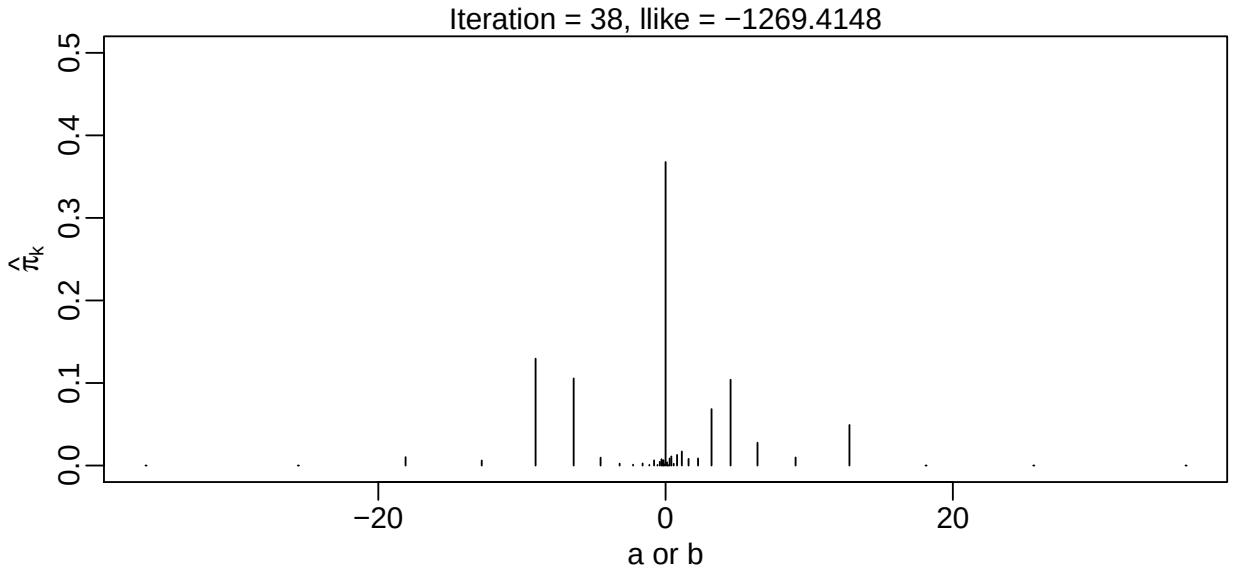

```
##  Iter = 37
## ldiff = 3.543e-05
## zdiff = 0.003971
```



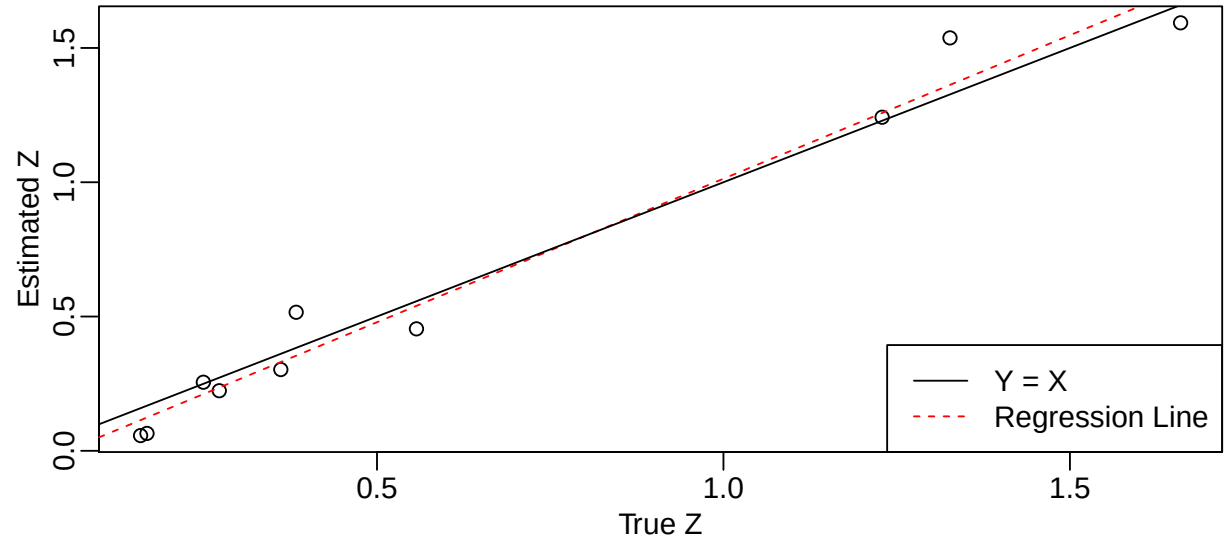


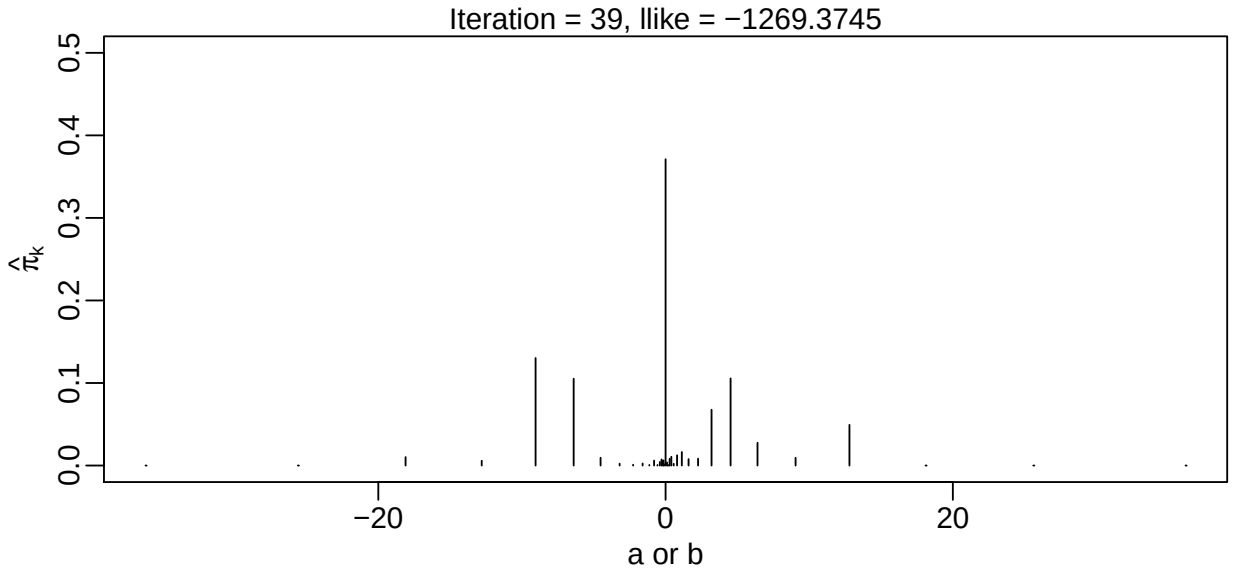

```
##  Iter = 38
## ldiff = 3.35e-05
## zdiff = 0.003853
```



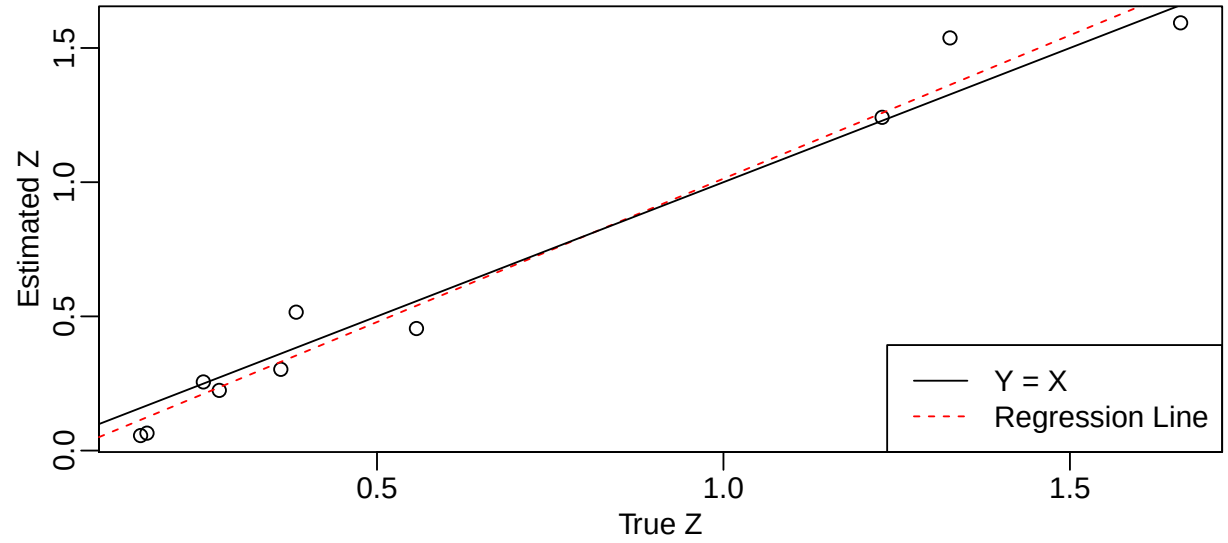


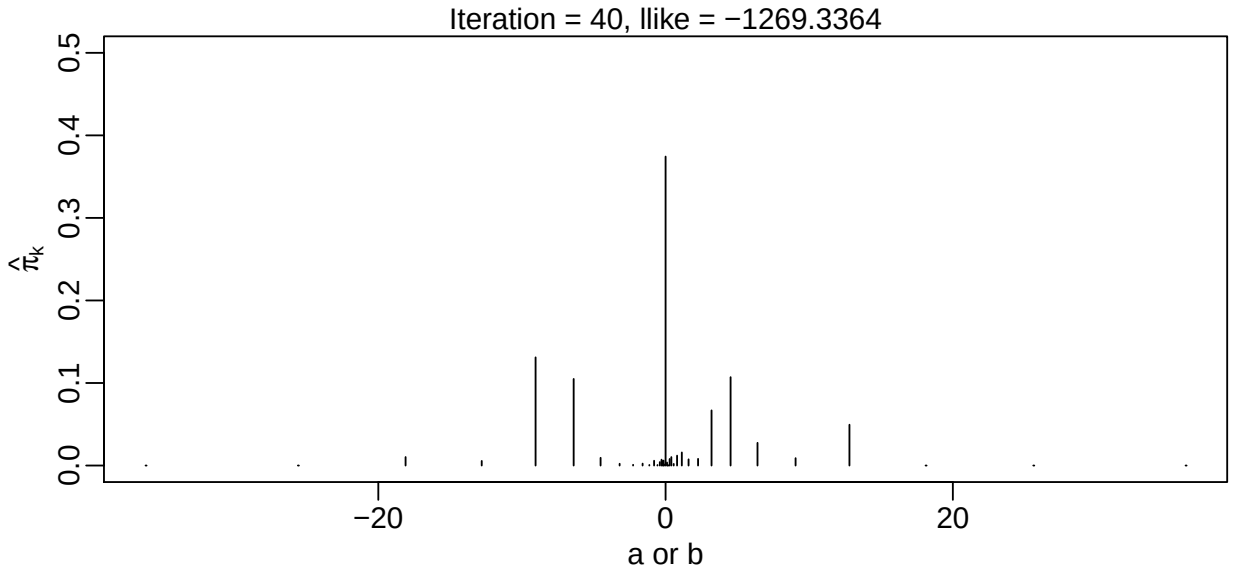

```
##  Iter = 39
## ldiff = 3.171e-05
## zdiff = 0.003723
```



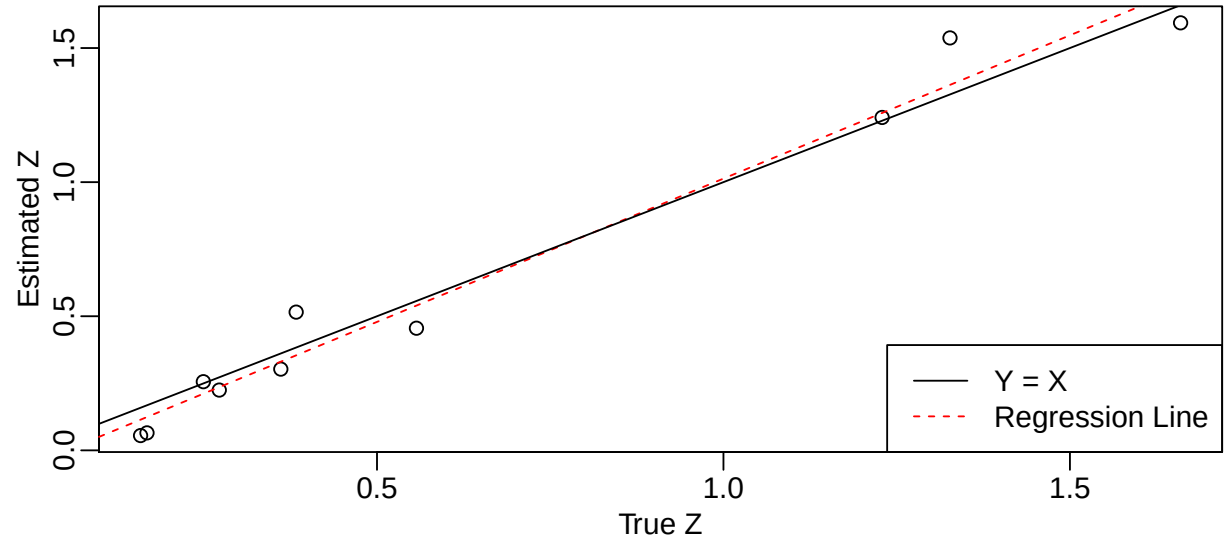


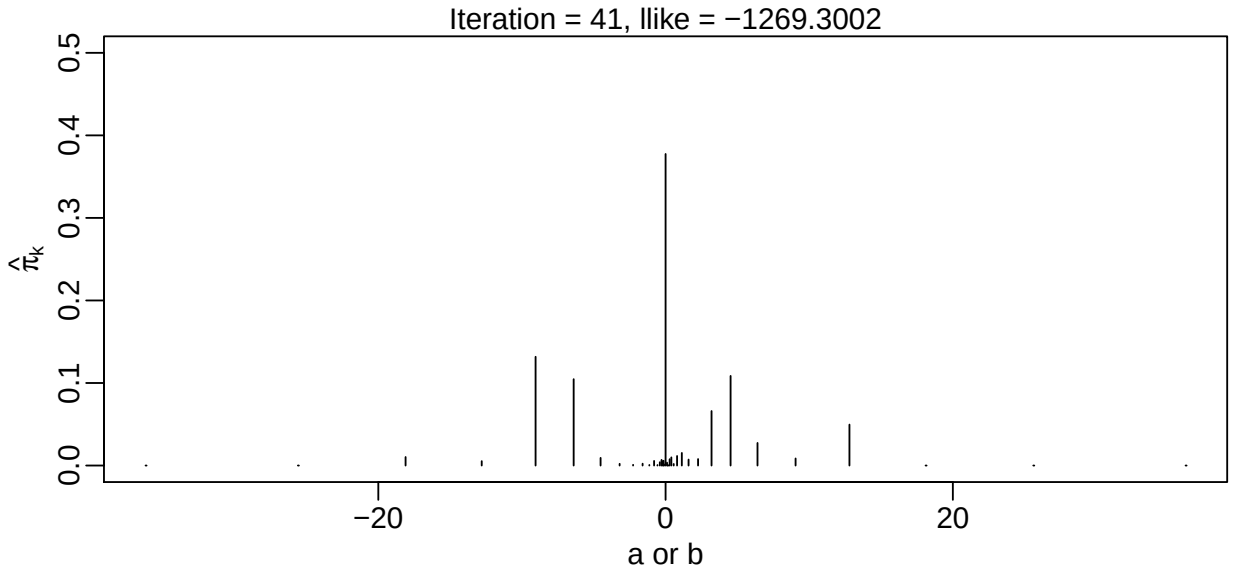

```
##  Iter = 40
## ldiff = 3.005e-05
## zdiff = 0.00359
```



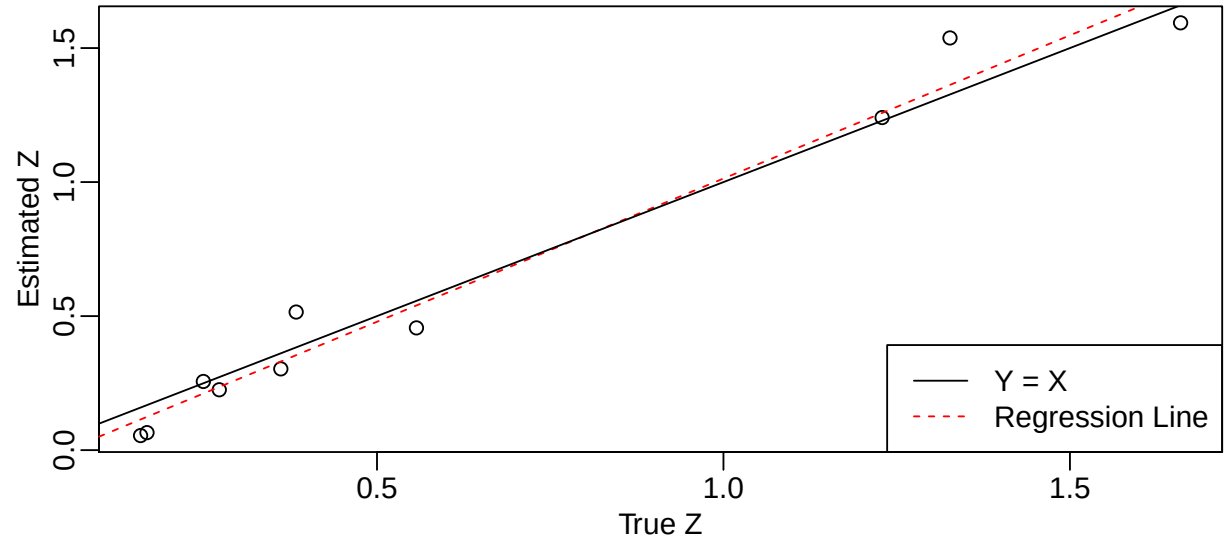


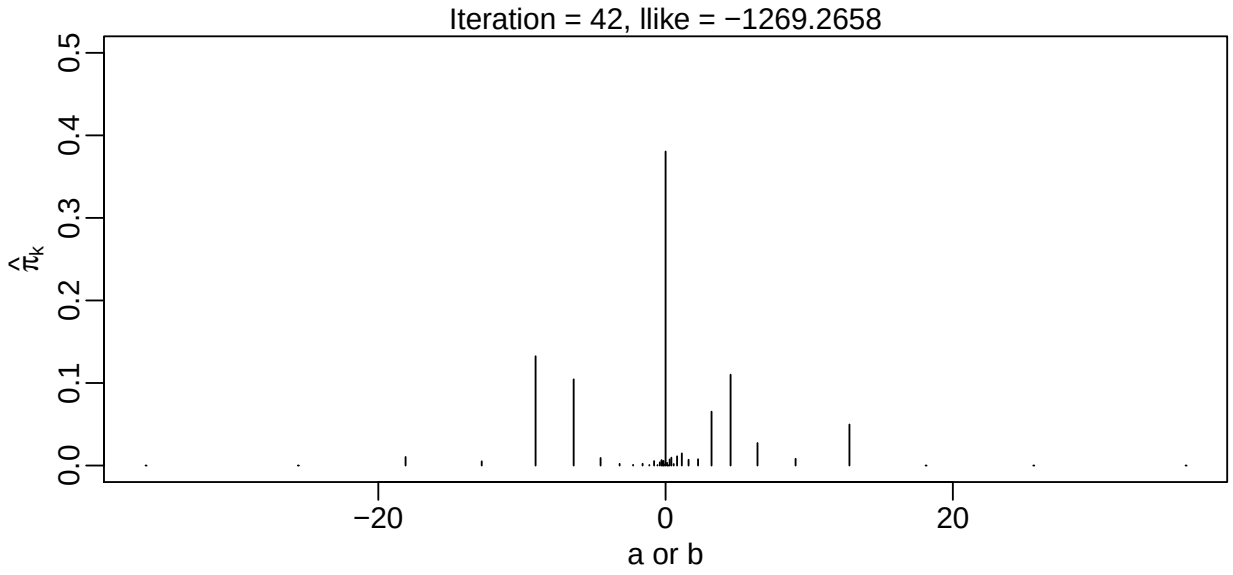

```
##  Iter = 41
## ldiff = 2.851e-05
## zdiff = 0.003458
```



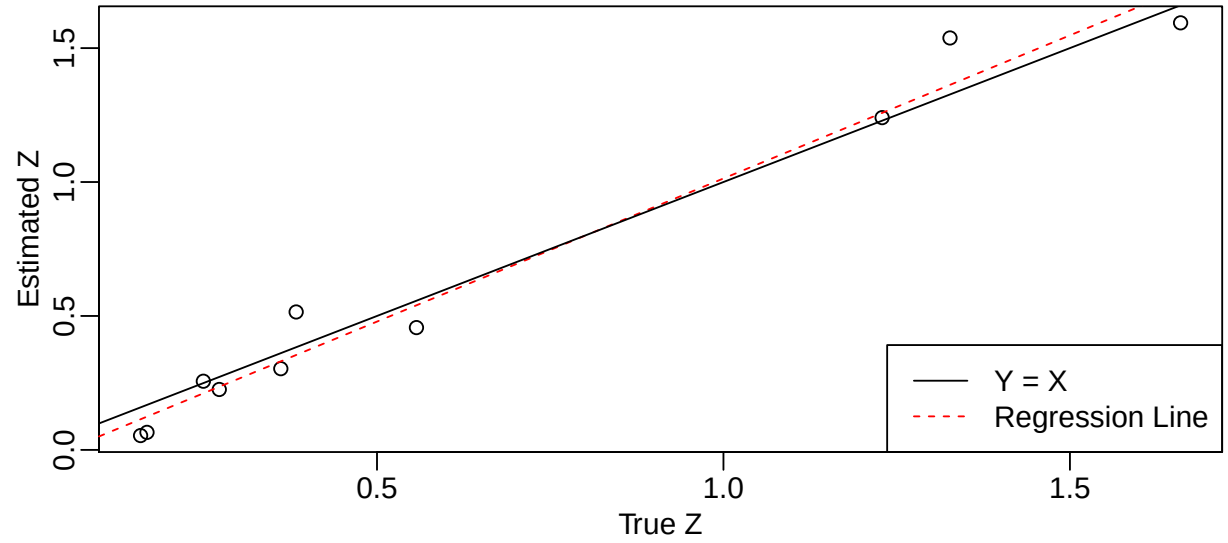


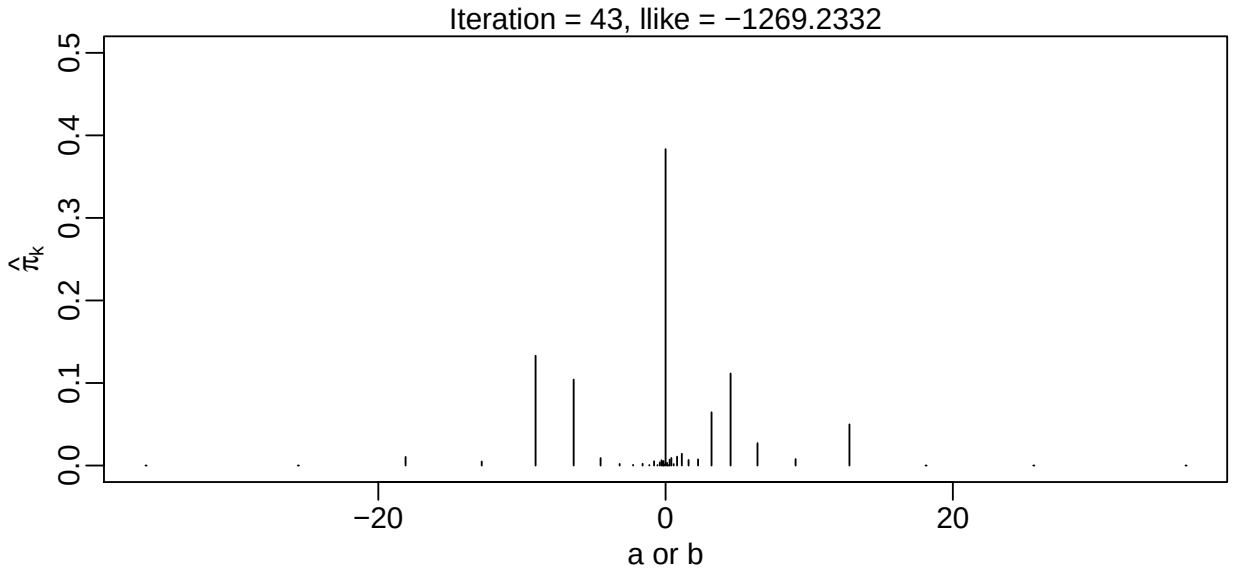

```
##  Iter = 42
## ldiff = 2.707e-05
## zdiff = 0.003328
```



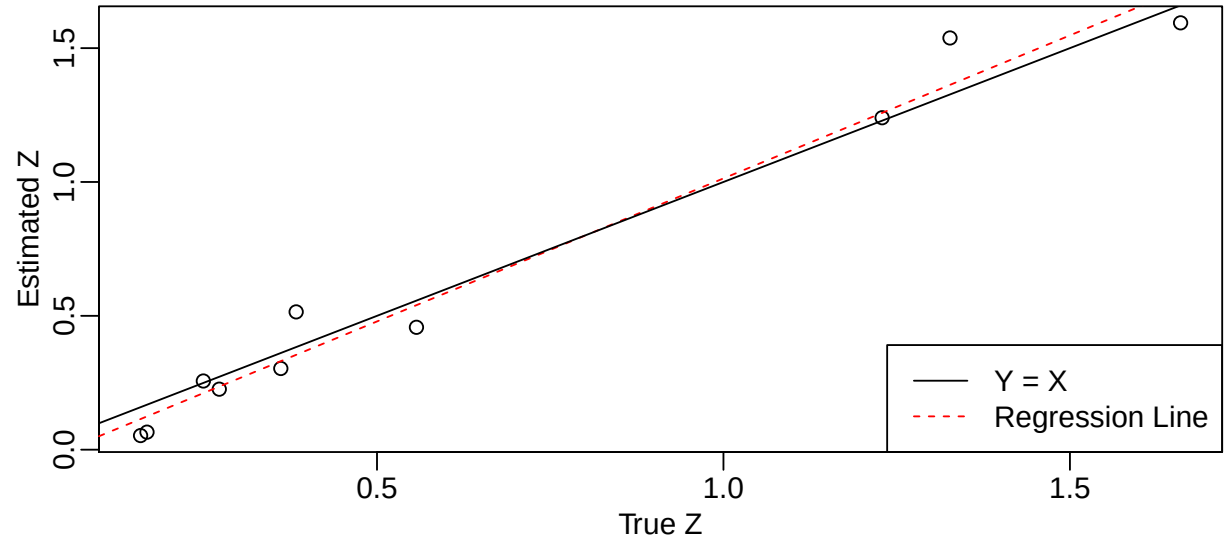


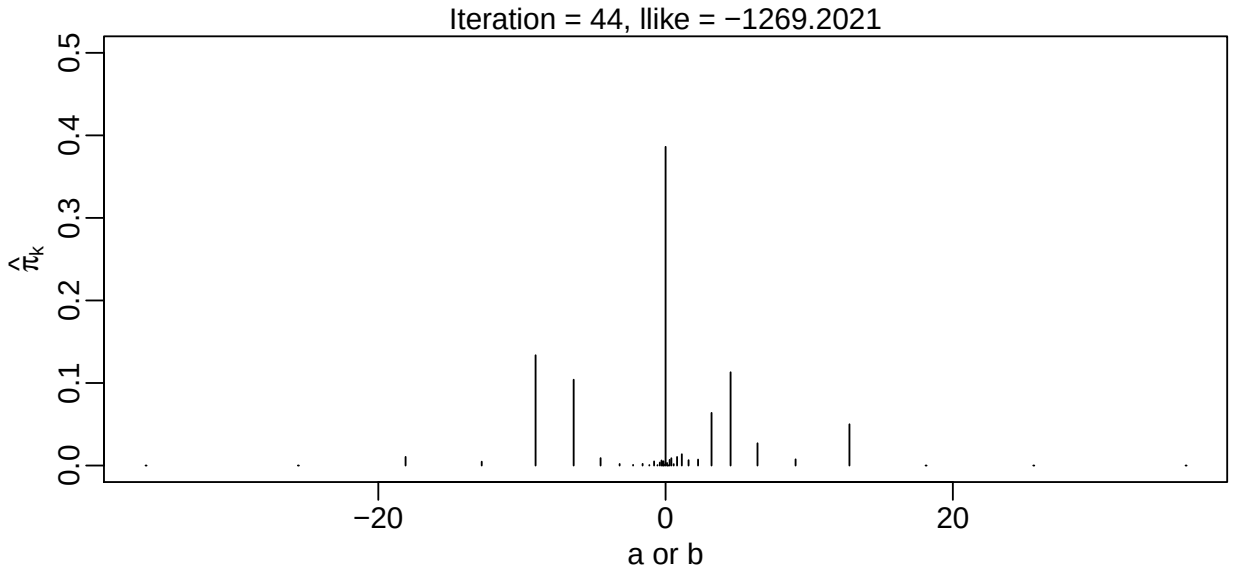

```
##  Iter = 43
## ldiff = 2.573e-05
## zdiff = 0.003201
```



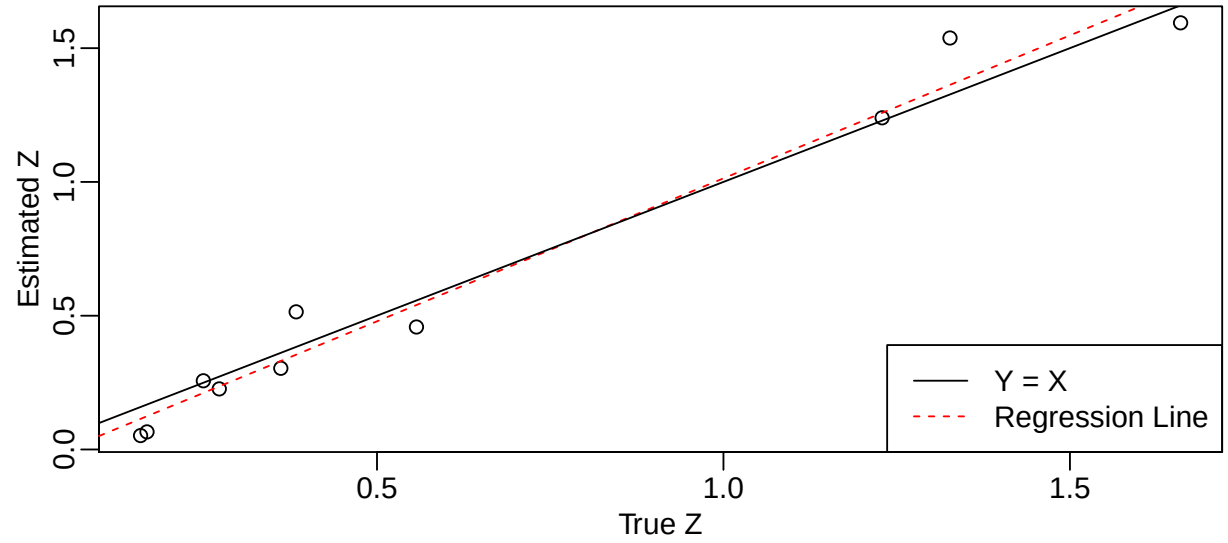


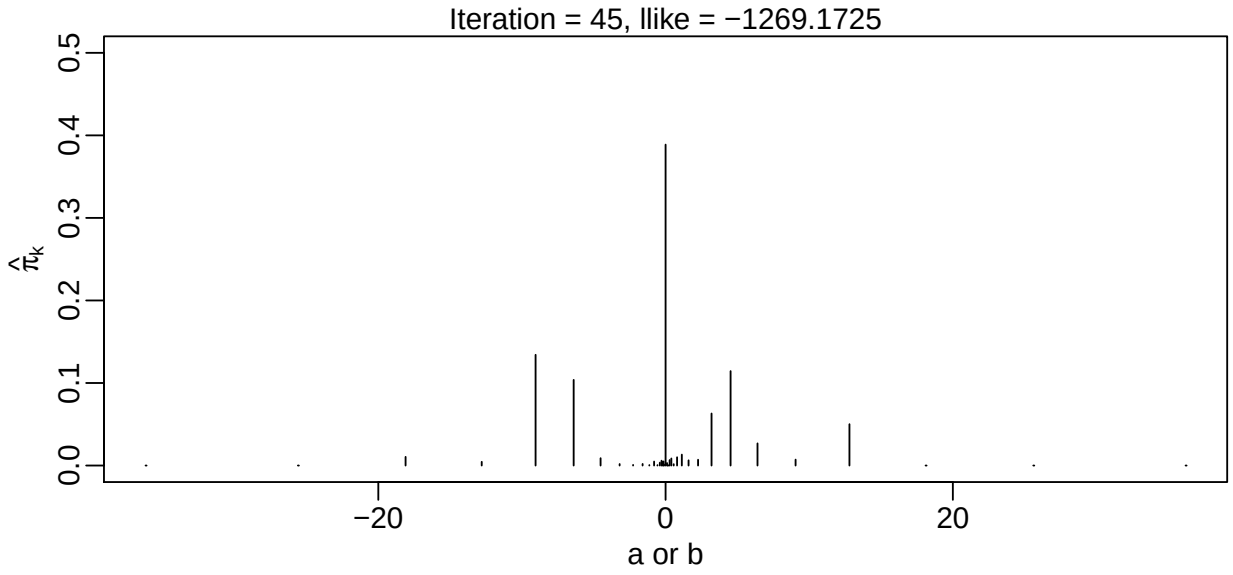

```
##  Iter = 44
## ldiff = 2.448e-05
## zdiff = 0.003079
```



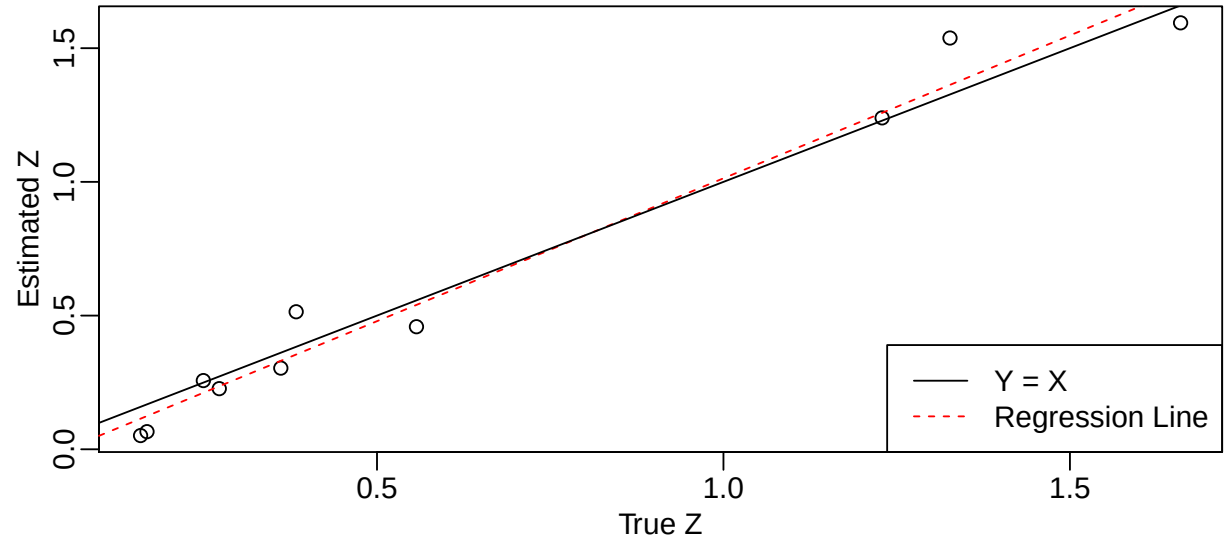


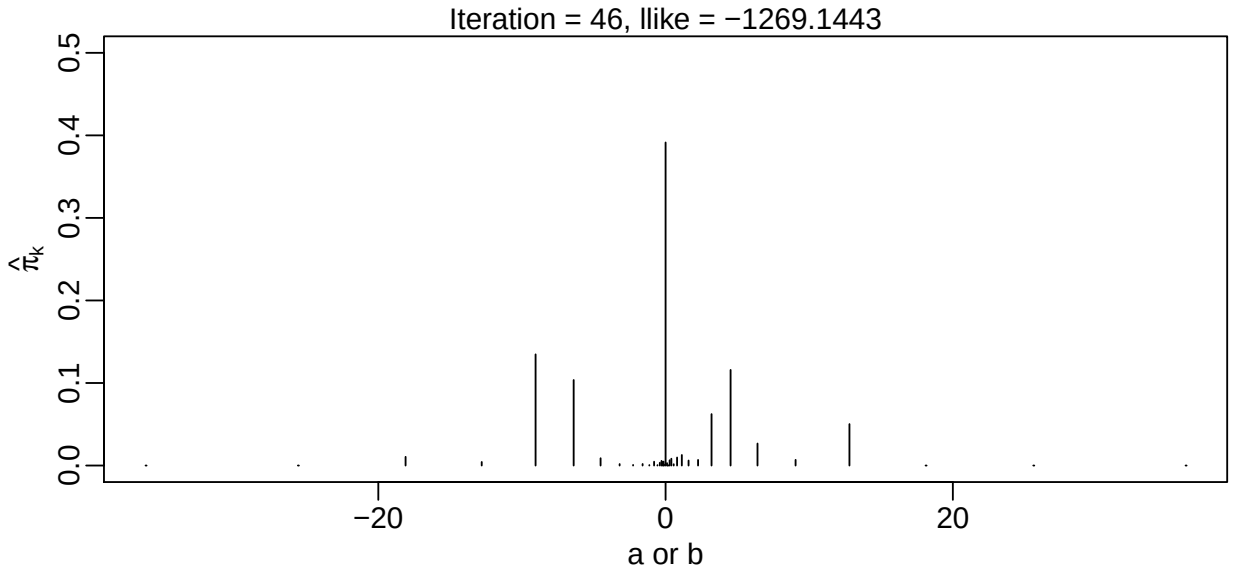

```
##  Iter = 45
## ldiff = 2.331e-05
## zdiff = 0.002962
```



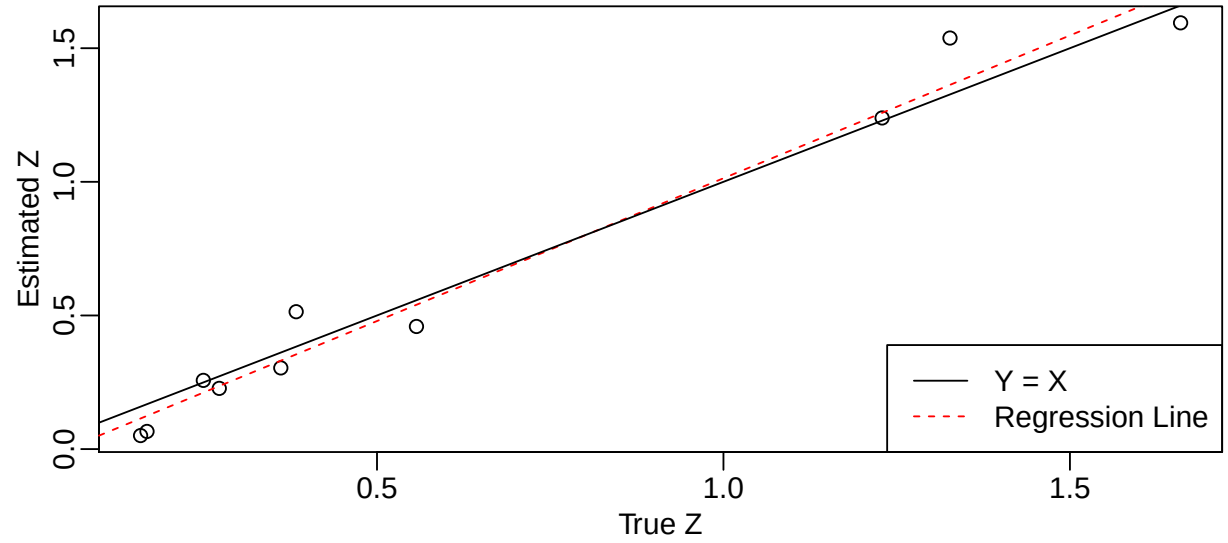


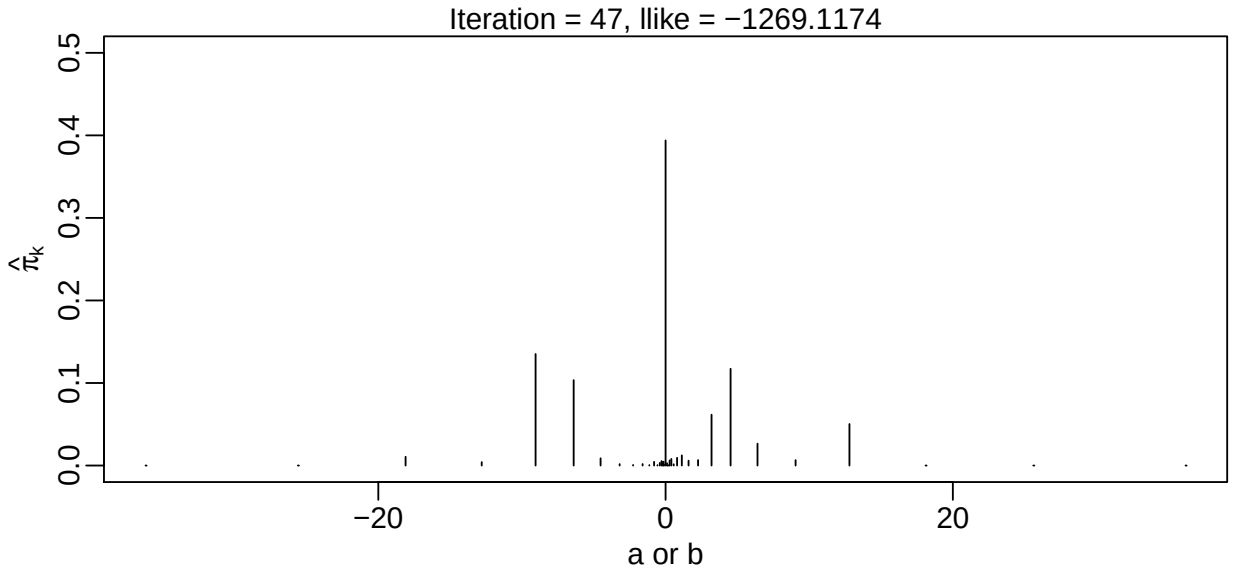

```
##  Iter = 46
## ldiff = 2.222e-05
## zdiff = 0.00285
```



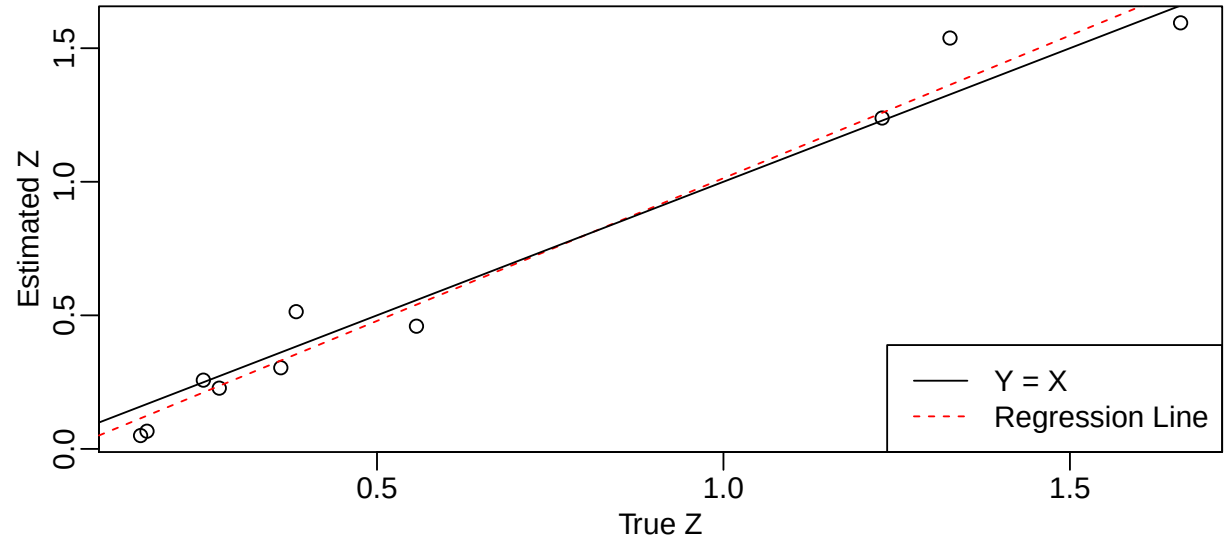


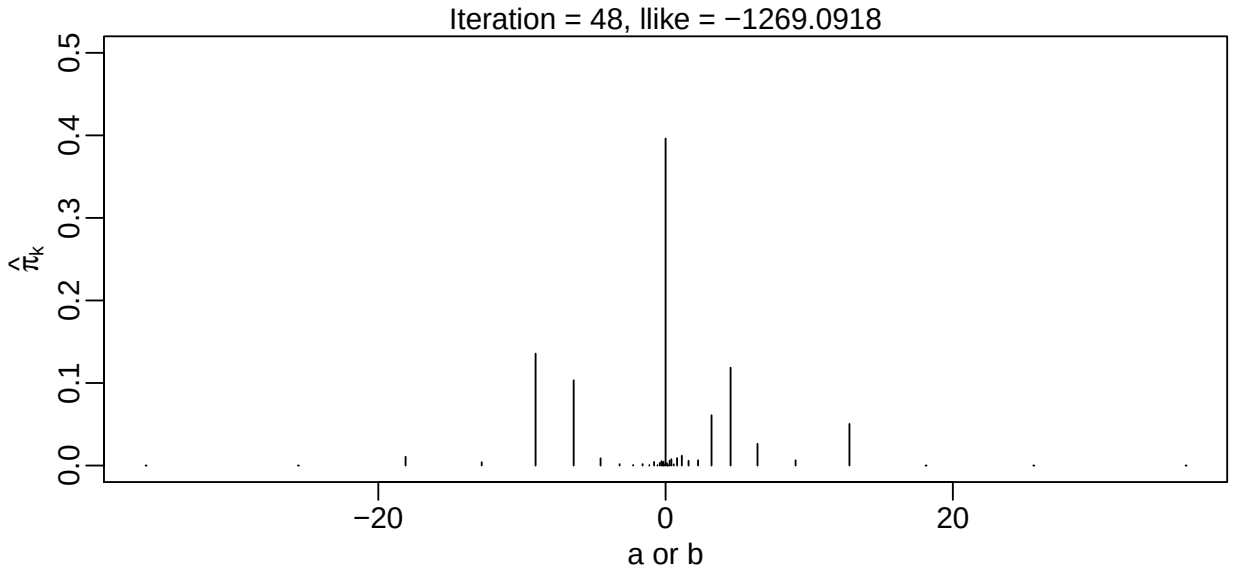

```
##  Iter = 47
## ldiff = 2.119e-05
## zdiff = 0.002742
```



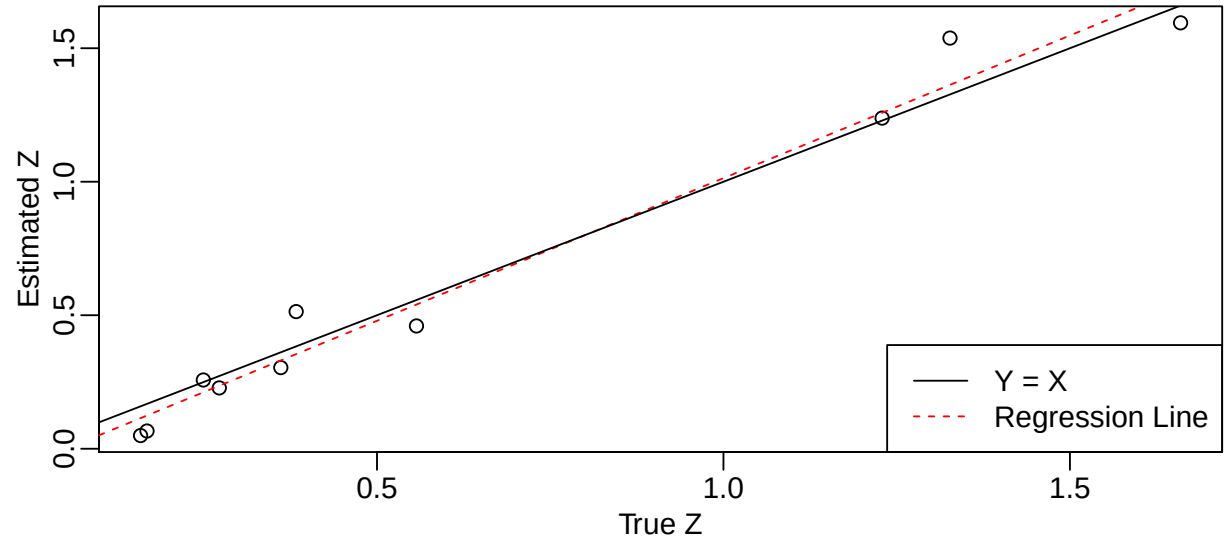


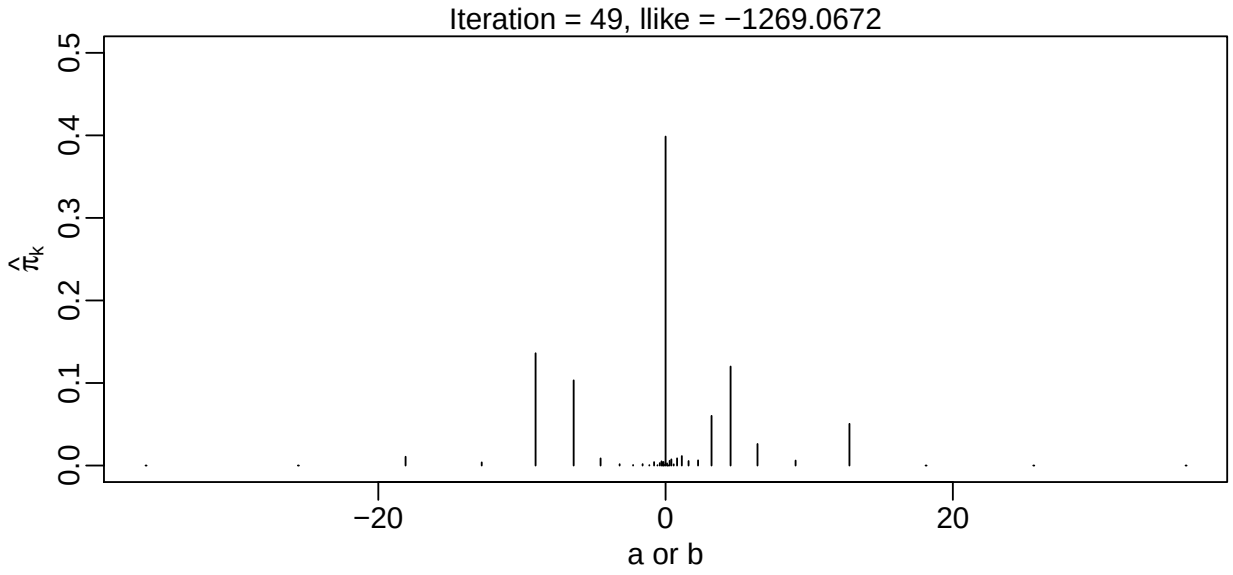

```
##  Iter = 48
## ldiff = 2.023e-05
## zdiff = 0.002639
```



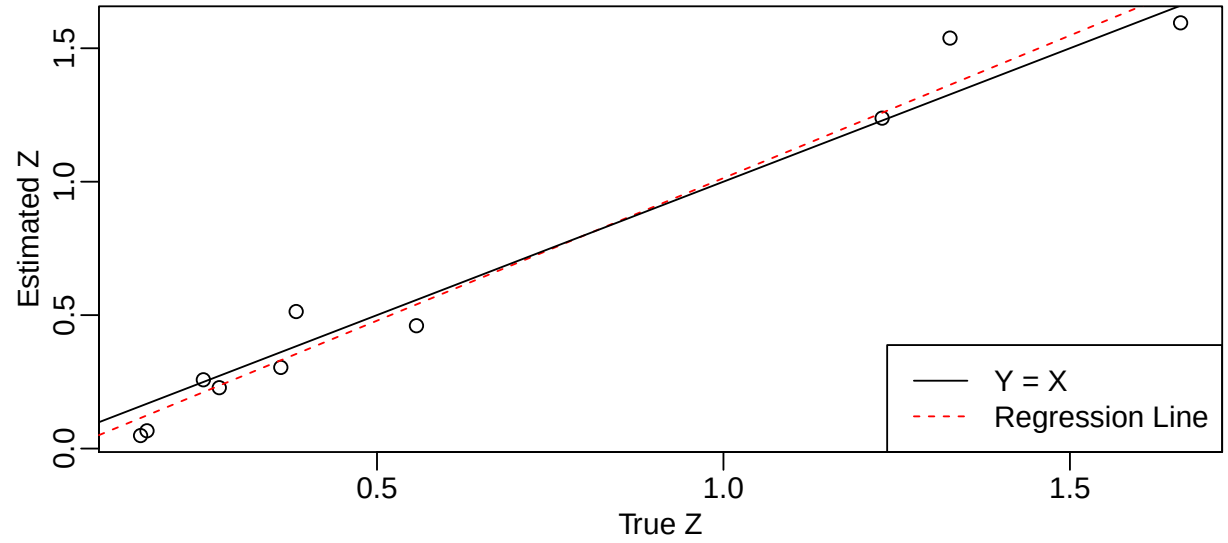


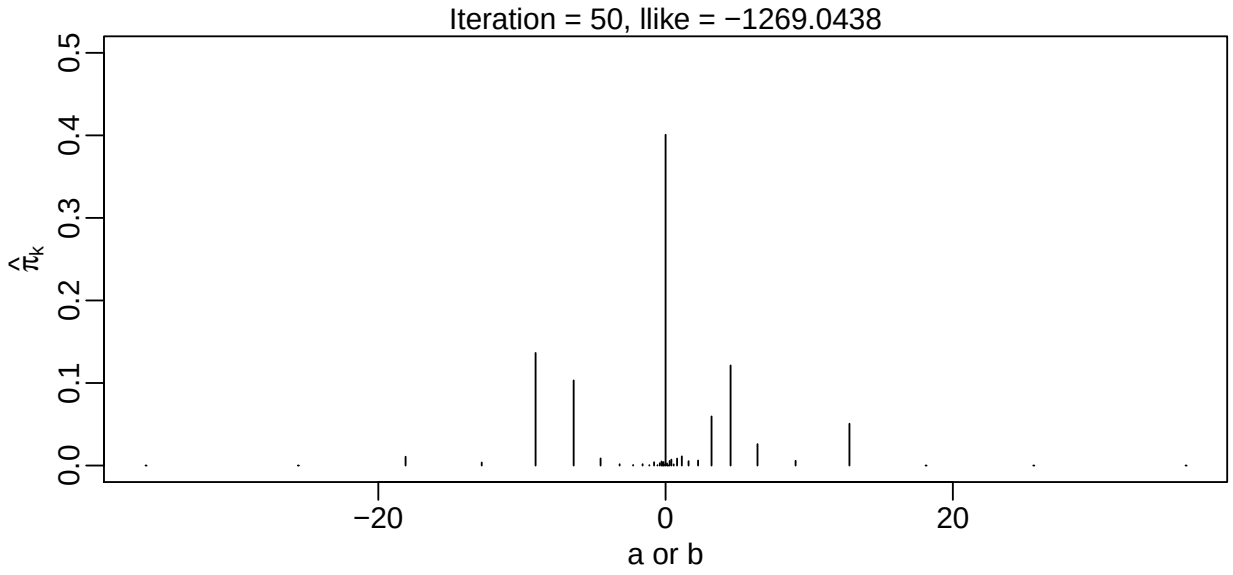

```
##  Iter = 49
## ldiff = 1.933e-05
## zdiff = 0.00254
```



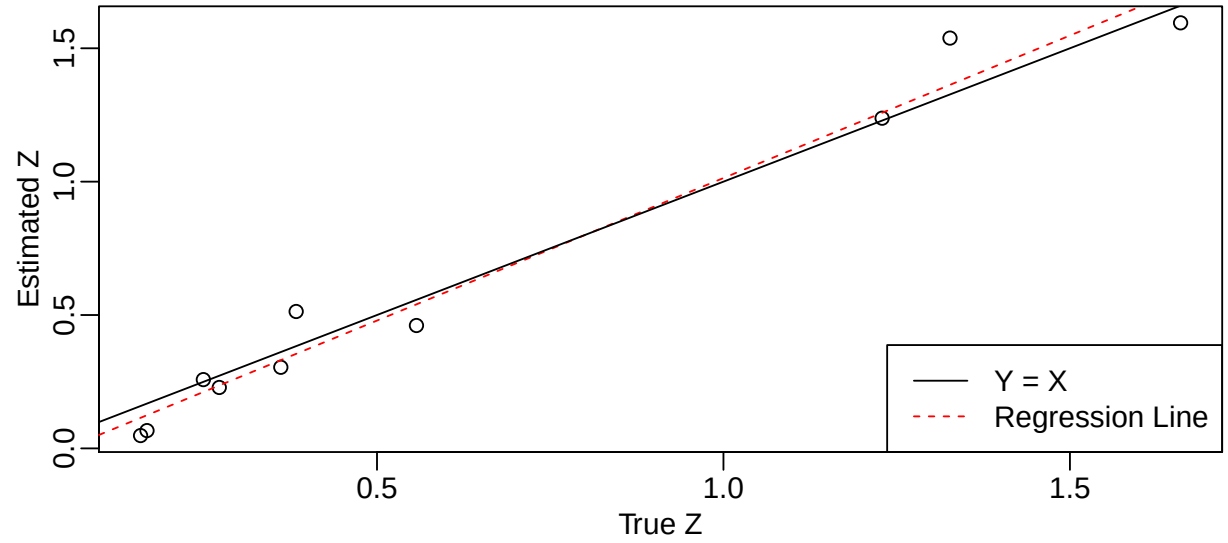


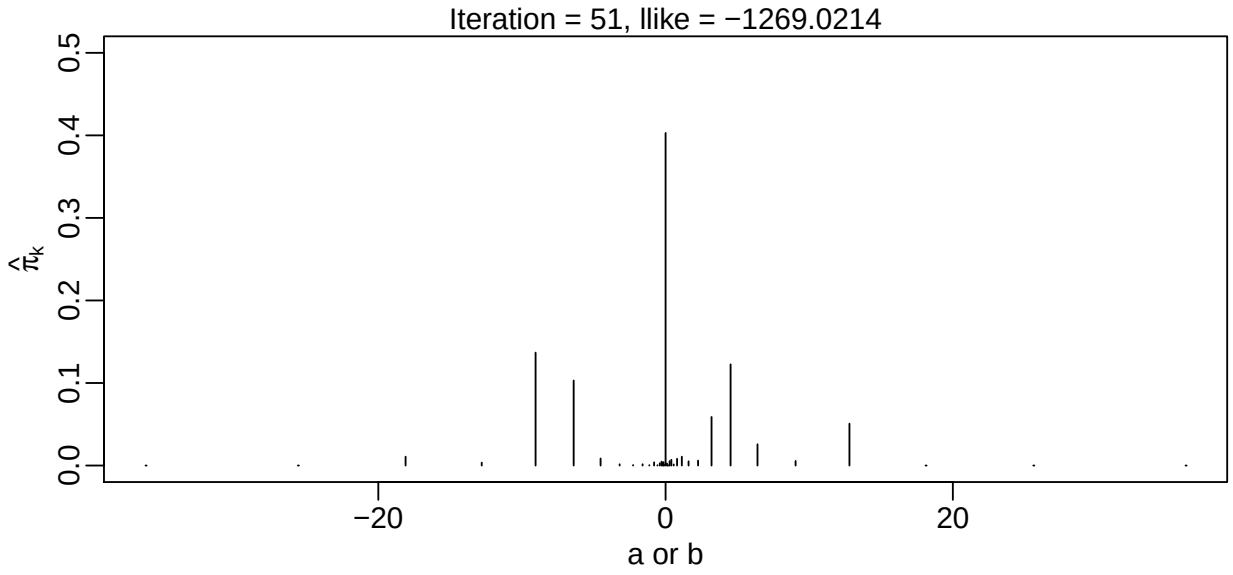

```
##  Iter = 50
## ldiff = 1.848e-05
## zdiff = 0.002446
```



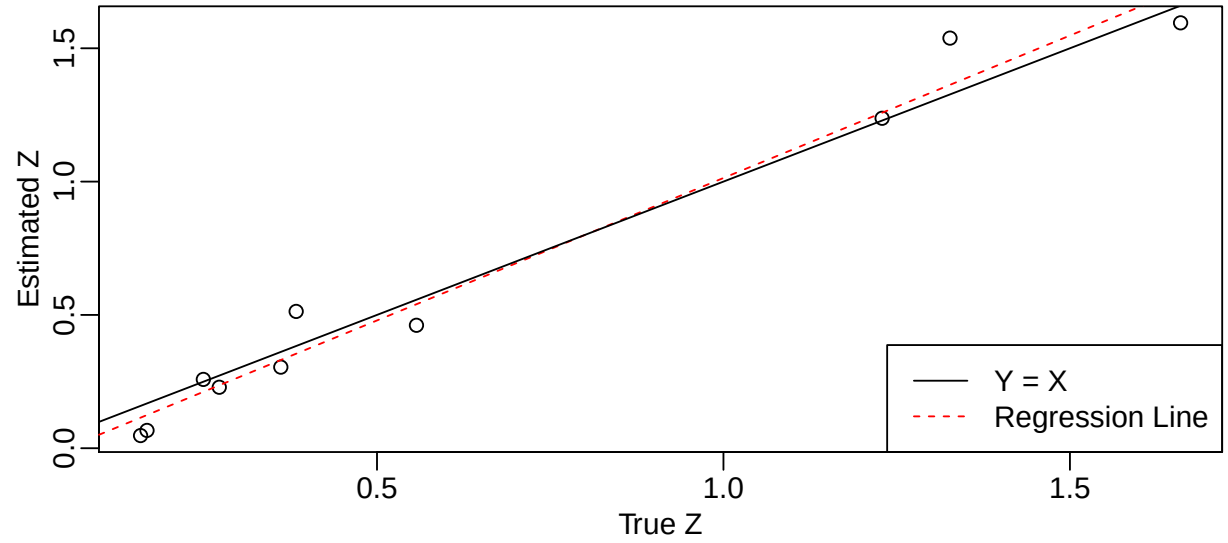


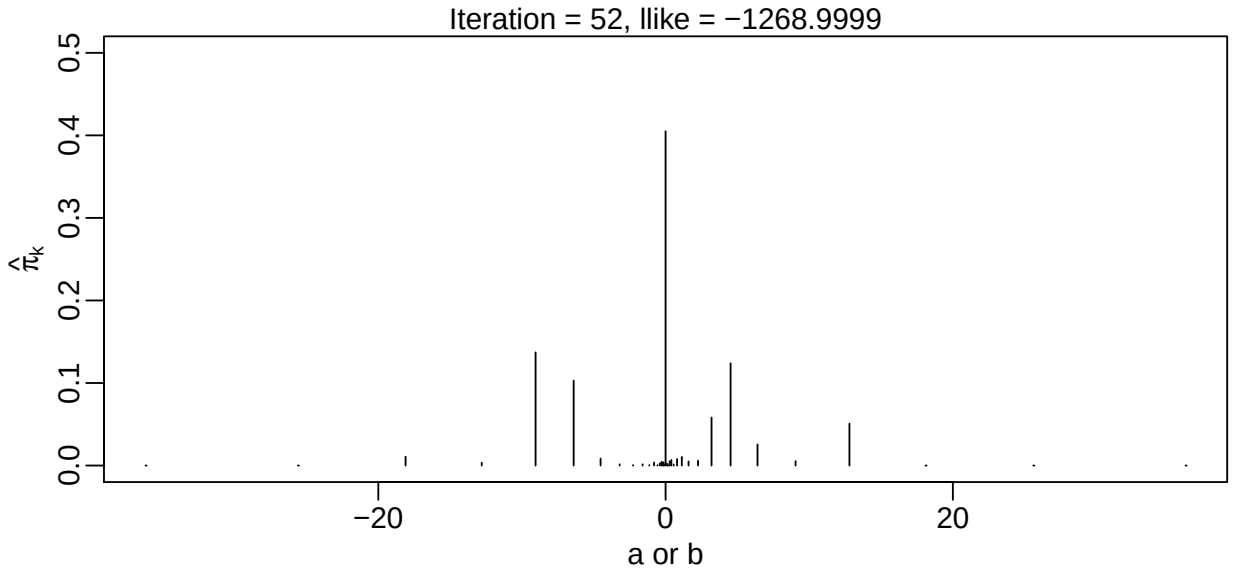

```
##  Iter = 51
## ldiff = 1.768e-05
## zdiff = 0.002355
```



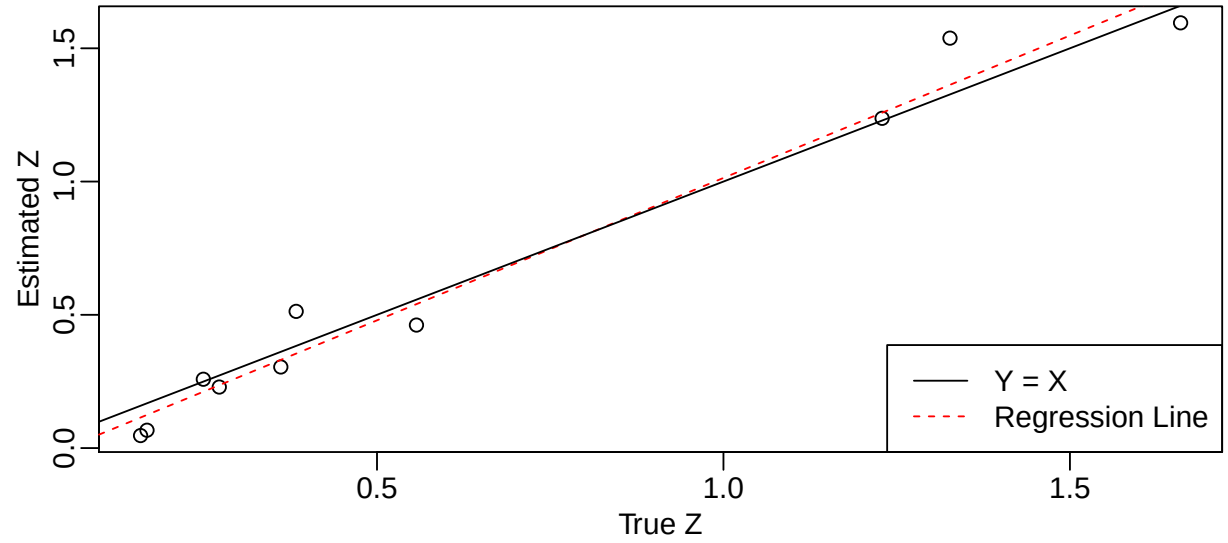


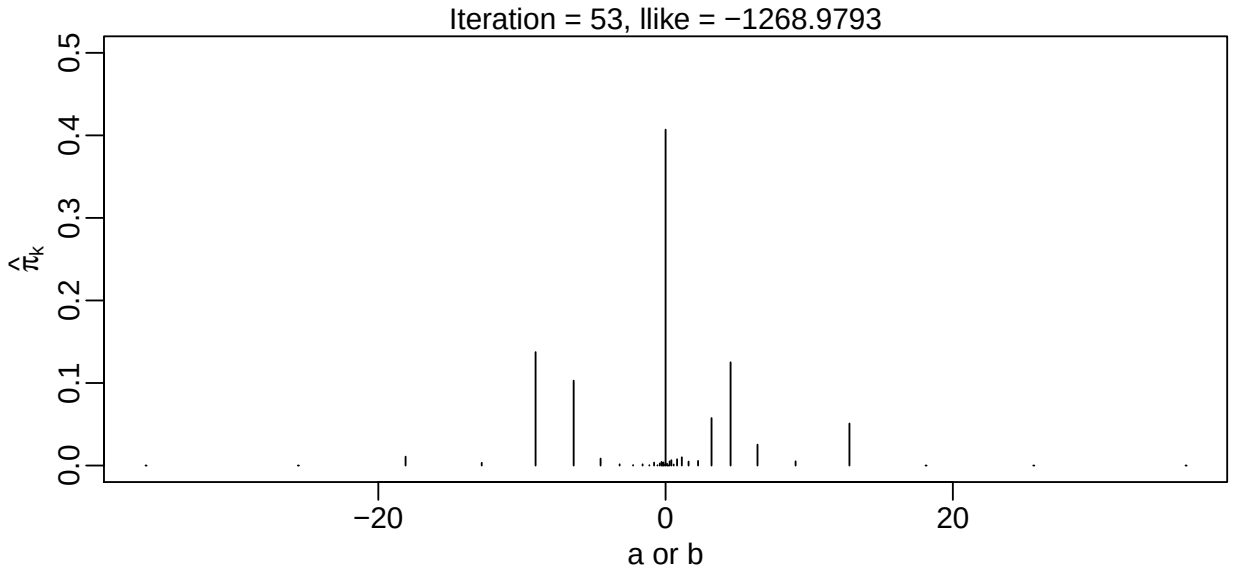

```
##  Iter = 52
## ldiff = 1.693e-05
## zdiff = 0.002269
```



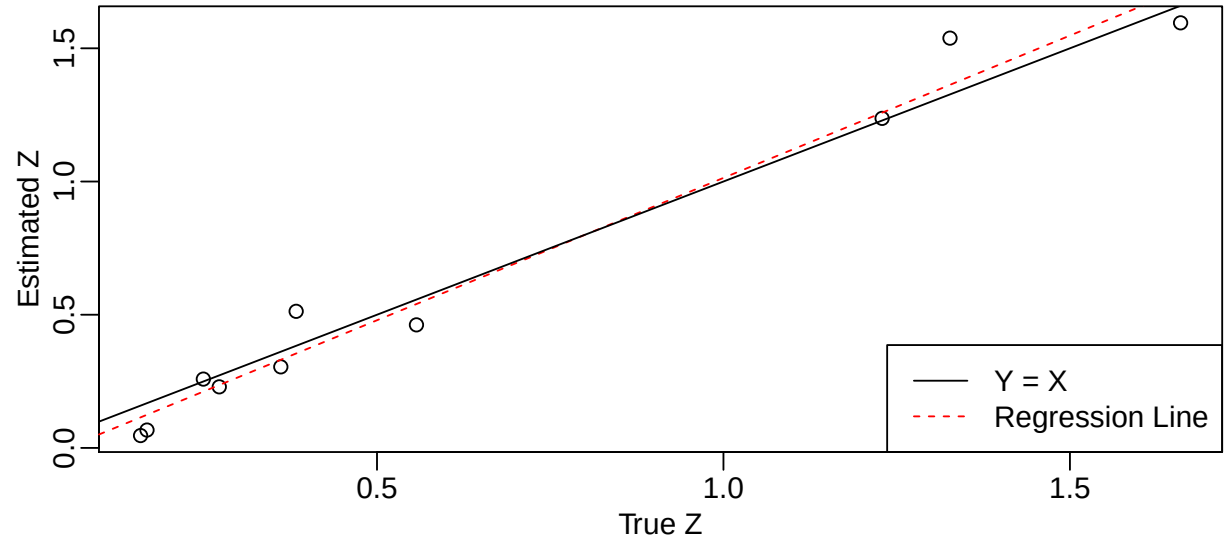


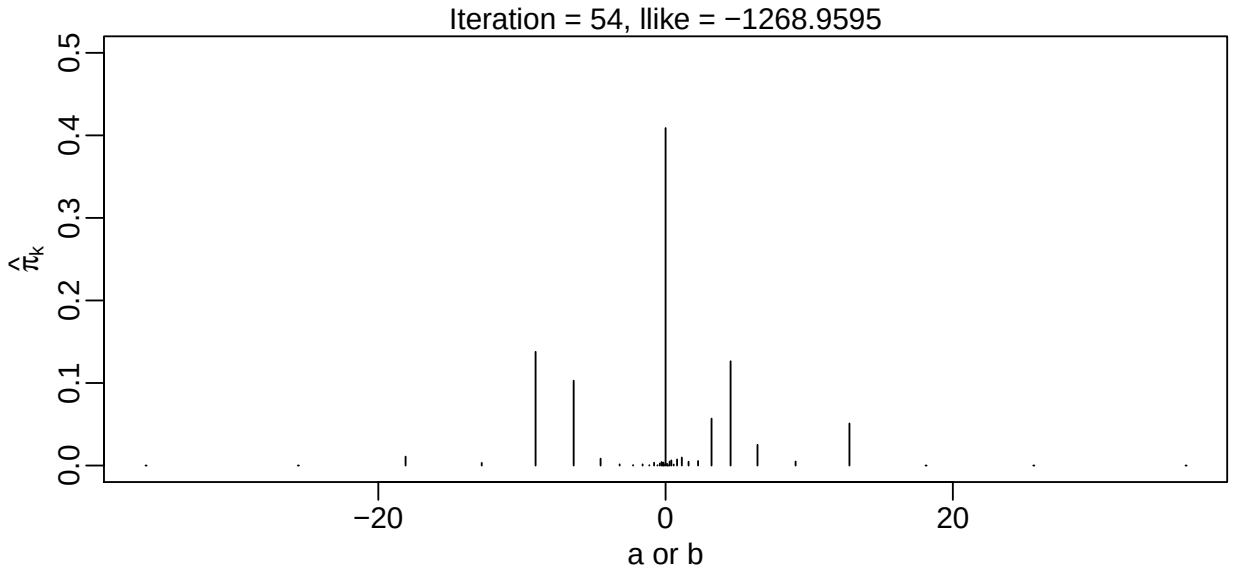

```
##  Iter = 53
## ldiff = 1.622e-05
## zdiff = 0.002187
```



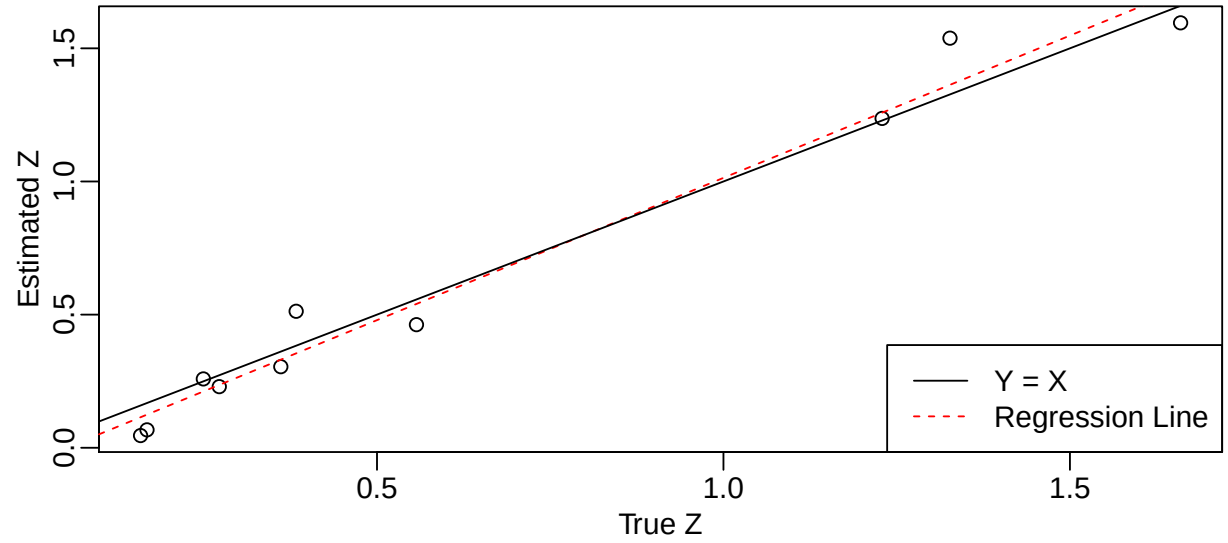


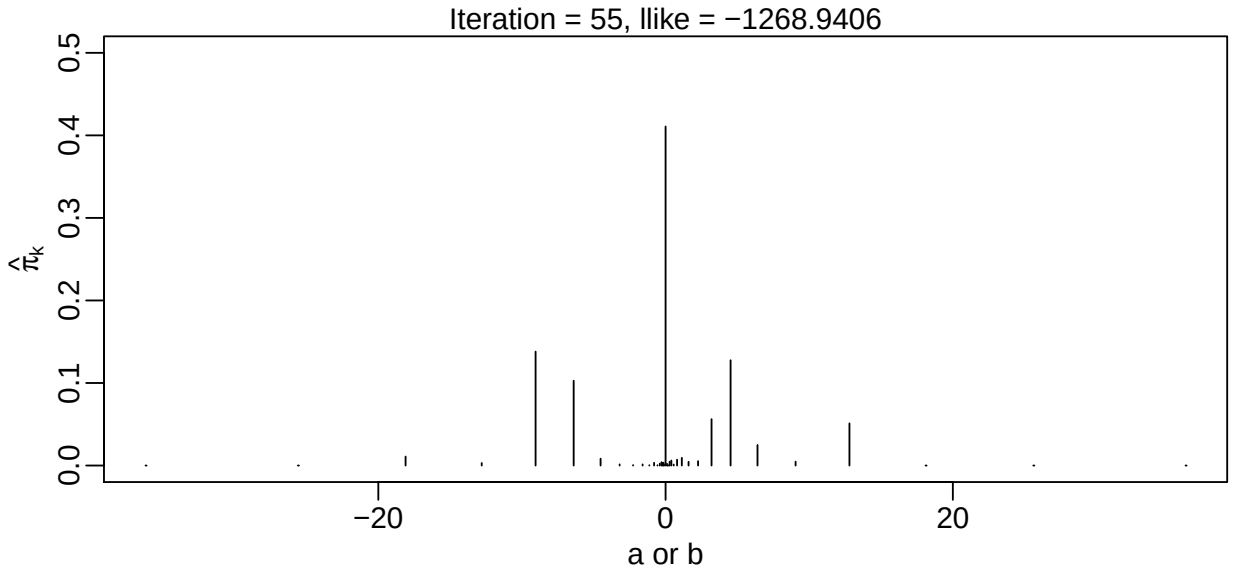

```
##  Iter = 54
## ldiff = 1.556e-05
## zdiff = 0.002108
```



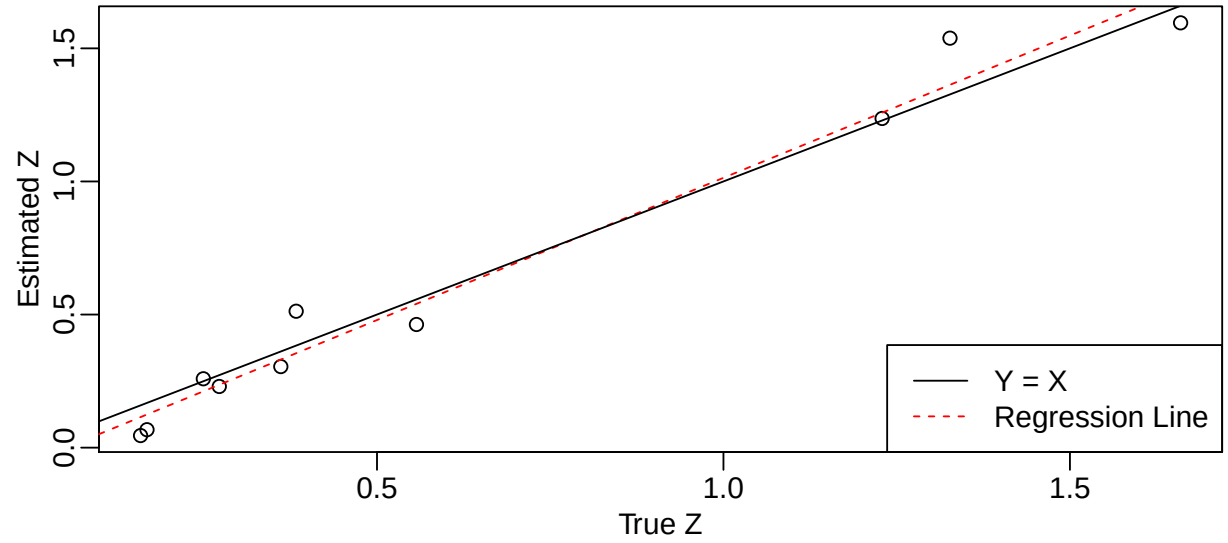


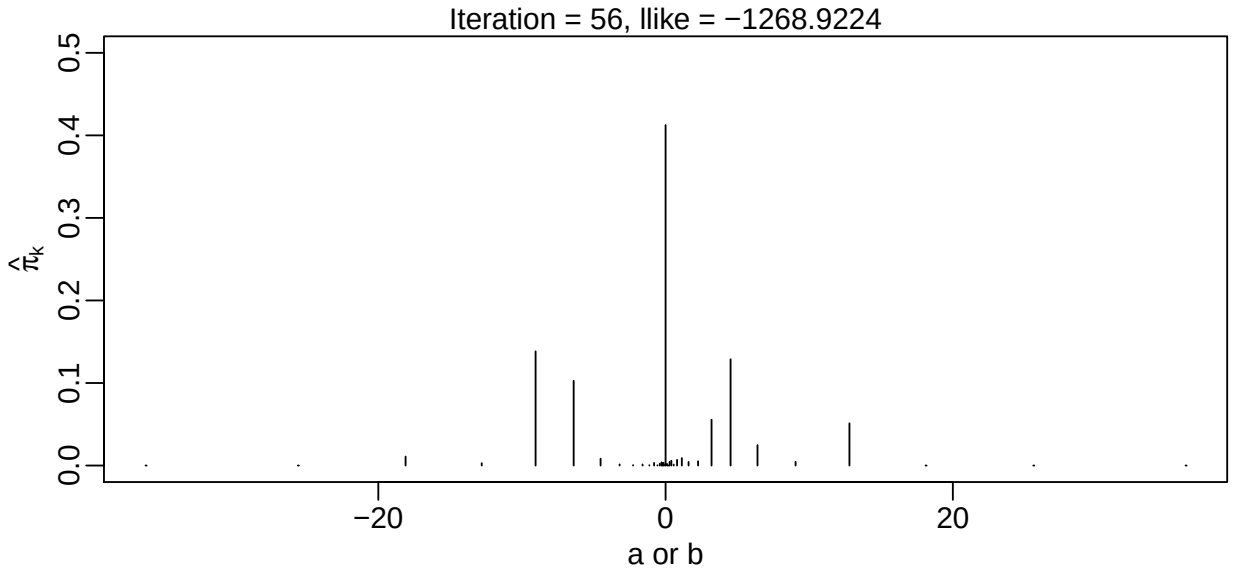

```
##  Iter = 55
## ldiff = 1.493e-05
## zdiff = 0.002032
```



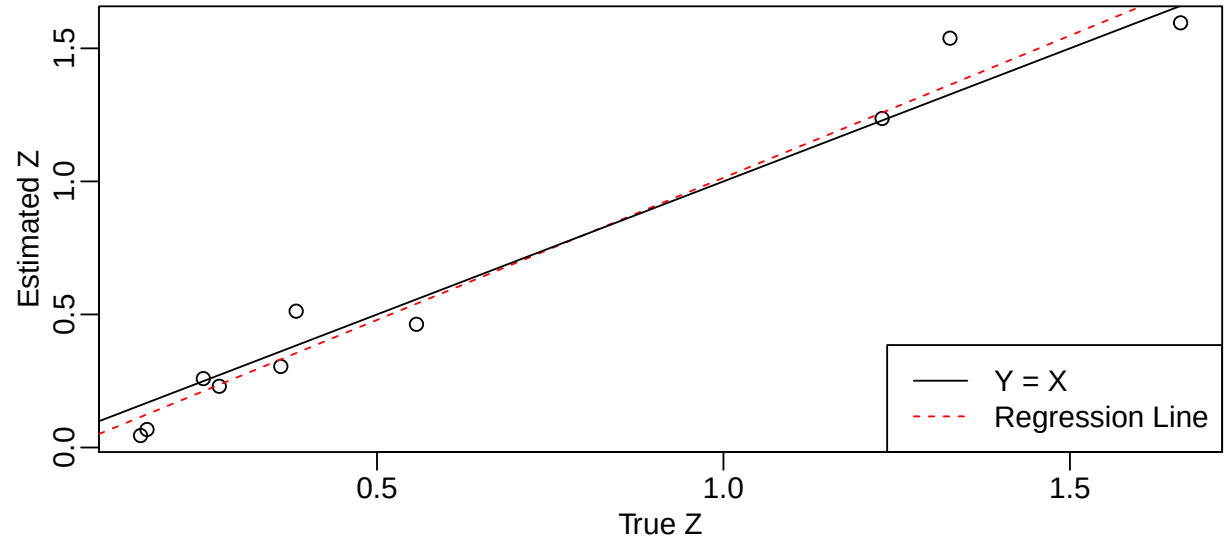


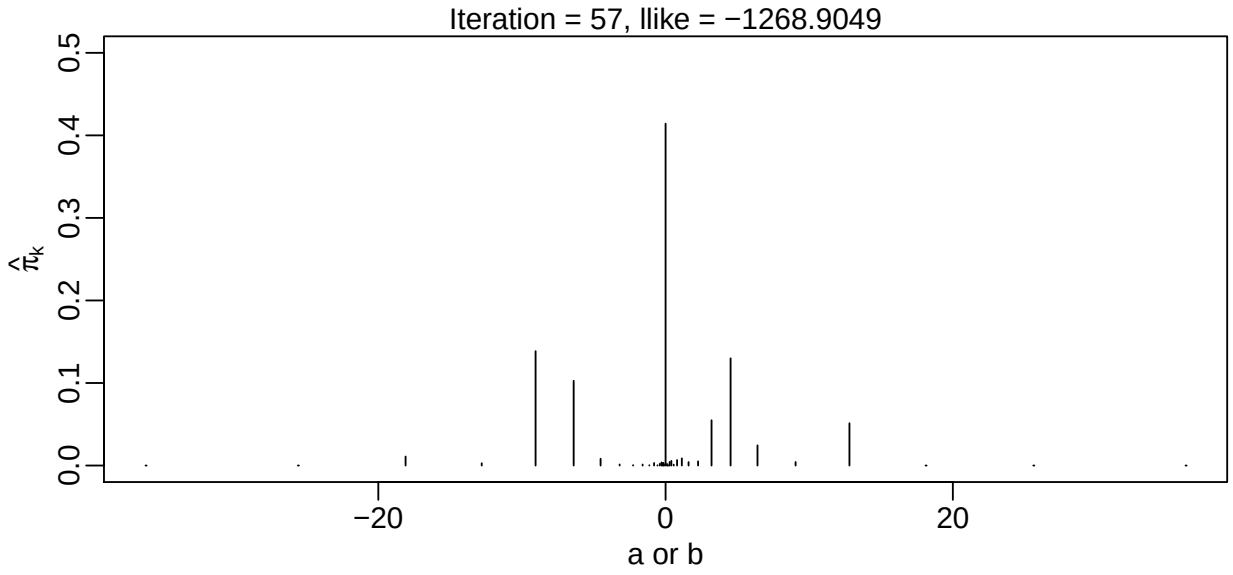

```
##  Iter = 56
## ldiff = 1.433e-05
## zdiff = 0.00196
```



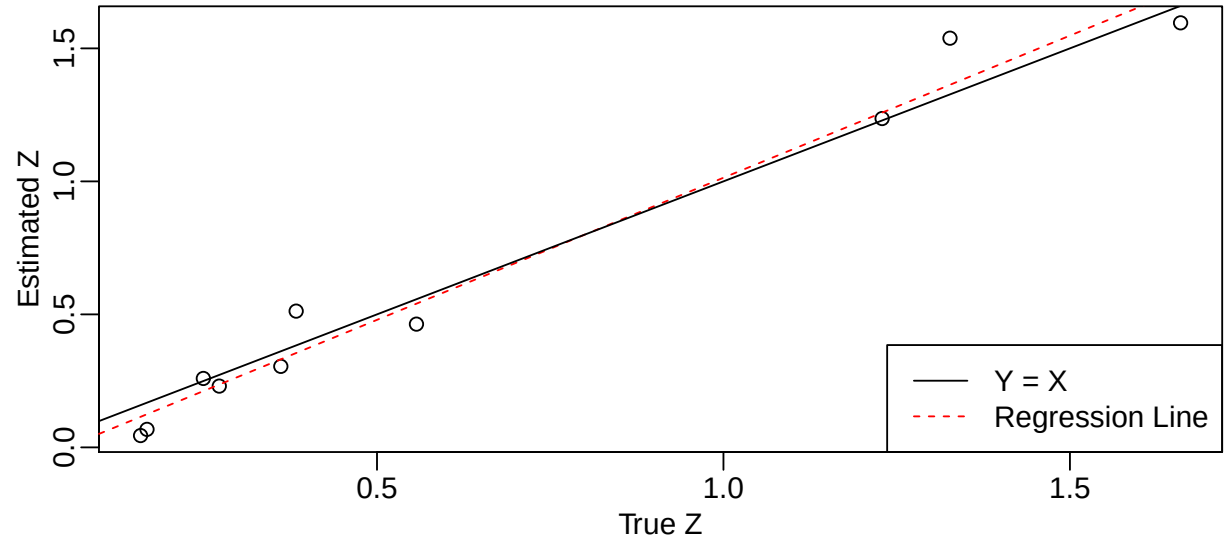


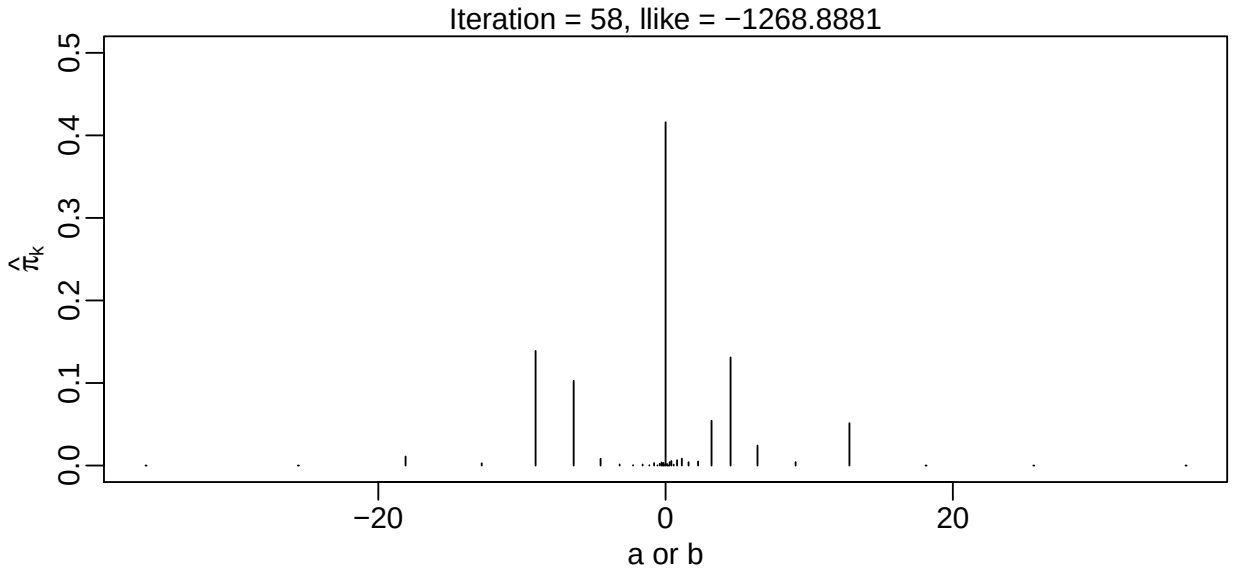

```
##  Iter = 57
## ldiff = 1.377e-05
## zdiff = 0.001891
```



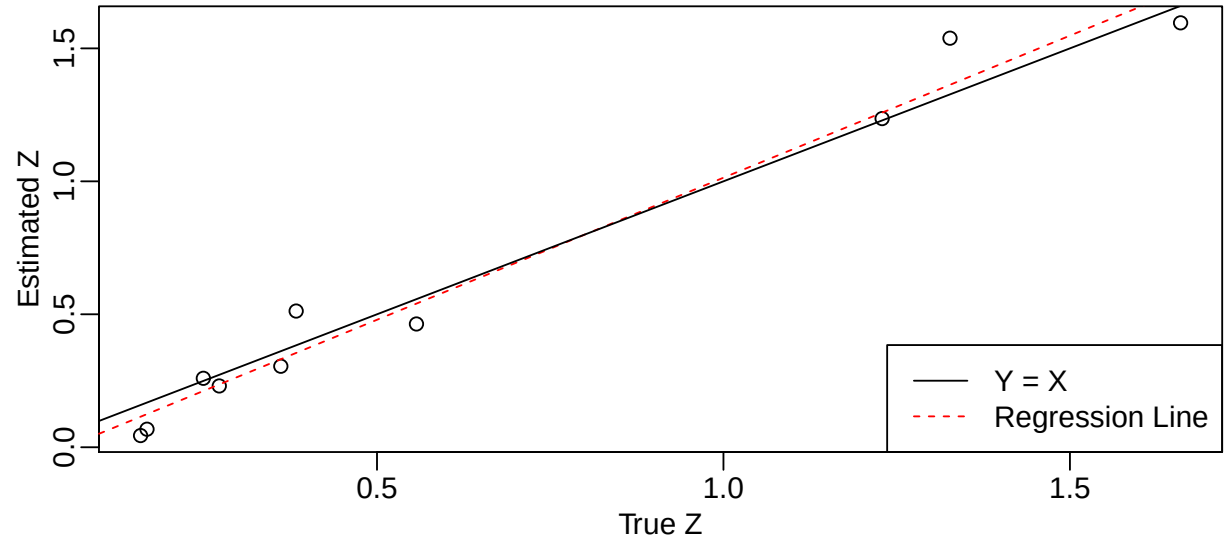


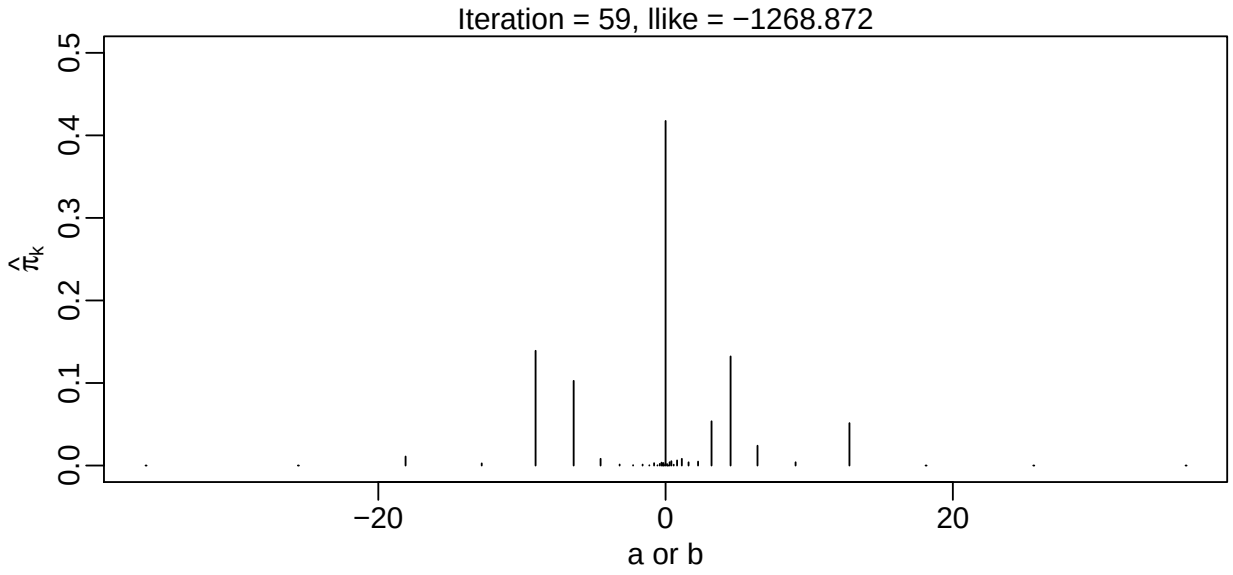

```
##  Iter = 58
## ldiff = 1.324e-05
## zdiff = 0.001825
```



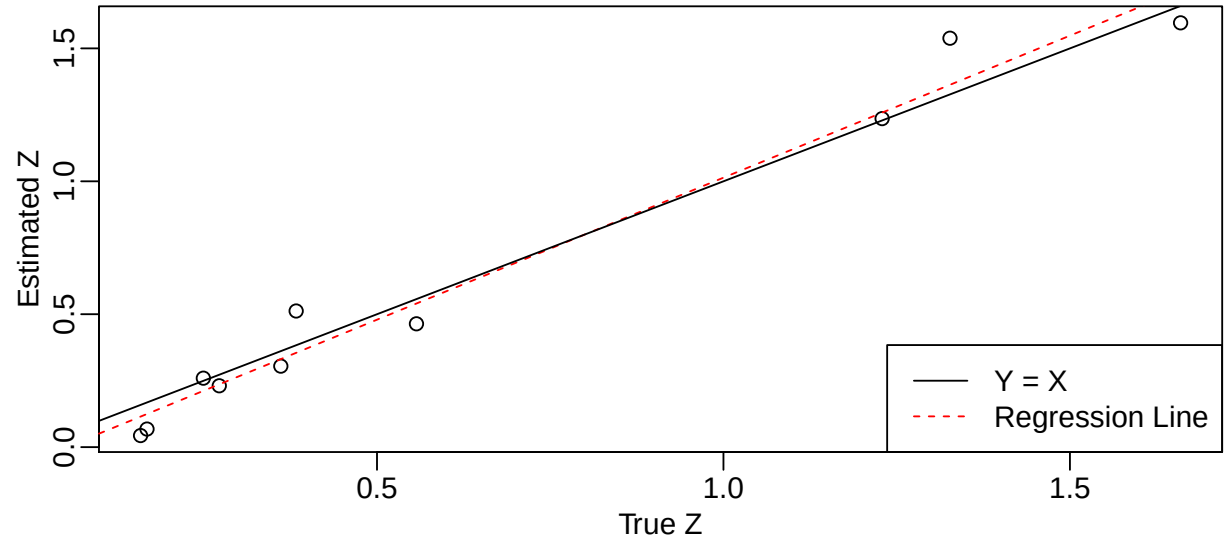


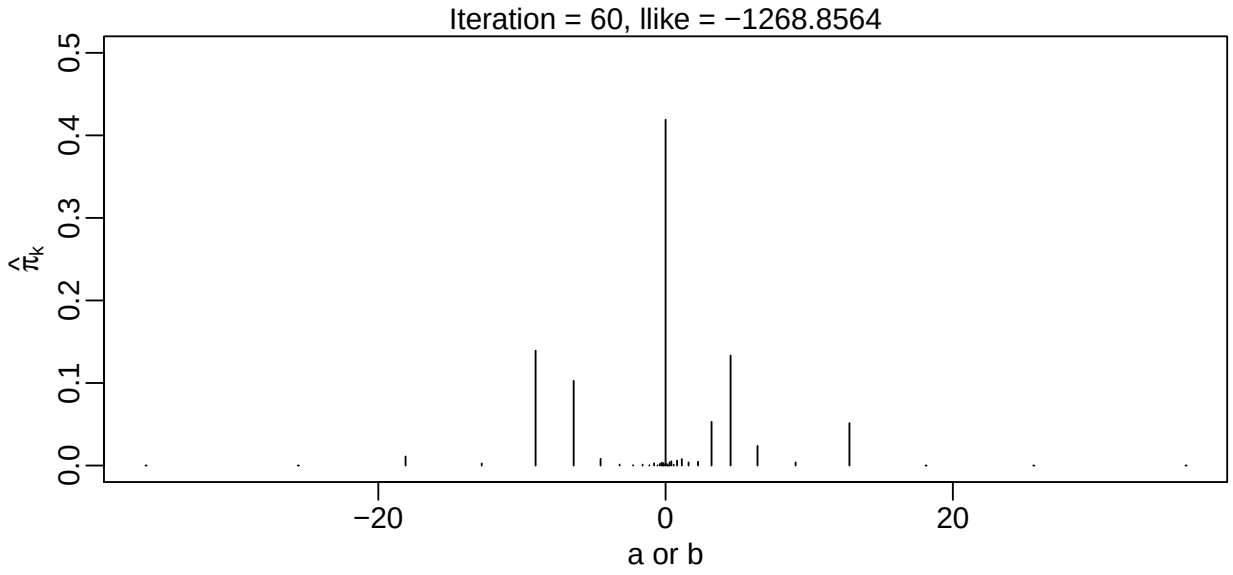

```
##  Iter = 59
## ldiff = 1.273e-05
## zdiff = 0.001762
```



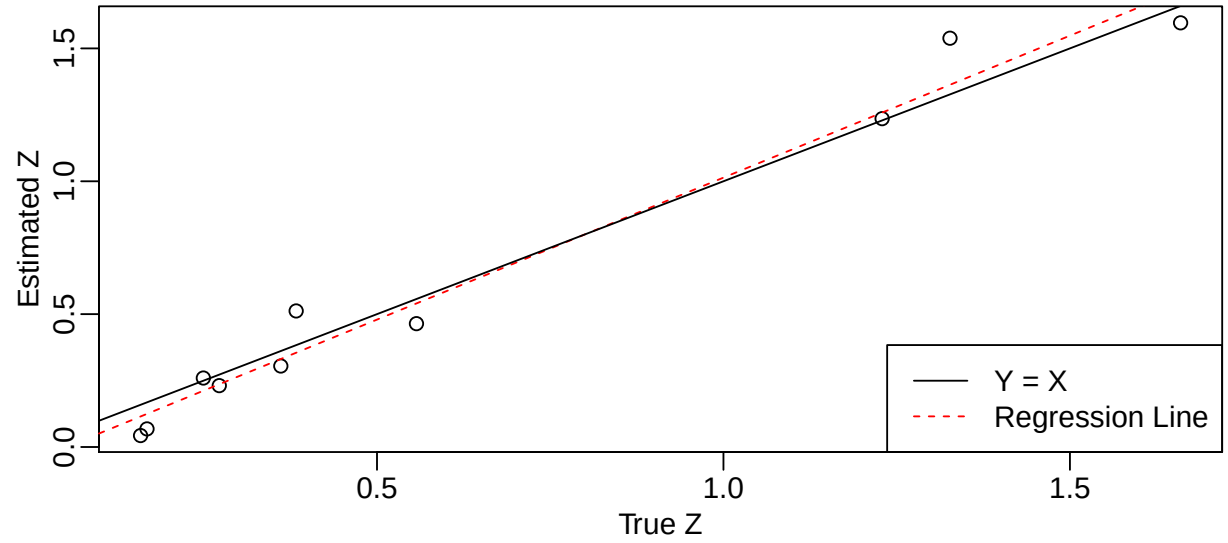


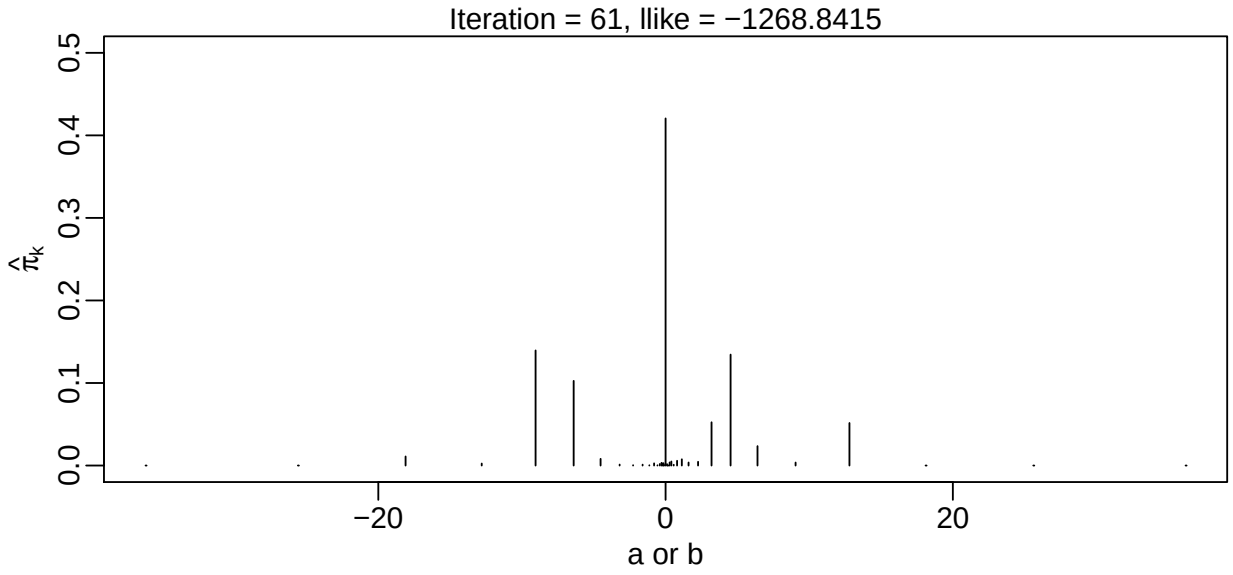

```
##  Iter = 60
## ldiff = 1.225e-05
## zdiff = 0.001702
```



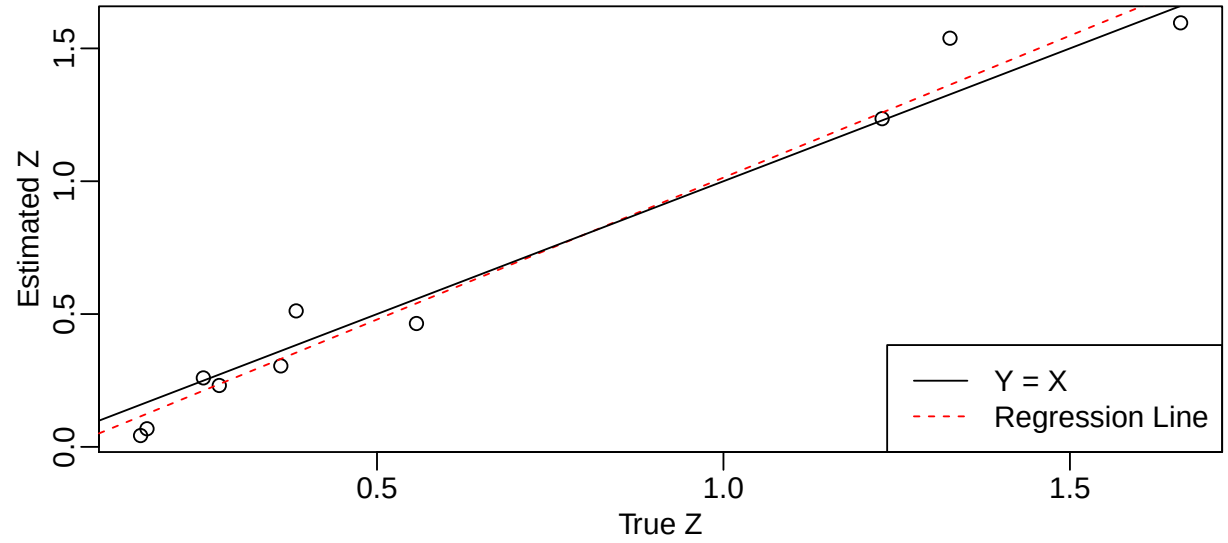


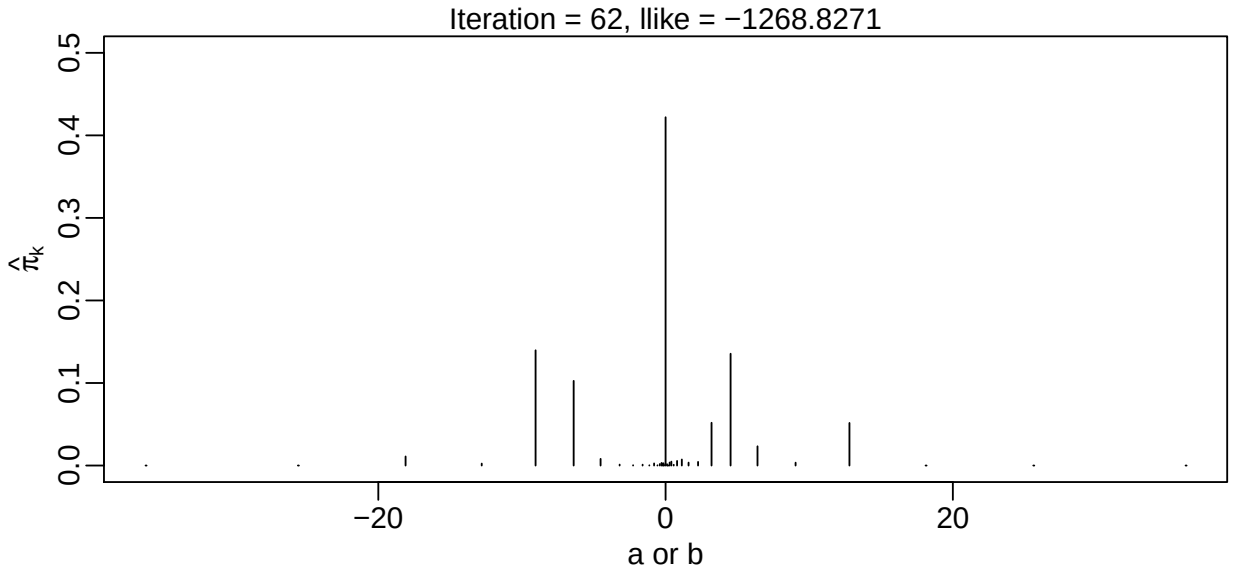

```
##  Iter = 61
## ldiff = 1.18e-05
## zdiff = 0.001645
```



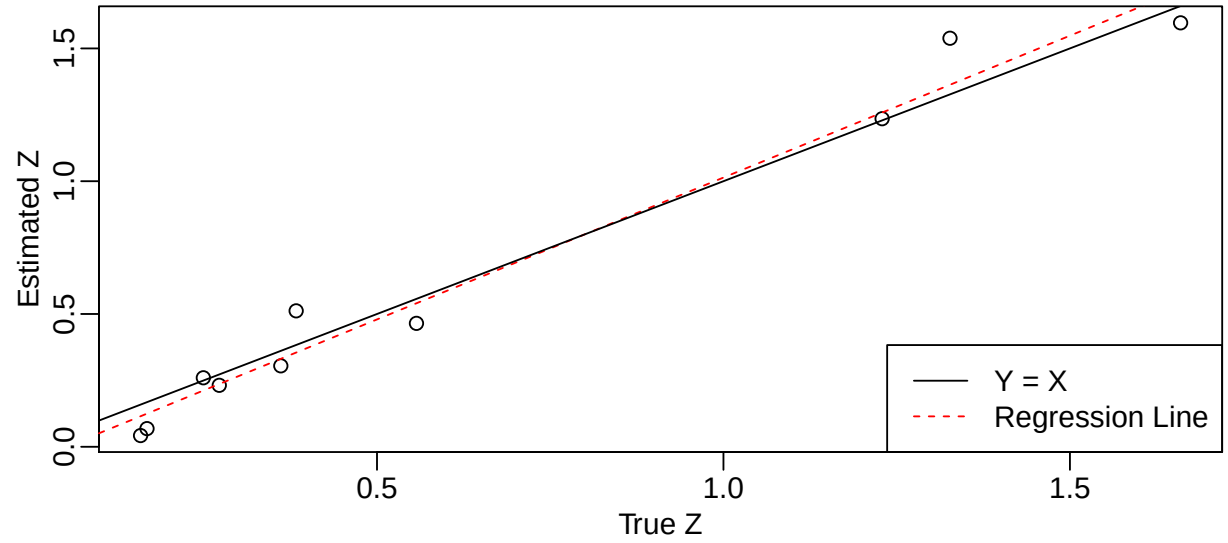


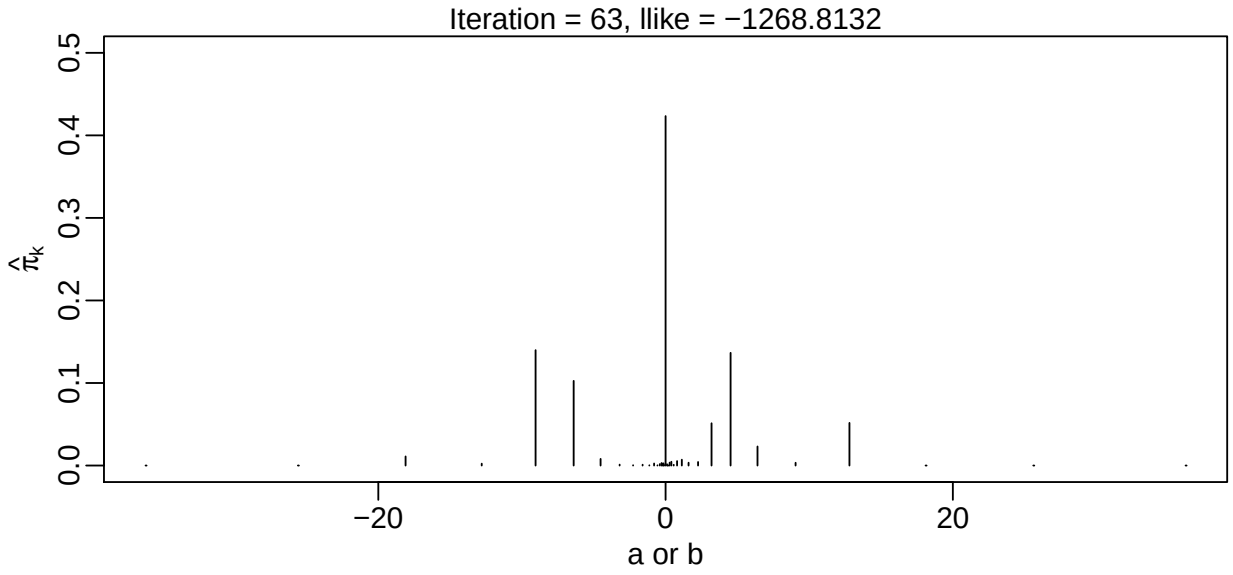

```
##  Iter = 62
## ldiff = 1.136e-05
## zdiff = 0.00159
```



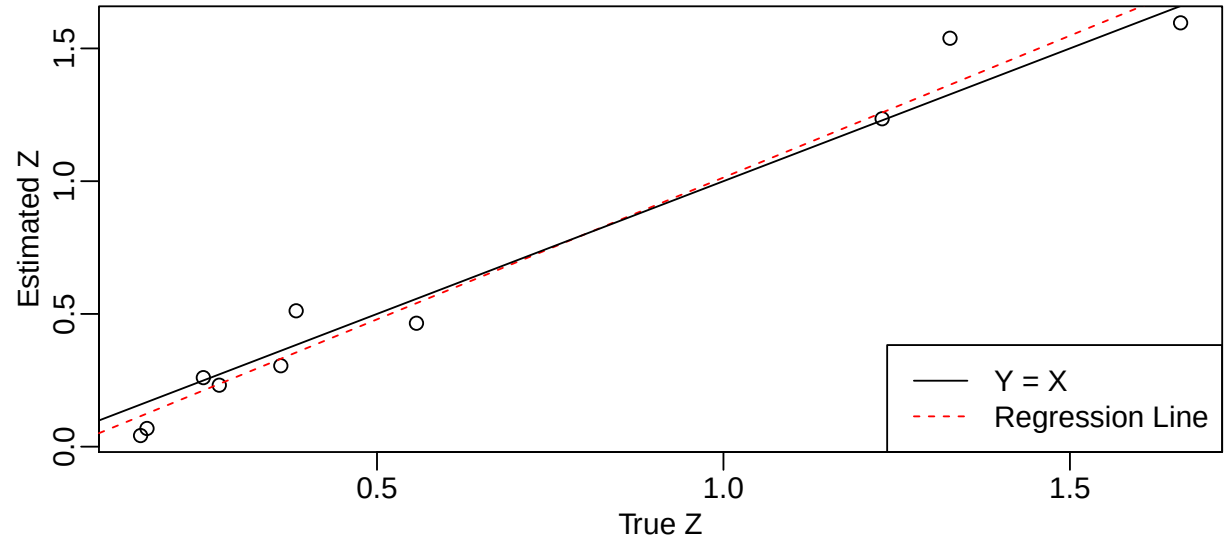


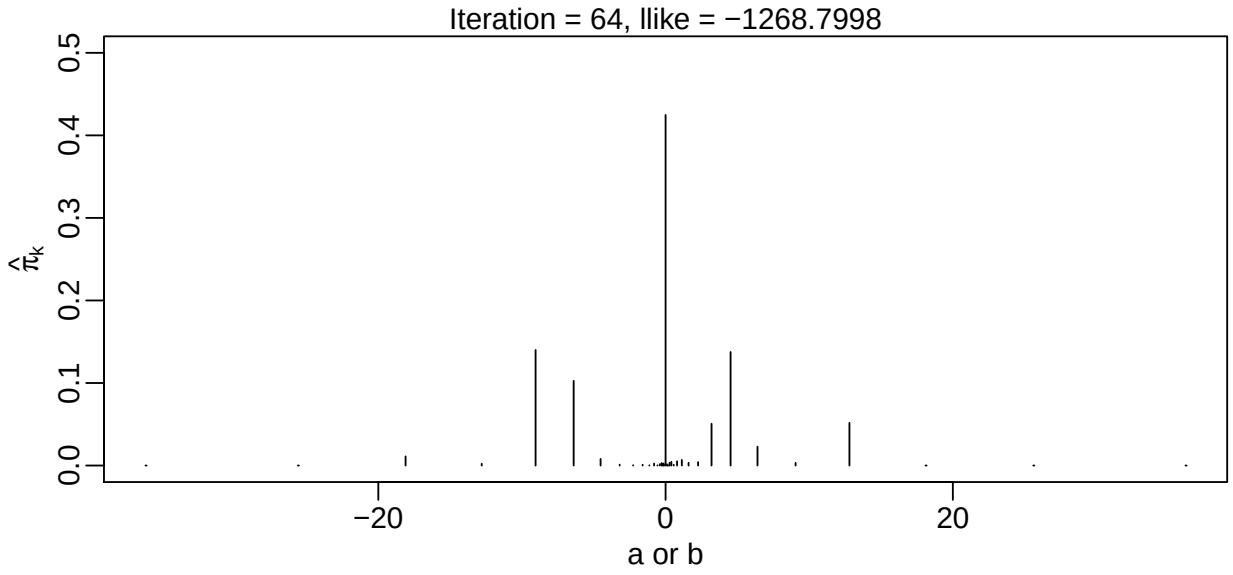

```
##  Iter = 63
## ldiff = 1.095e-05
## zdiff = 0.001537
```



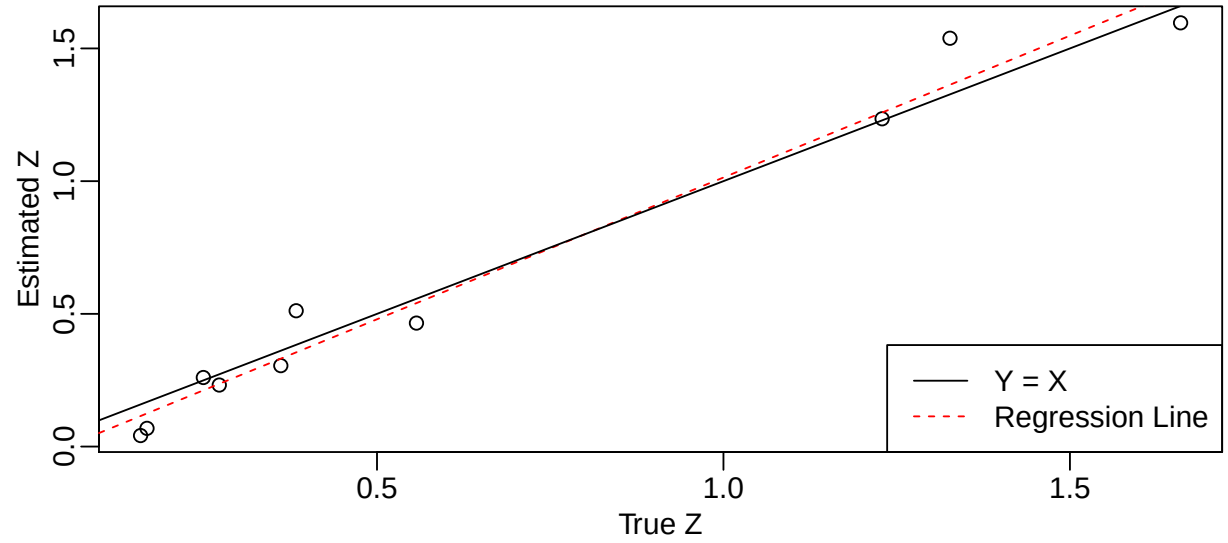


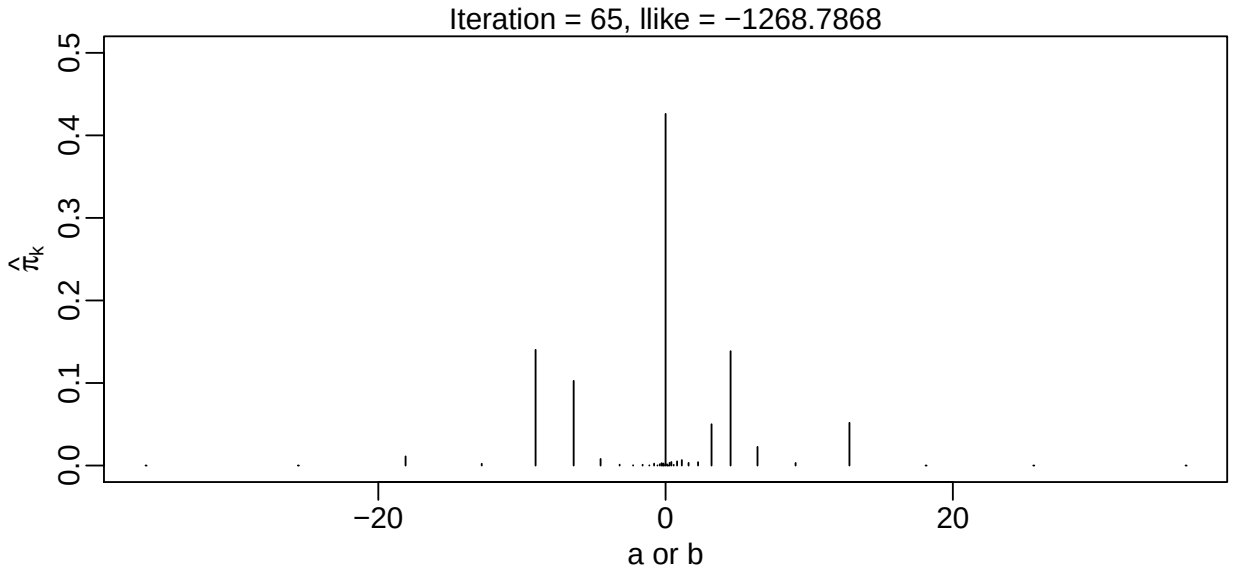

```
##  Iter = 64
## ldiff = 1.056e-05
## zdiff = 0.001487
```



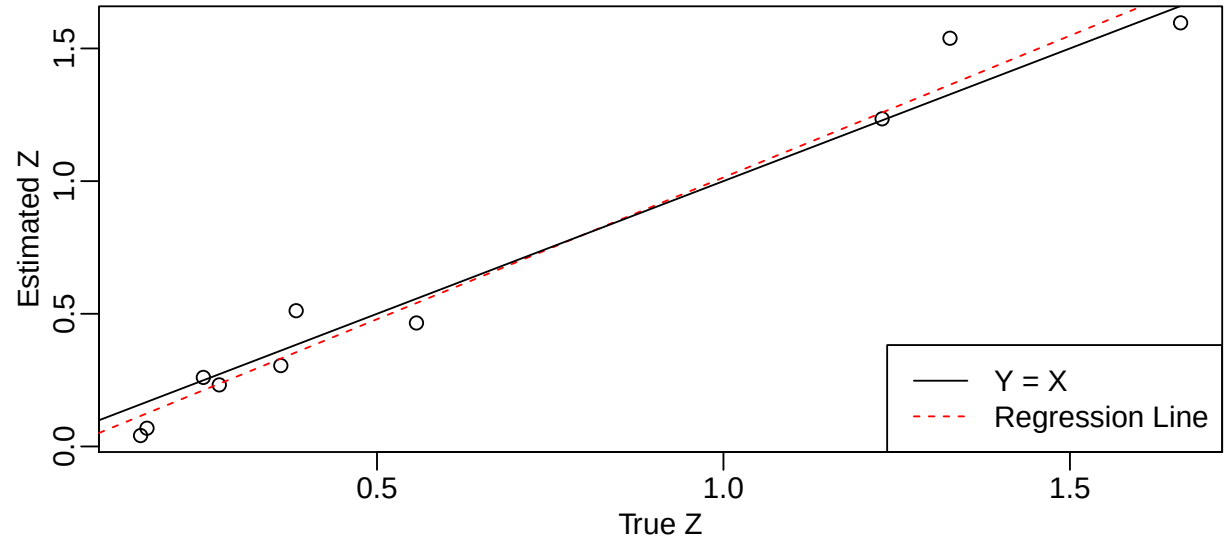


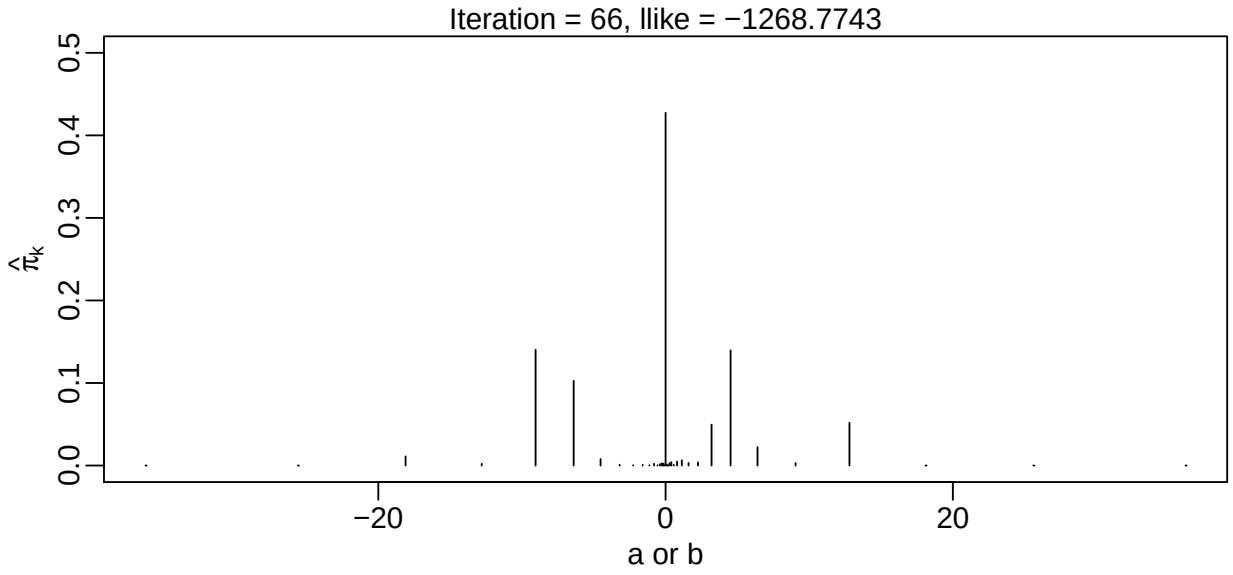

```
##  Iter = 65
## ldiff = 1.019e-05
## zdiff = 0.001439
```



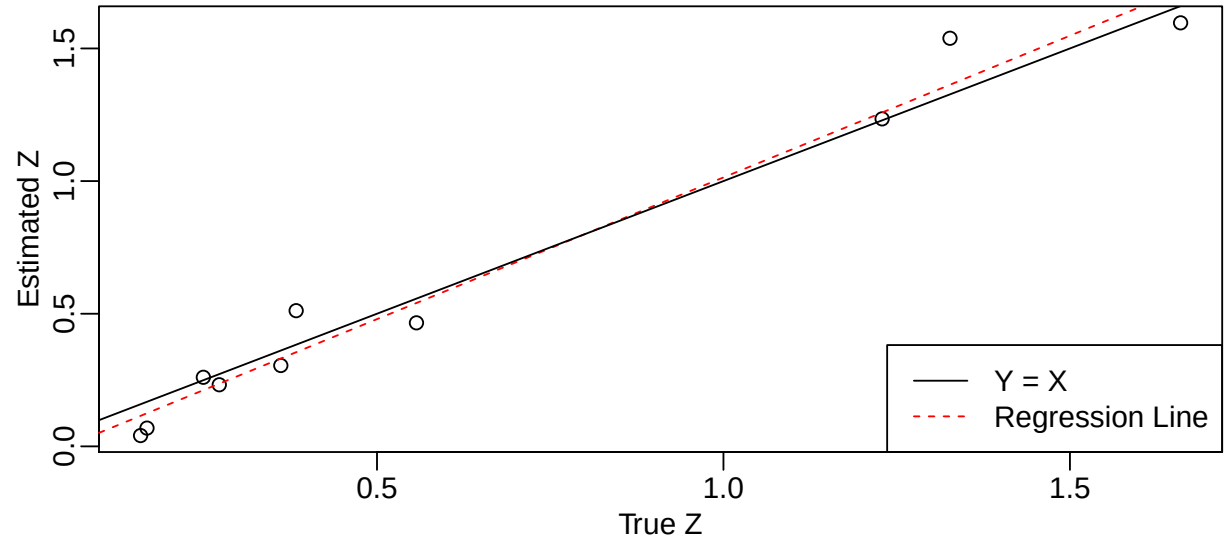


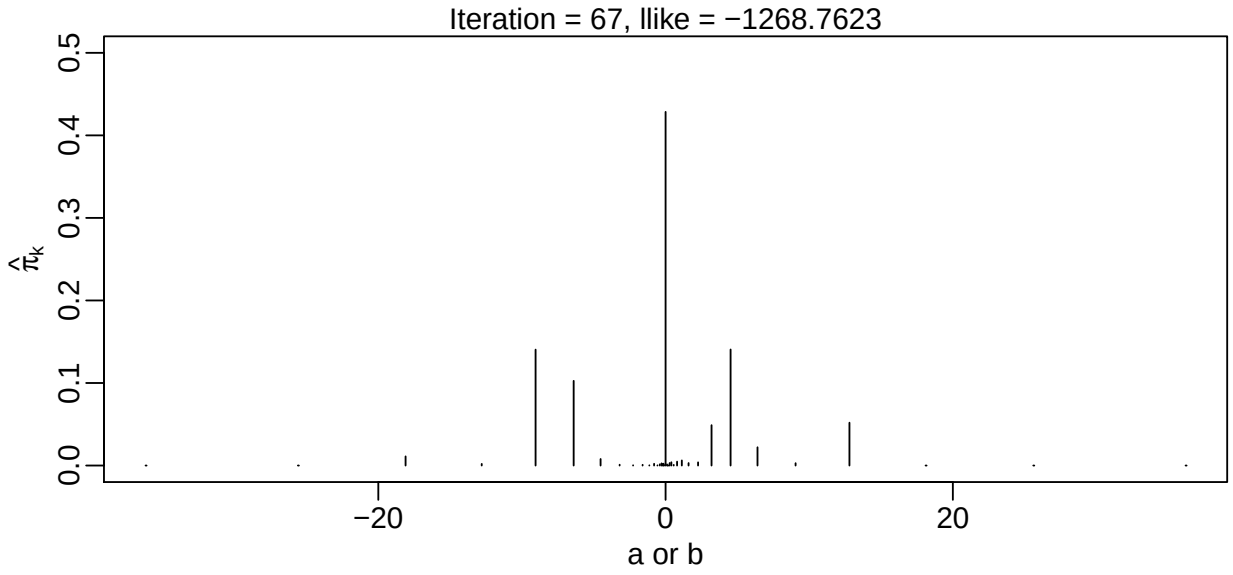

```
##  Iter = 66
## ldiff = 9.835e-06
## zdiff = 0.001393
```



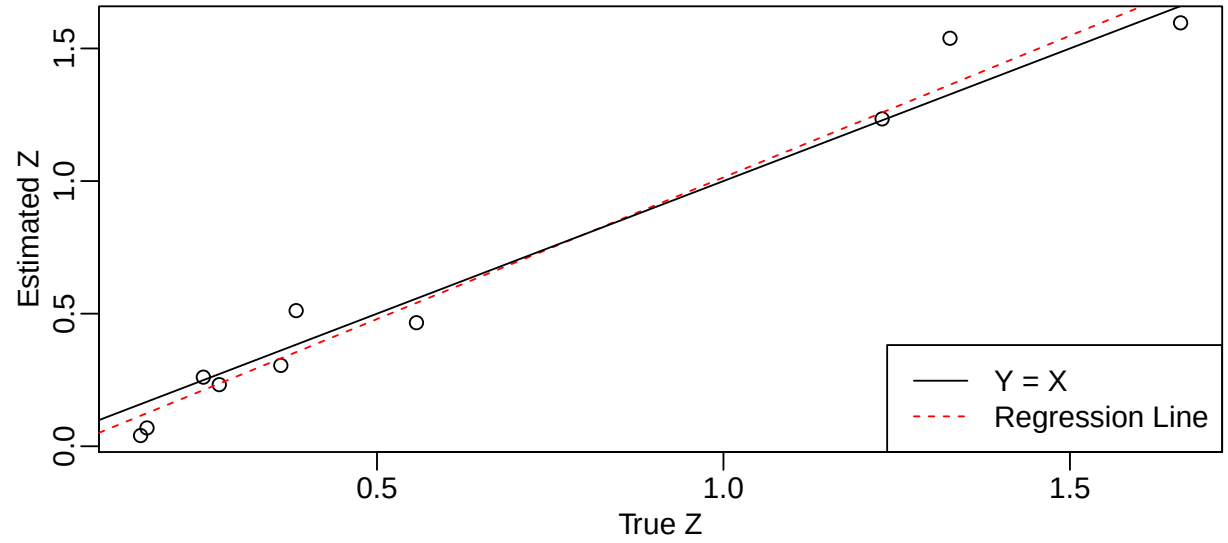


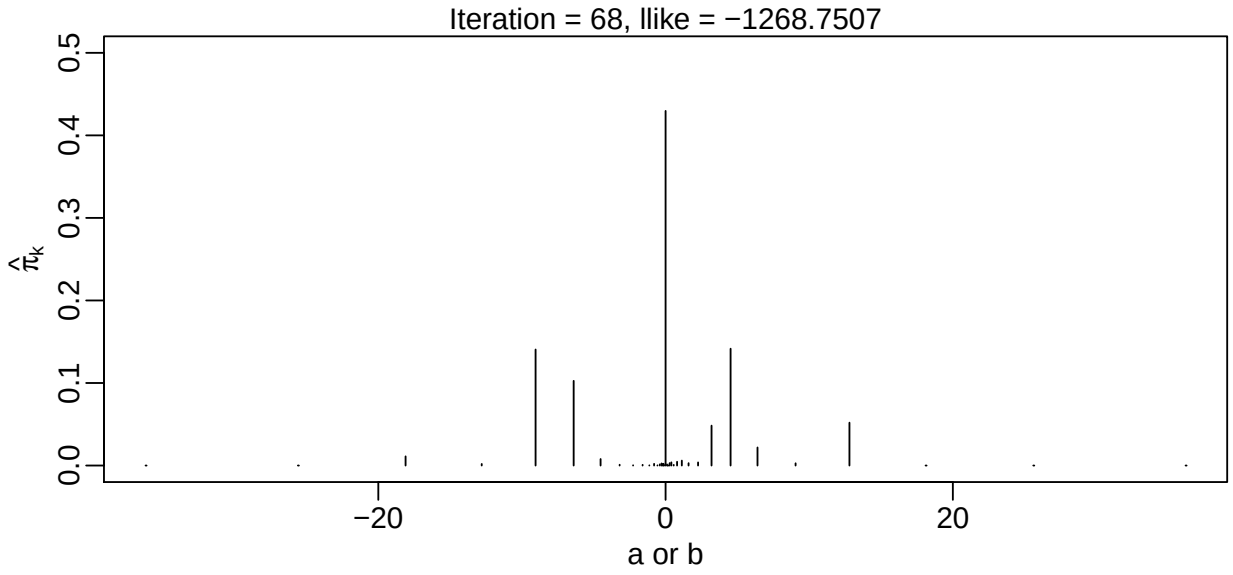

```
##  Iter = 67
## ldiff = 9.497e-06
## zdiff = 0.001349
```



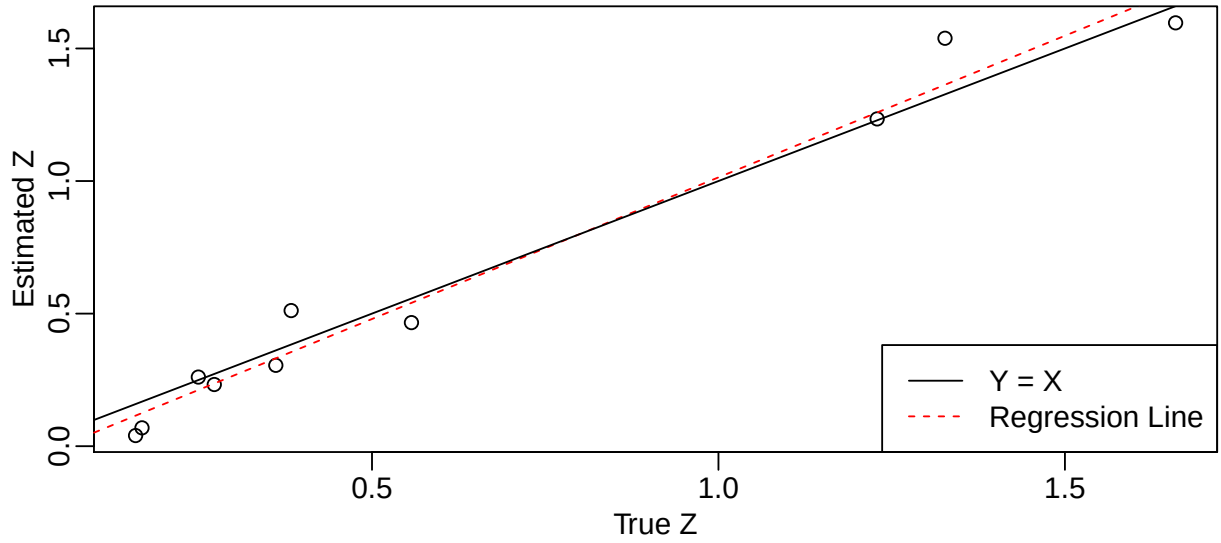


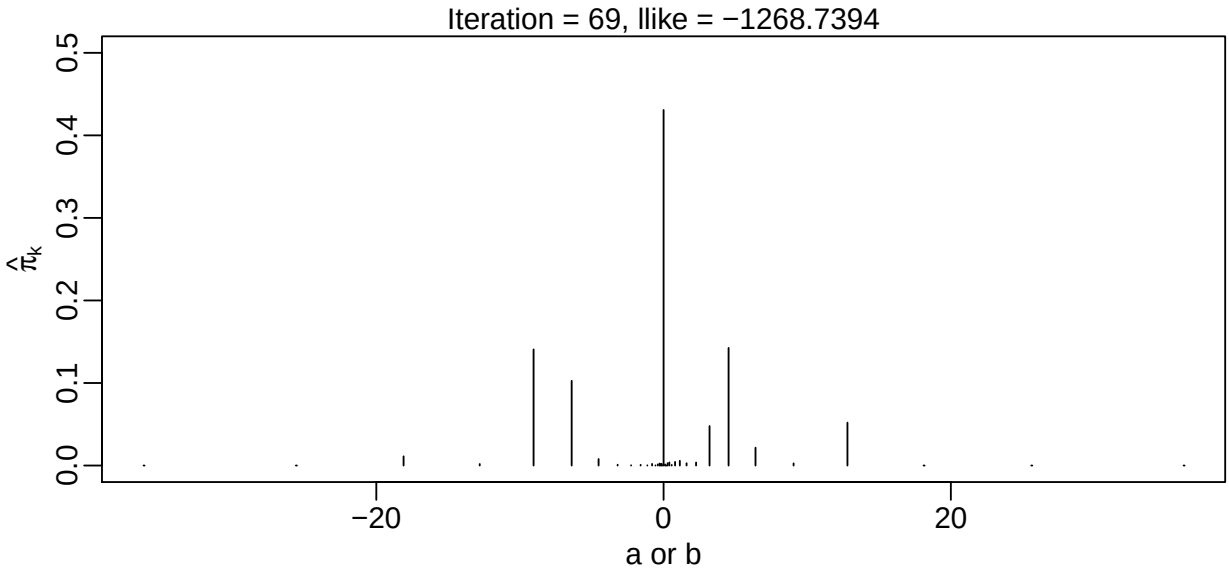

```
##  Iter = 68
## ldiff = 9.174e-06
## zdiff = 0.001306
```



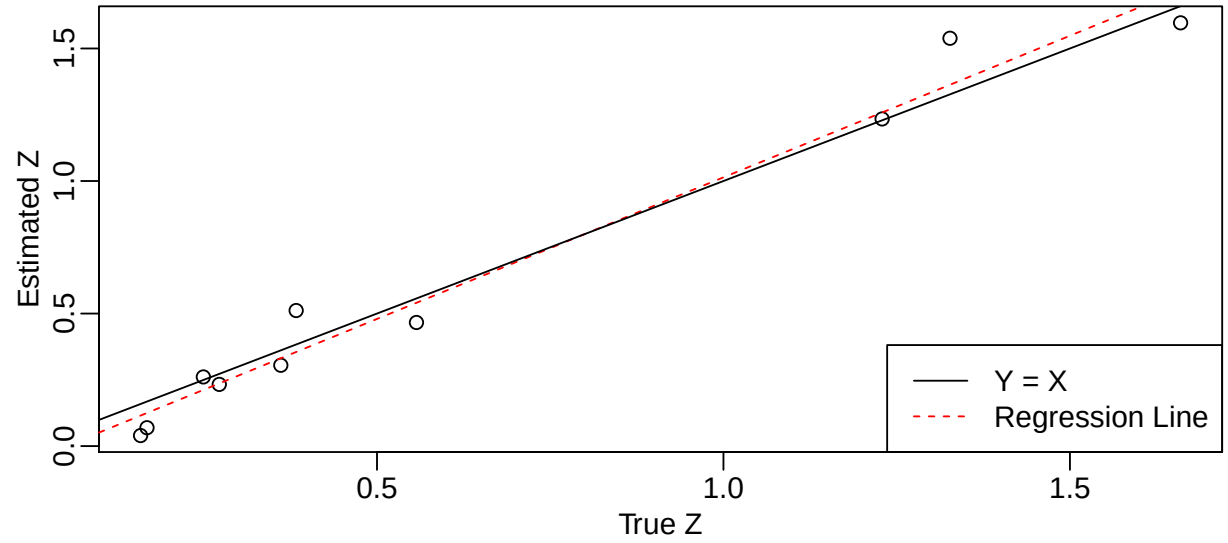


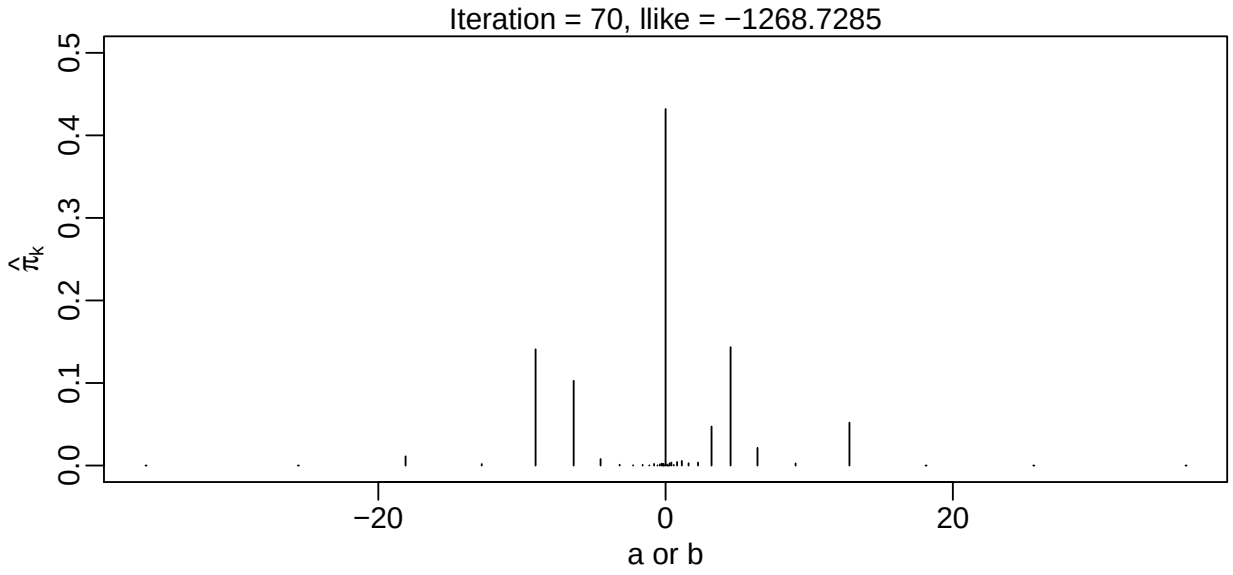

```
##  Iter = 69
## ldiff = 8.865e-06
## zdiff = 0.001266
```



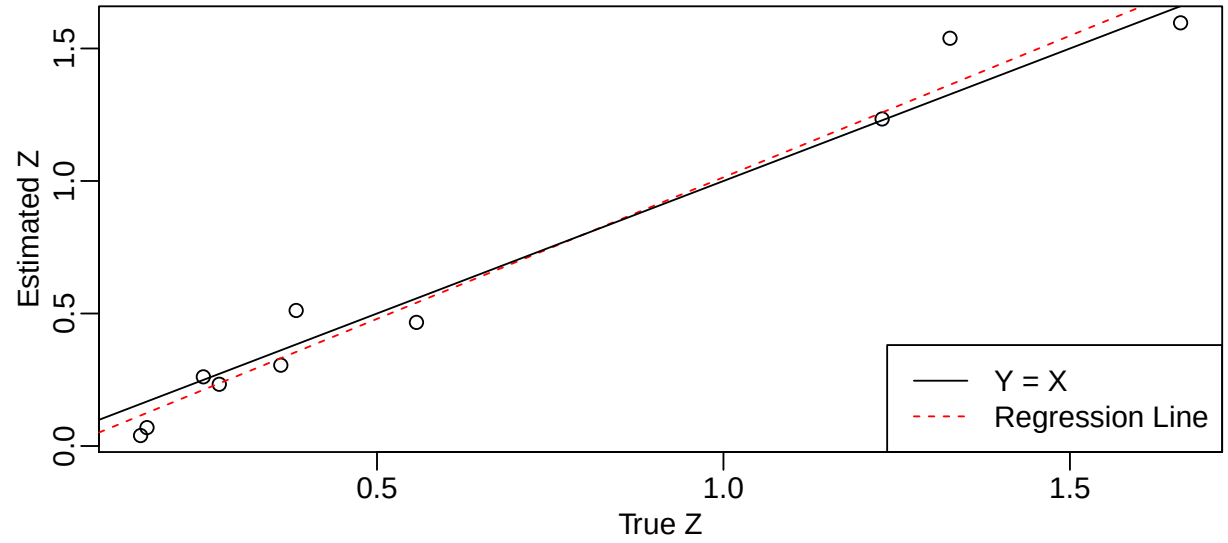


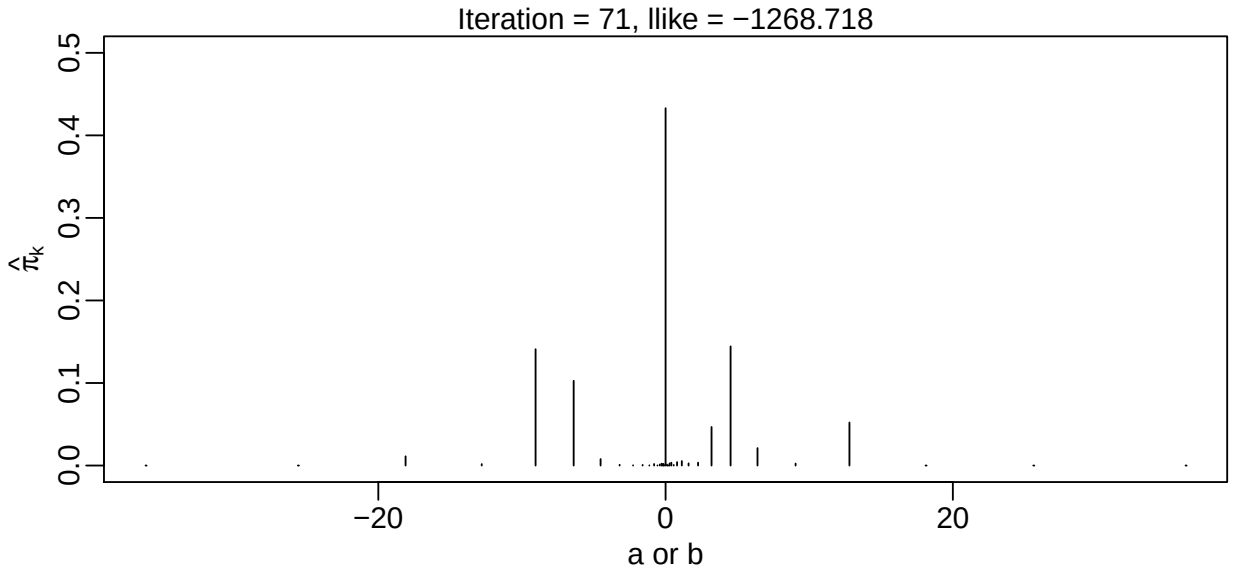

```
##  Iter = 70
## ldiff = 8.571e-06
## zdiff = 0.001227
```



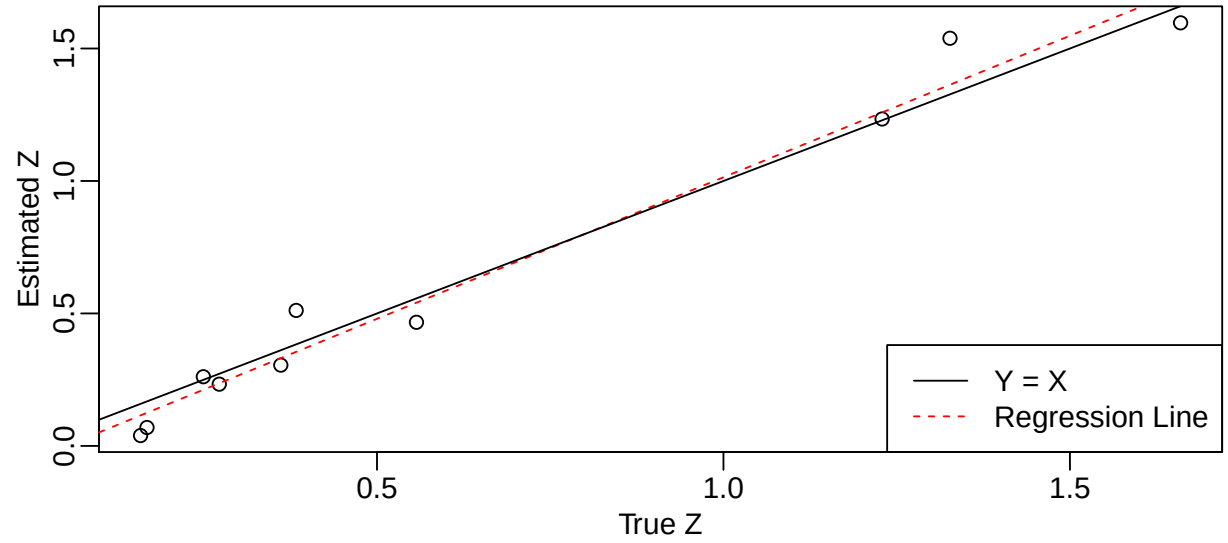


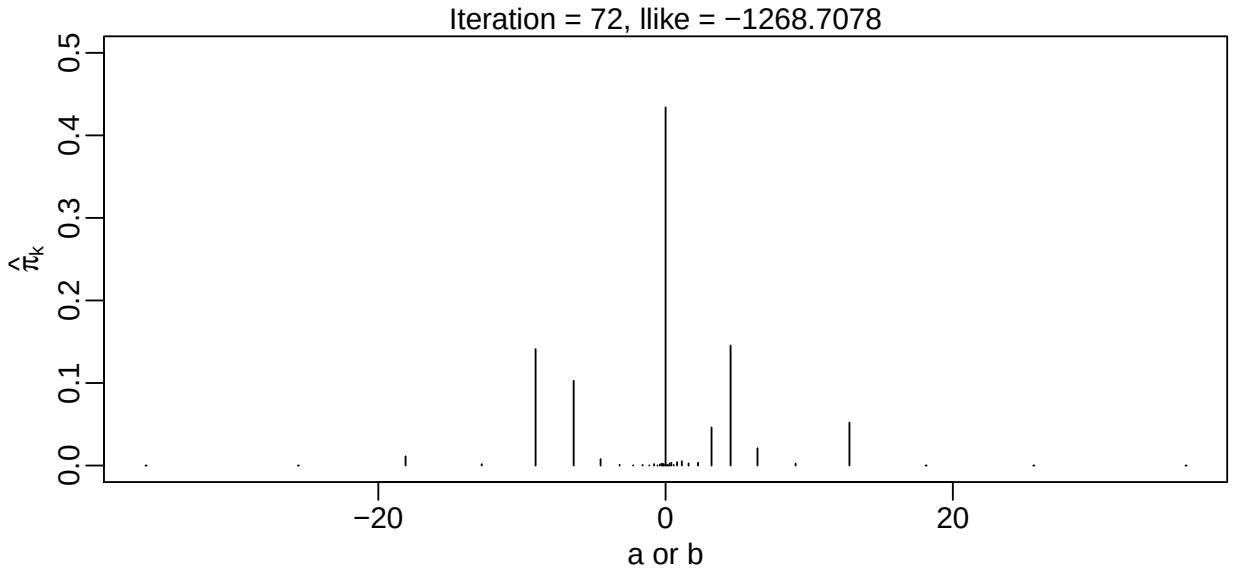

```
##  Iter = 71
## ldiff = 8.289e-06
## zdiff = 0.00119
```



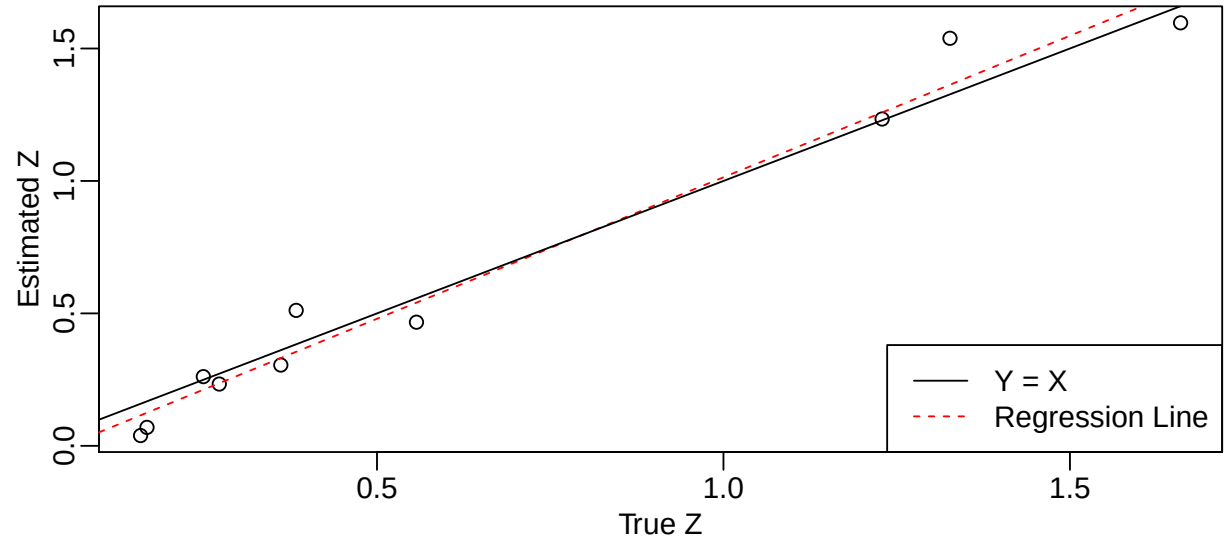


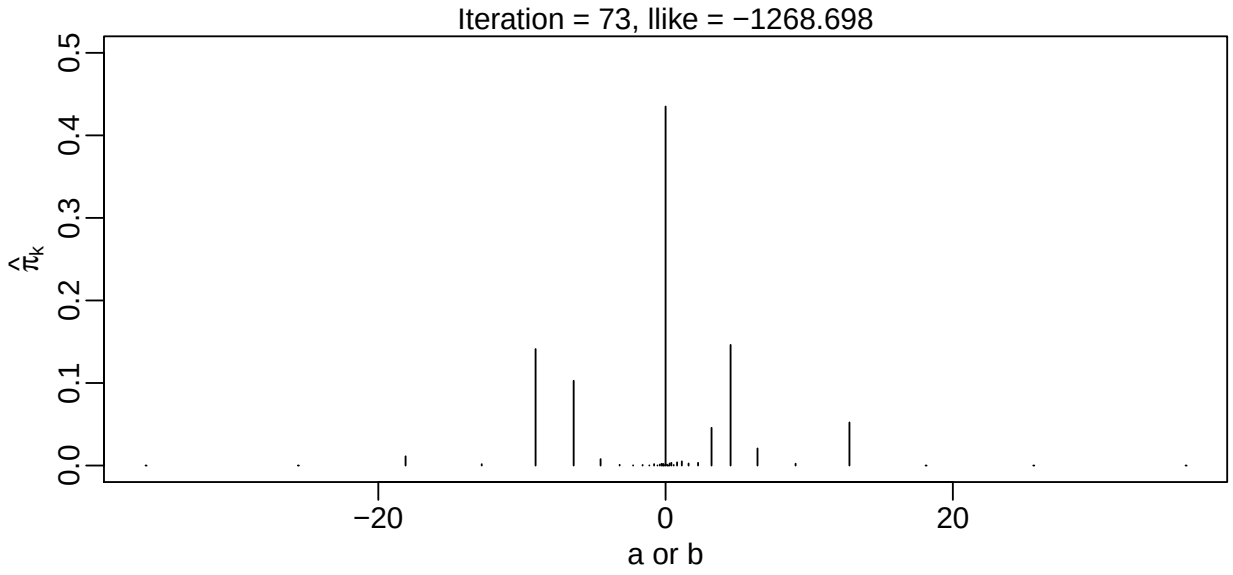

```
##  Iter = 72
## ldiff = 8.019e-06
## zdiff = 0.001154
```



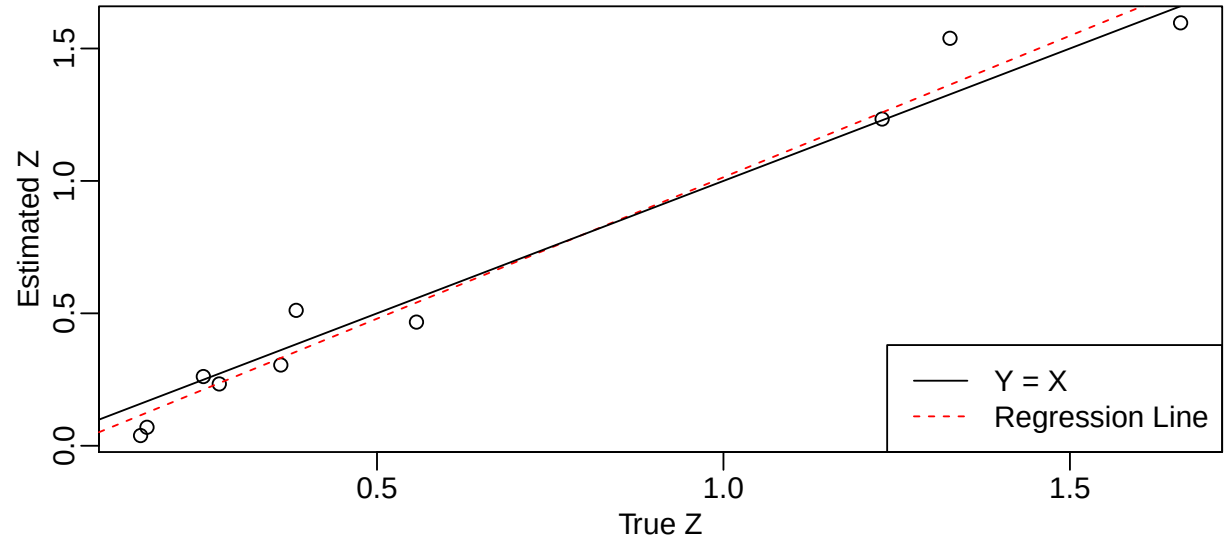


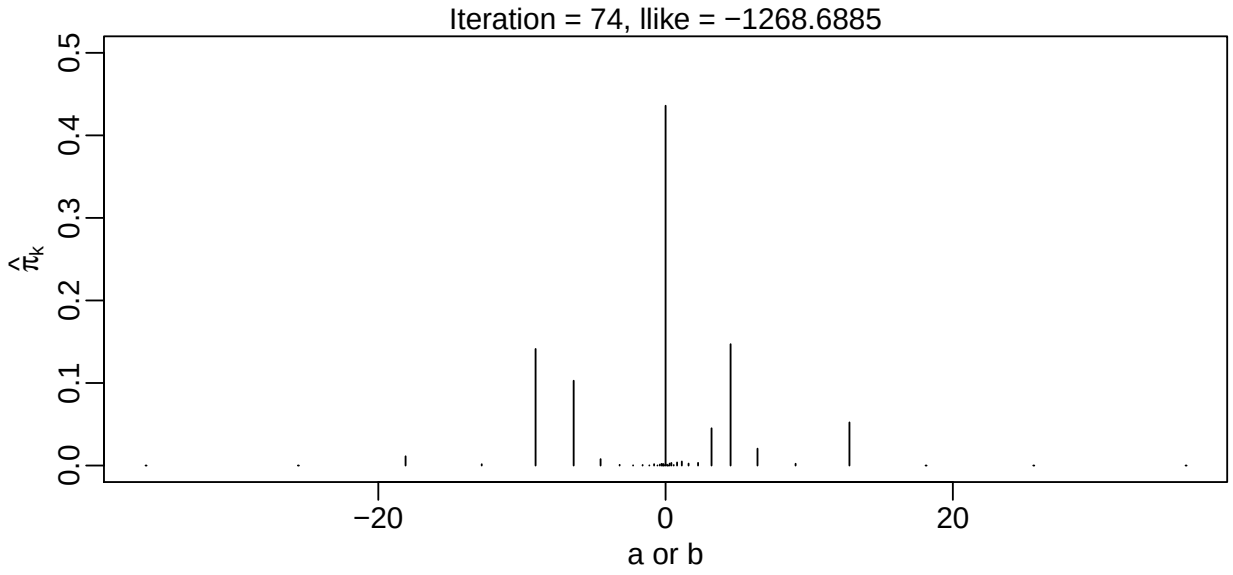

```
##  Iter = 73
## ldiff = 7.761e-06
## zdiff = 0.00112
```



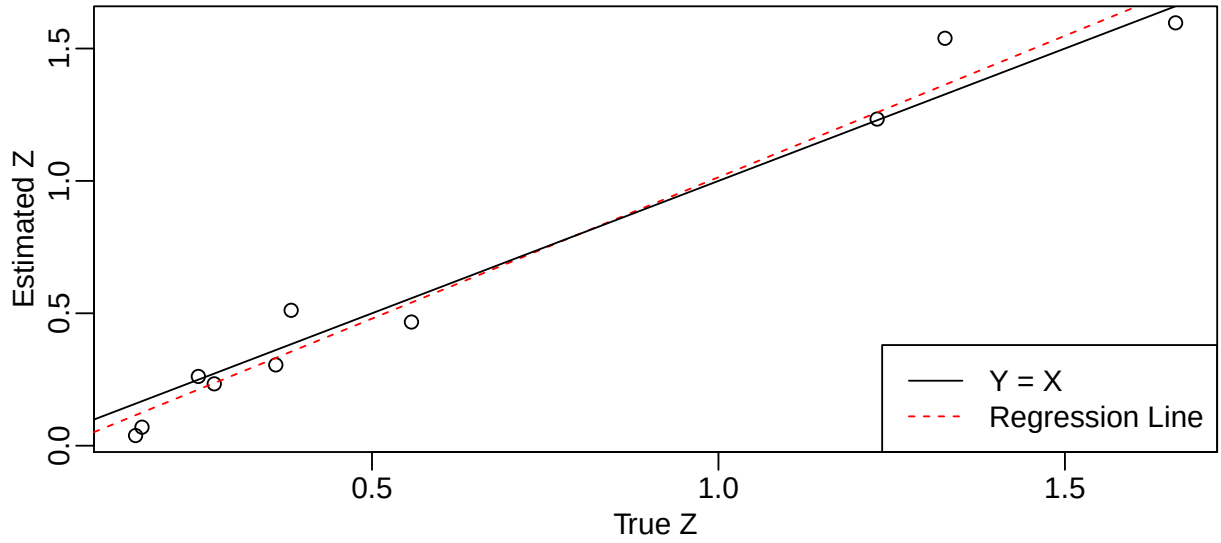


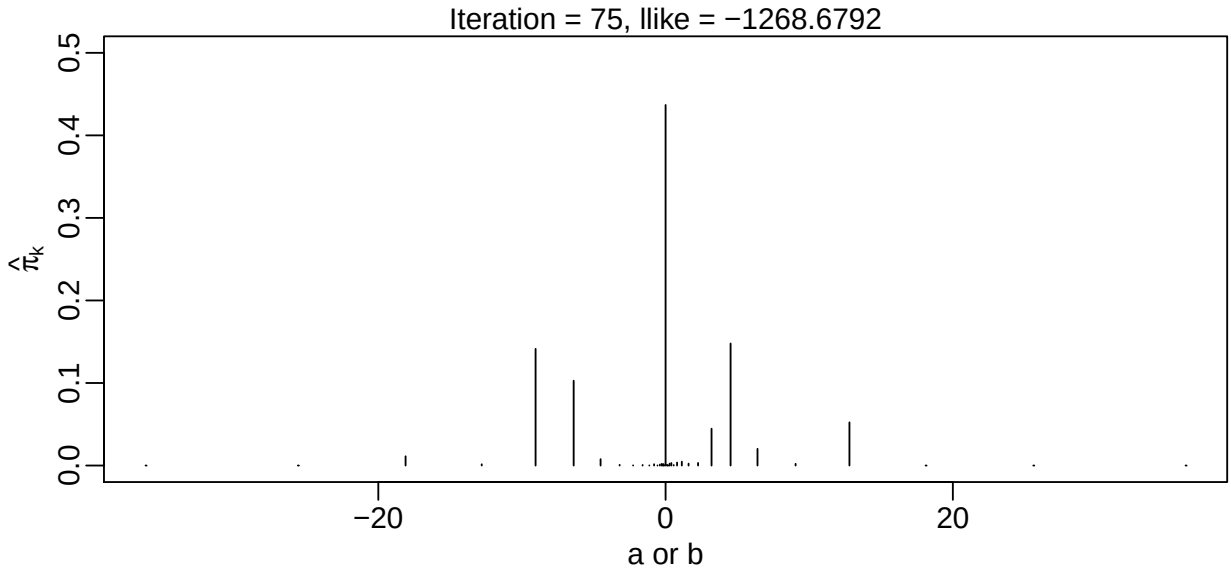

```
##  Iter = 74
## ldiff = 7.514e-06
## zdiff = 0.001088
```



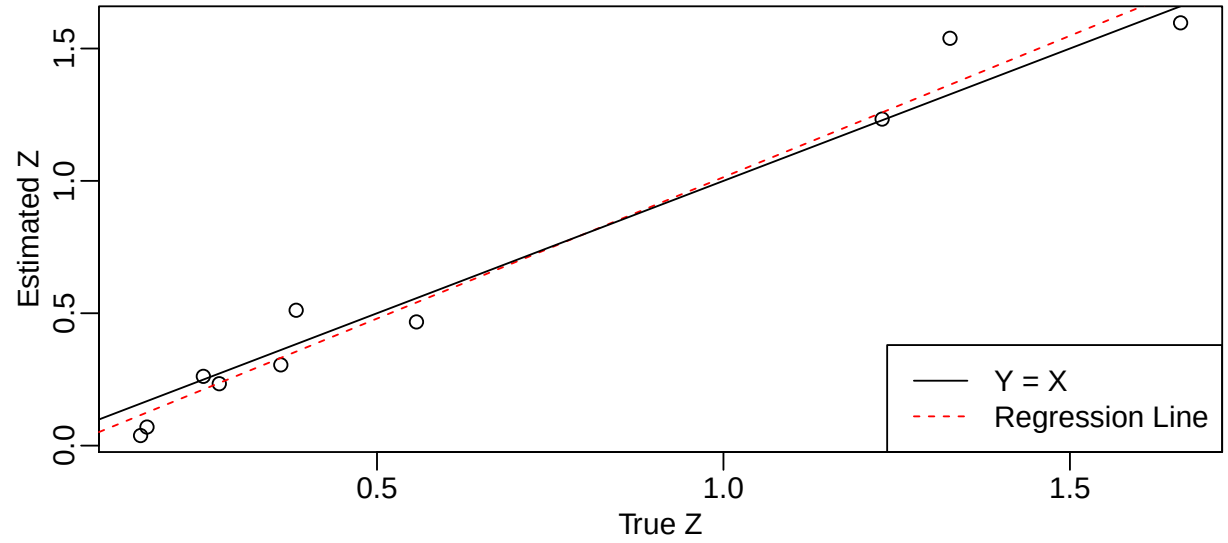


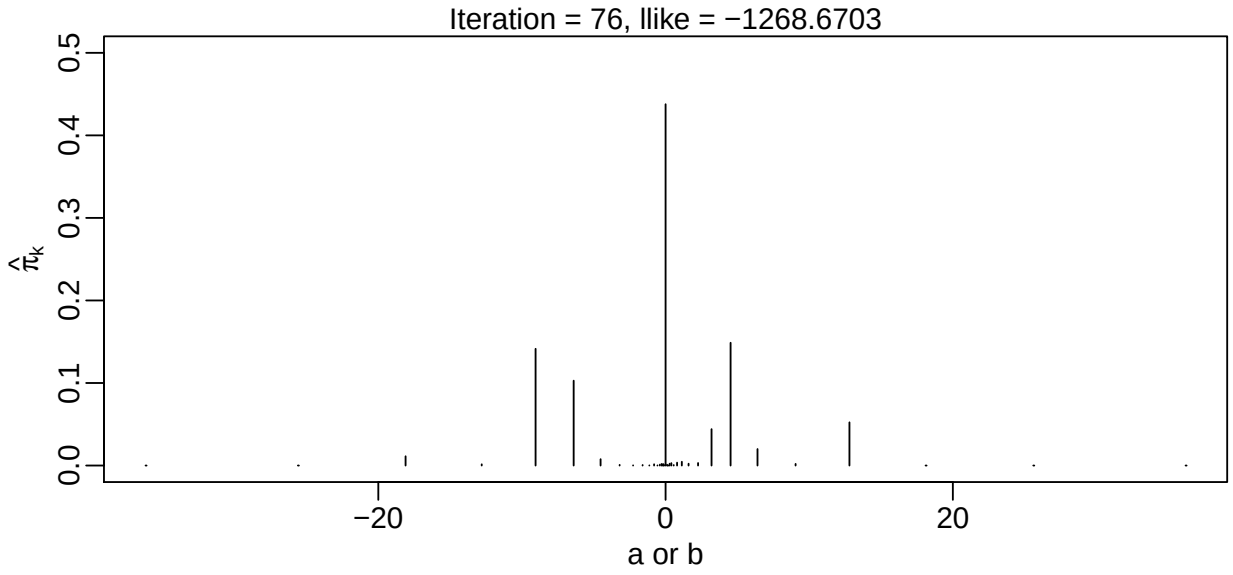

```
##  Iter = 75
## ldiff = 7.277e-06
## zdiff = 0.001056
```



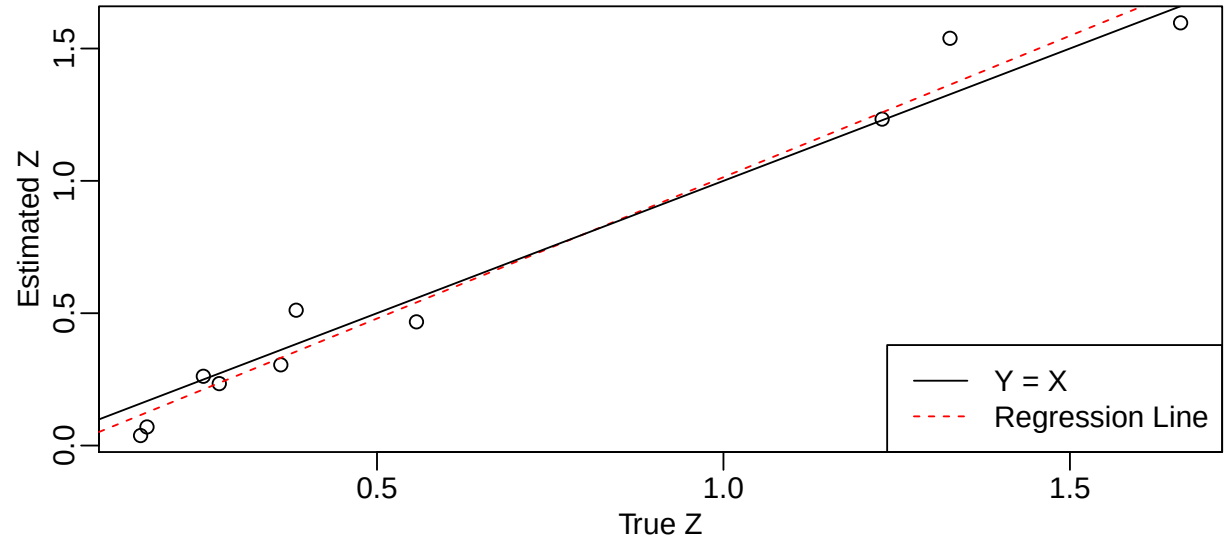


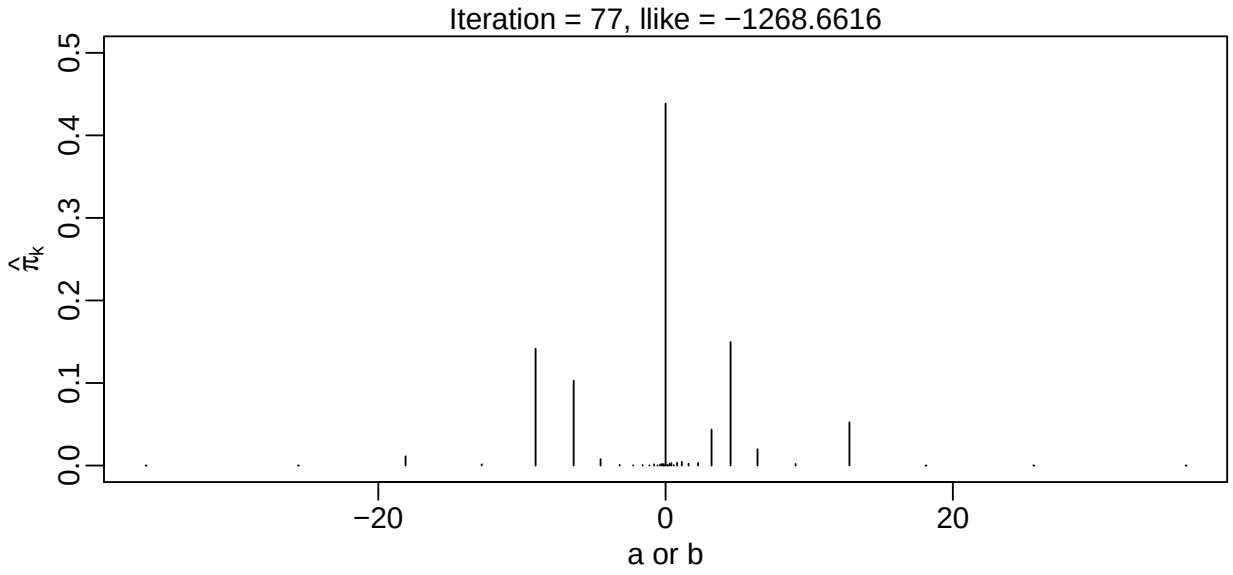

```
##  Iter = 76
## ldiff = 7.05e-06
## zdiff = 0.001026
```



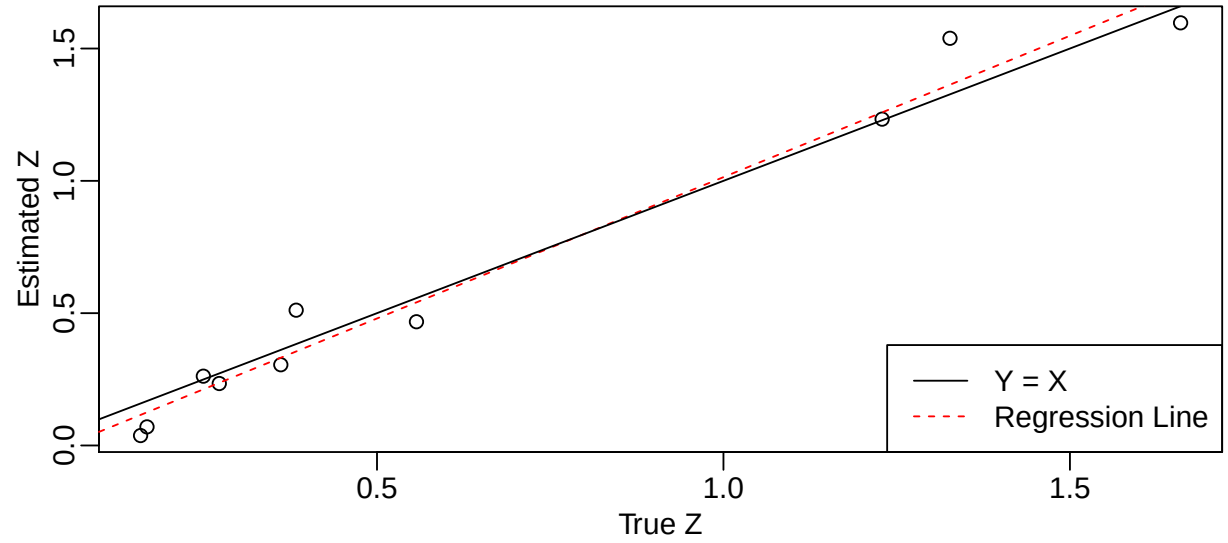


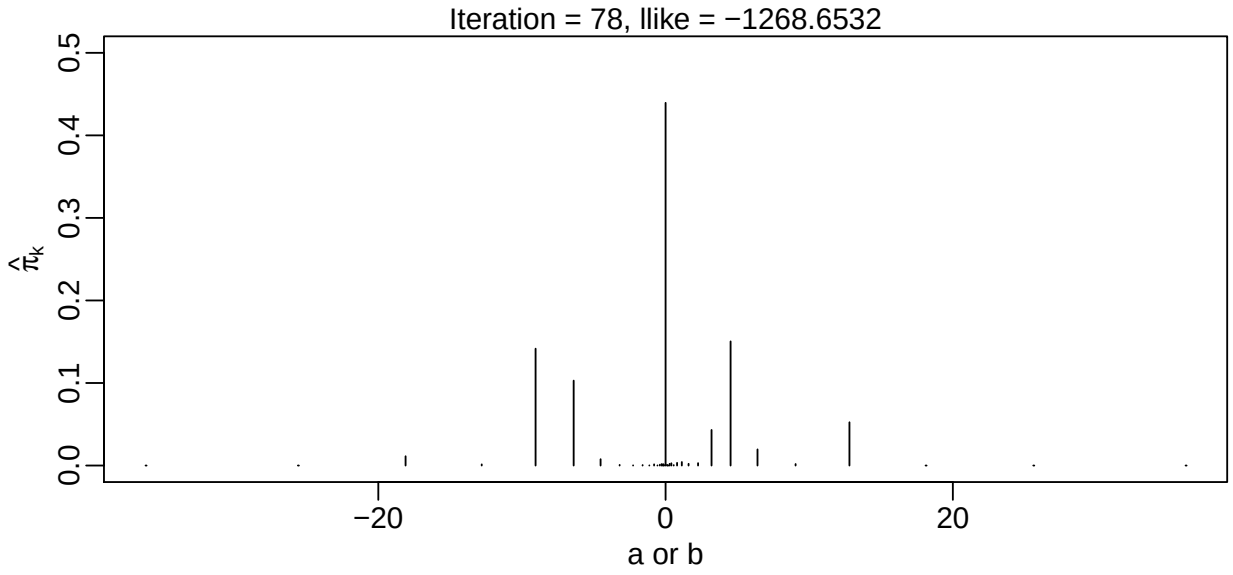

```
##  Iter = 77
## ldiff = 6.832e-06
## zdiff = 0.0009975
```



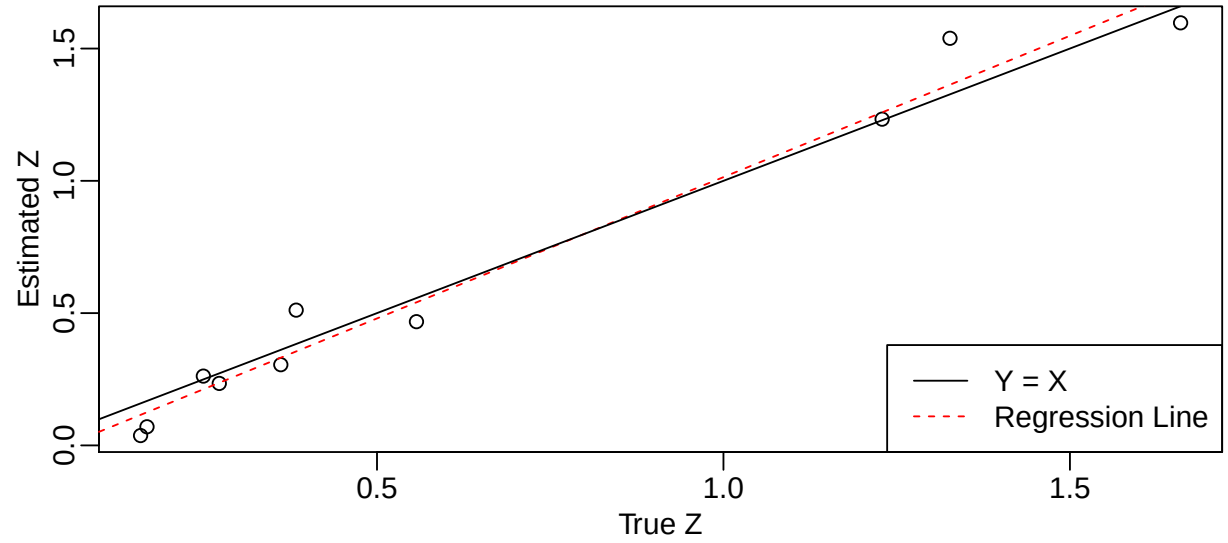


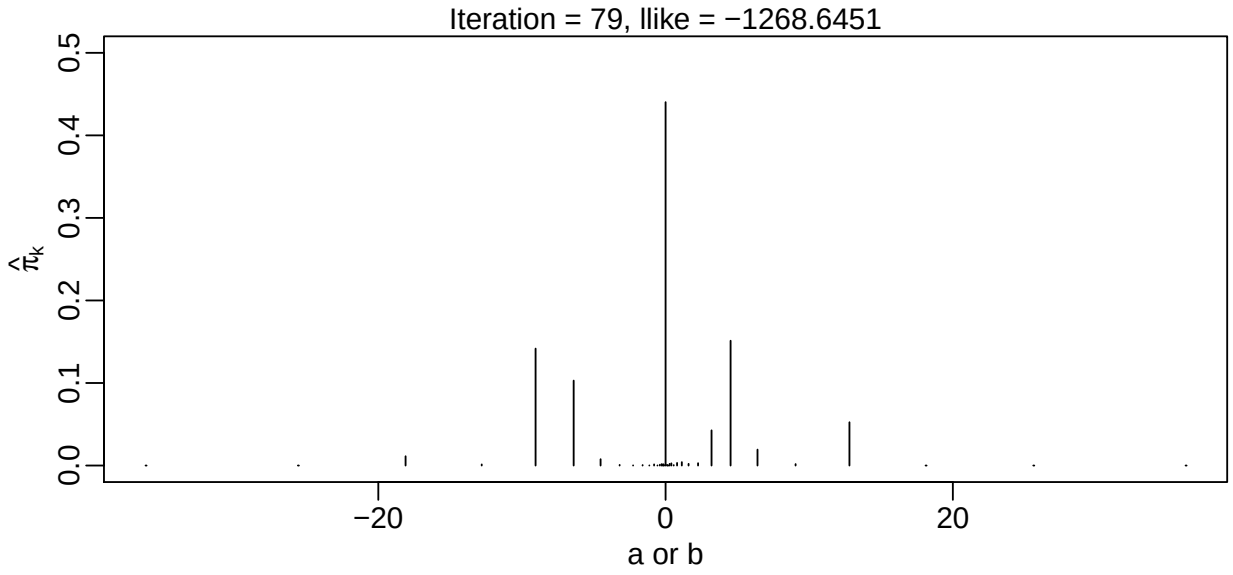

```
##  Iter = 78
## ldiff = 6.623e-06
## zdiff = 0.0009729
```



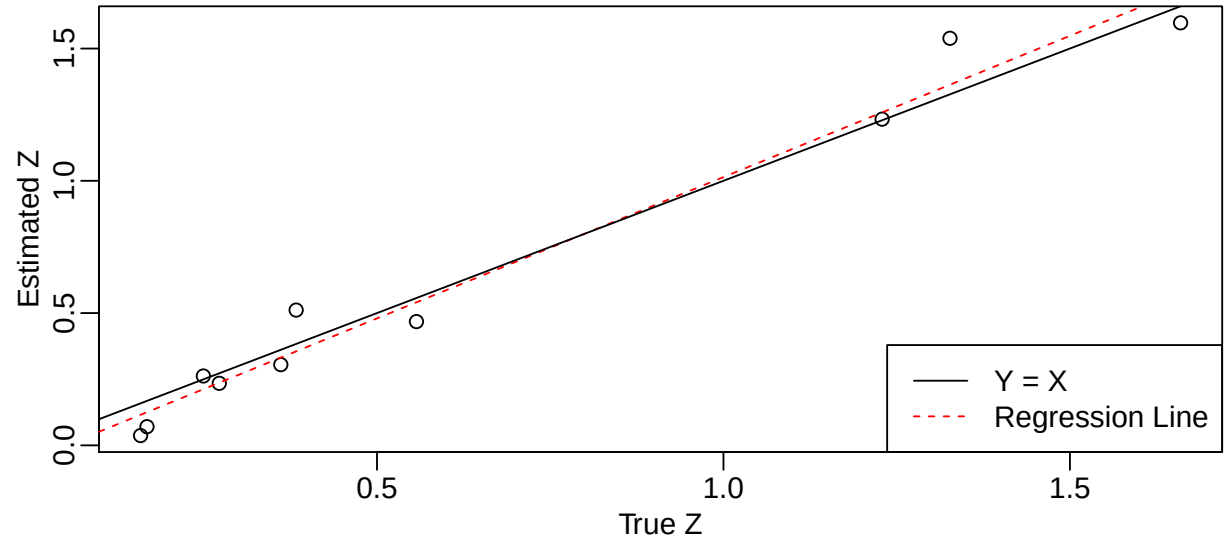


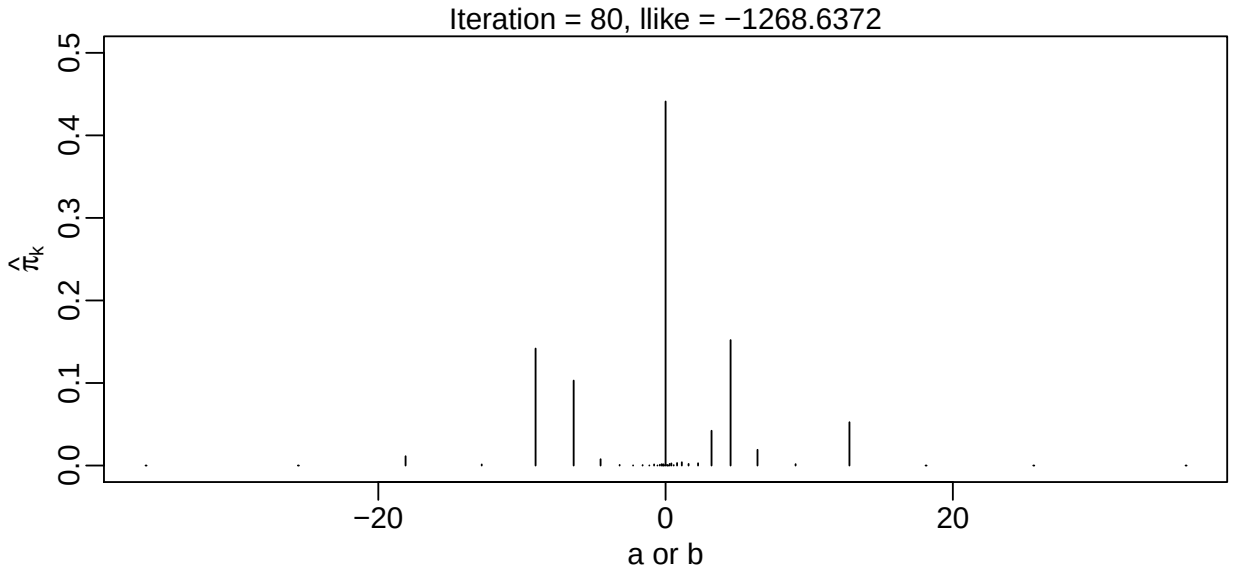

```
##  Iter = 79
## ldiff = 6.422e-06
## zdiff = 0.0009492
```



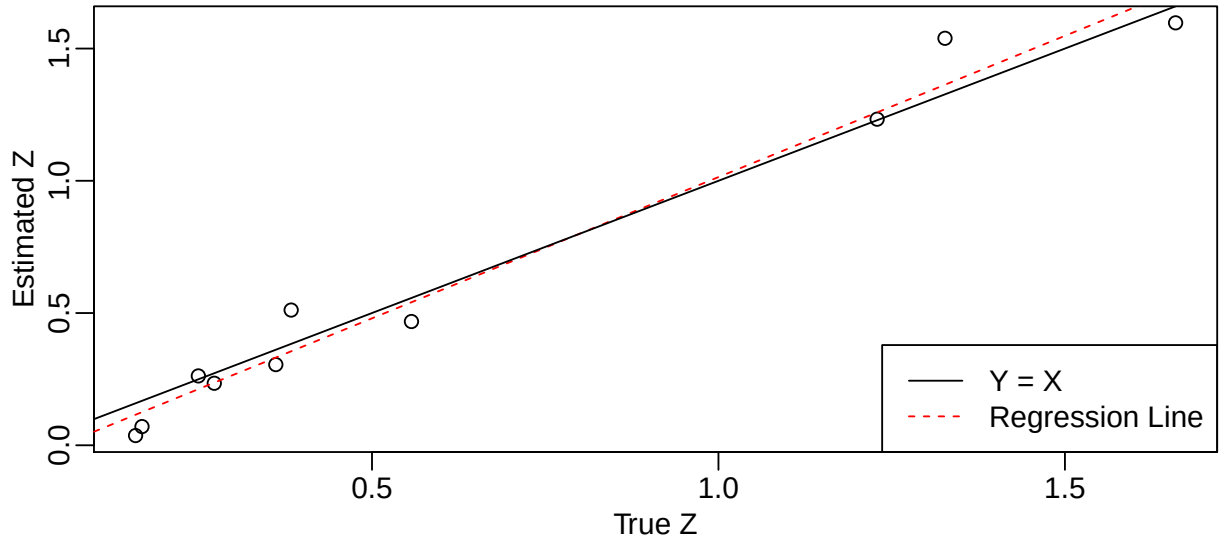


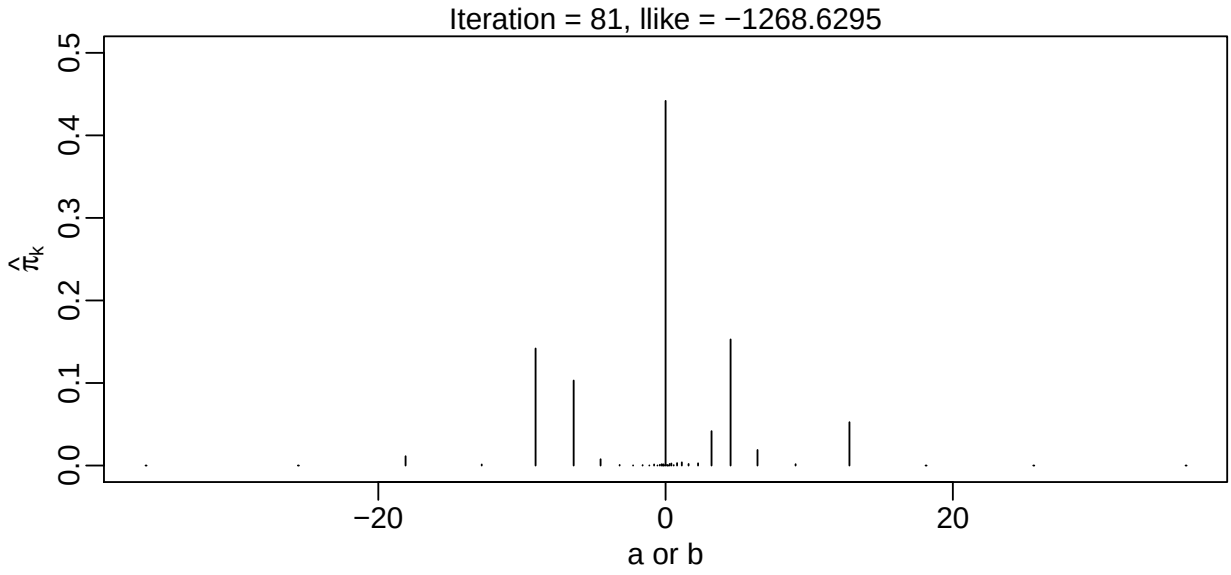

```
##  Iter = 80
## ldiff = 6.229e-06
## zdiff = 0.0009264
```



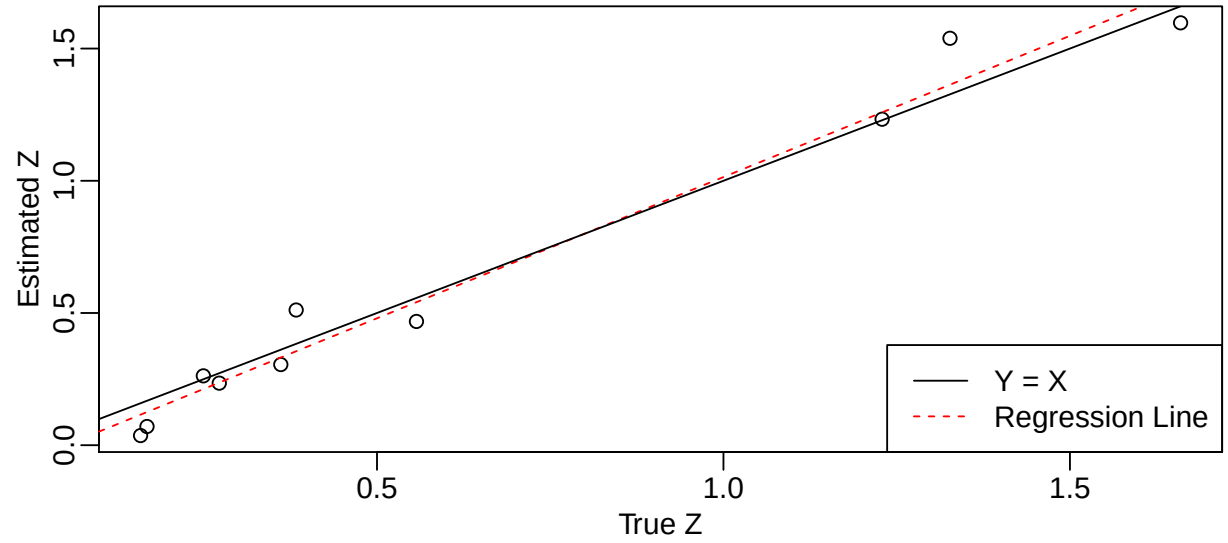


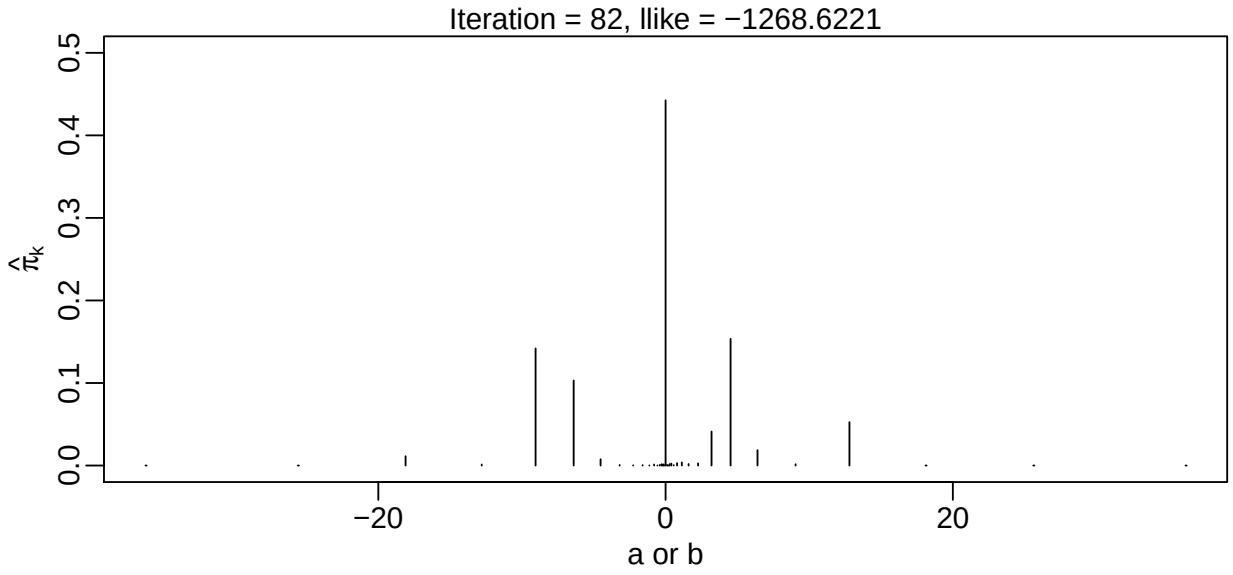

```
##  Iter = 81
## ldiff = 6.044e-06
## zdiff = 0.0009072
```



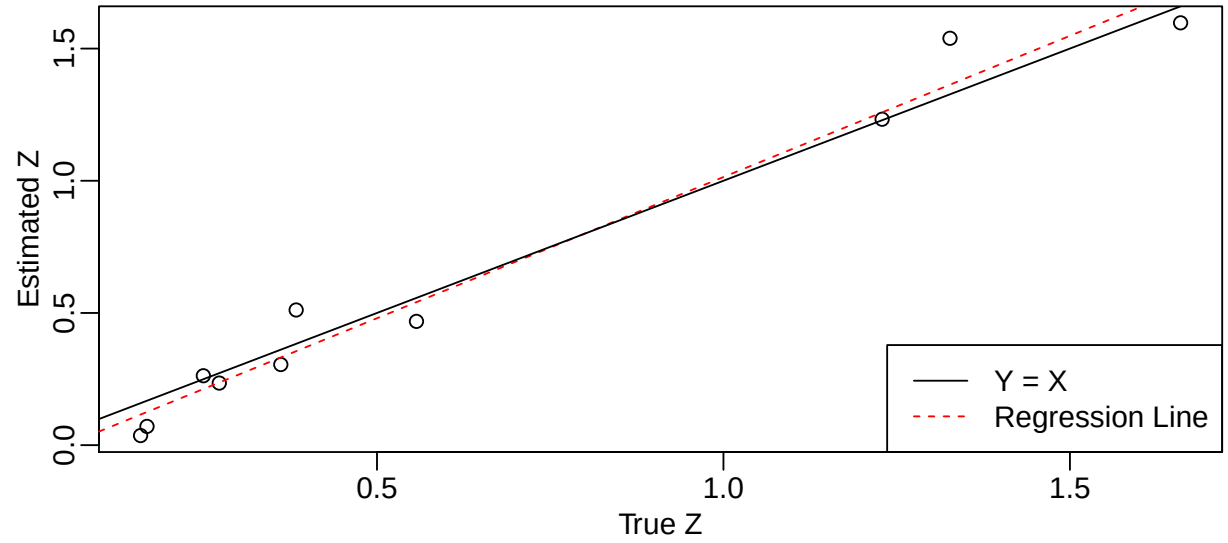


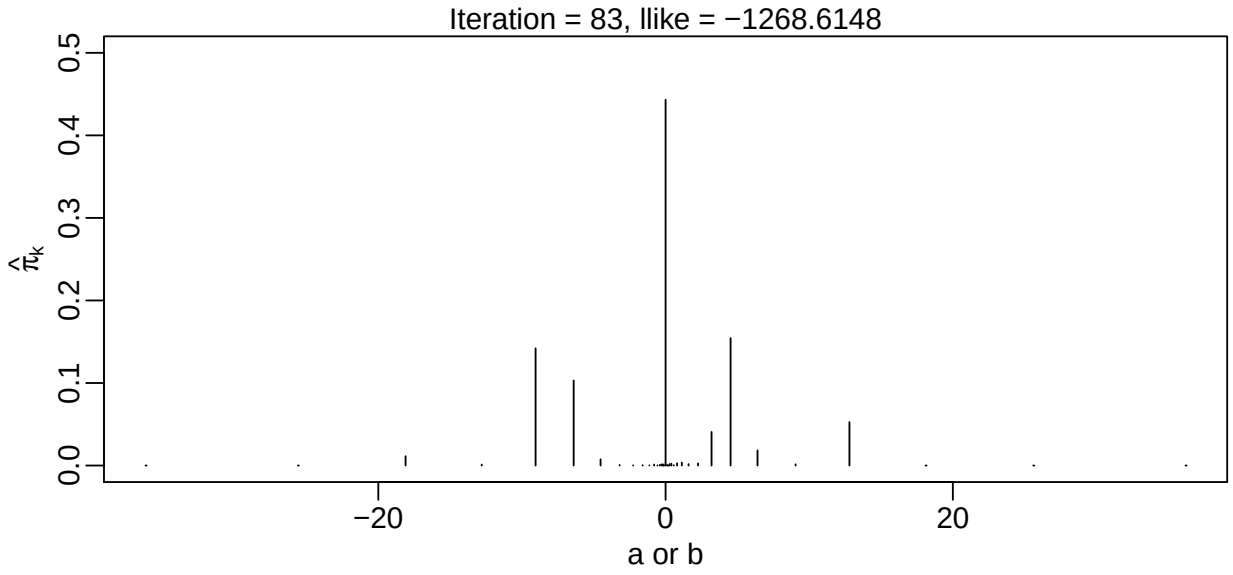

```
##  Iter = 82
## ldiff = 5.865e-06
## zdiff = 0.0008907
```



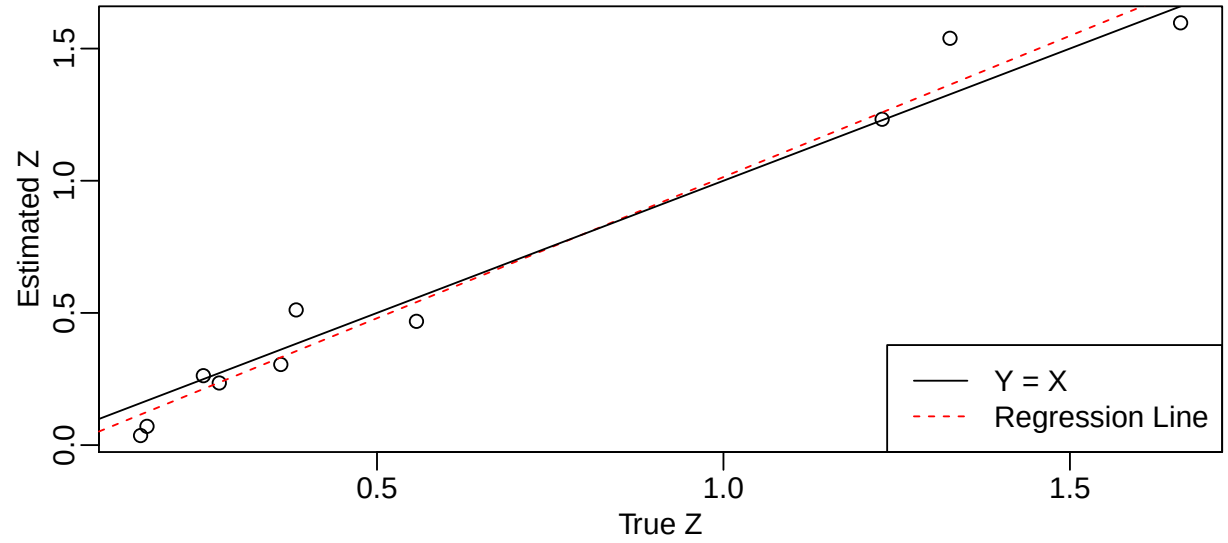


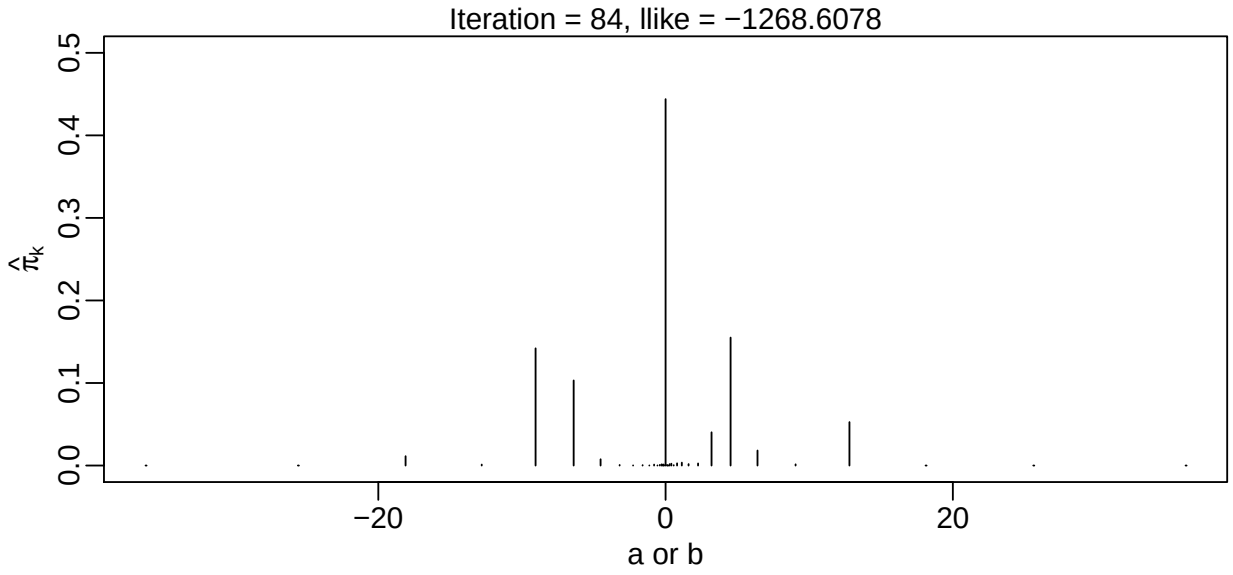

```
##  Iter = 83
## ldiff = 5.694e-06
## zdiff = 0.0008747
```



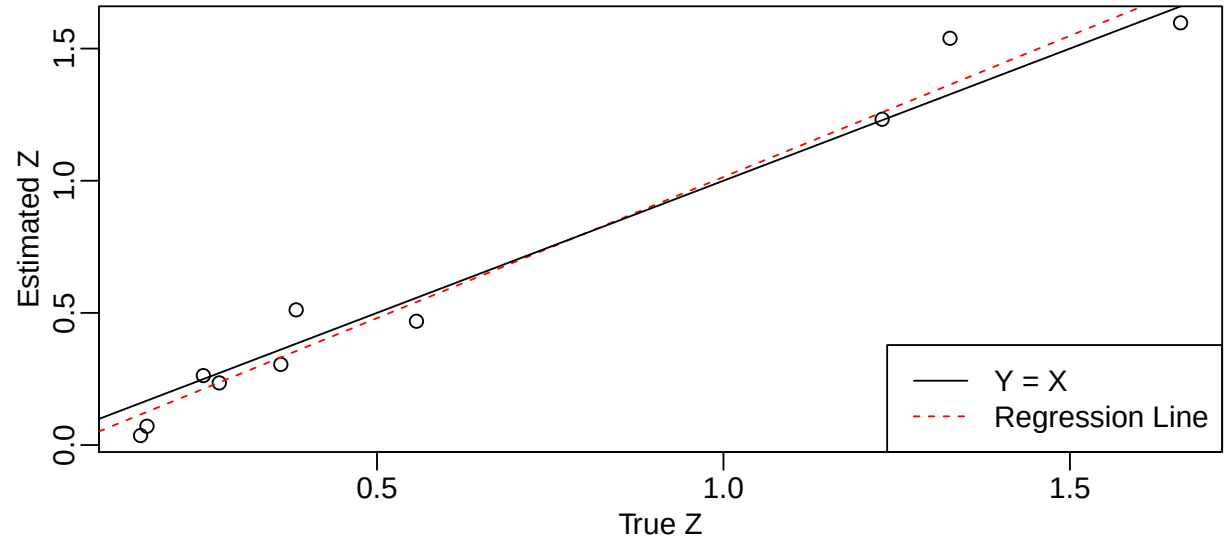


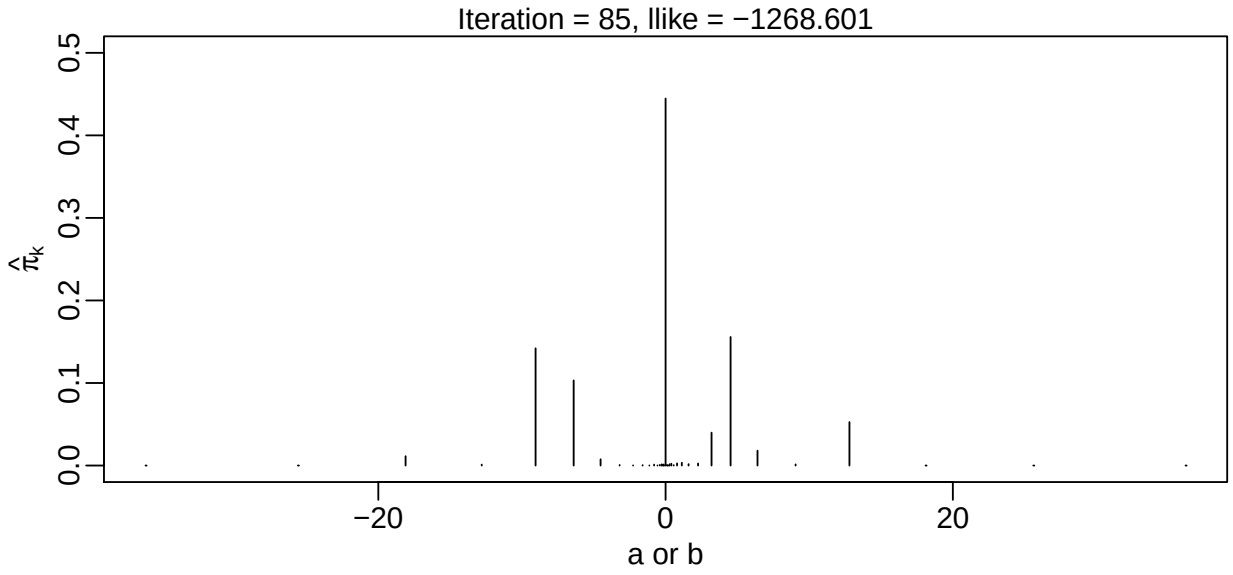

```
##  Iter = 84
## ldiff = 5.528e-06
## zdiff = 0.000859
```



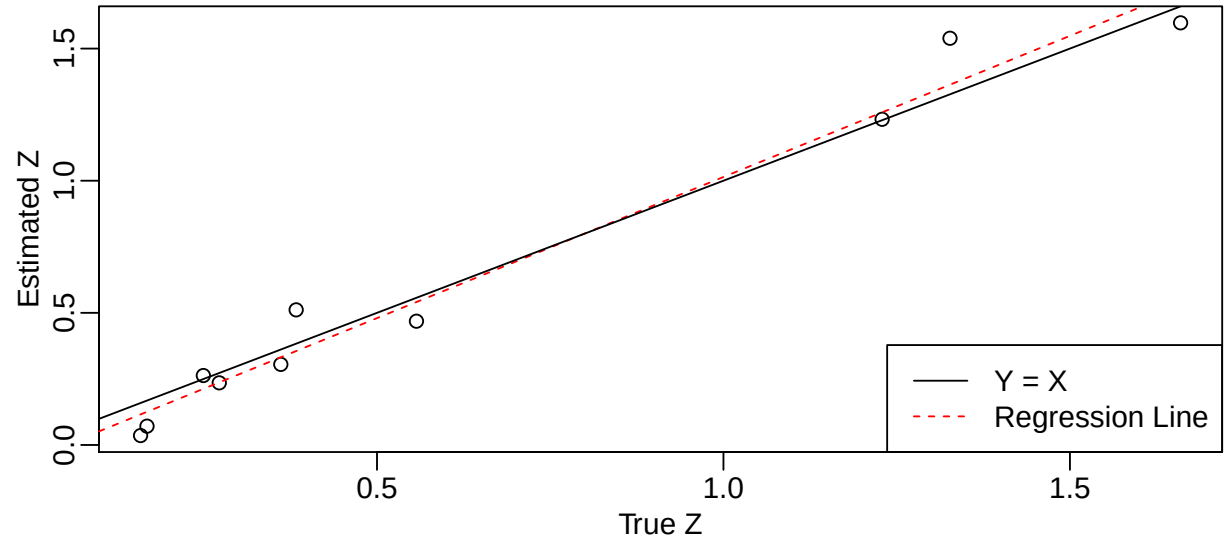


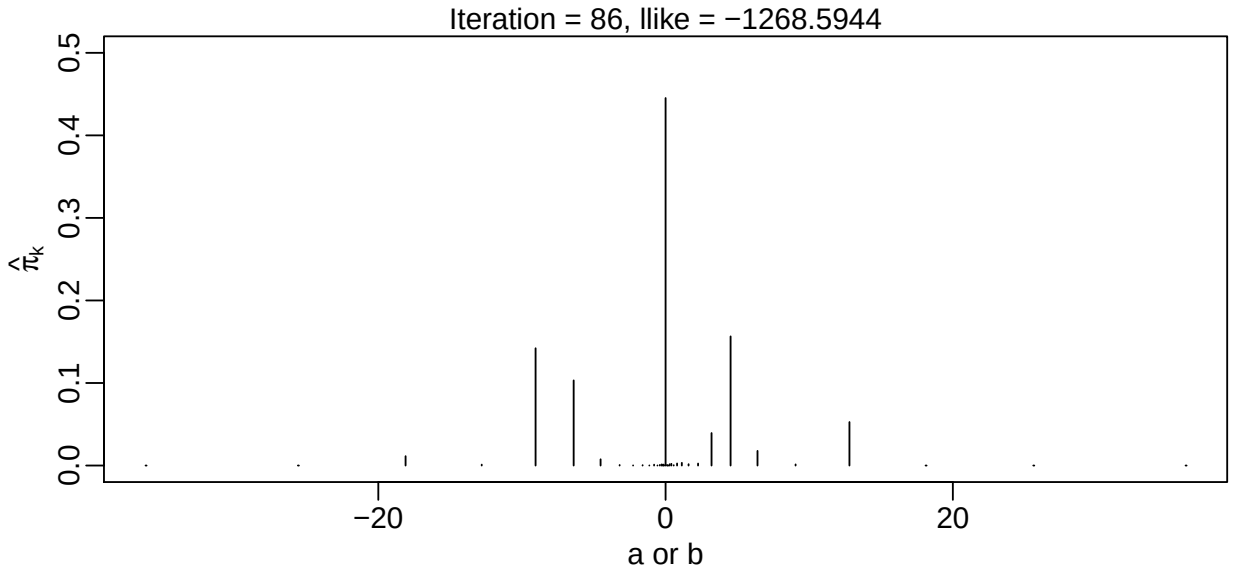

```
##  Iter = 85
## ldiff = 5.369e-06
## zdiff = 0.0008438
```



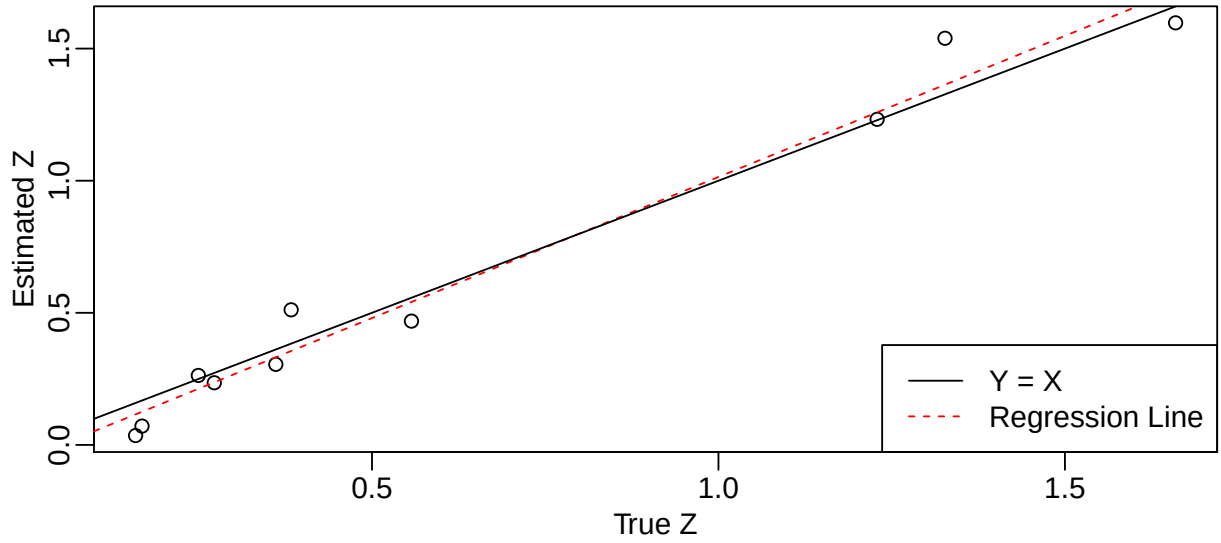


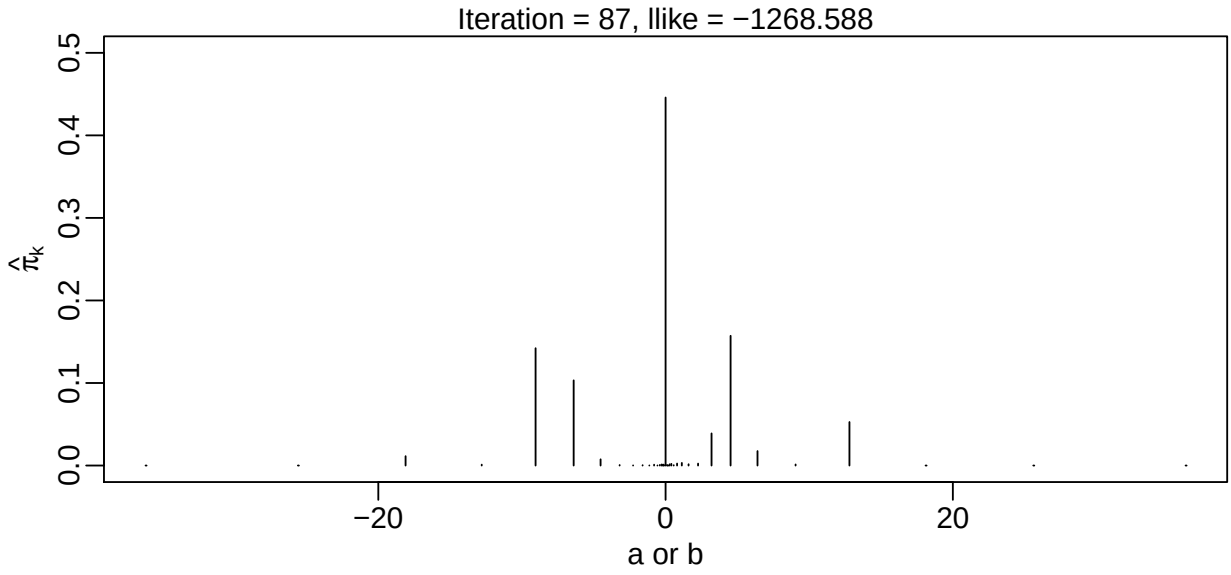

```
##  Iter = 86
## ldiff = 5.216e-06
## zdiff = 0.000829
```



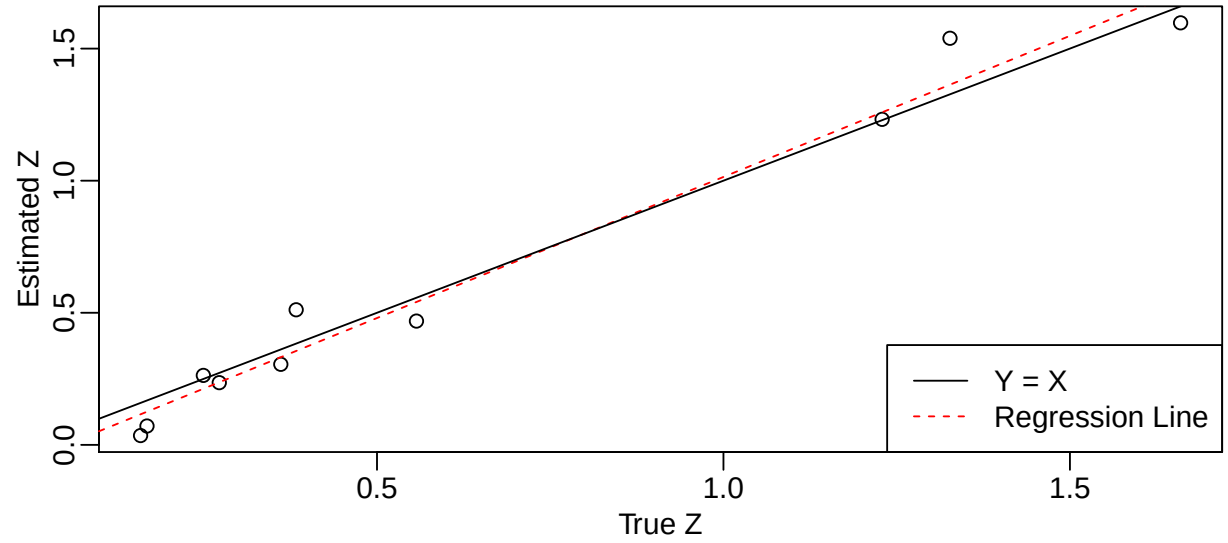


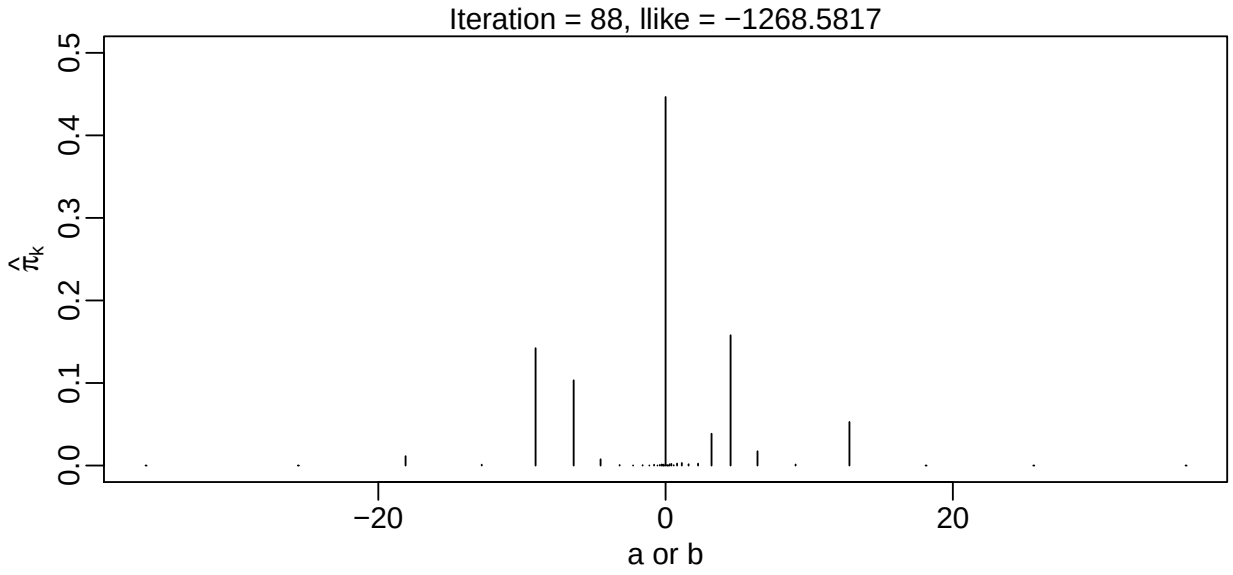

```
##  Iter = 87
## ldiff = 5.069e-06
## zdiff = 0.0008146
```



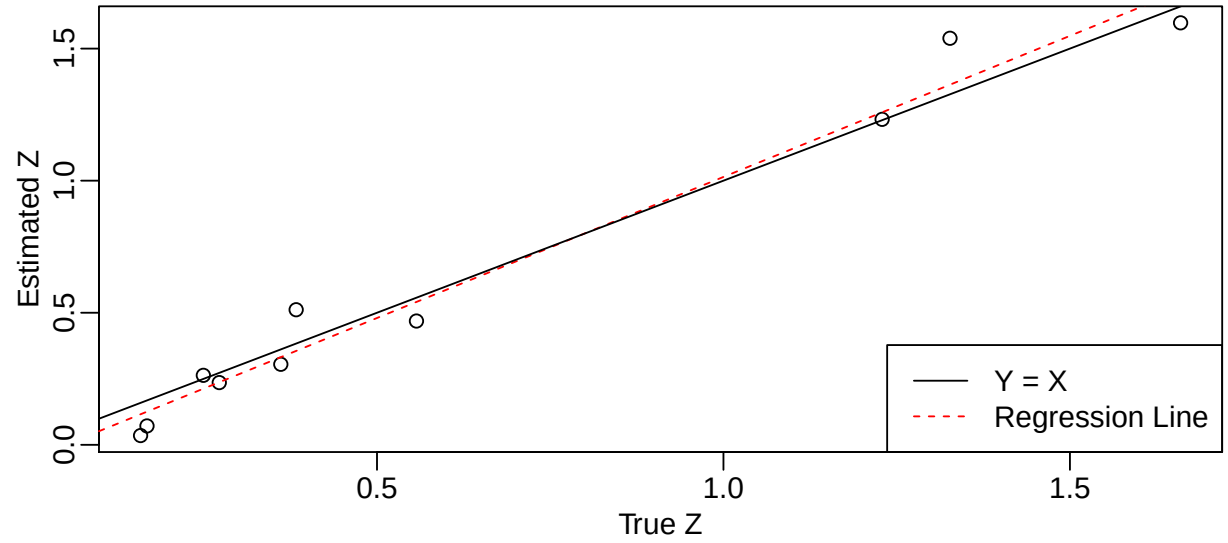


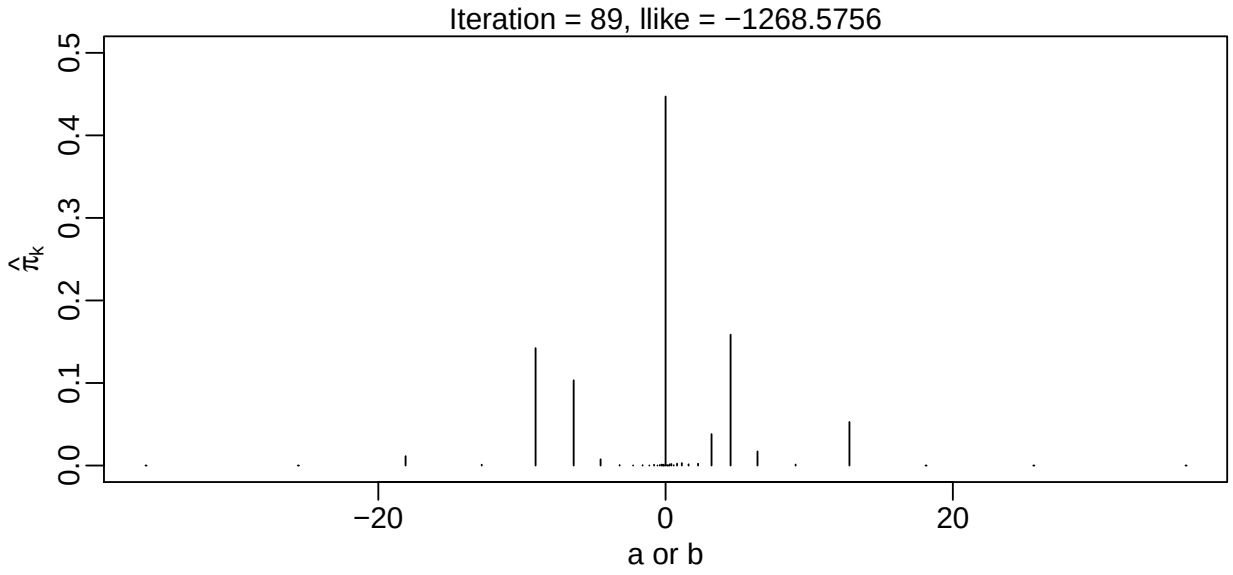

```
##  Iter = 88
## ldiff = 4.926e-06
## zdiff = 0.0008005
```



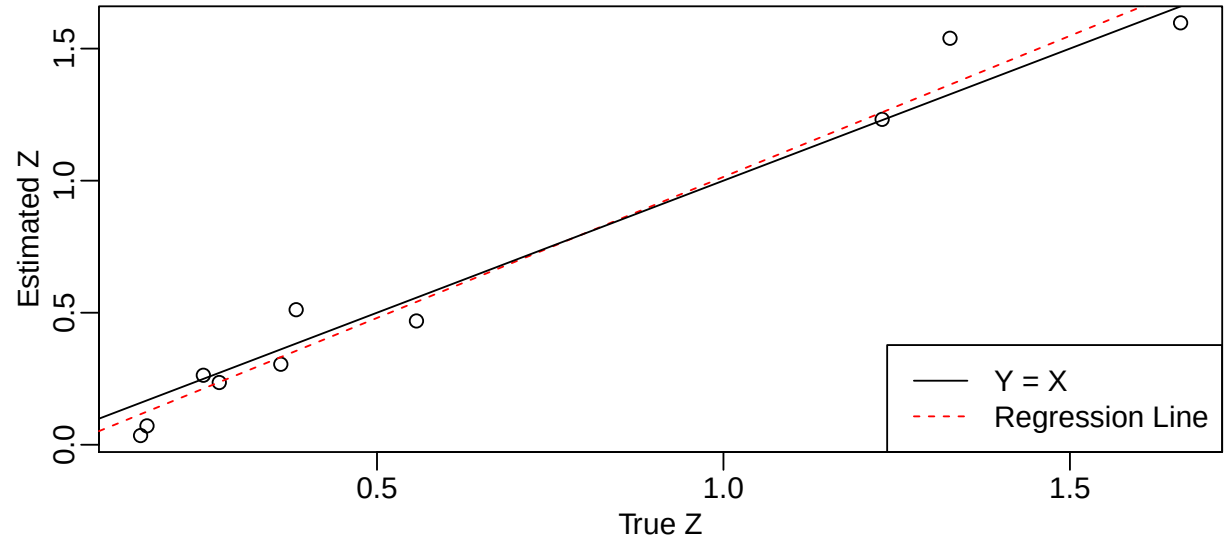


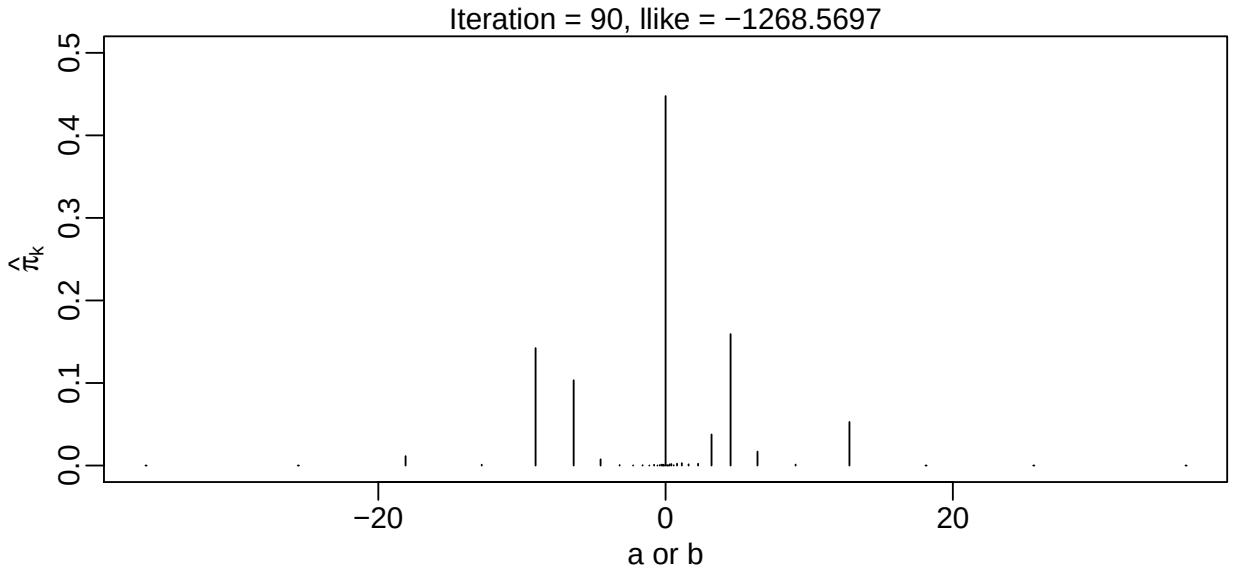

```
##  Iter = 89
## ldiff = 4.789e-06
## zdiff = 0.0007868
```



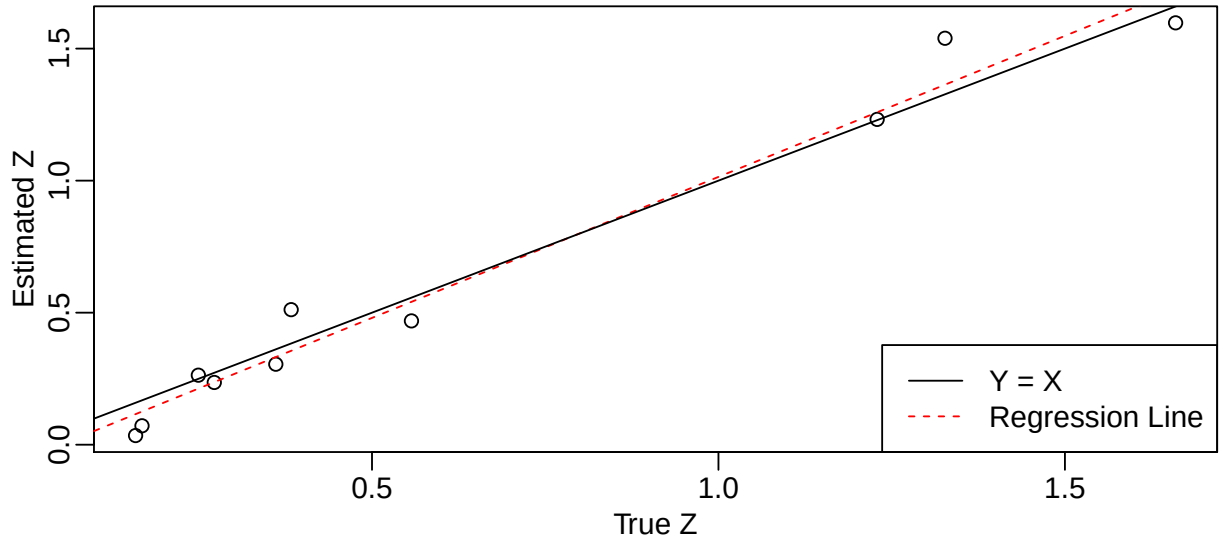


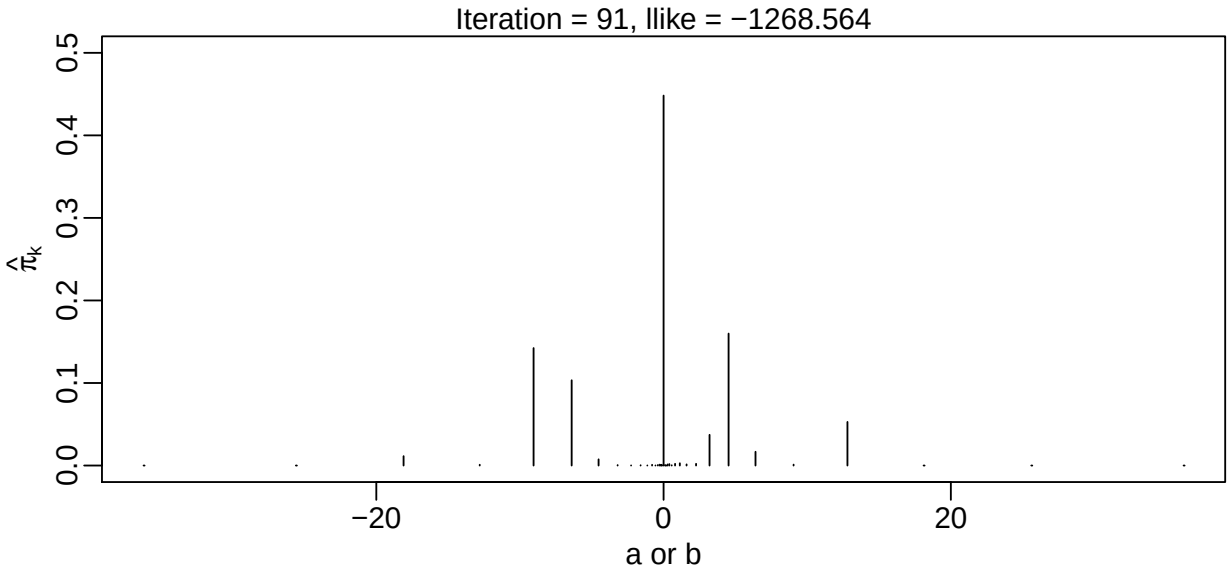

```
##  Iter = 90
## ldiff = 4.657e-06
## zdiff = 0.0007734
```



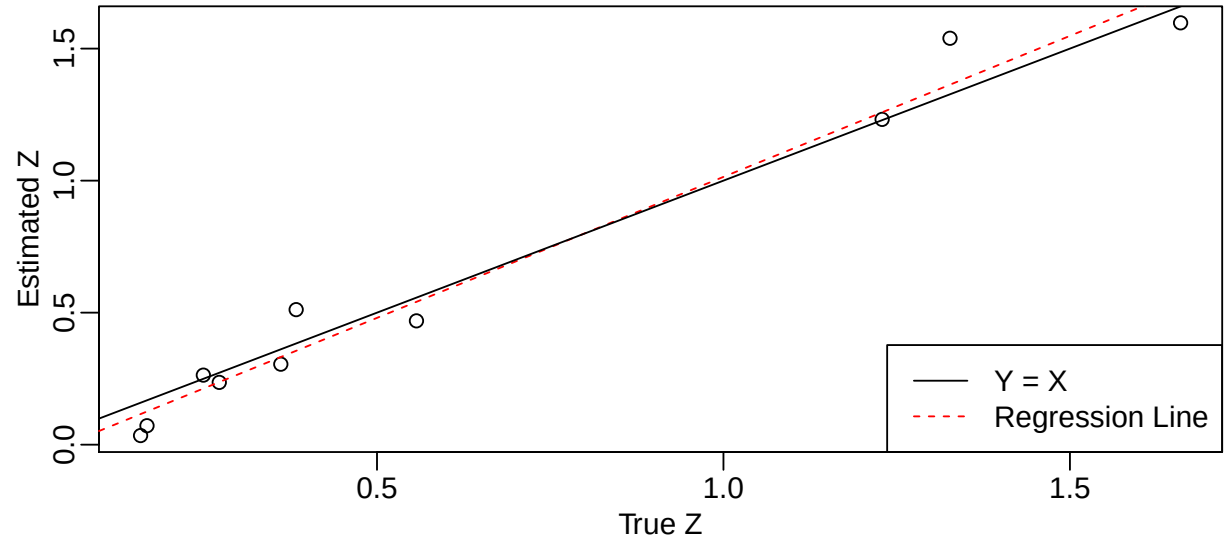


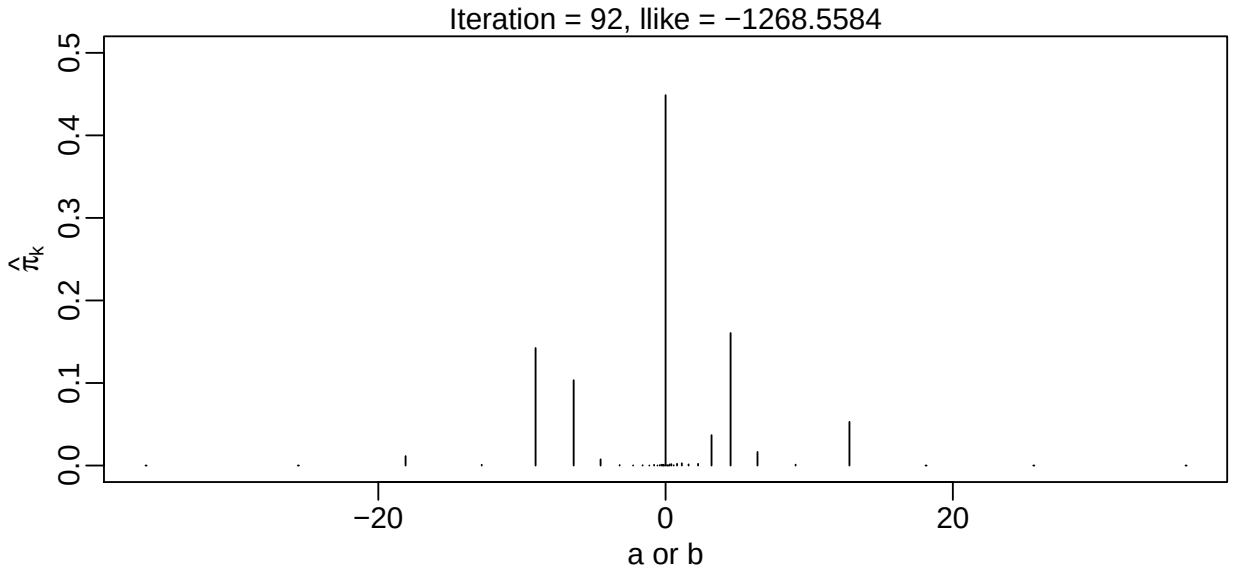

```
##  Iter = 91
## ldiff = 4.529e-06
## zdiff = 0.0007604
```



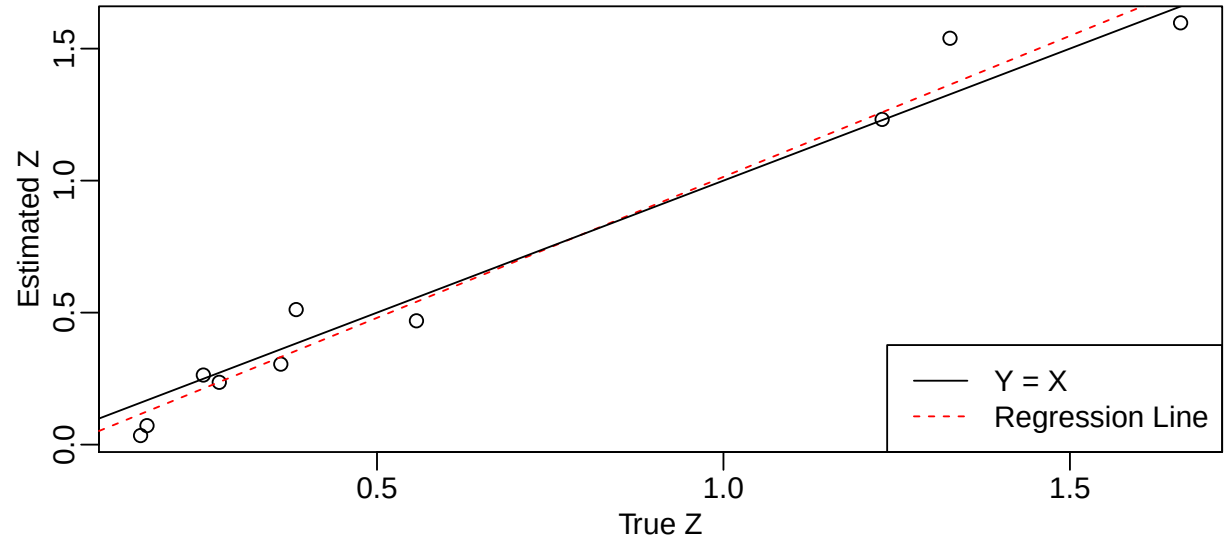


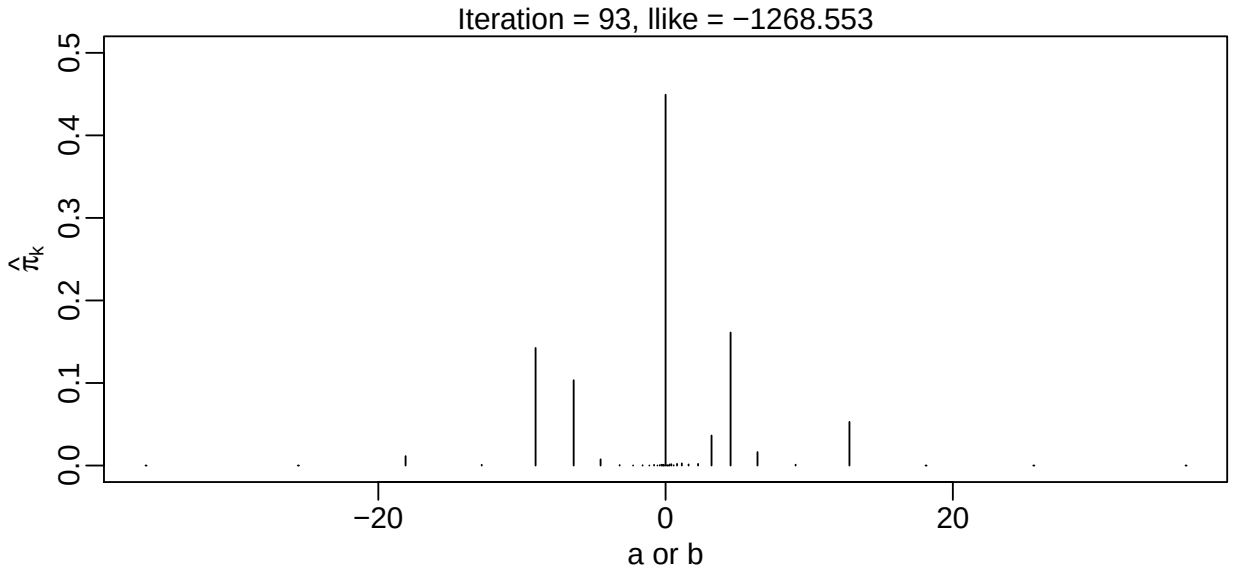

```
##  Iter = 92
## ldiff = 4.406e-06
## zdiff = 0.0007476
```



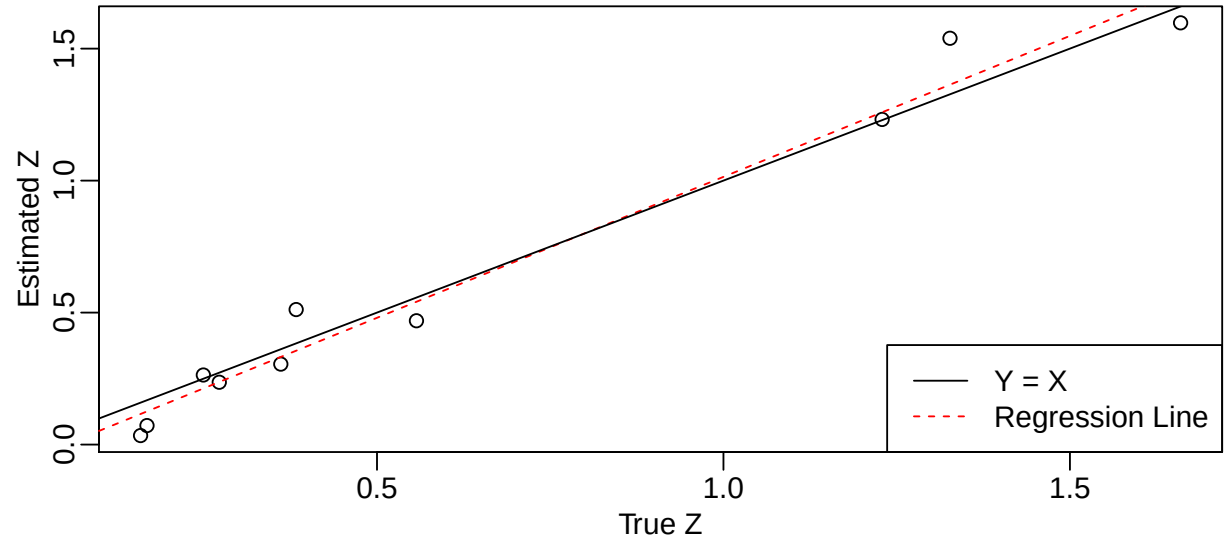


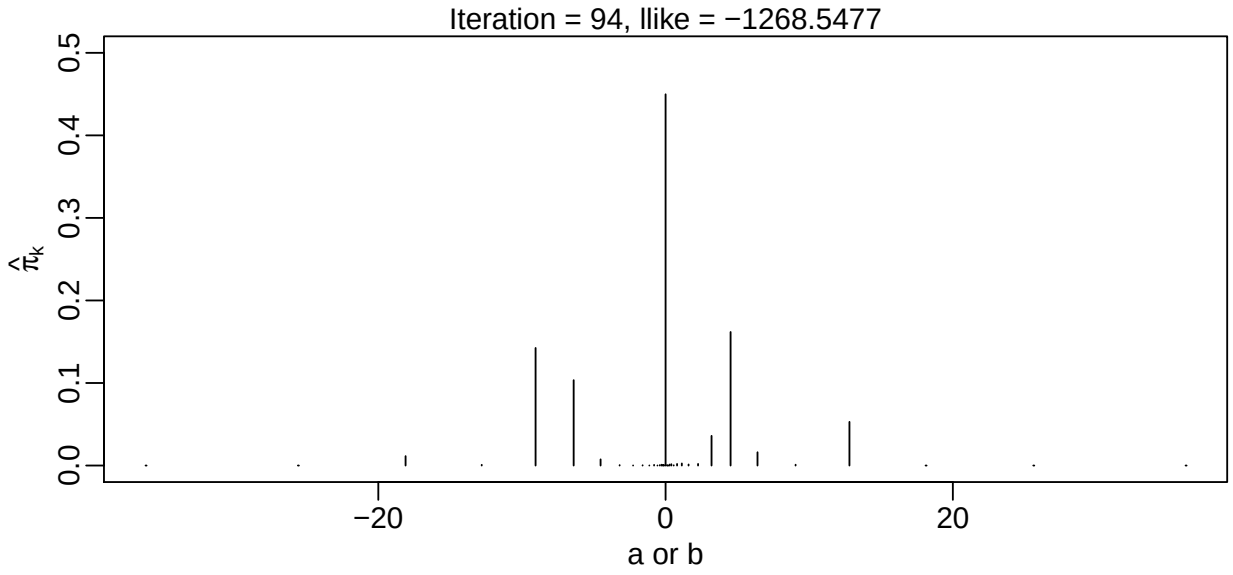

```
##  Iter = 93
## ldiff = 4.287e-06
## zdiff = 0.0007352
```



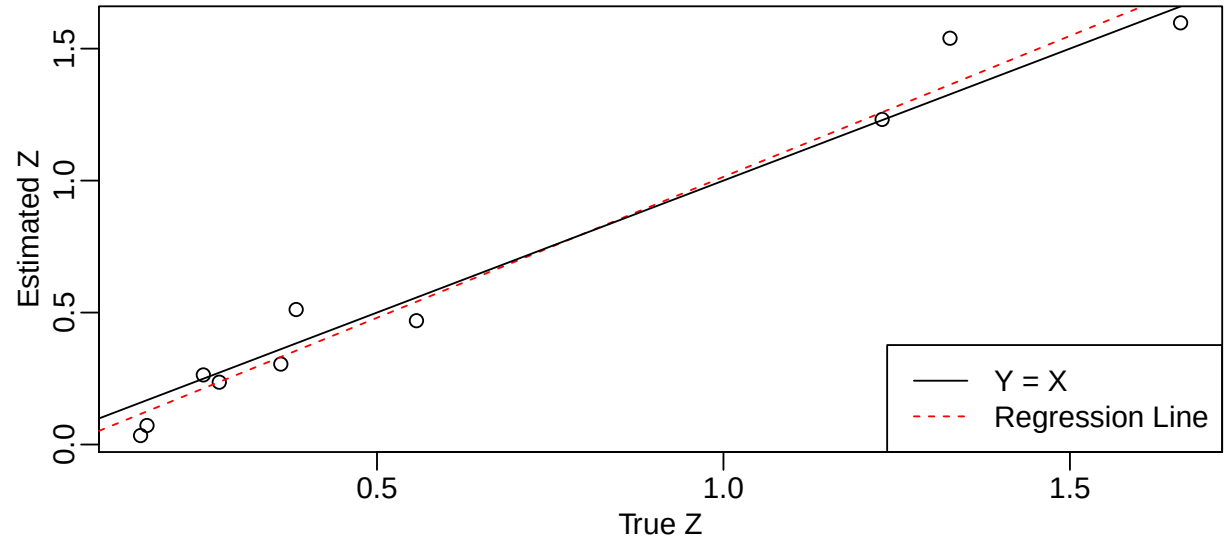


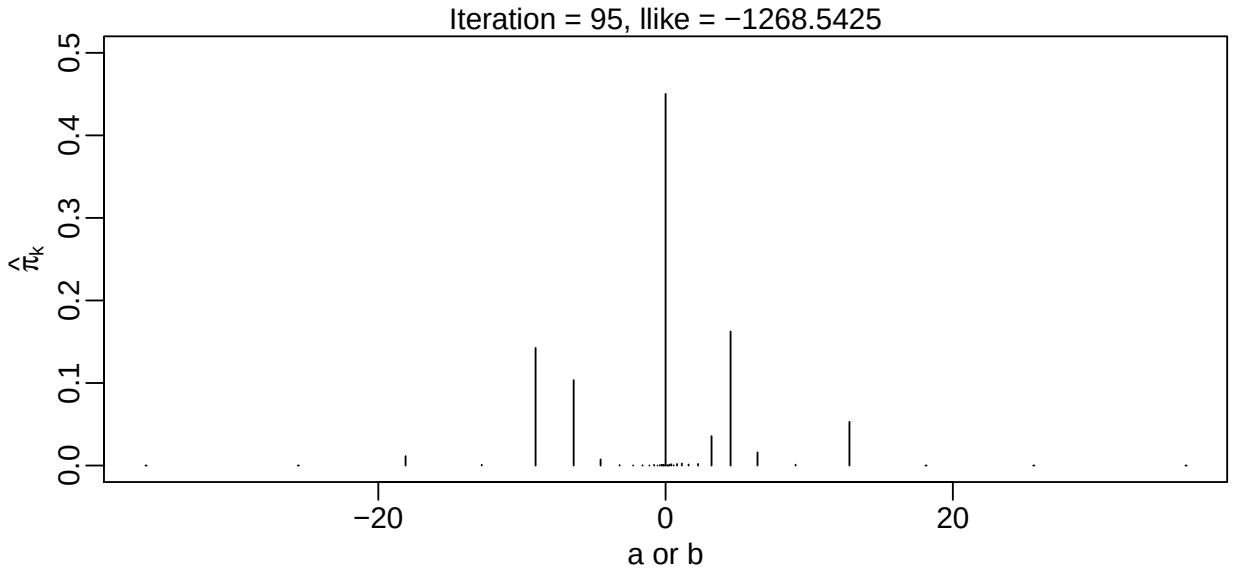

```
##  Iter = 94
## ldiff = 4.172e-06
## zdiff = 0.000723
```



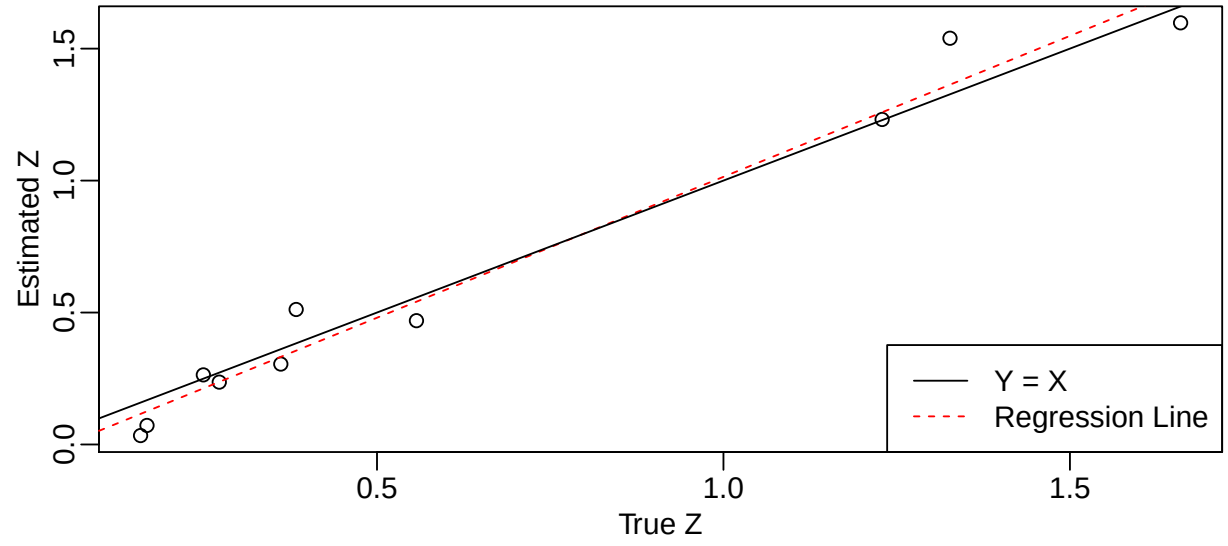


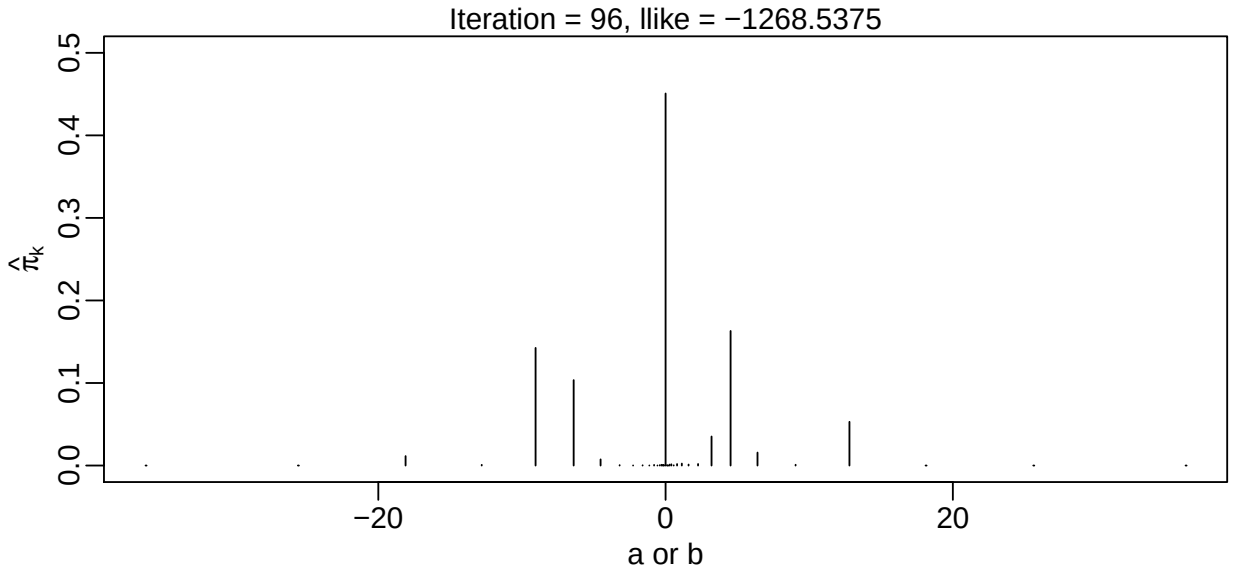

```
##  Iter = 95
## ldiff = 4.061e-06
## zdiff = 0.0007111
```



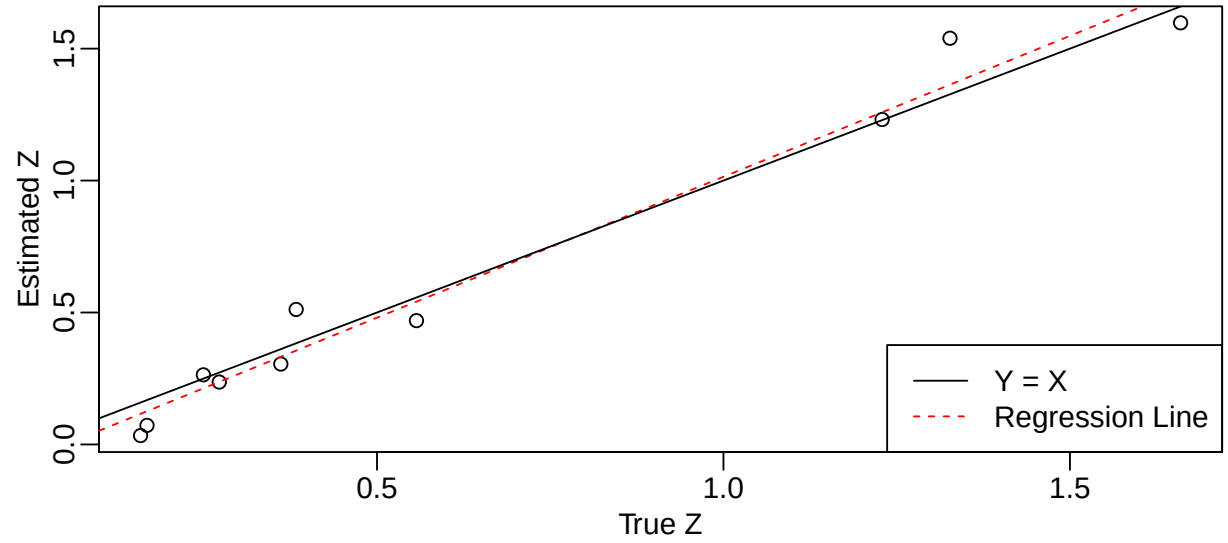


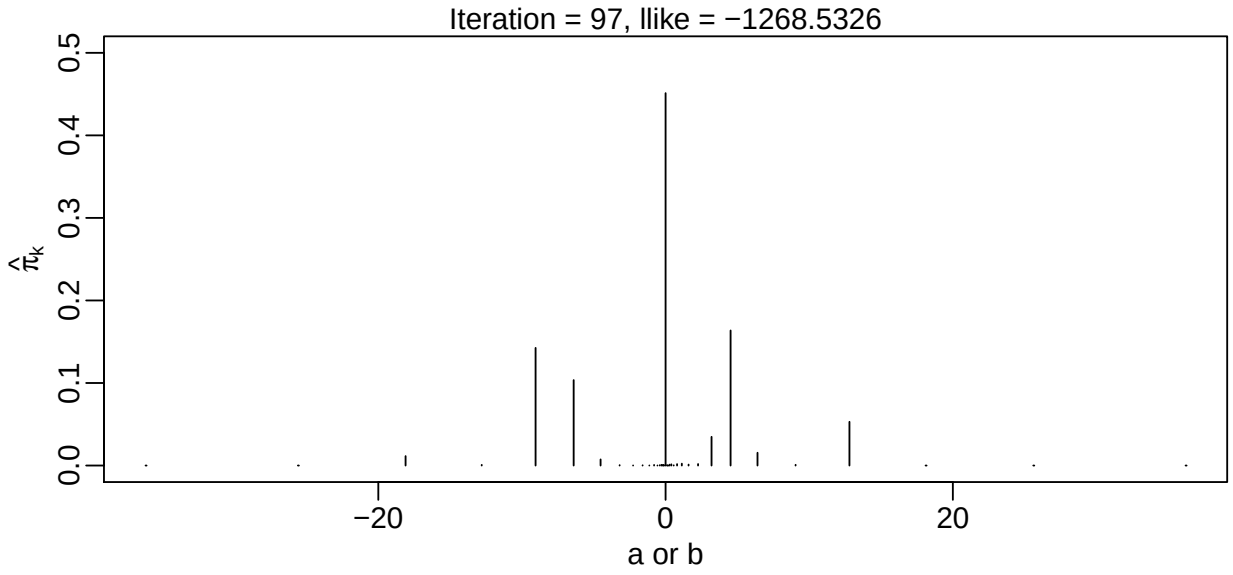

```
##  Iter = 96
## ldiff = 3.954e-06
## zdiff = 0.0006995
```



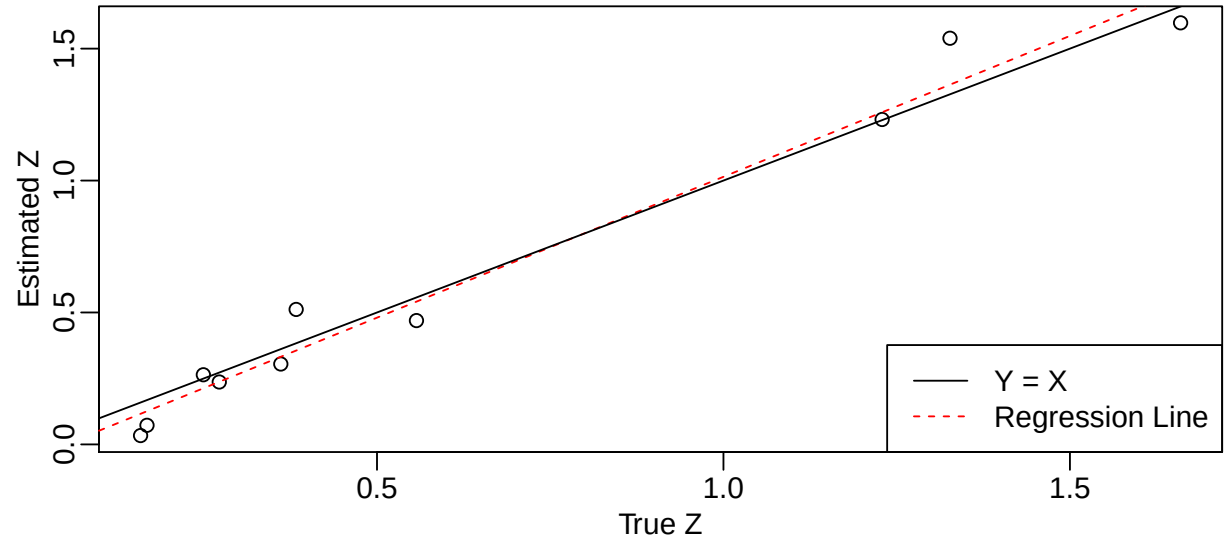


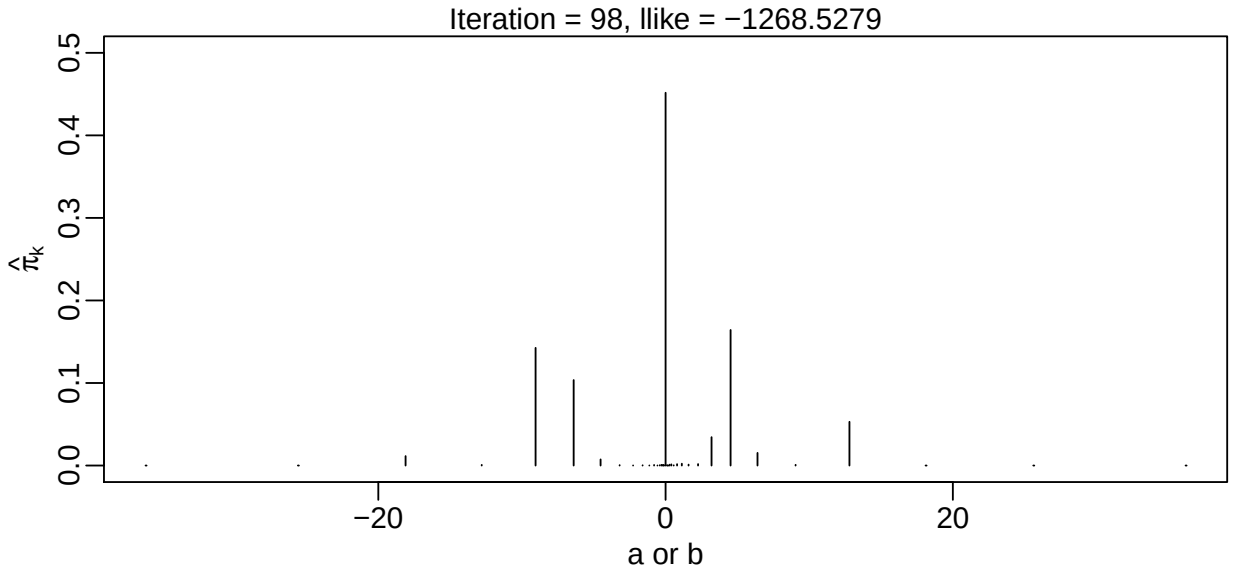

```
##  Iter = 97
## ldiff = 3.85e-06
## zdiff = 0.0006881
```



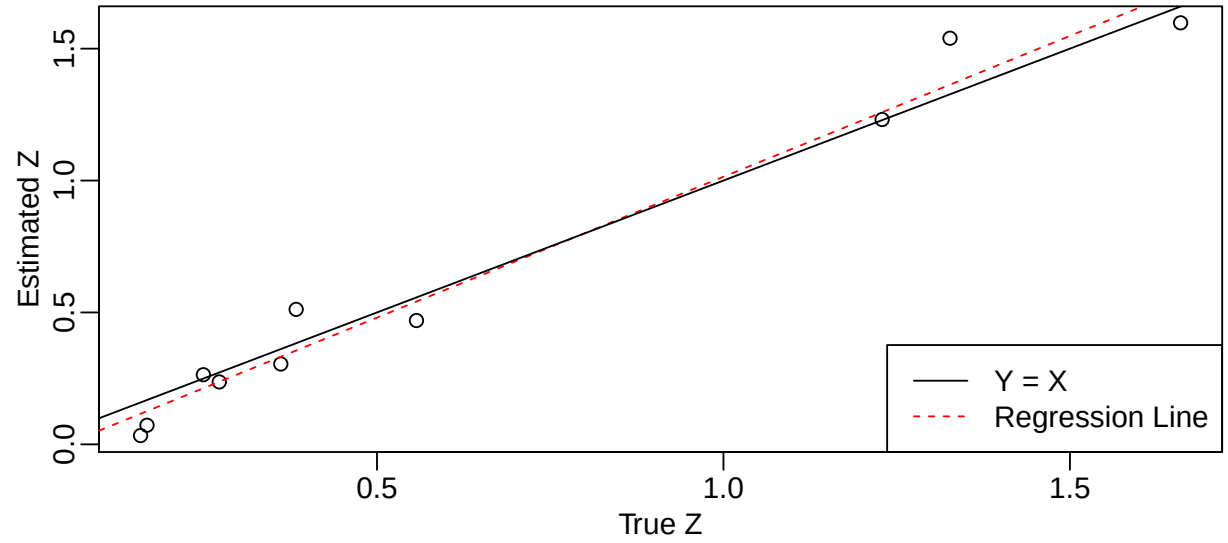


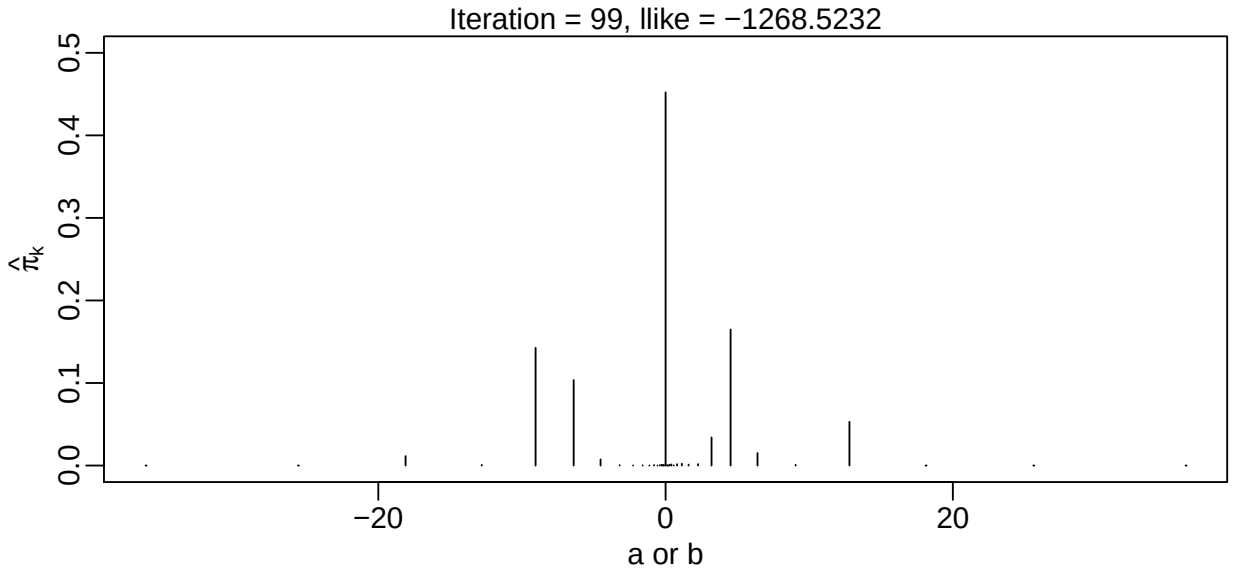

```
##  Iter = 98
## ldiff = 3.75e-06
## zdiff = 0.0006771
```



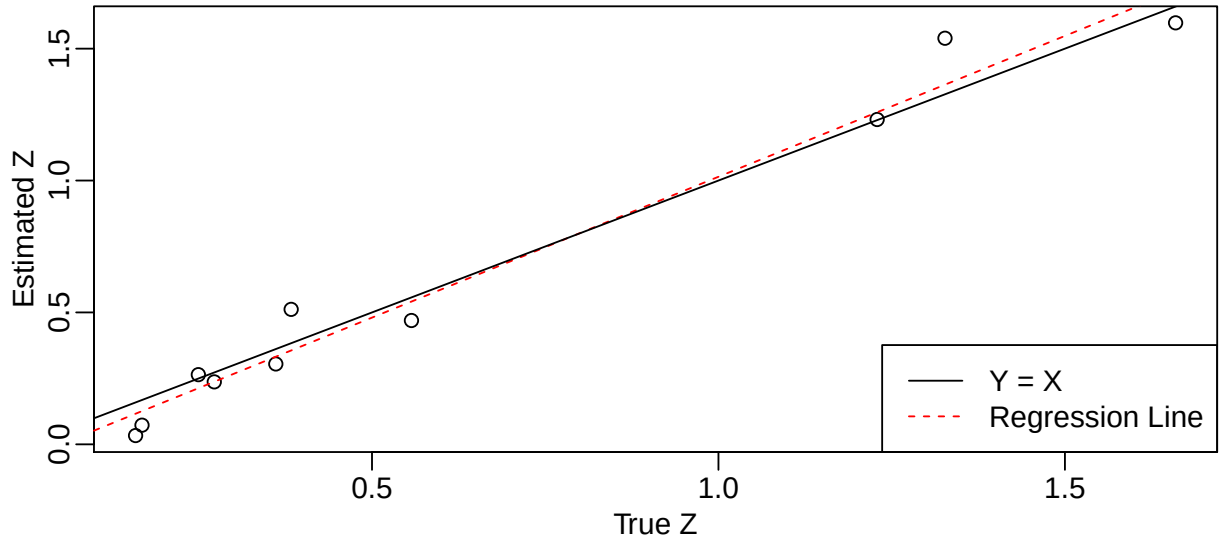


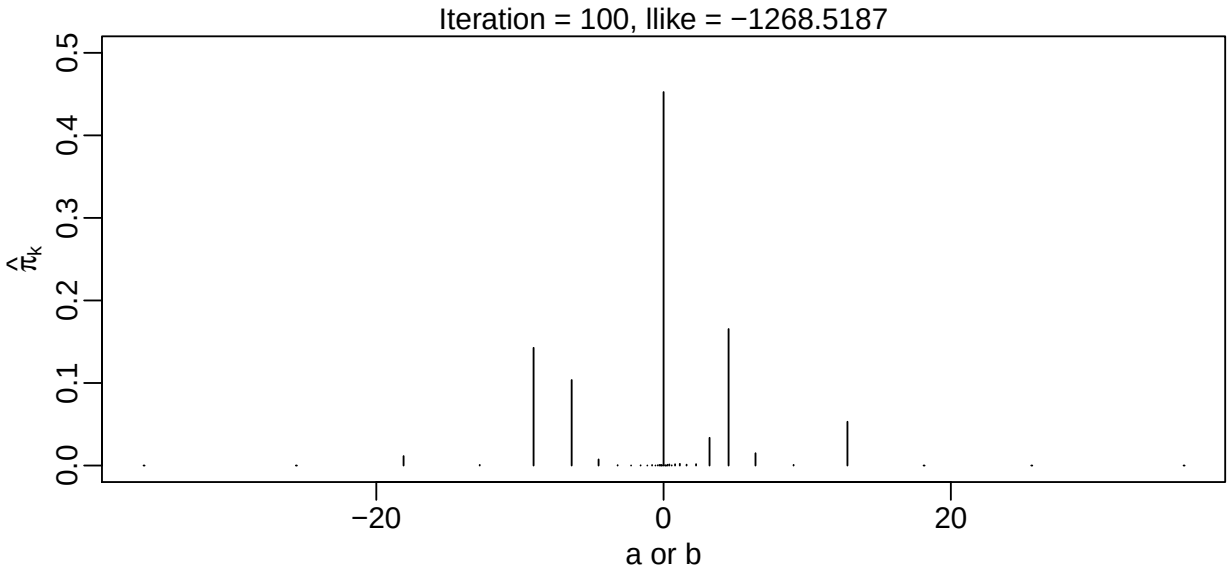

```
##  Iter = 99
## ldiff = 3.653e-06
## zdiff = 0.0006662
```



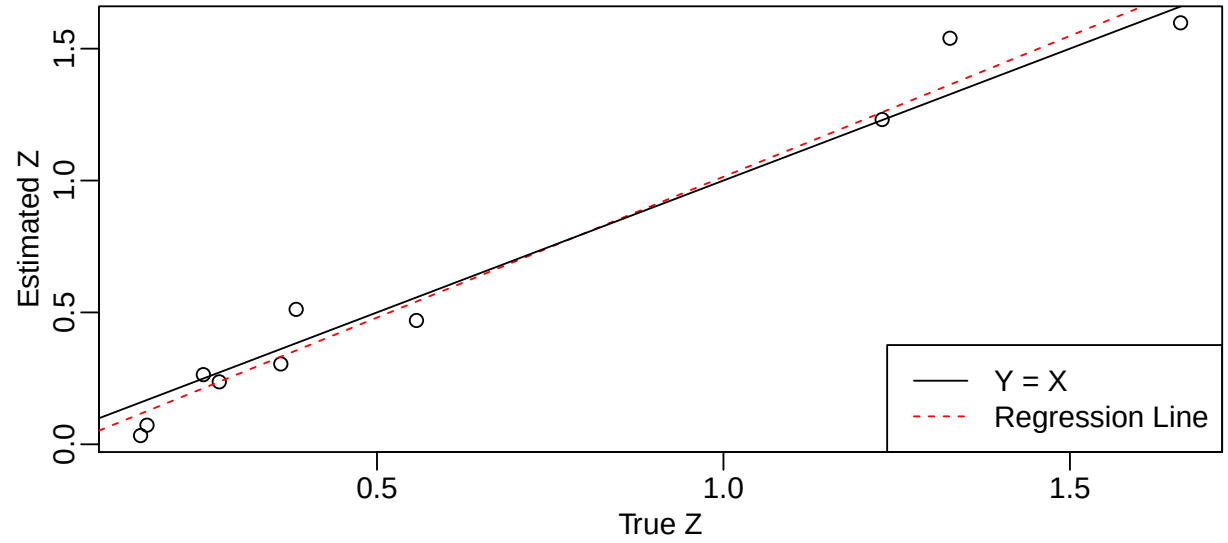


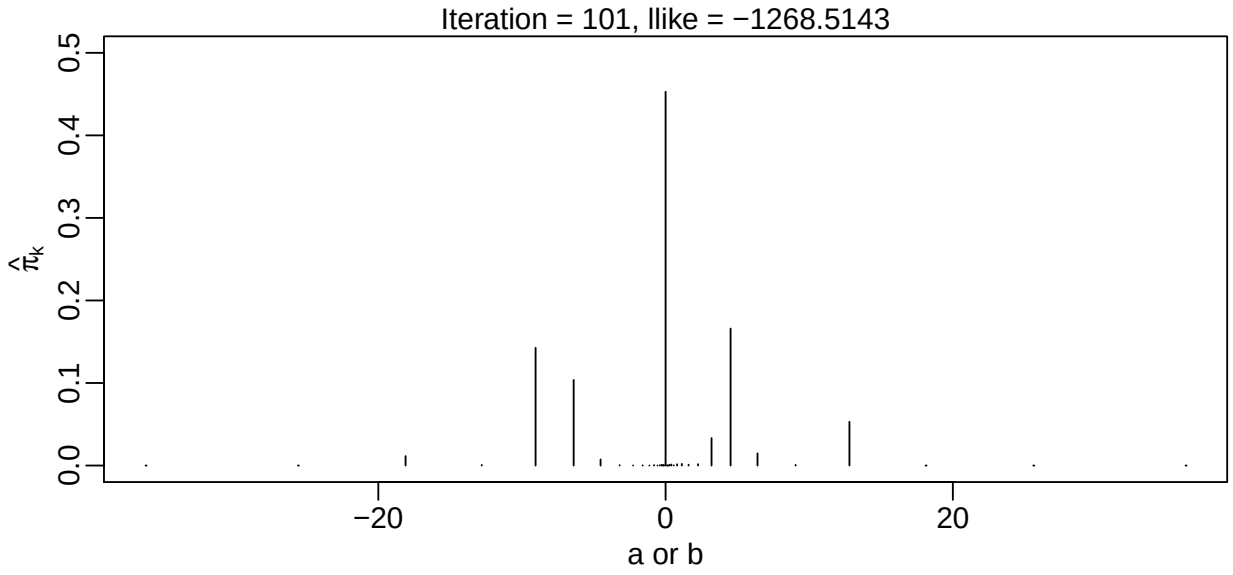

```
##  Iter = 100
## ldiff = 3.559e-06
## zdiff = 0.0006556
```



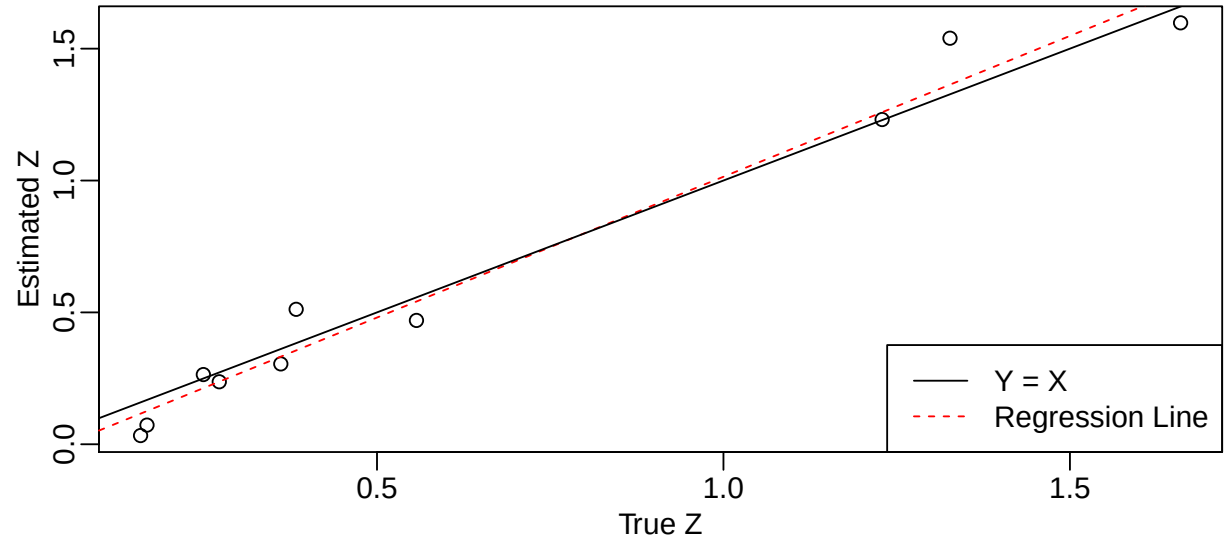


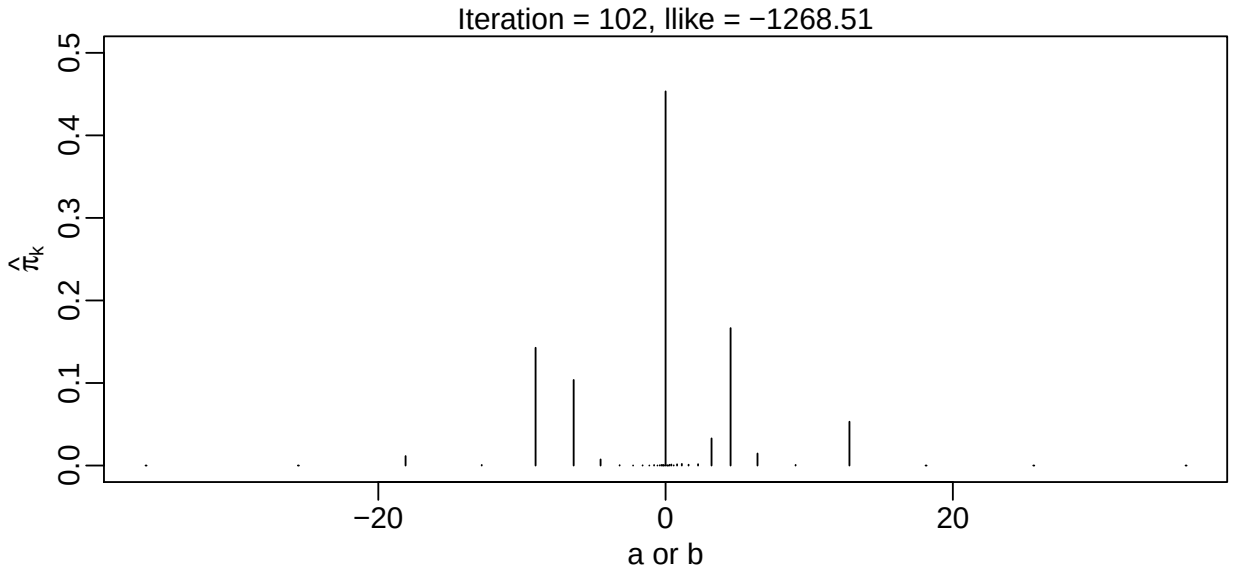

```
##  Iter = 101
## ldiff = 3.466e-06
## zdiff = 0.000258
```



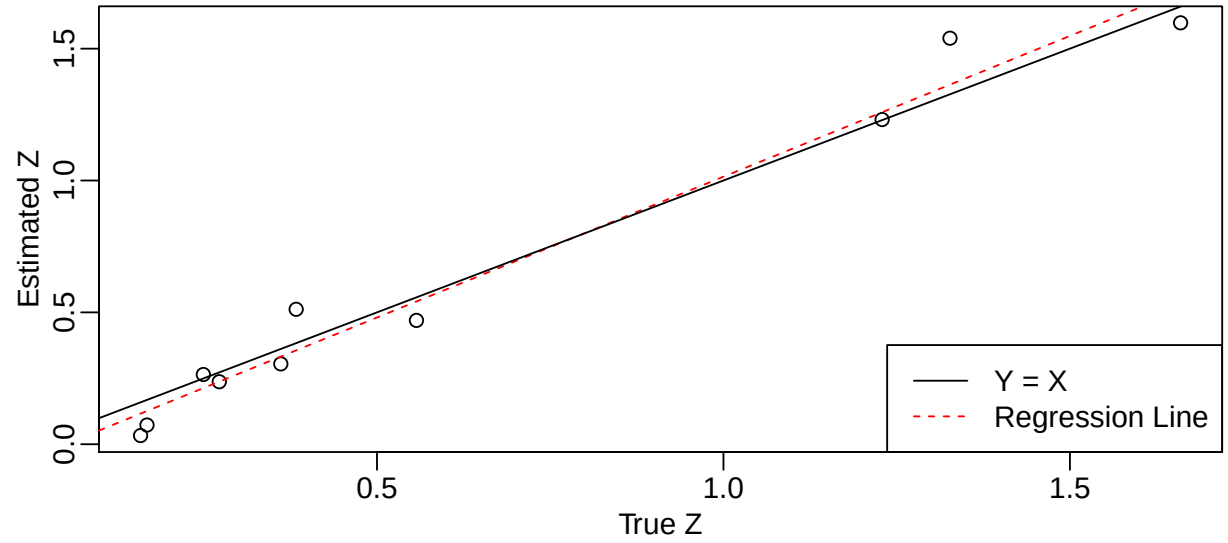


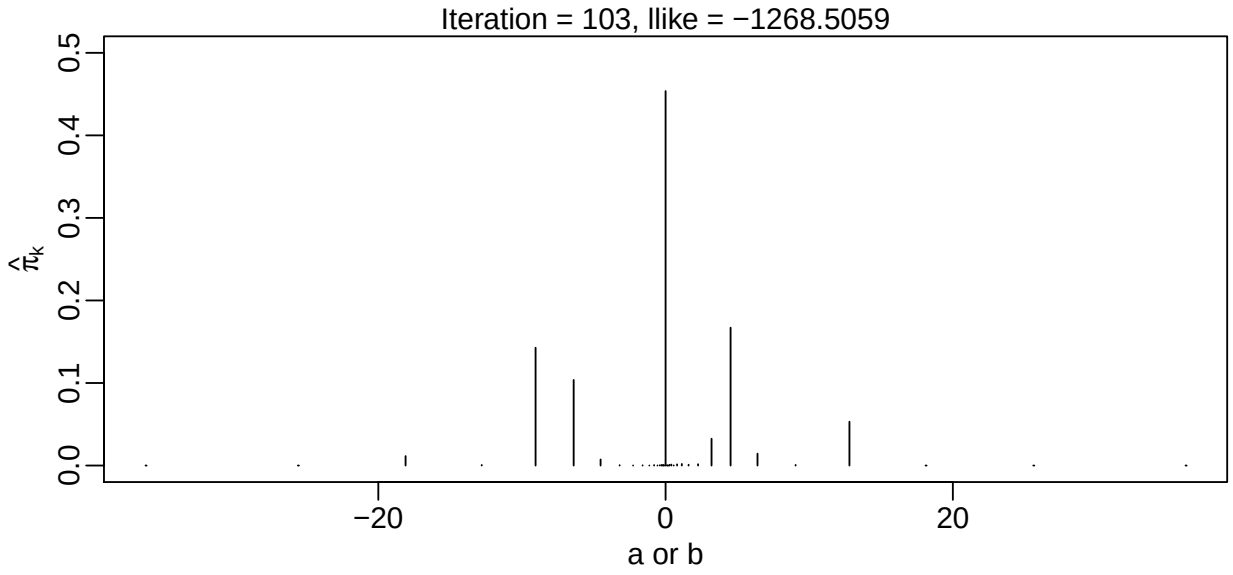

```
##  Iter = 102
## ldiff = 3.376e-06
## zdiff = 0.0008433
```



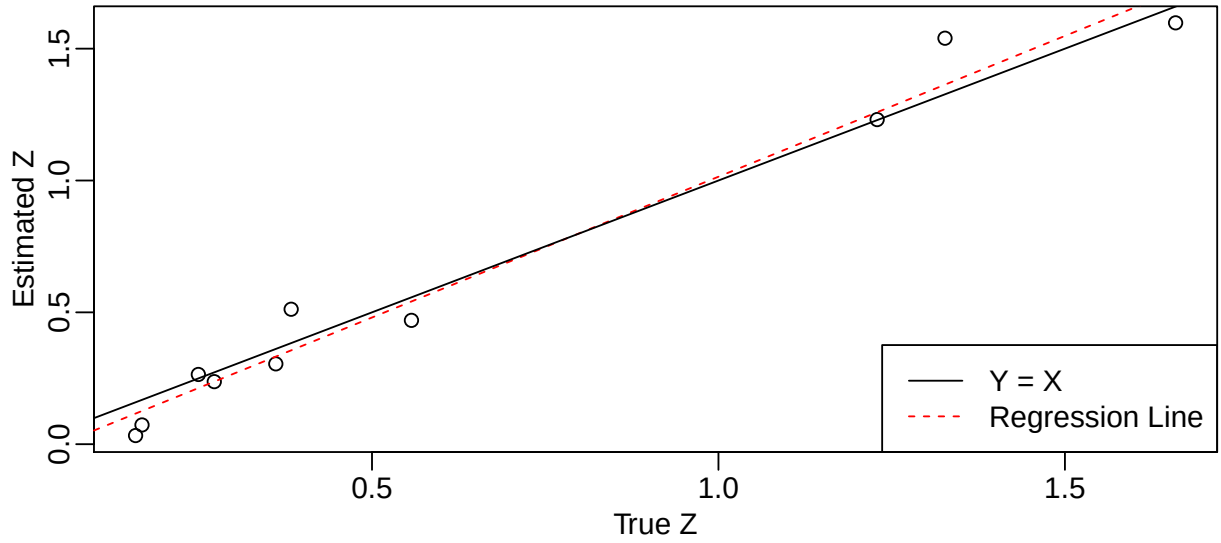


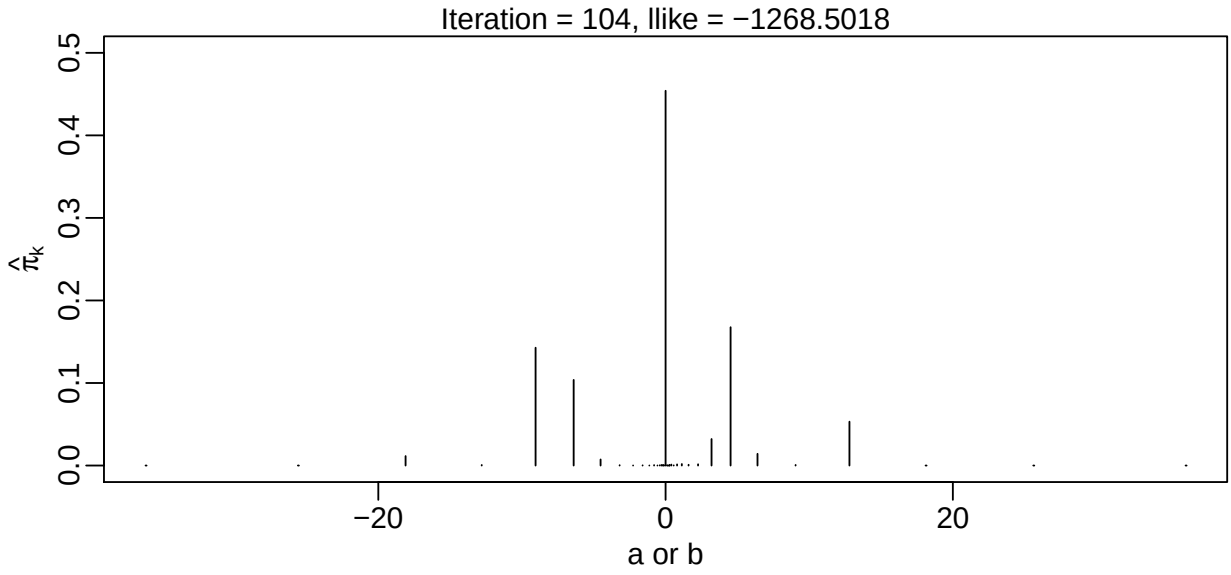

```
##  Iter = 103
## ldiff = 3.295e-06
## zdiff = 0.0007235
```



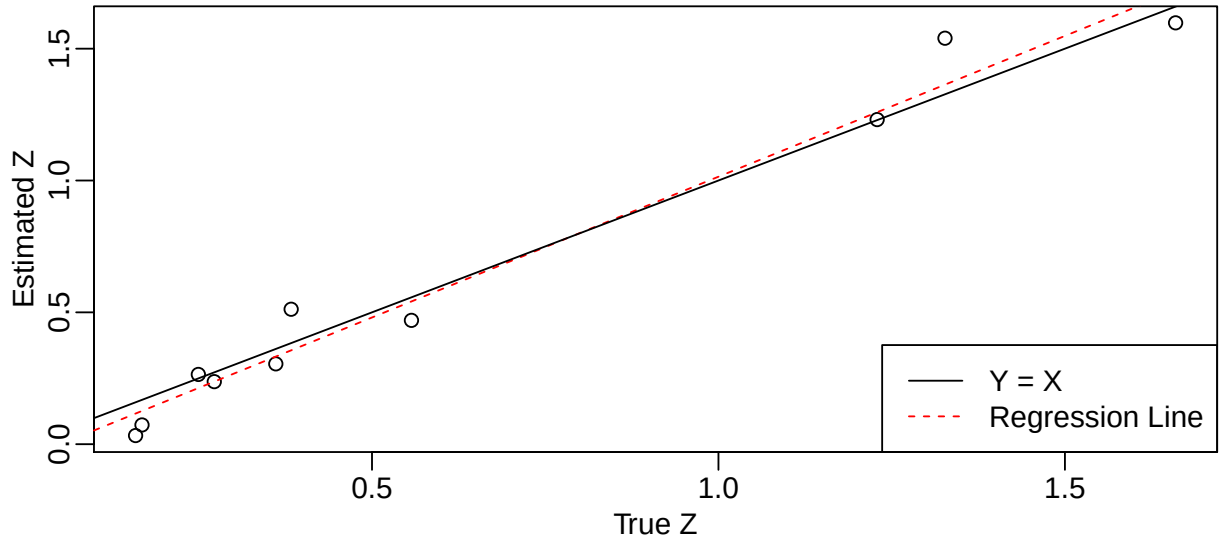


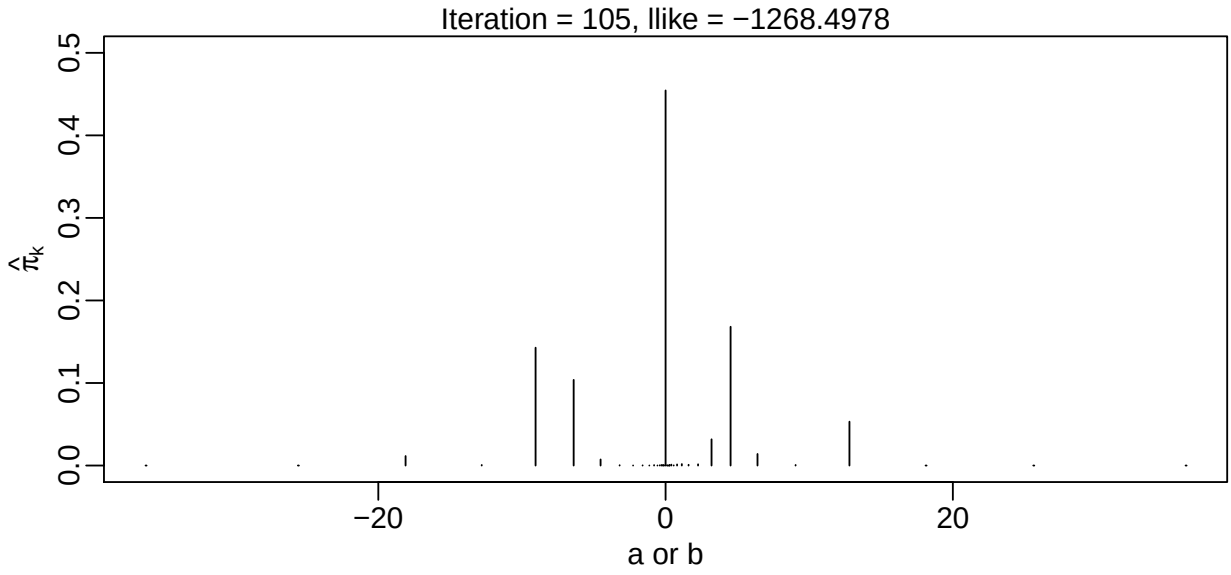

```
##  Iter = 104
## ldiff = 3.214e-06
## zdiff = 0.0006627
```



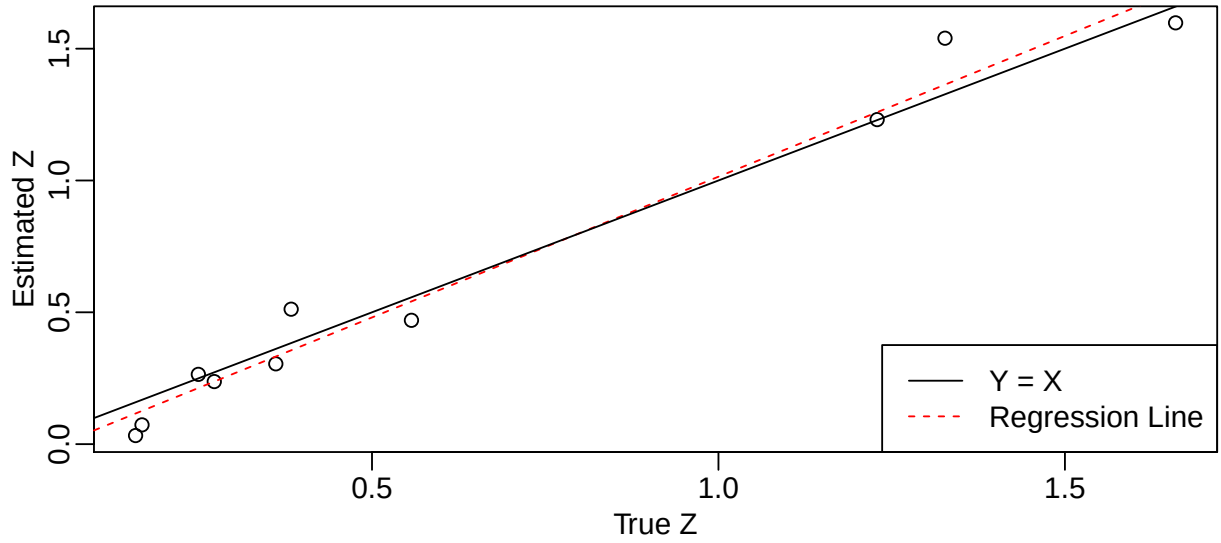


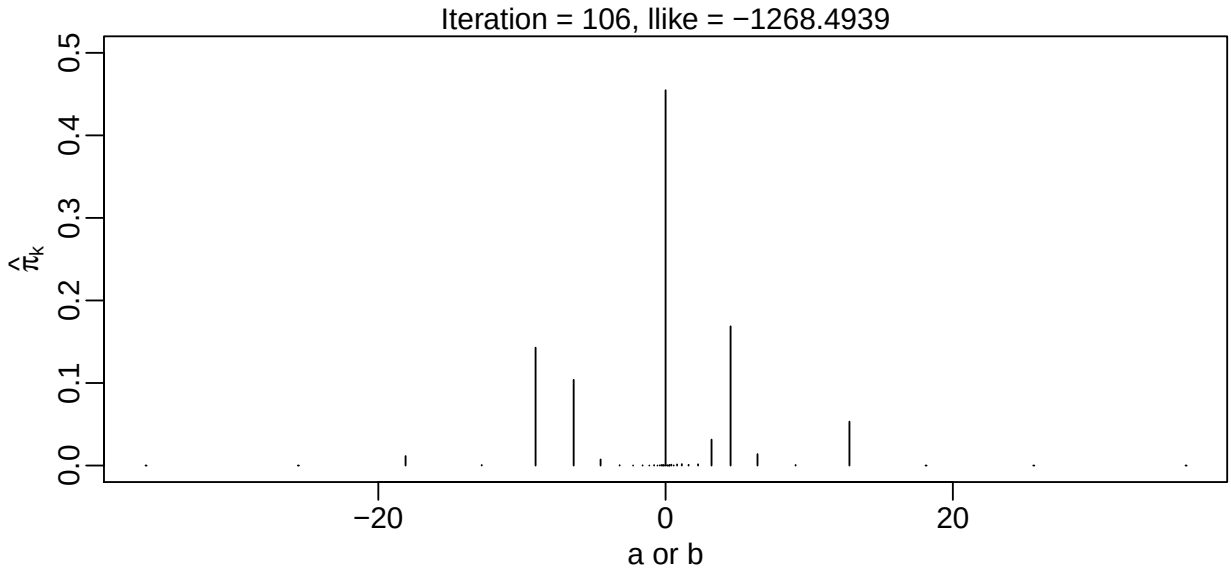

```
##  Iter = 105
## ldiff = 3.132e-06
## zdiff = 0.0002475
```



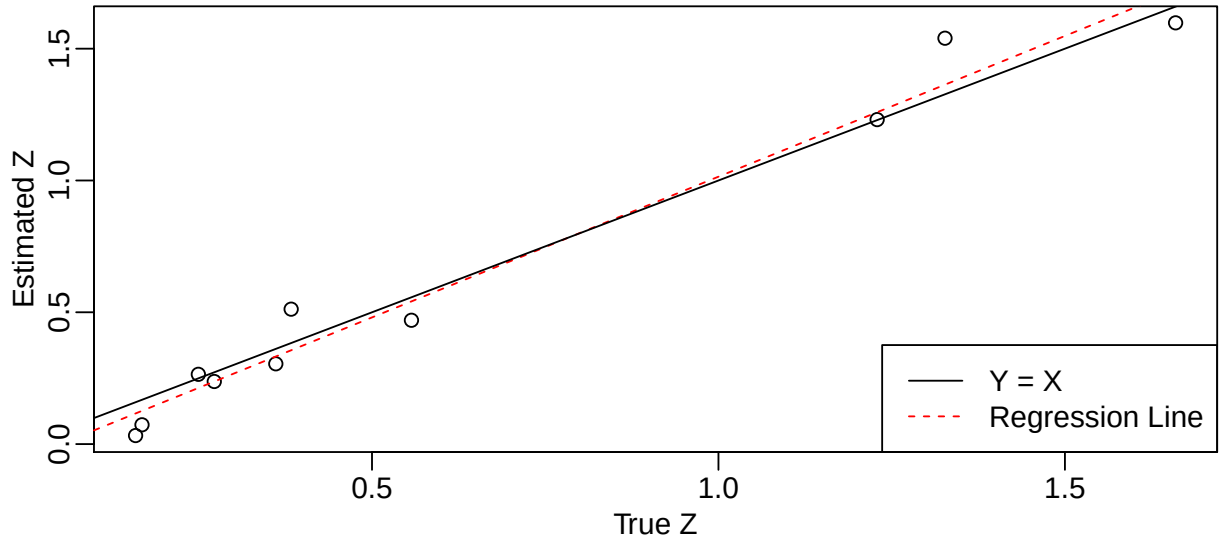


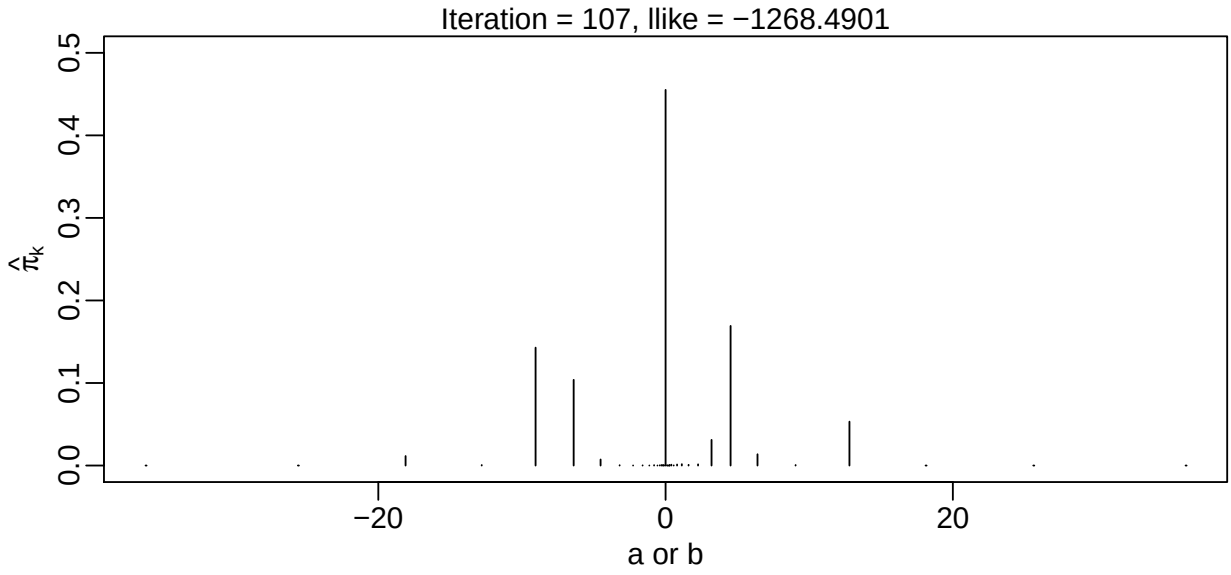

```
##  Iter = 106
## ldiff = 3.053e-06
## zdiff = 0.0008114
```



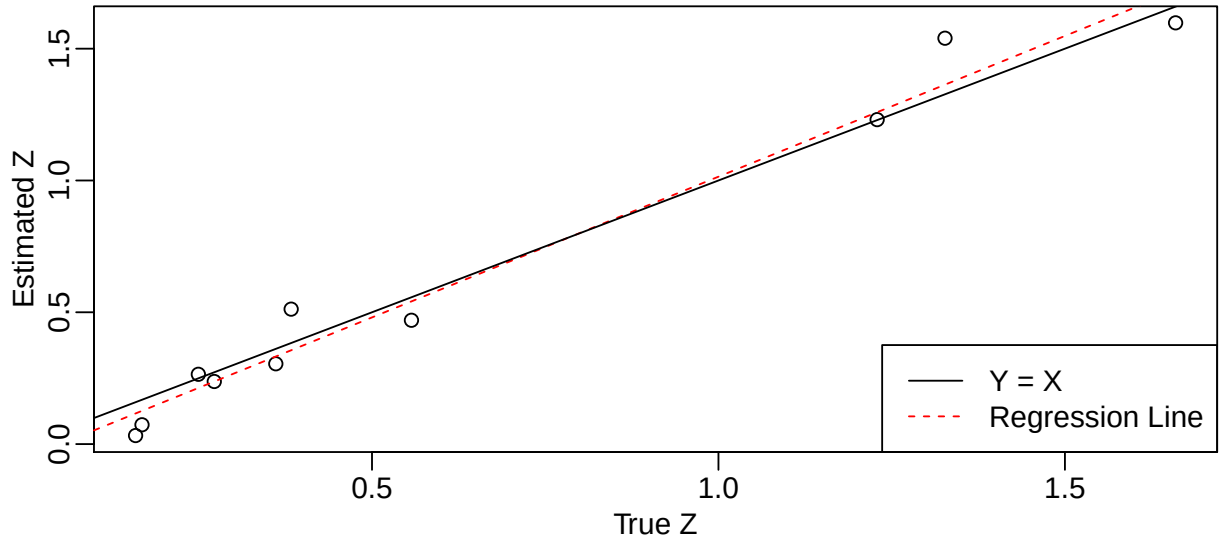


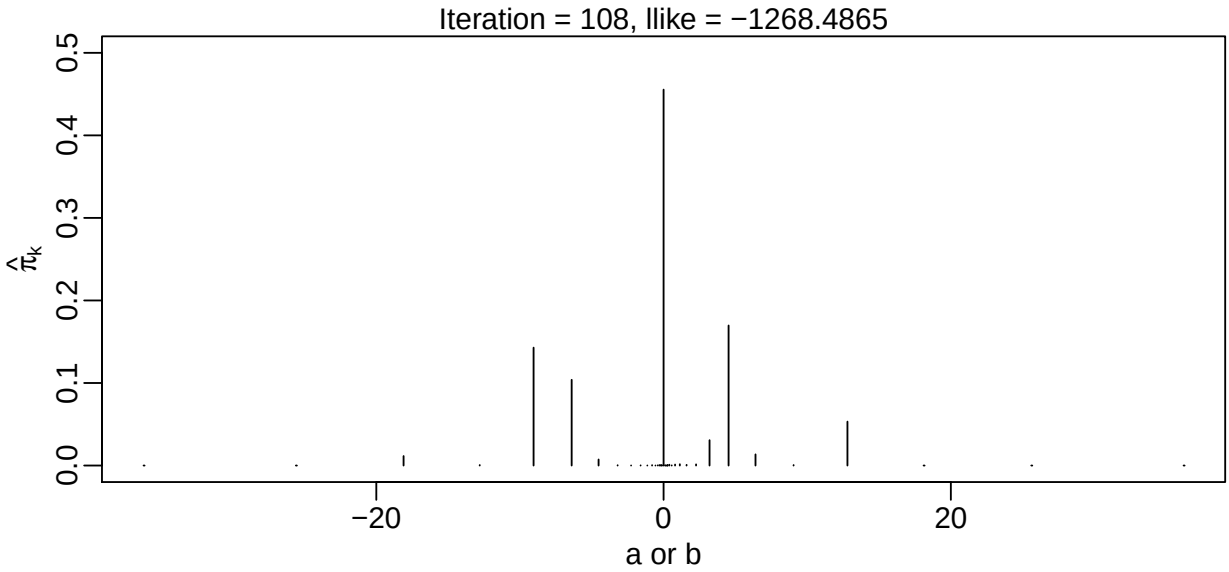

```
##  Iter = 107
## ldiff = 2.981e-06
## zdiff = 0.0006897
```



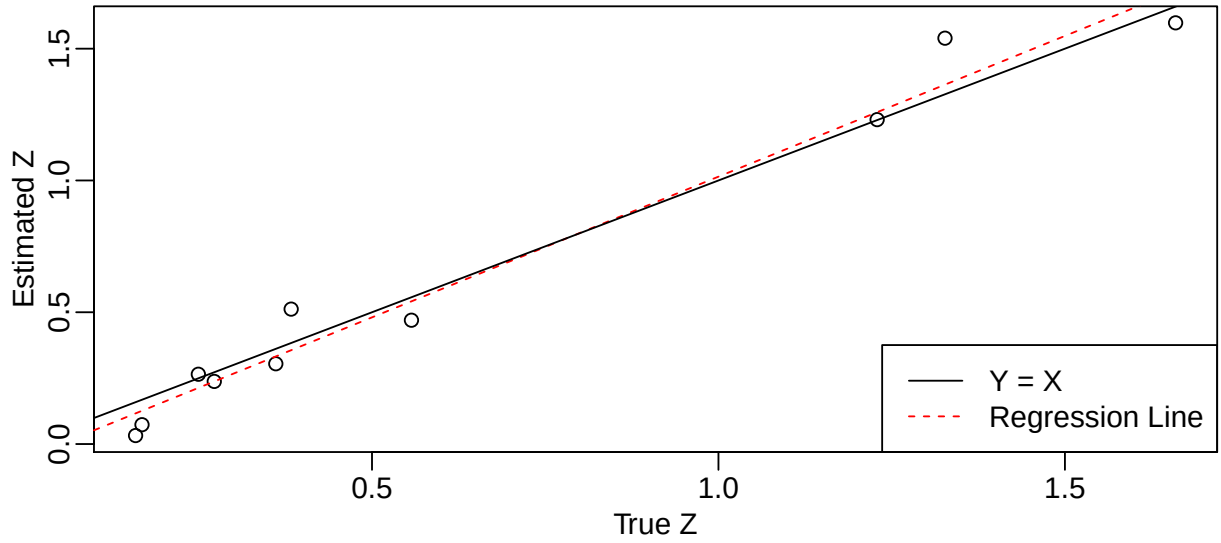


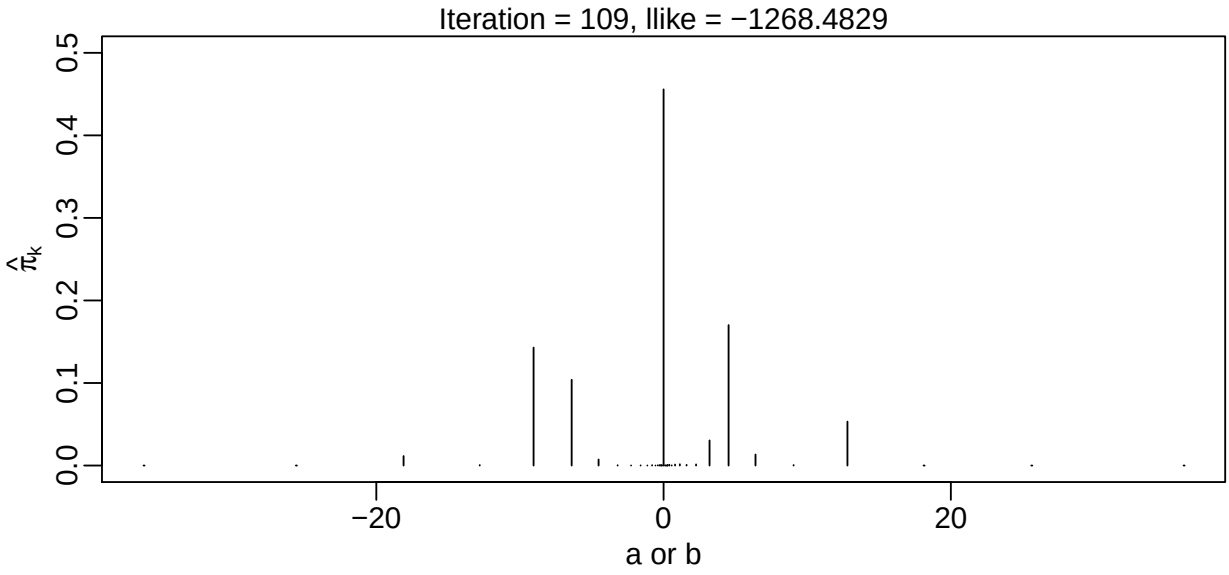

```
##  Iter = 108
## ldiff = 2.908e-06
## zdiff = 0.0002428
```



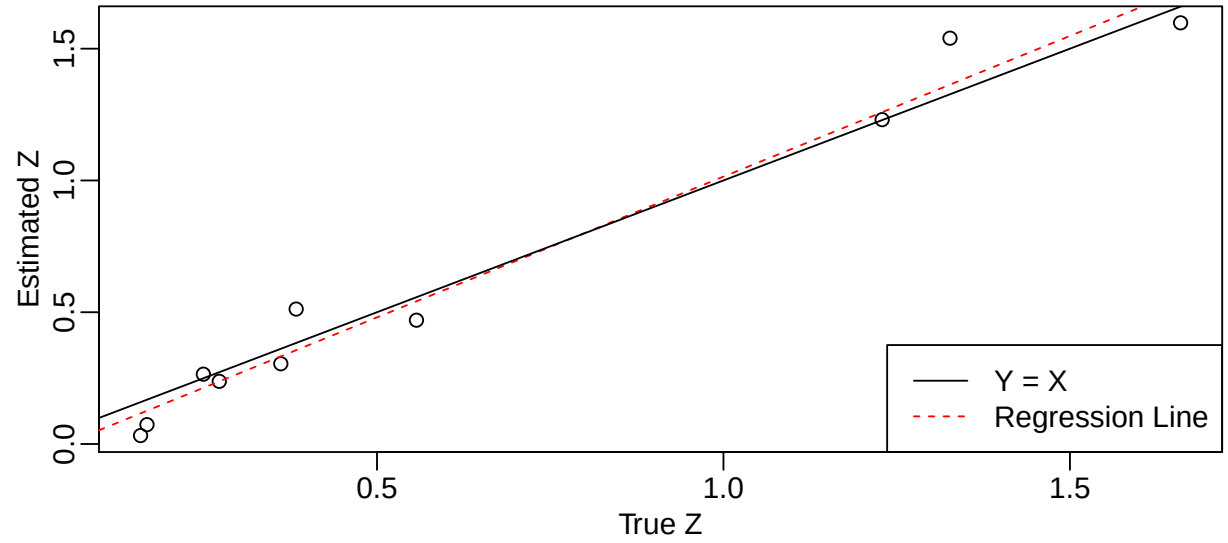


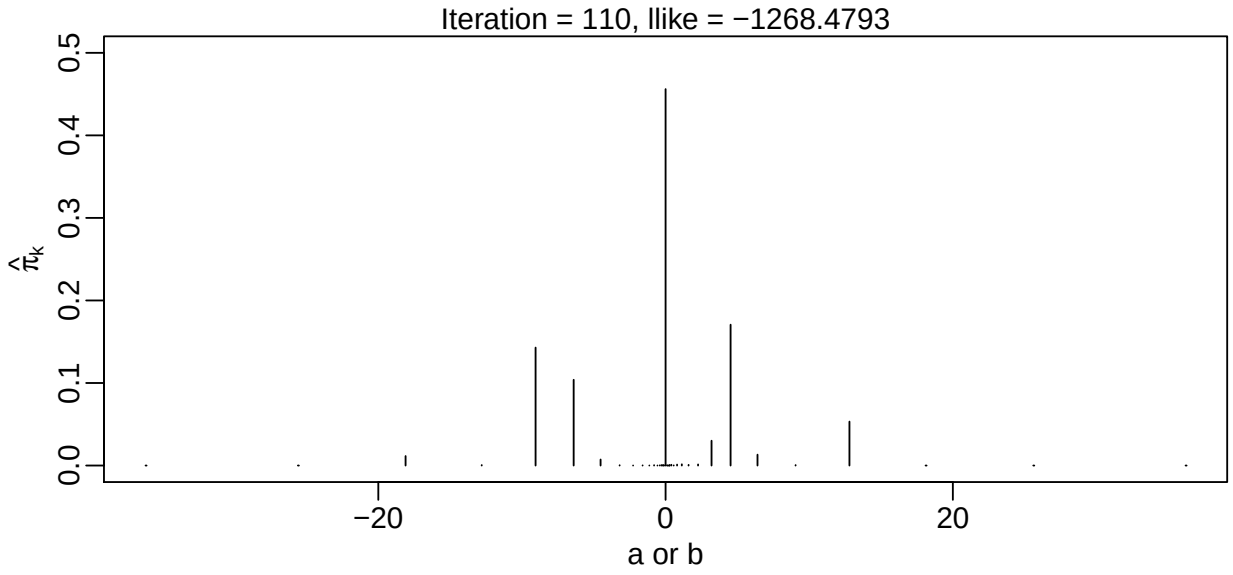

```
##  Iter = 109
## ldiff = 2.836e-06
## zdiff = 0.0007976
```



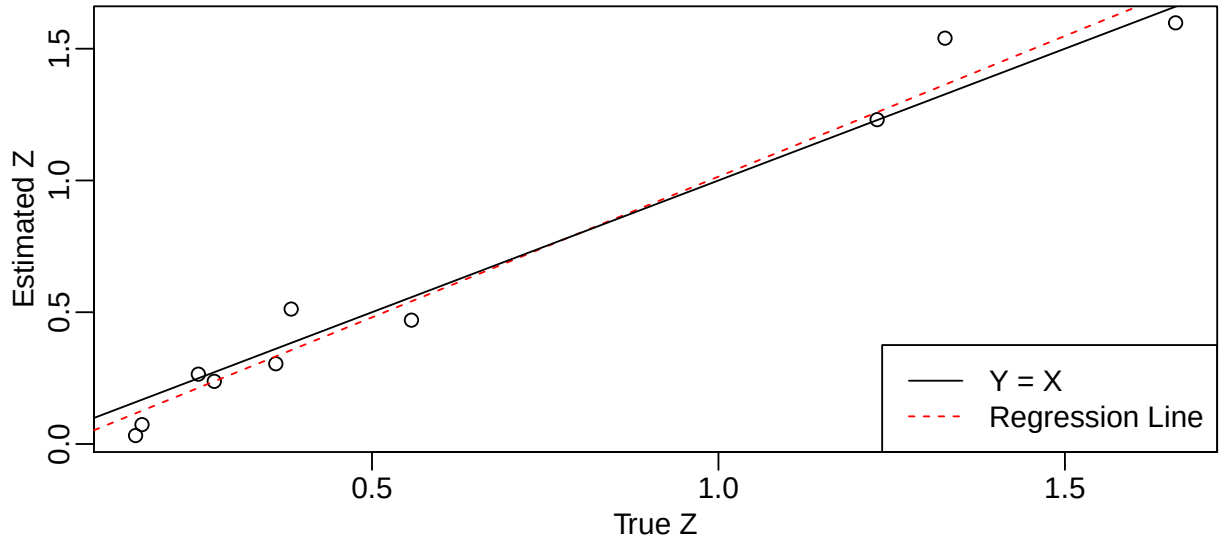


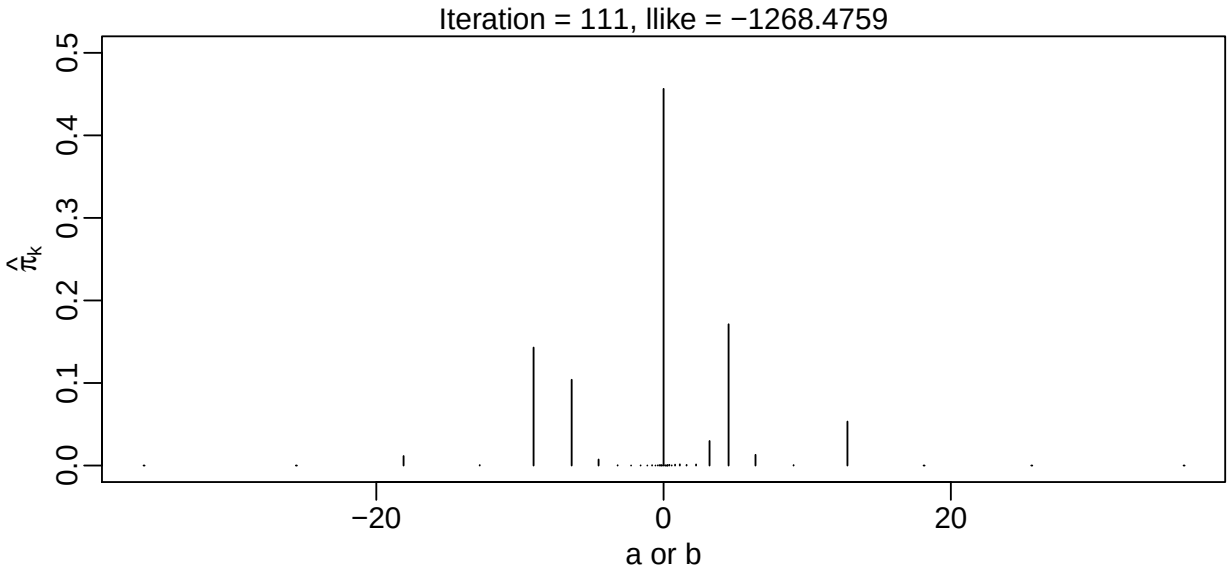

```
##  Iter = 110
## ldiff = 2.771e-06
## zdiff = 0.00067
```



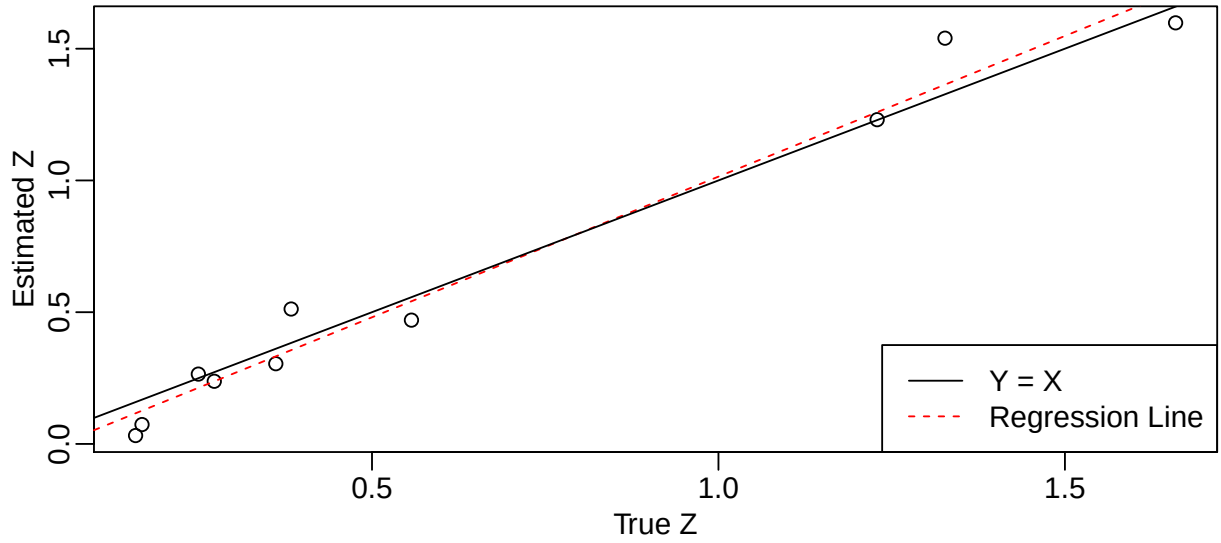


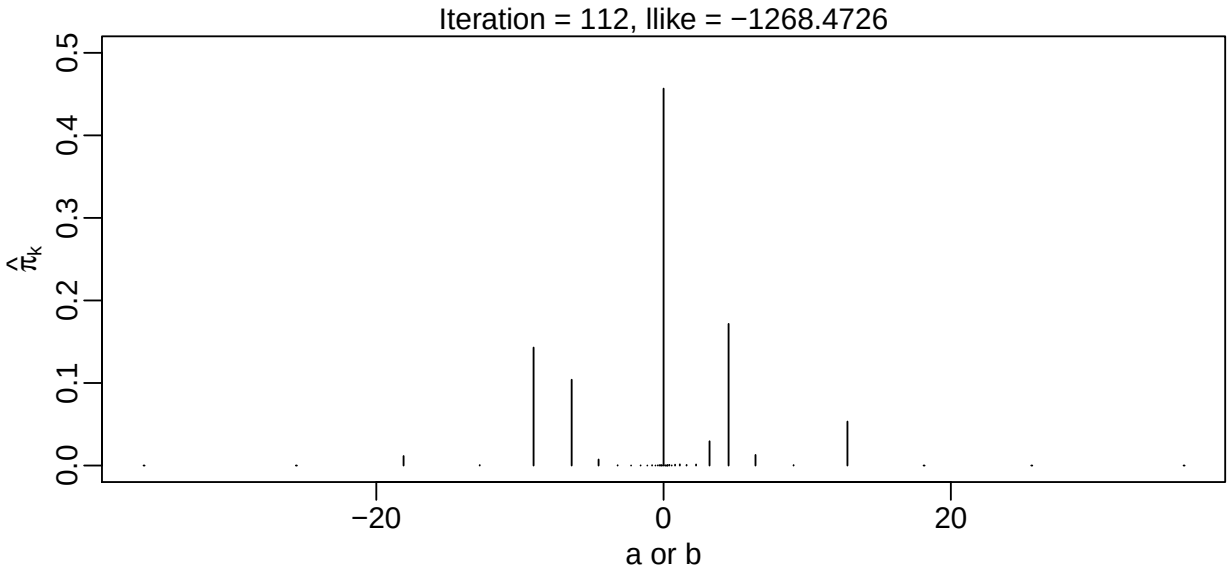

```
##  Iter = 111
## ldiff = 2.704e-06
## zdiff = 0.0002329
```



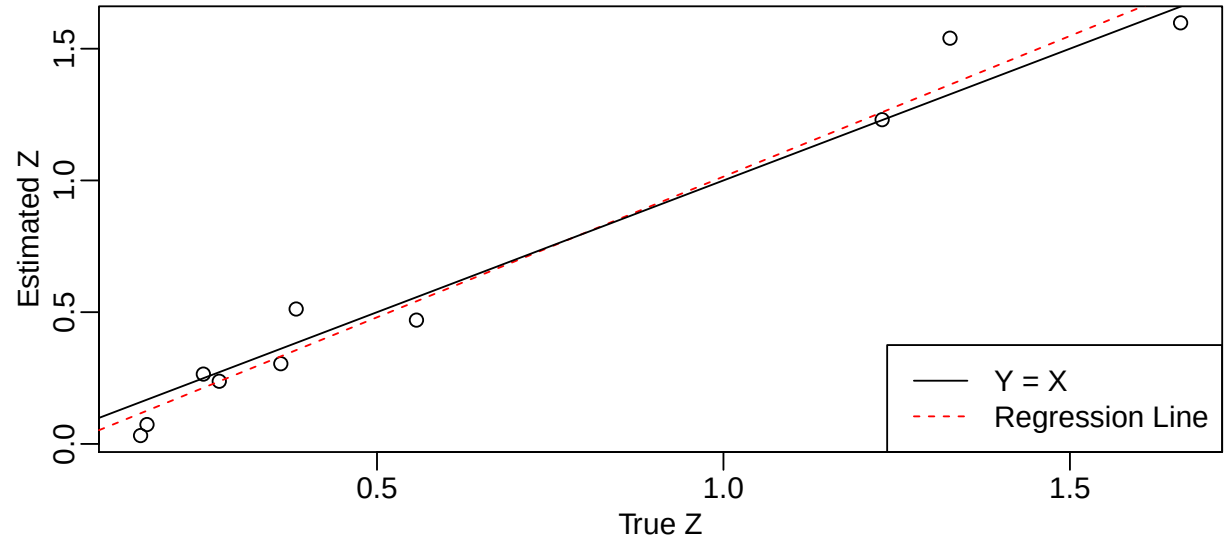


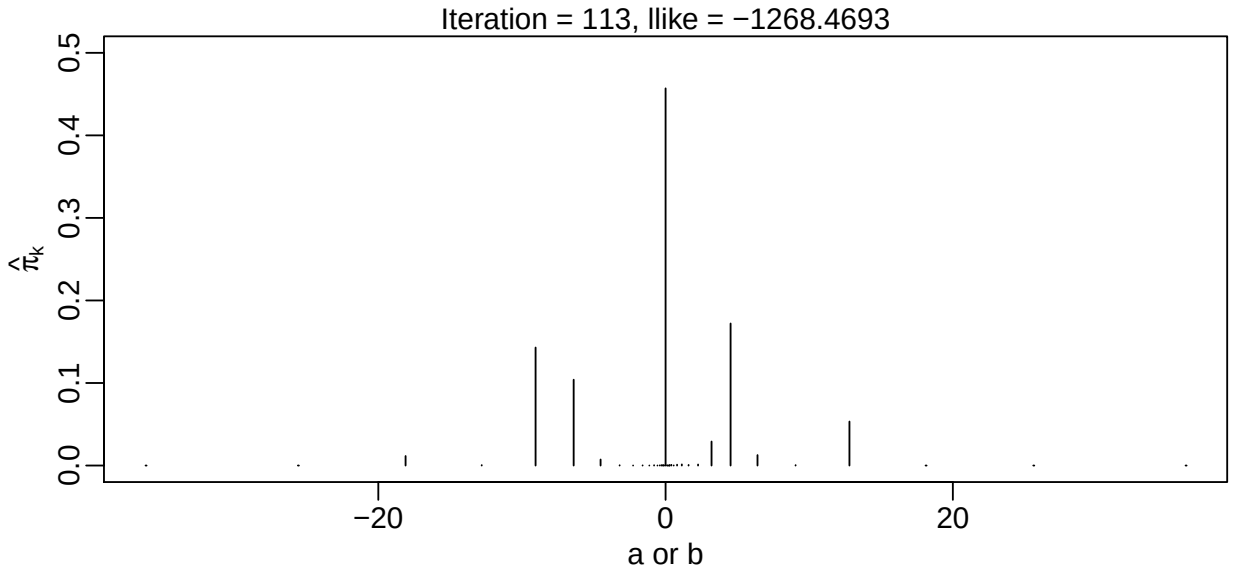

```
##  Iter = 112
## ldiff = 2.638e-06
## zdiff = 0.0007668
```



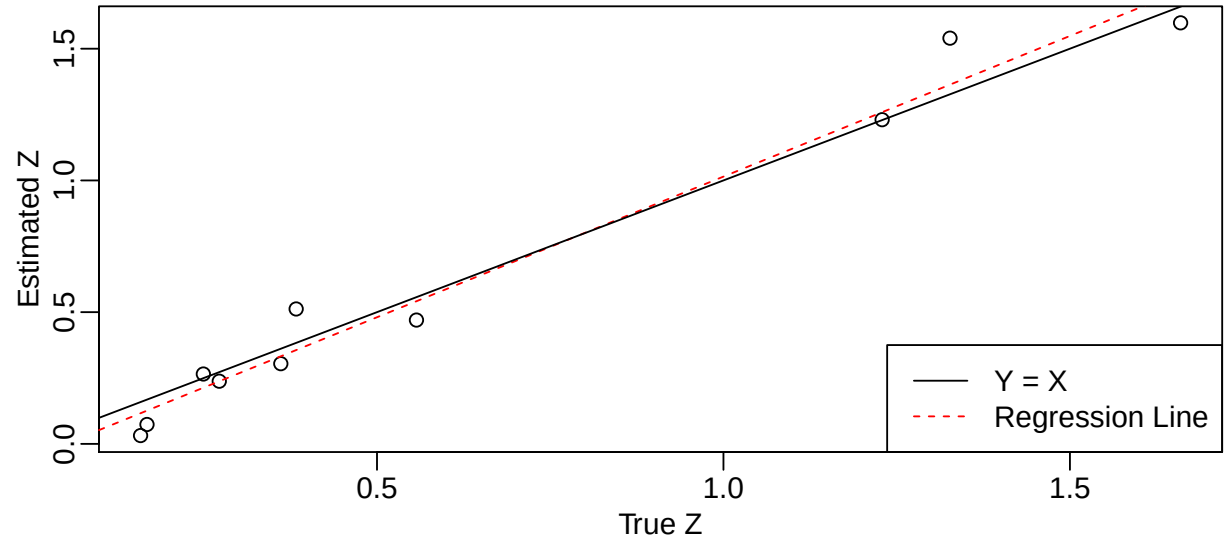


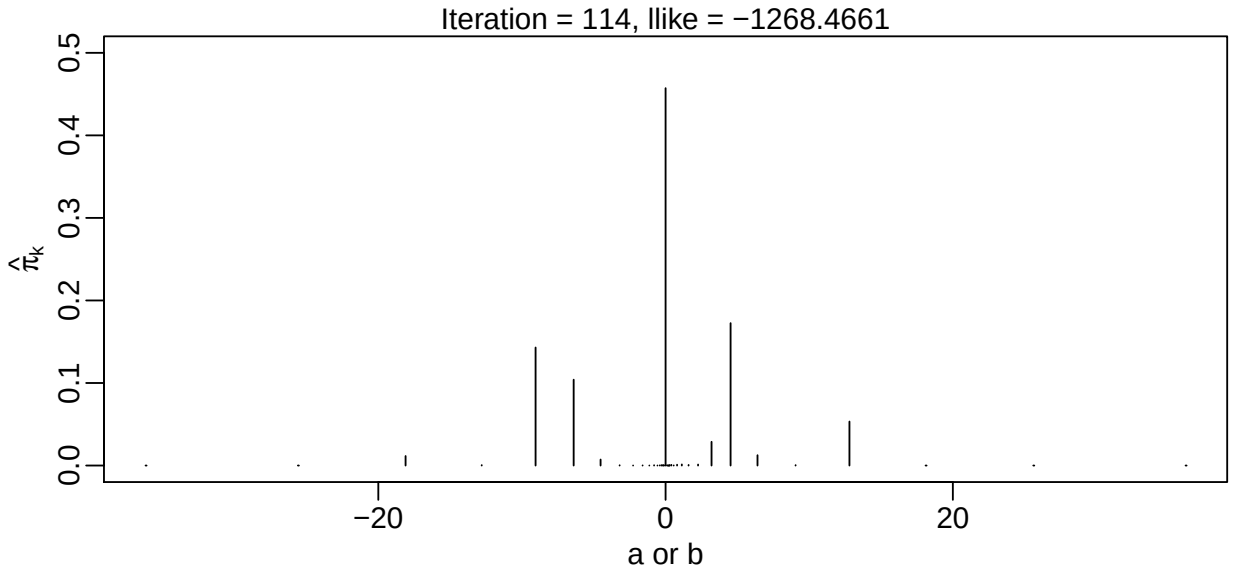

```
##  Iter = 113
## ldiff = 2.577e-06
## zdiff = 0.0002396
```



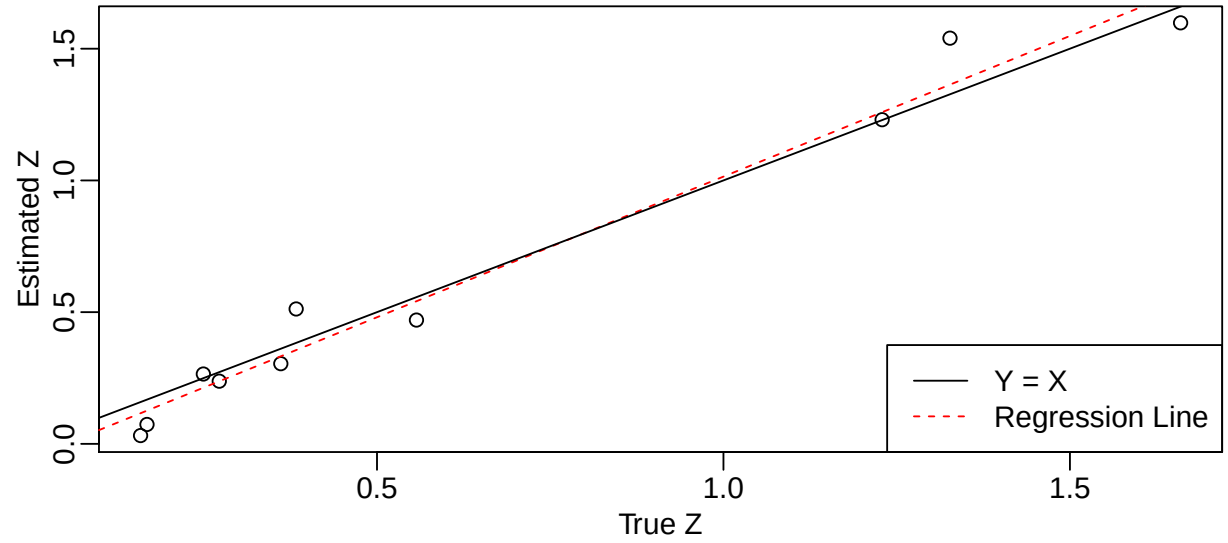


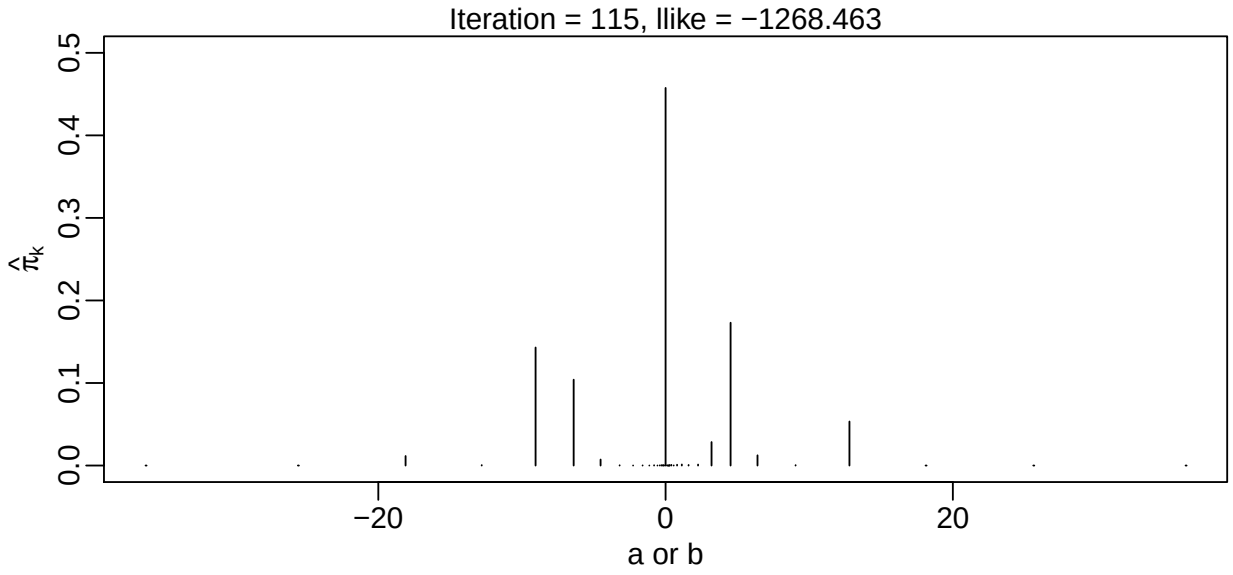

```
##  Iter = 114
## ldiff = 2.516e-06
## zdiff = 0.00079
```



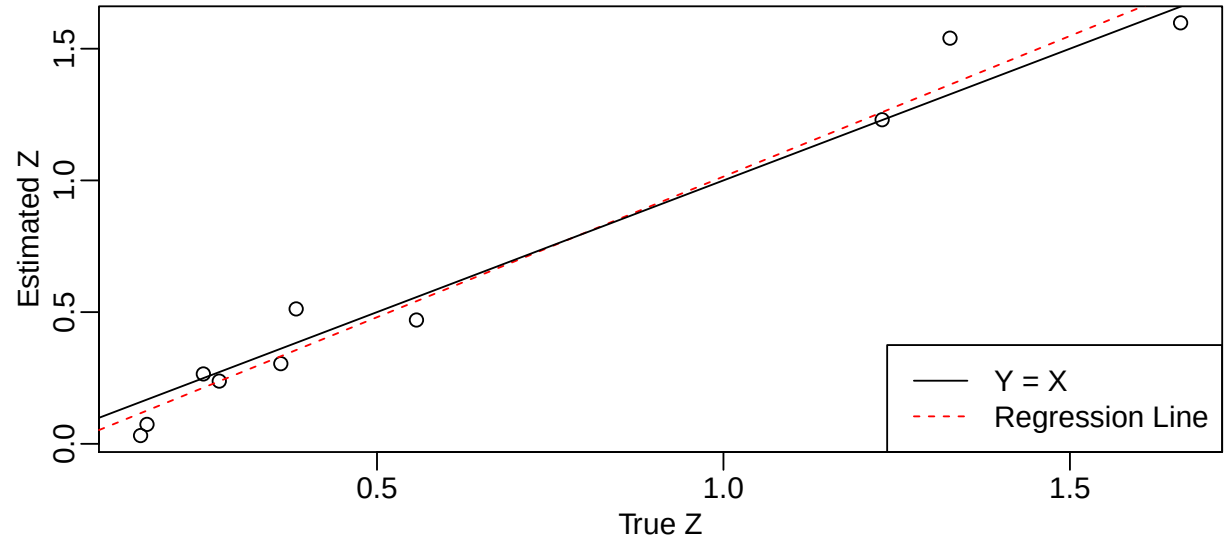


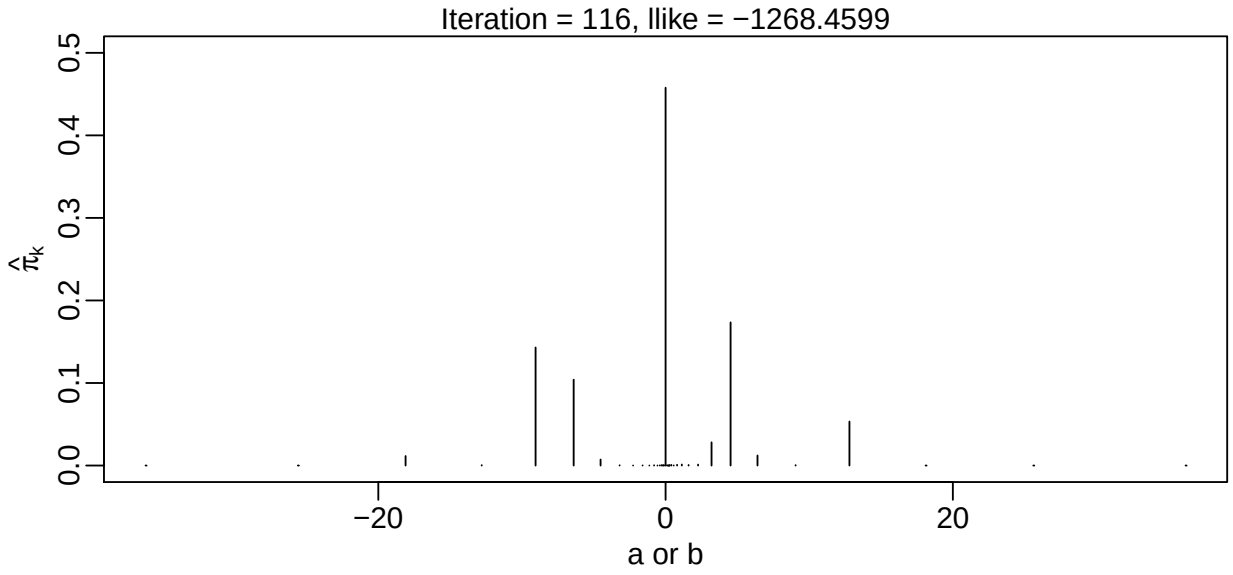

```
##  Iter = 115
## ldiff = 2.458e-06
## zdiff = 0.0002379
```



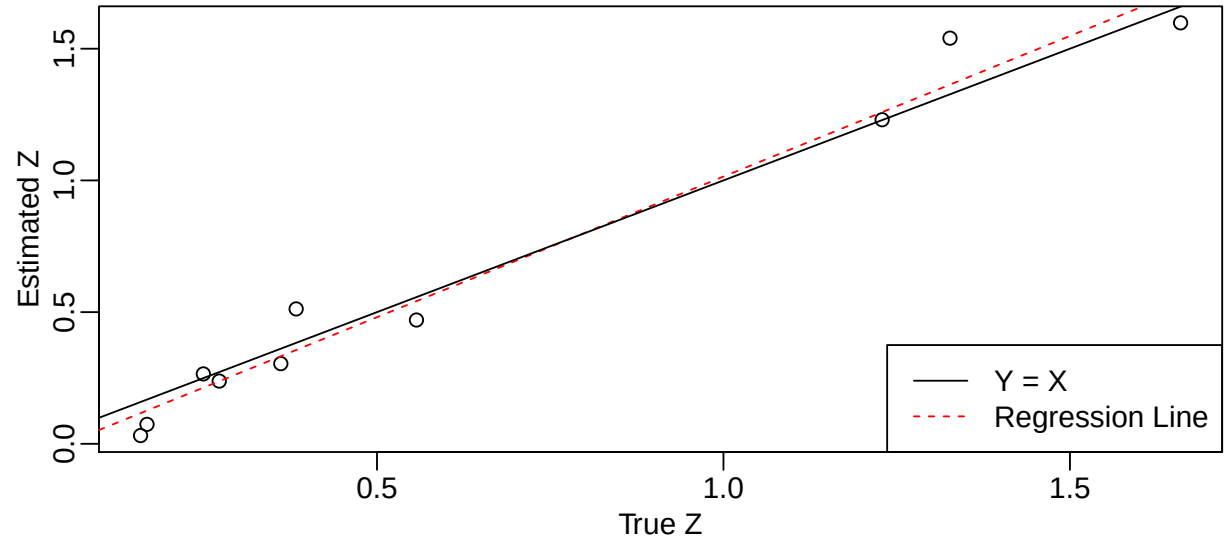


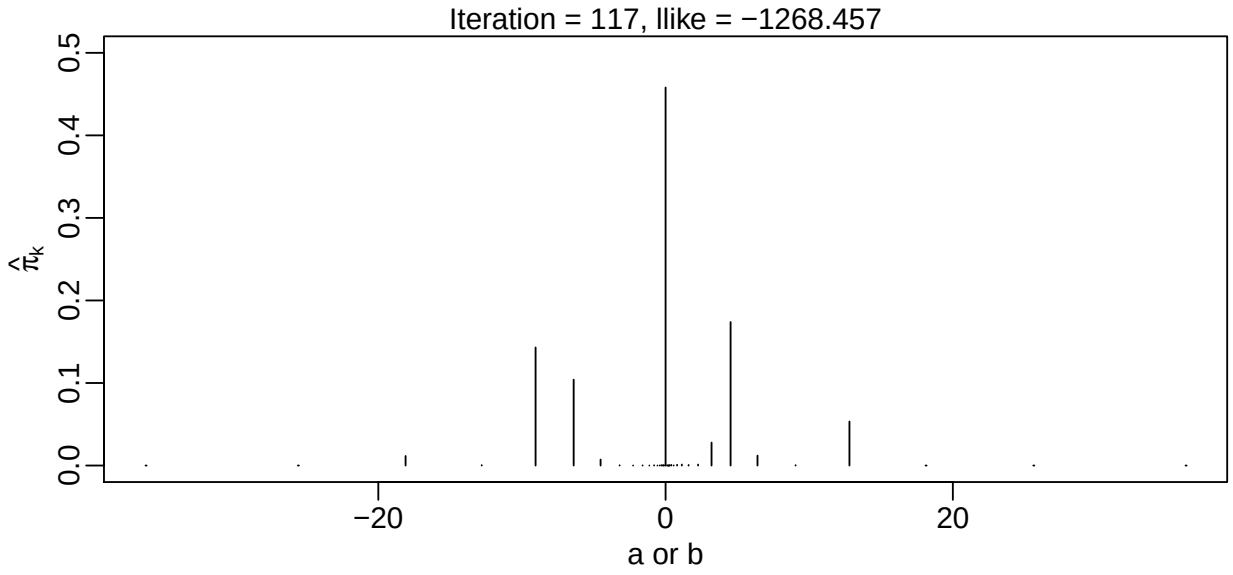

```
##  Iter = 116
## ldiff = 2.401e-06
## zdiff = 0.0007854
```



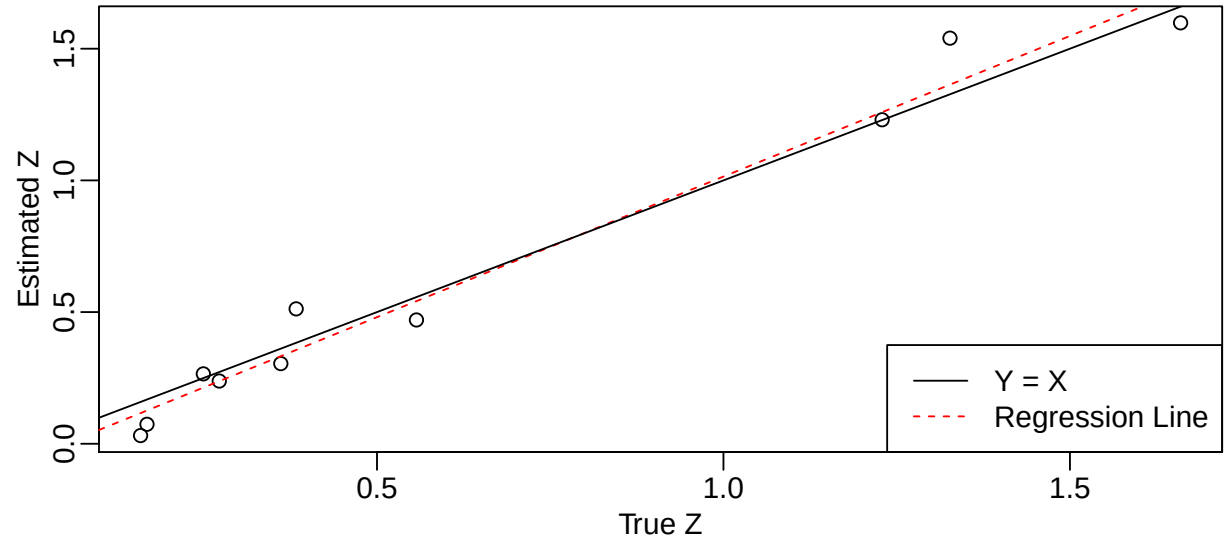


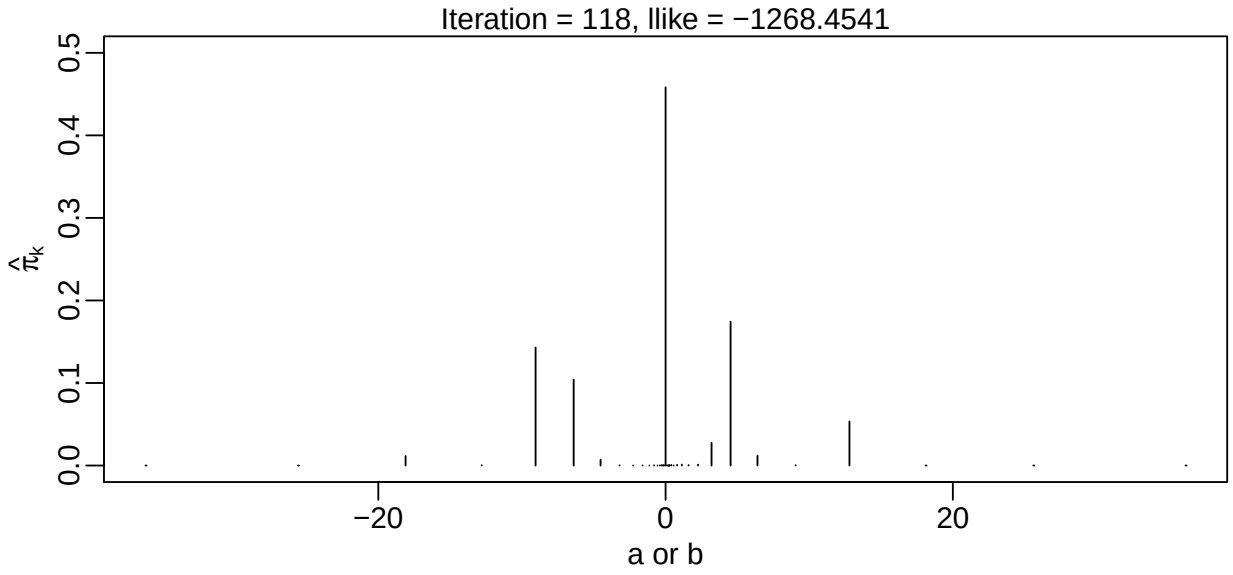

```
##  Iter = 117
## ldiff = 2.347e-06
## zdiff = 0.000233
```



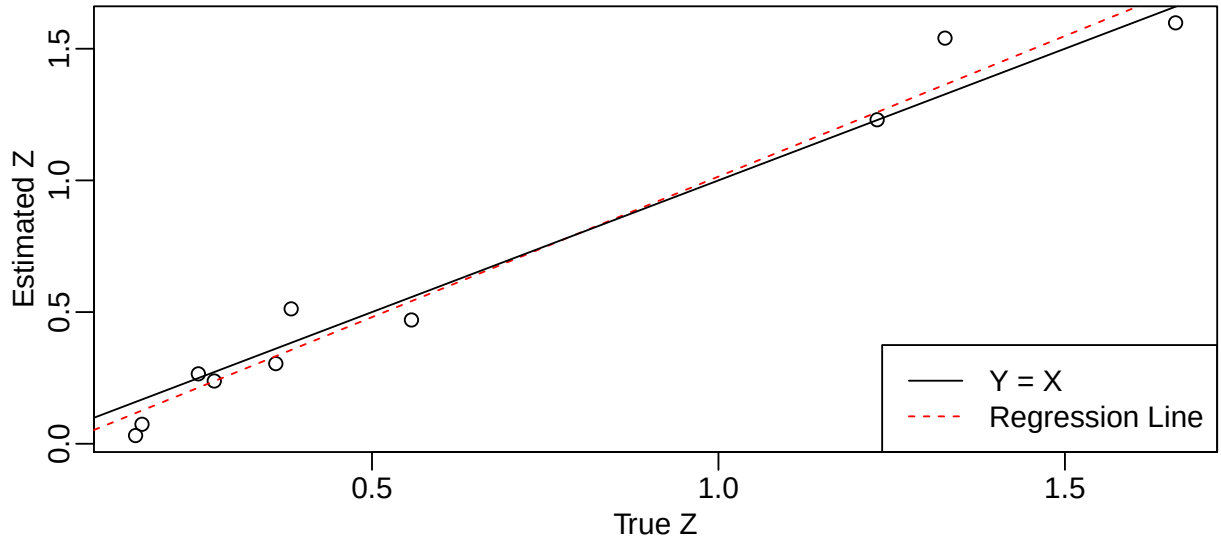


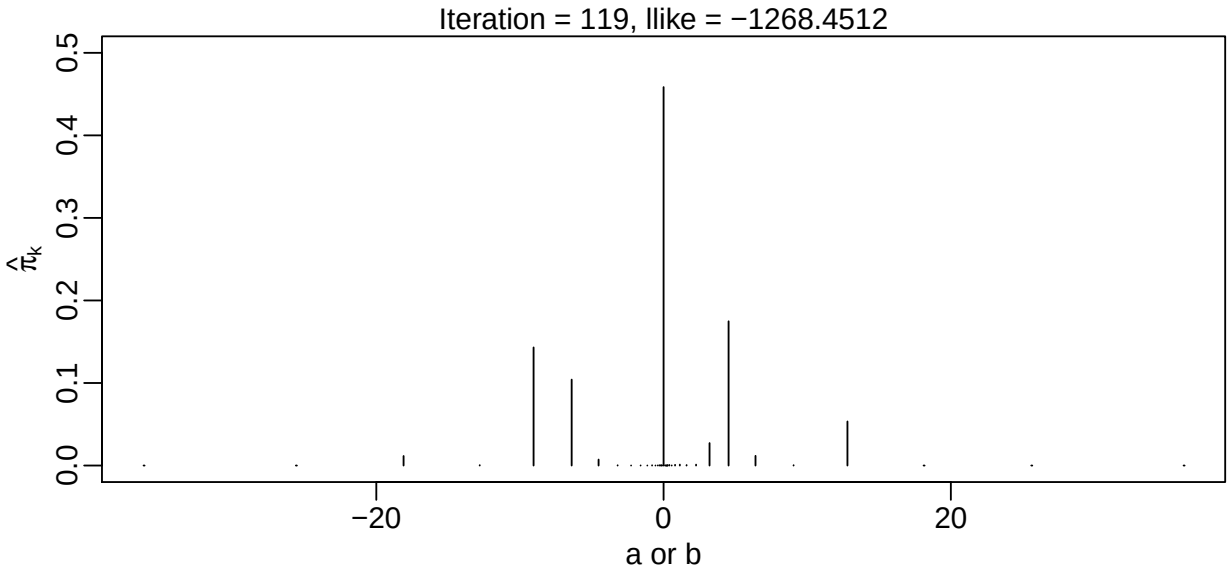

```
##  Iter = 118
## ldiff = 2.293e-06
## zdiff = 0.0007703
```



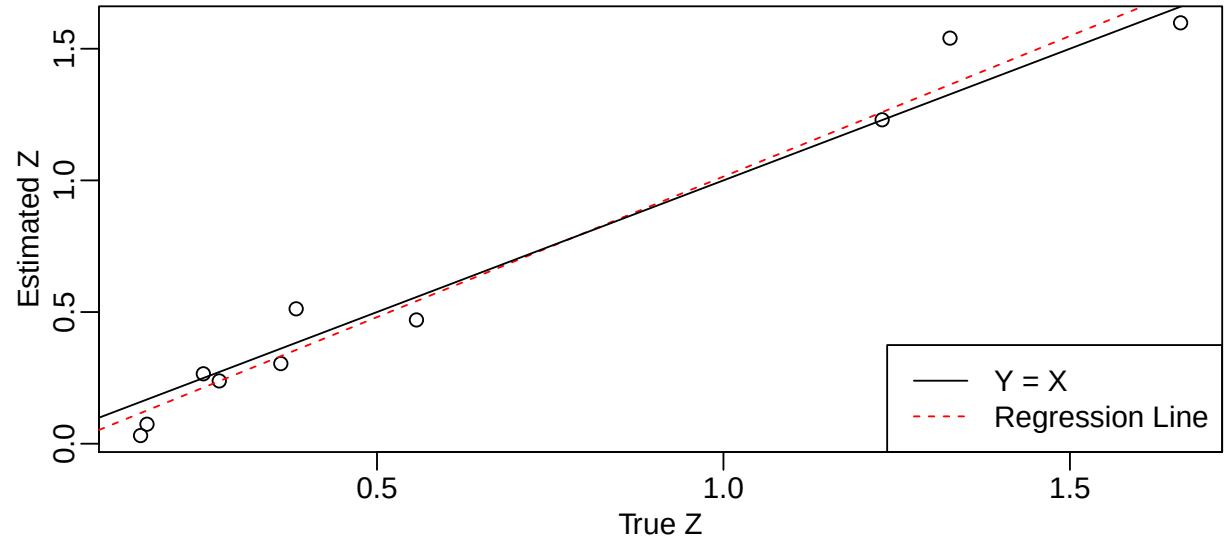


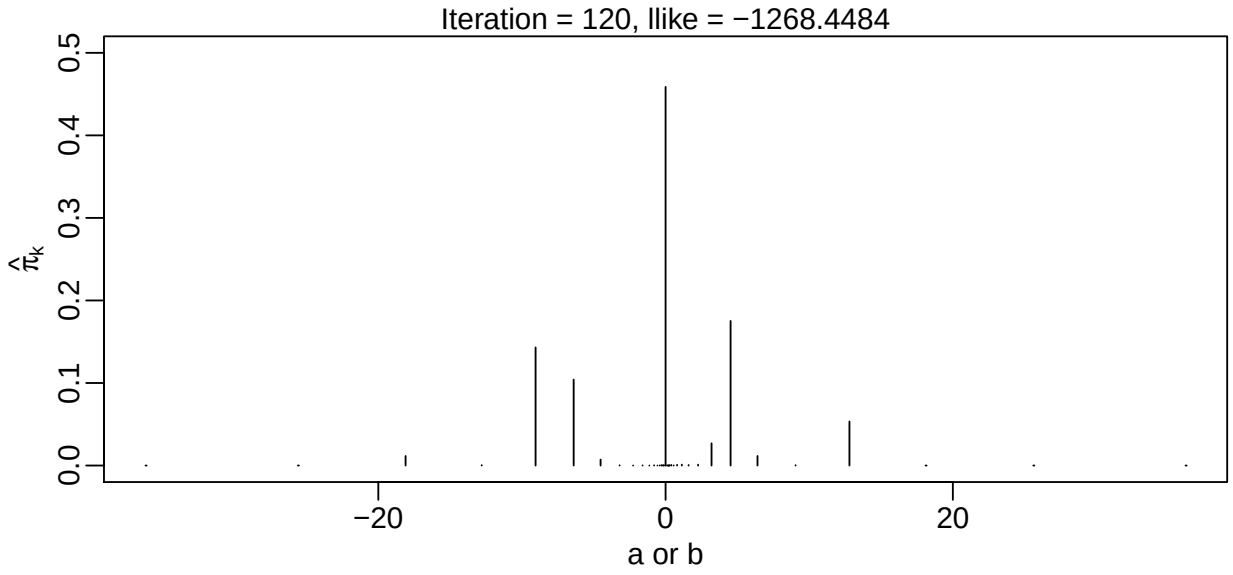

```
##  Iter = 119
## ldiff = 2.241e-06
## zdiff = 0.0002269
```



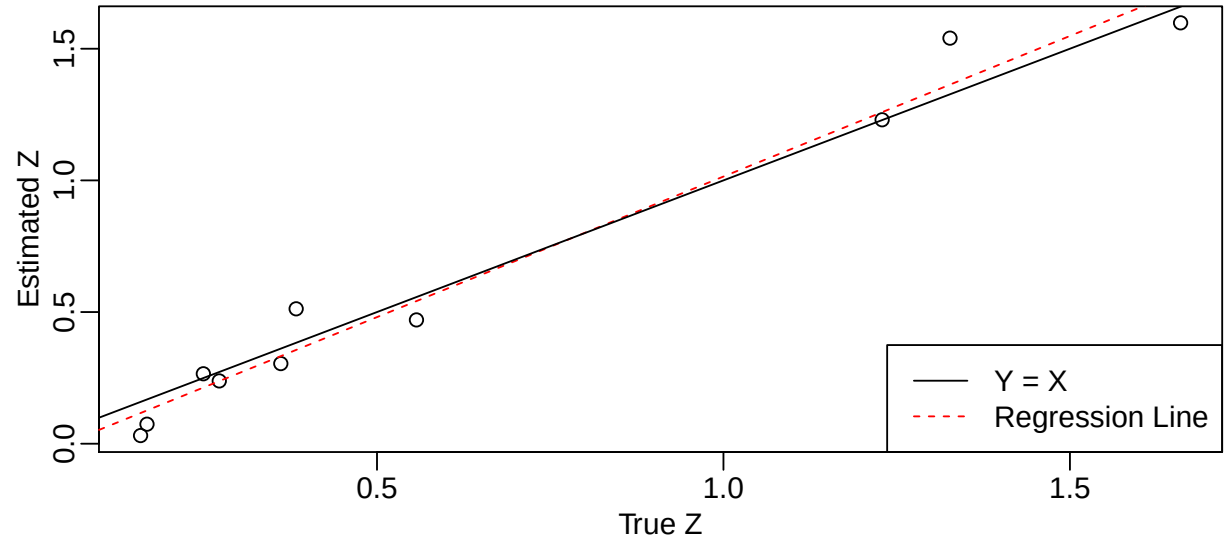


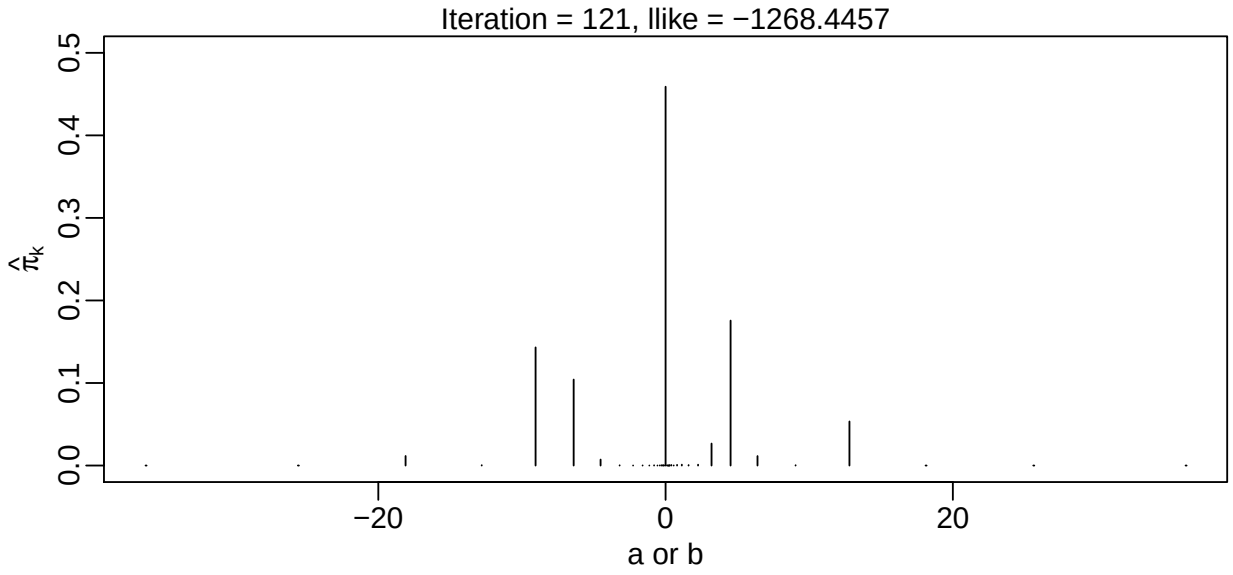

```
##  Iter = 120
## ldiff = 2.19e-06
## zdiff = 0.0007515
```



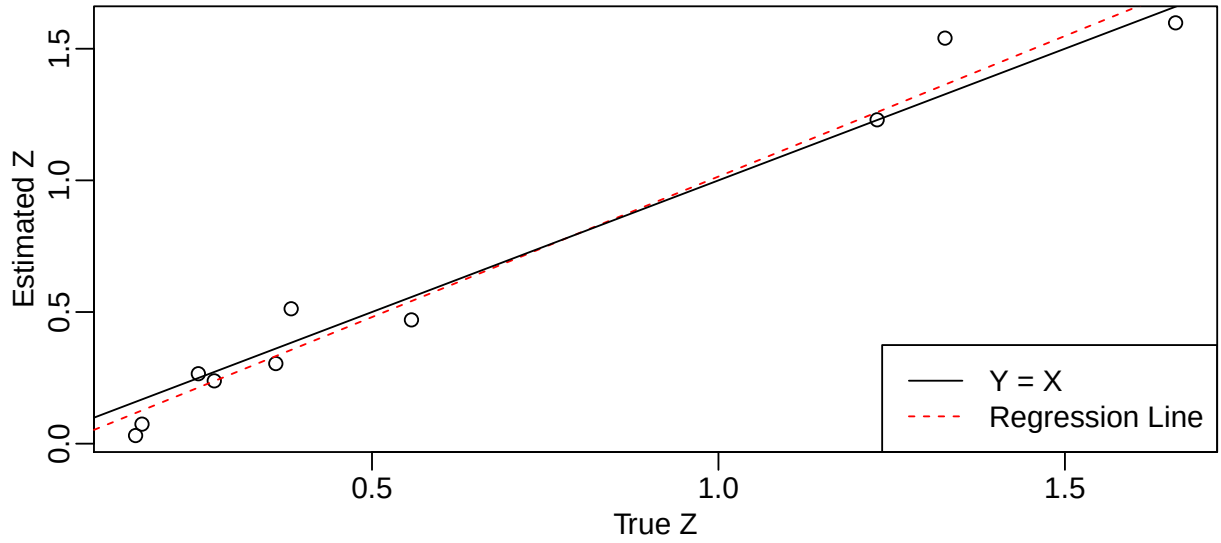


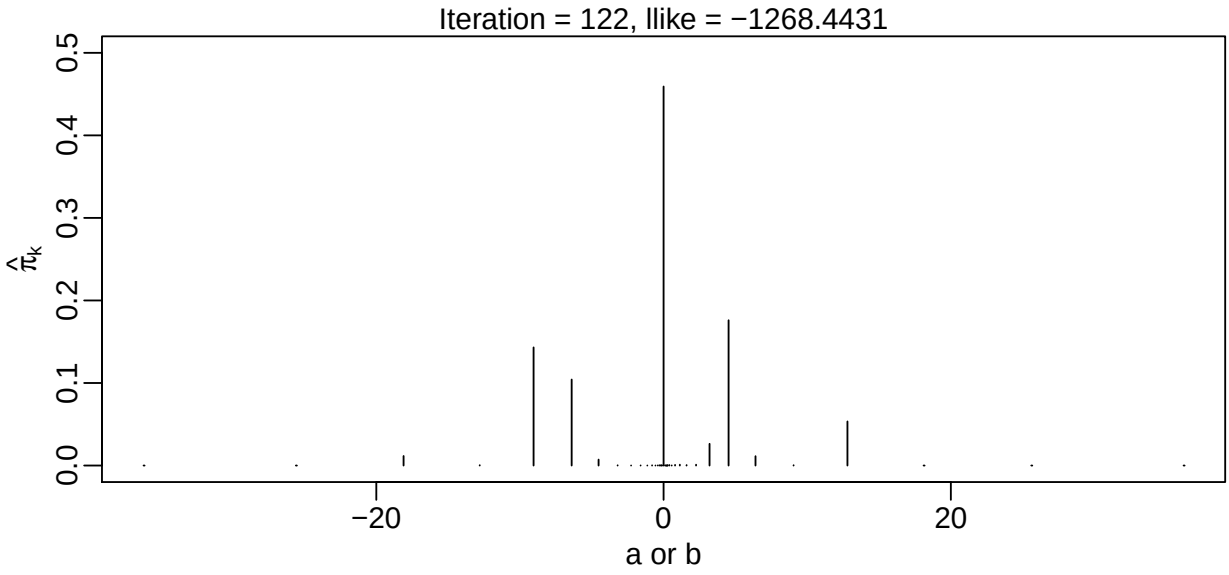

```
##  Iter = 121
## ldiff = 2.142e-06
## zdiff = 0.0002205
```



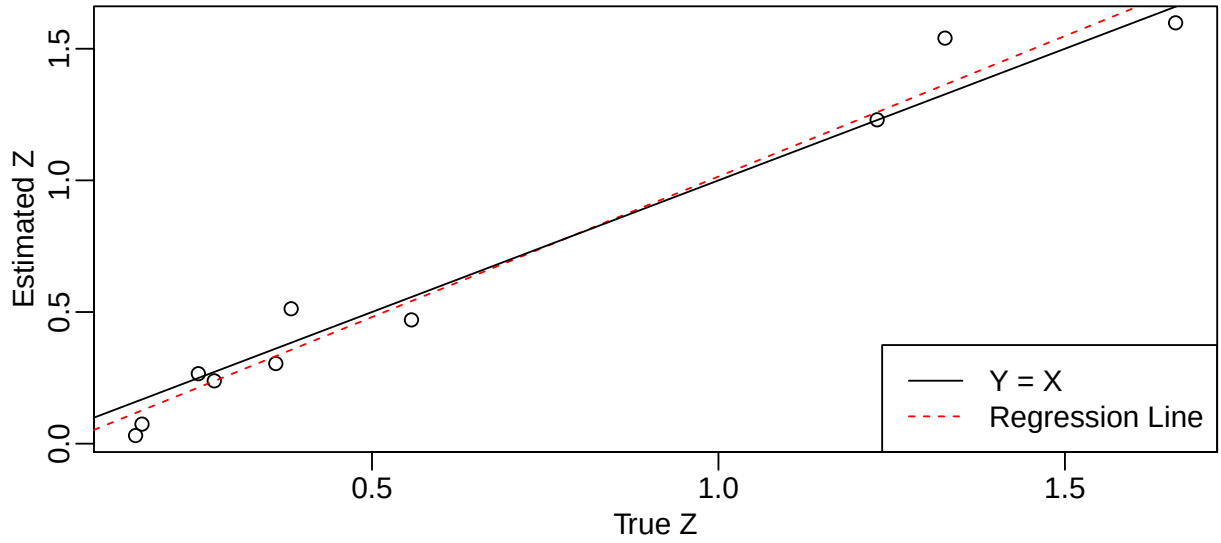


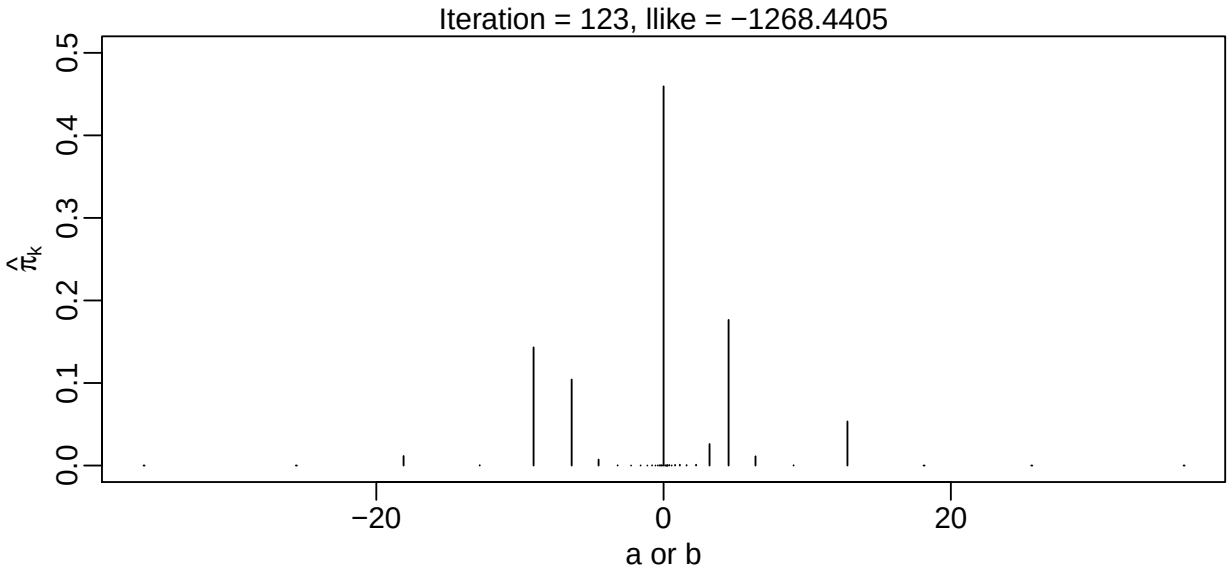

```
##  Iter = 122
## ldiff = 2.093e-06
## zdiff = 0.0007316
```



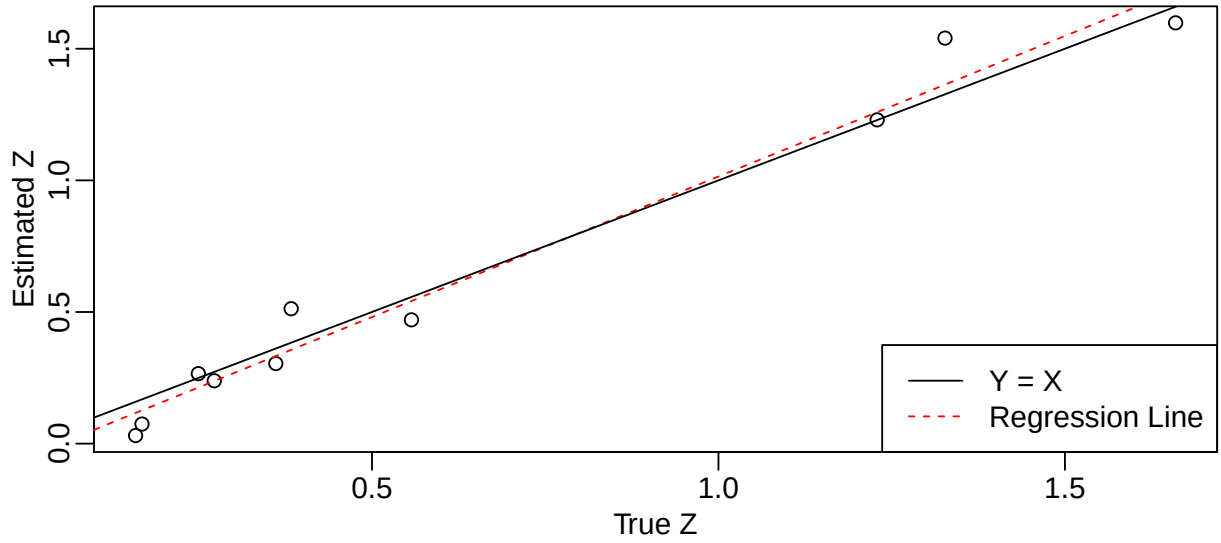


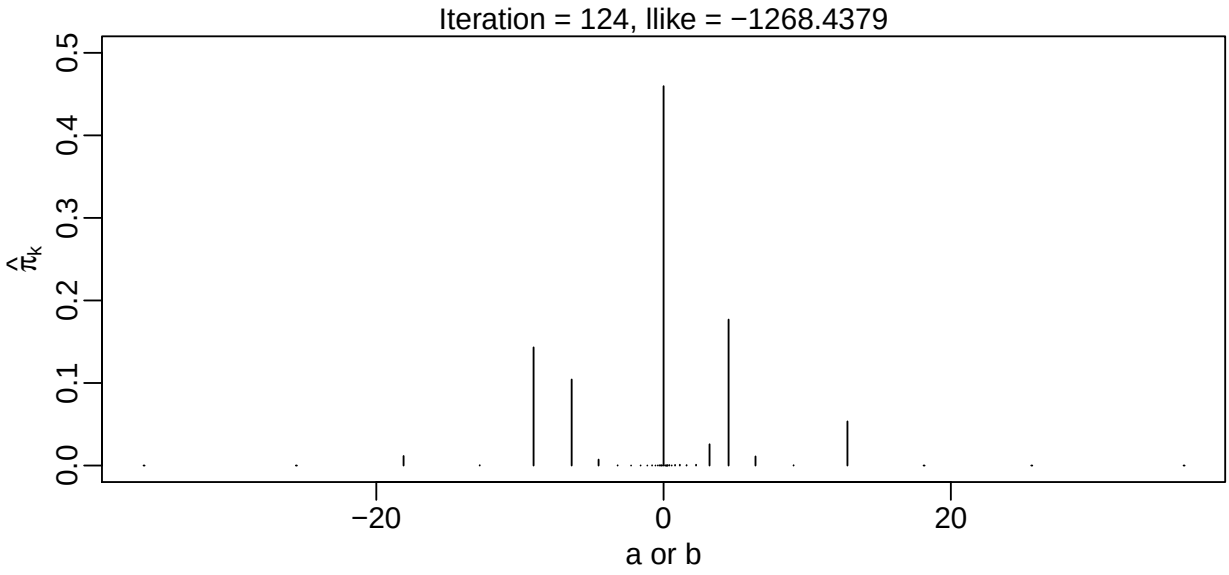

```
##  Iter = 123
## ldiff = 2.048e-06
## zdiff = 0.0002141
```



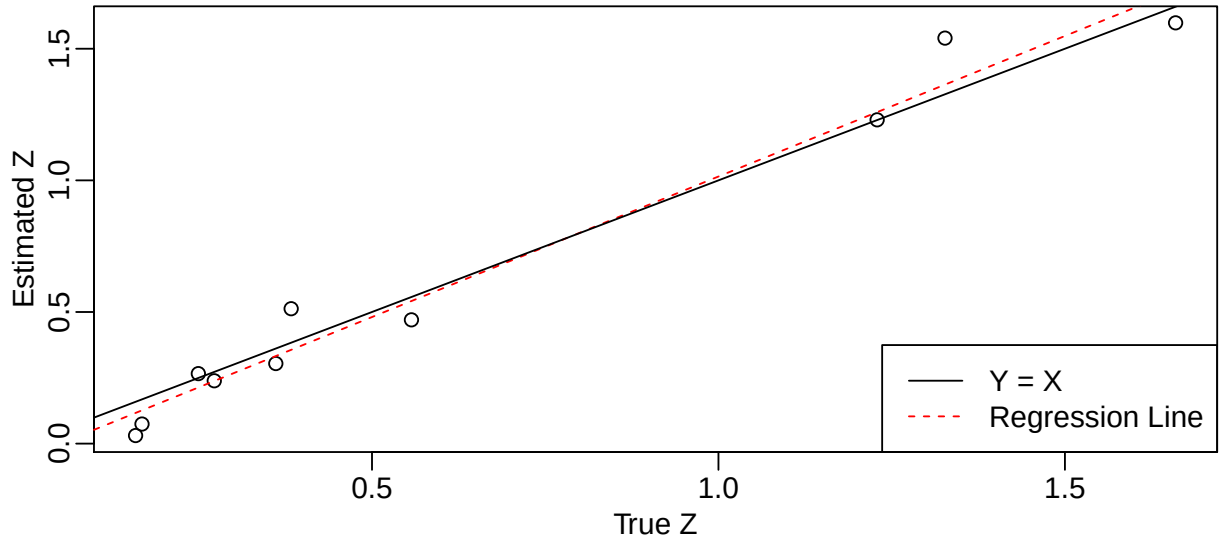


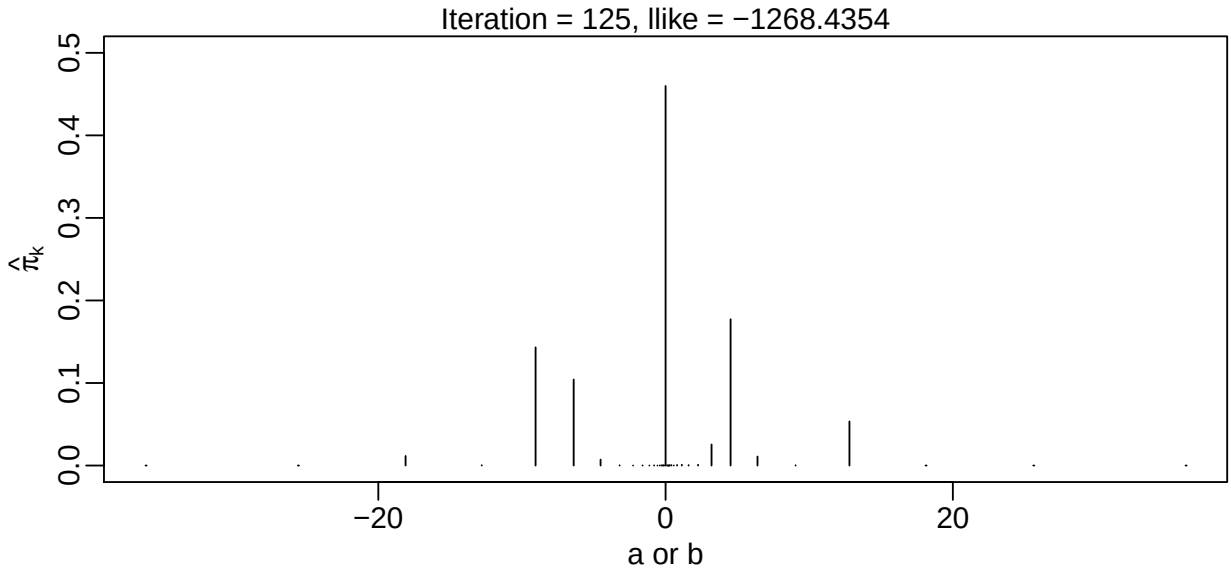

```
##  Iter = 124
## ldiff = 2.002e-06
## zdiff = 0.0007116
```



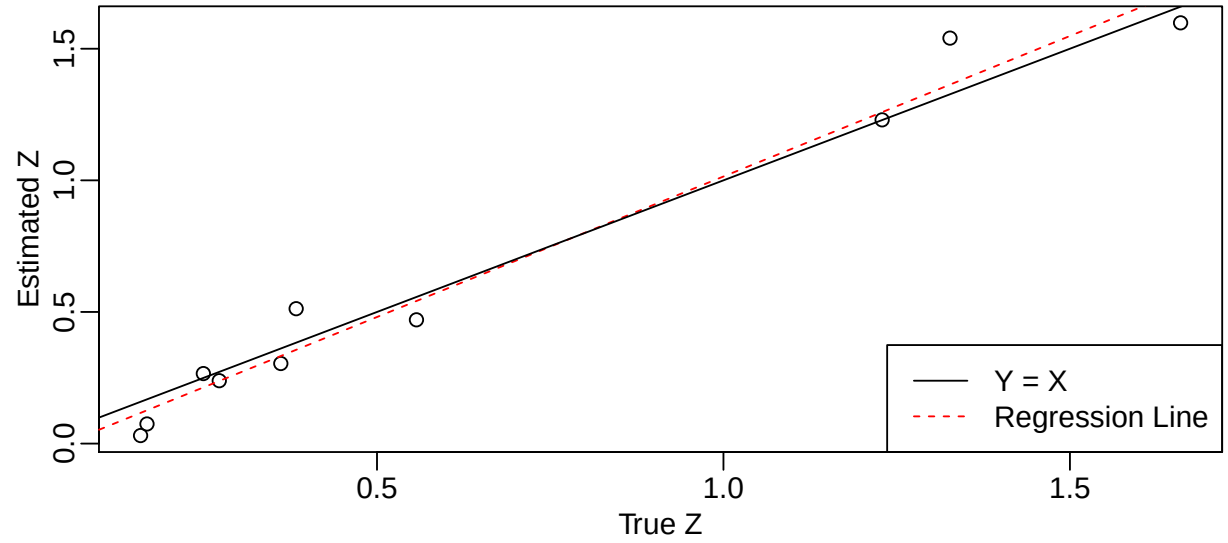


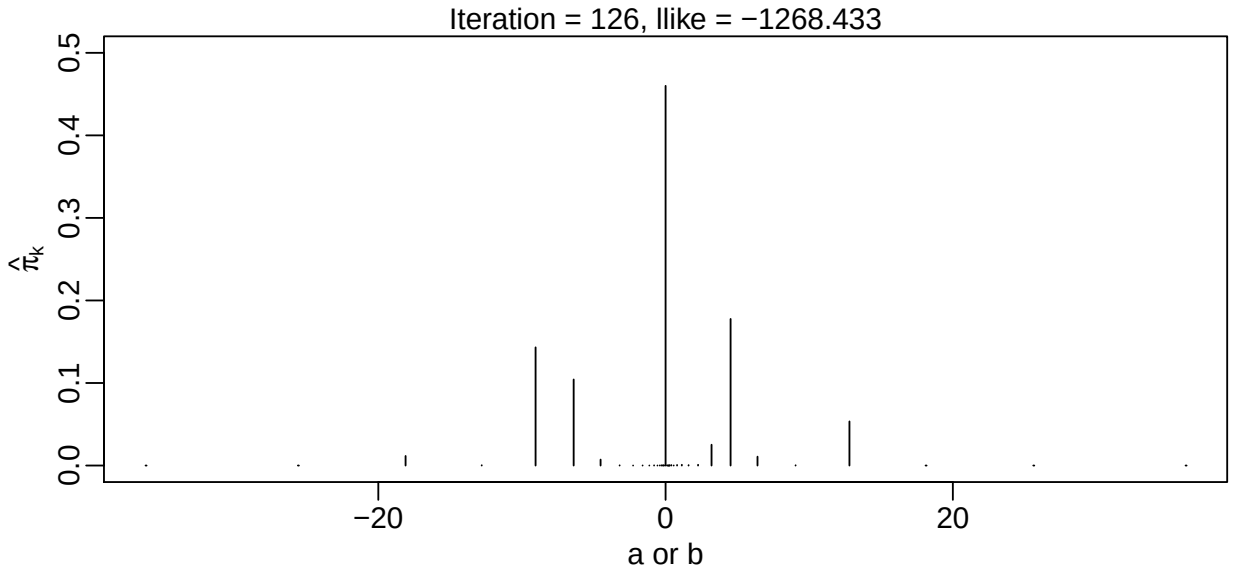

```
##  Iter = 125
## ldiff = 1.959e-06
## zdiff = 0.0002079
```



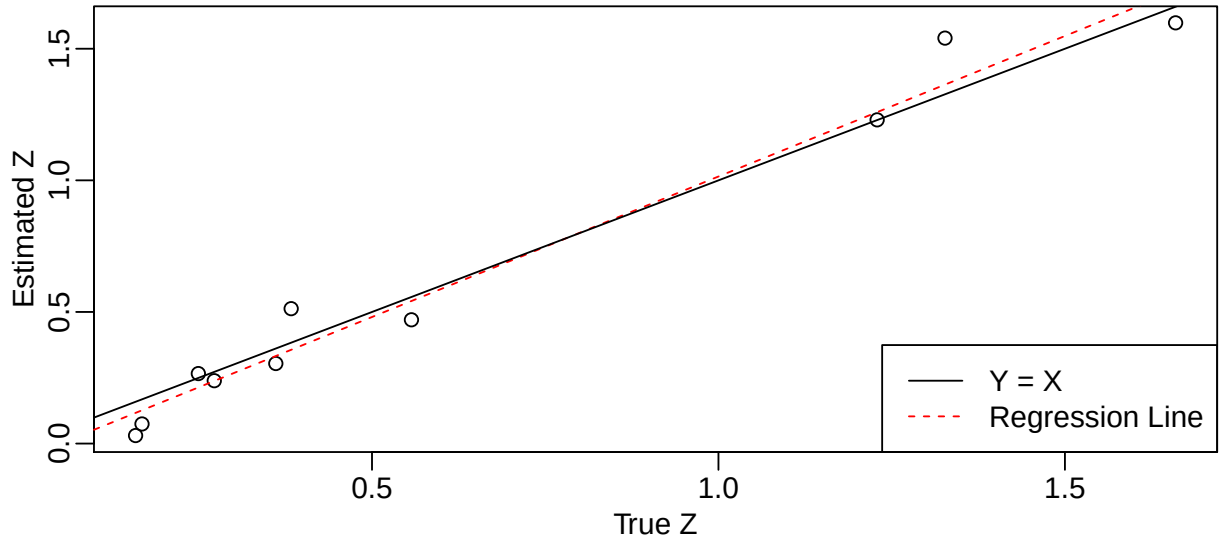


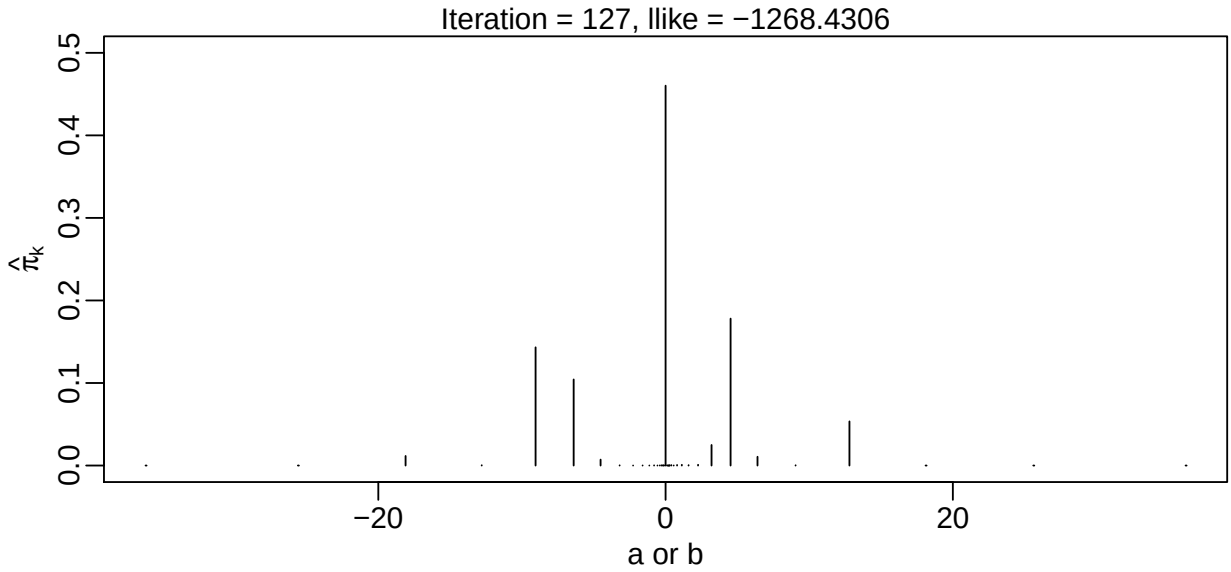

```
##  Iter = 126
## ldiff = 1.915e-06
## zdiff = 0.0006919
```



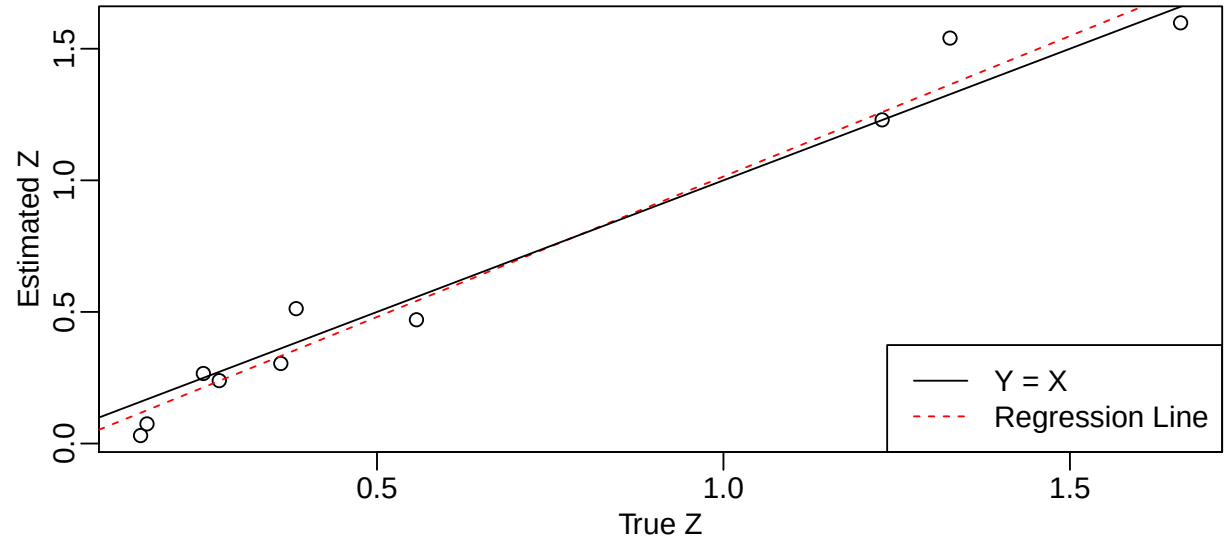


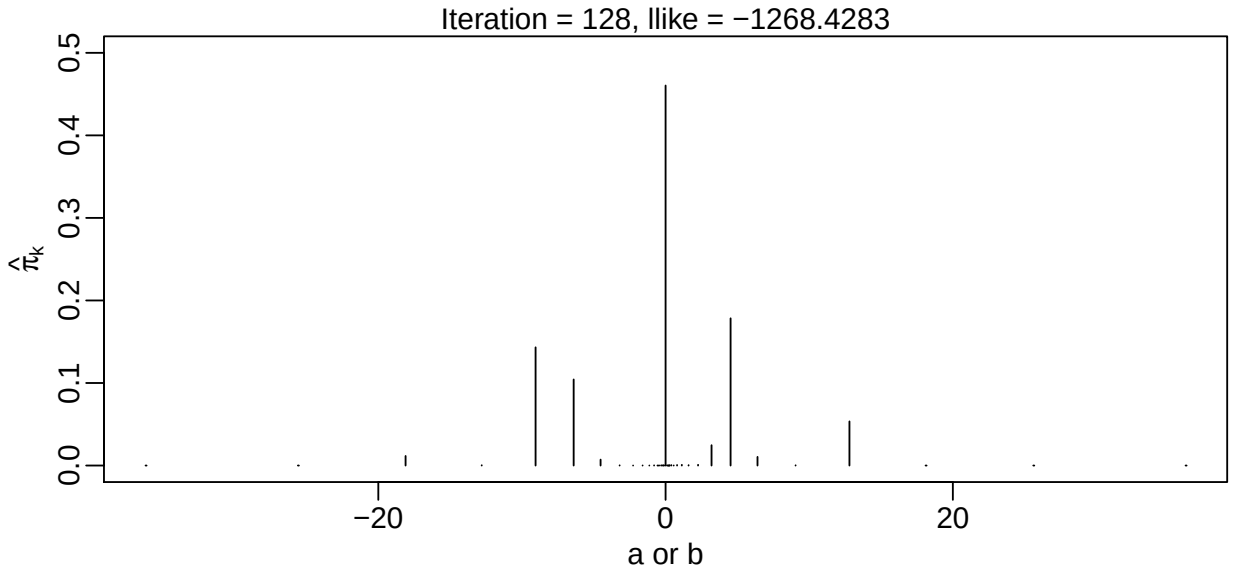

```
##  Iter = 127
## ldiff = 1.874e-06
## zdiff = 0.0002021
```



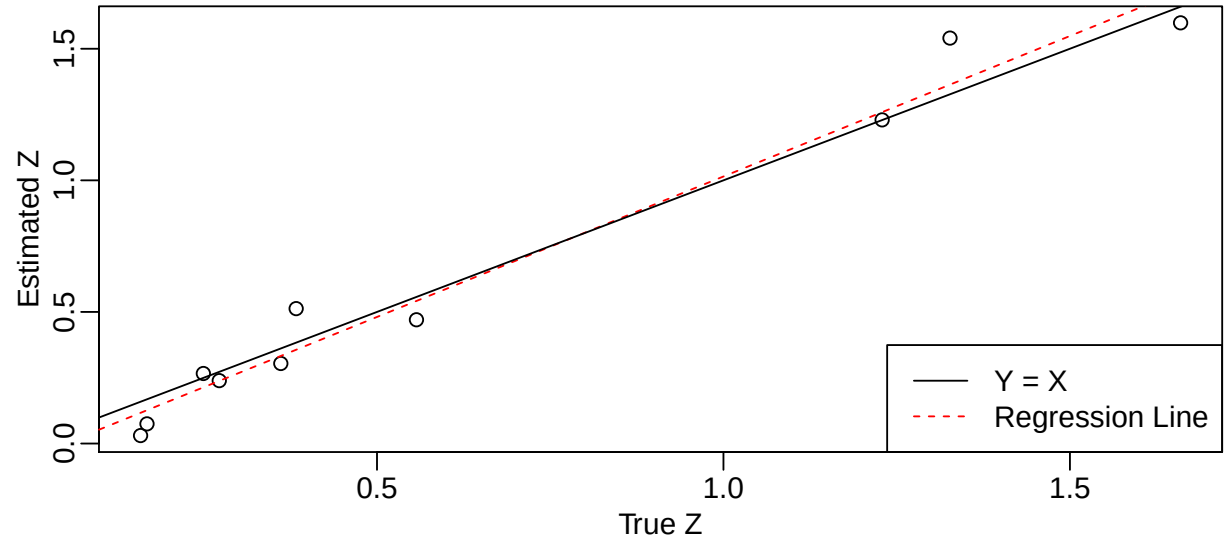


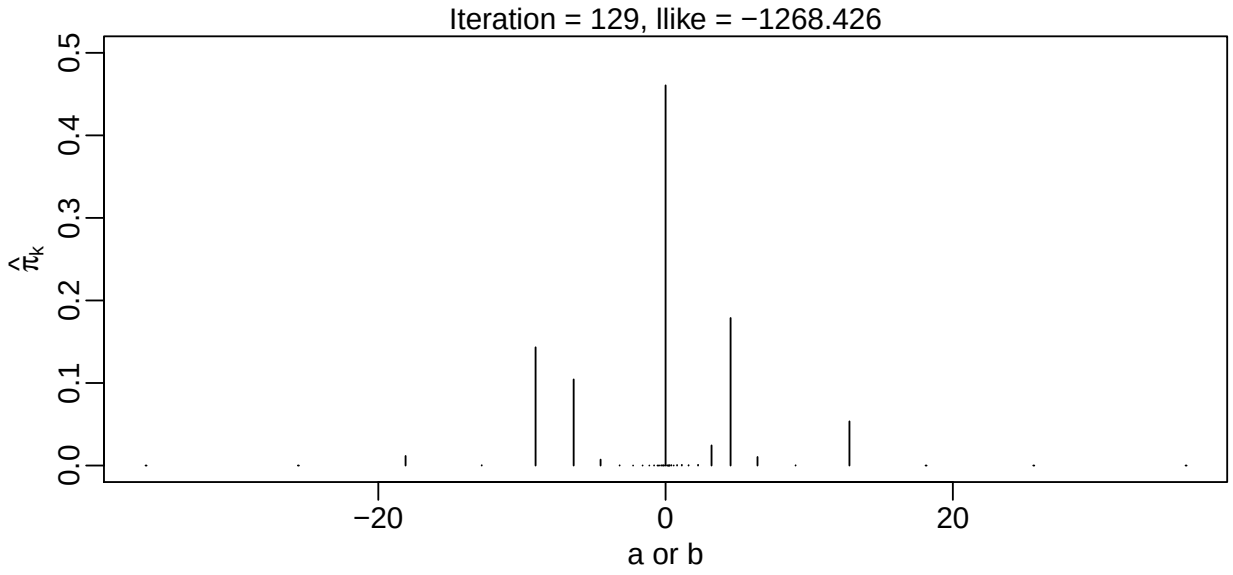

```
##  Iter = 128
## ldiff = 1.833e-06
## zdiff = 0.0006728
```



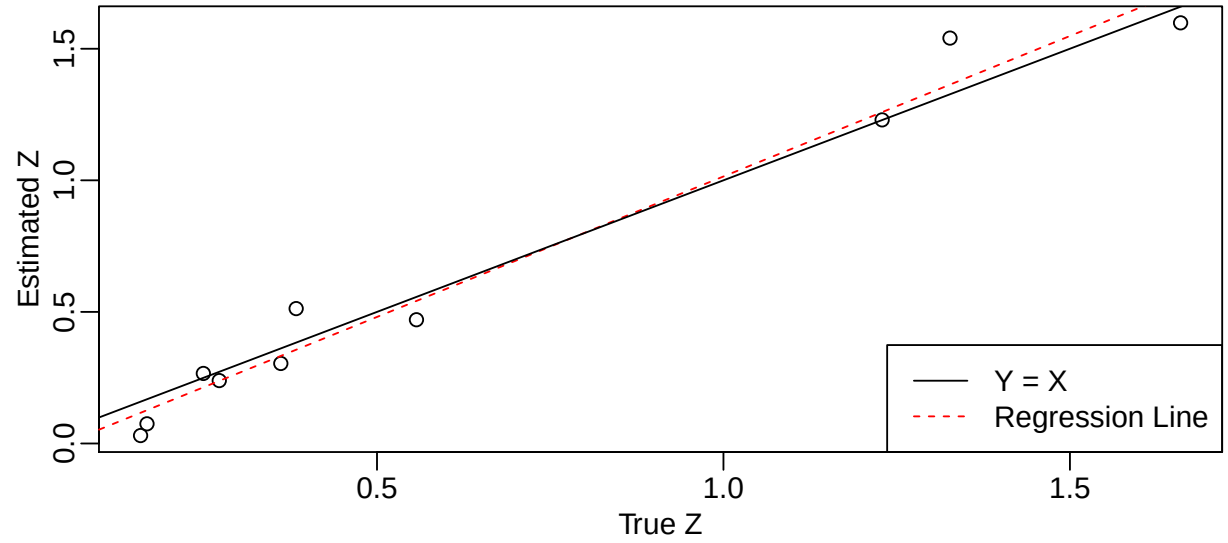


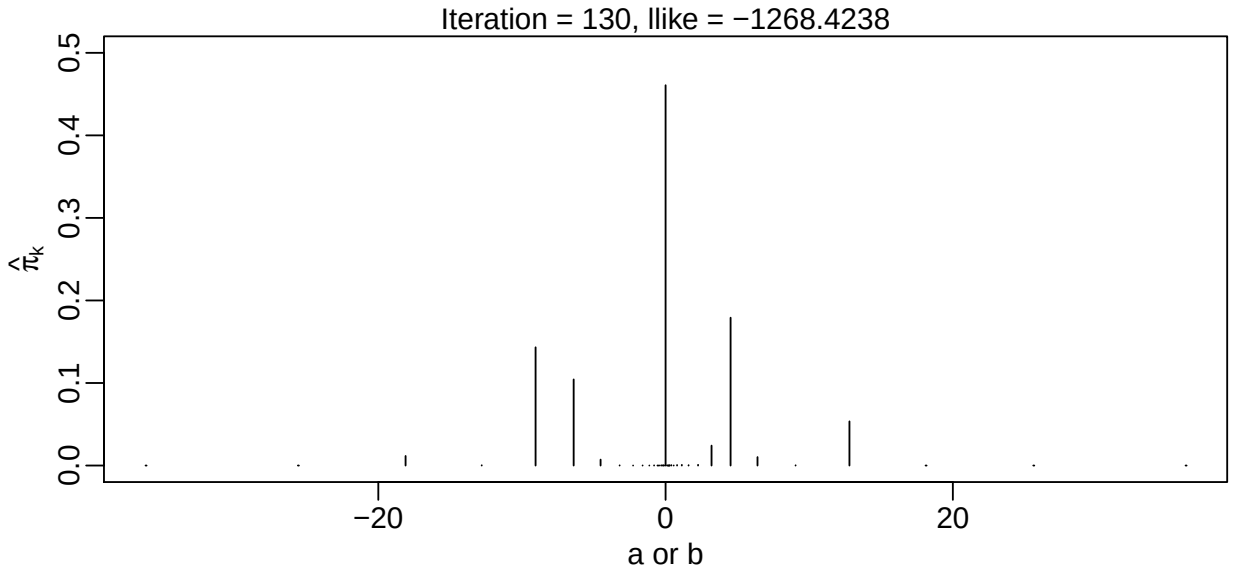

```
##  Iter = 129
## ldiff = 1.795e-06
## zdiff = 0.0001965
```



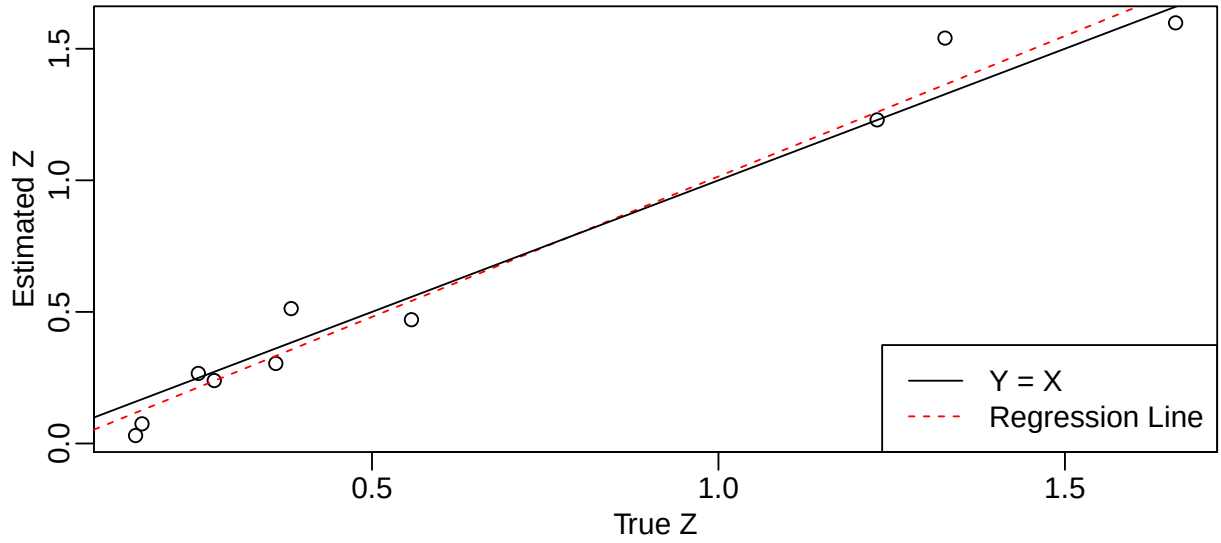


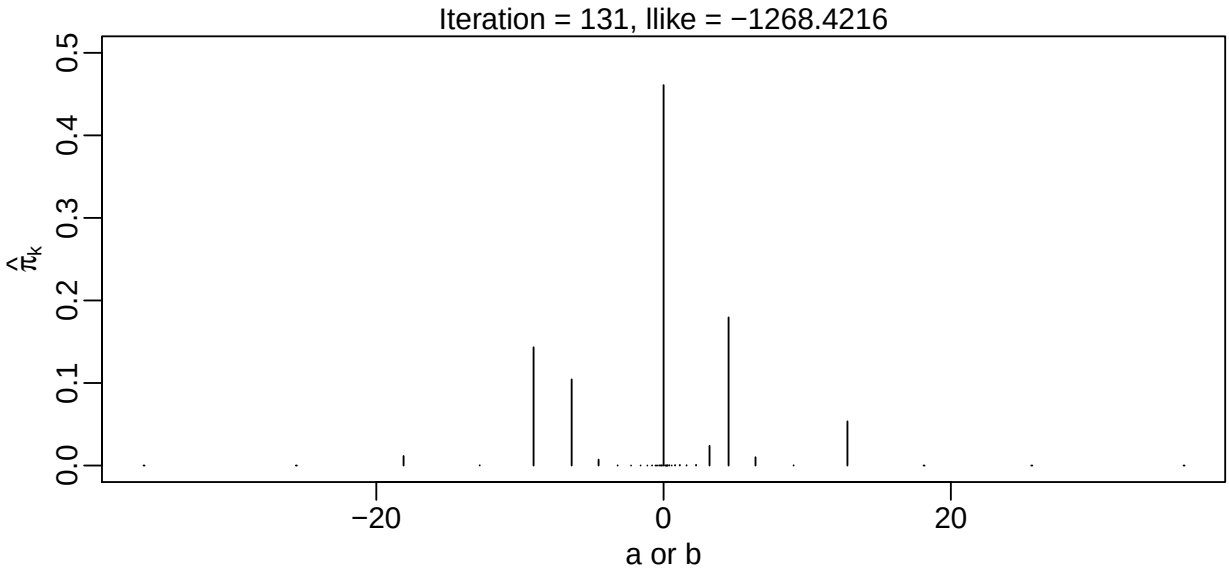

```
##  Iter = 130
## ldiff = 1.756e-06
## zdiff = 0.0006542
```



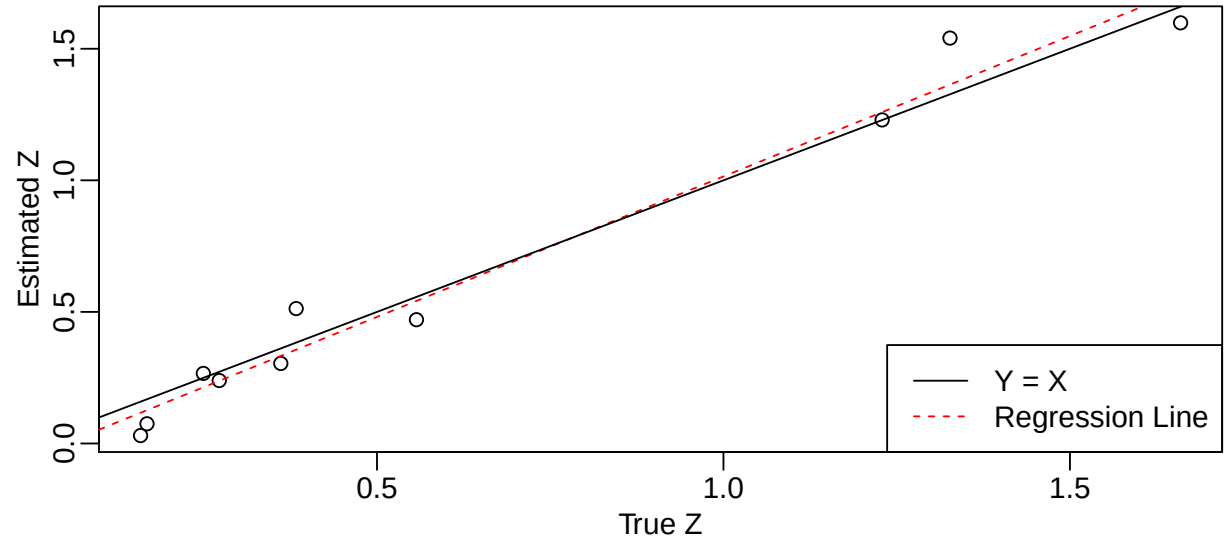


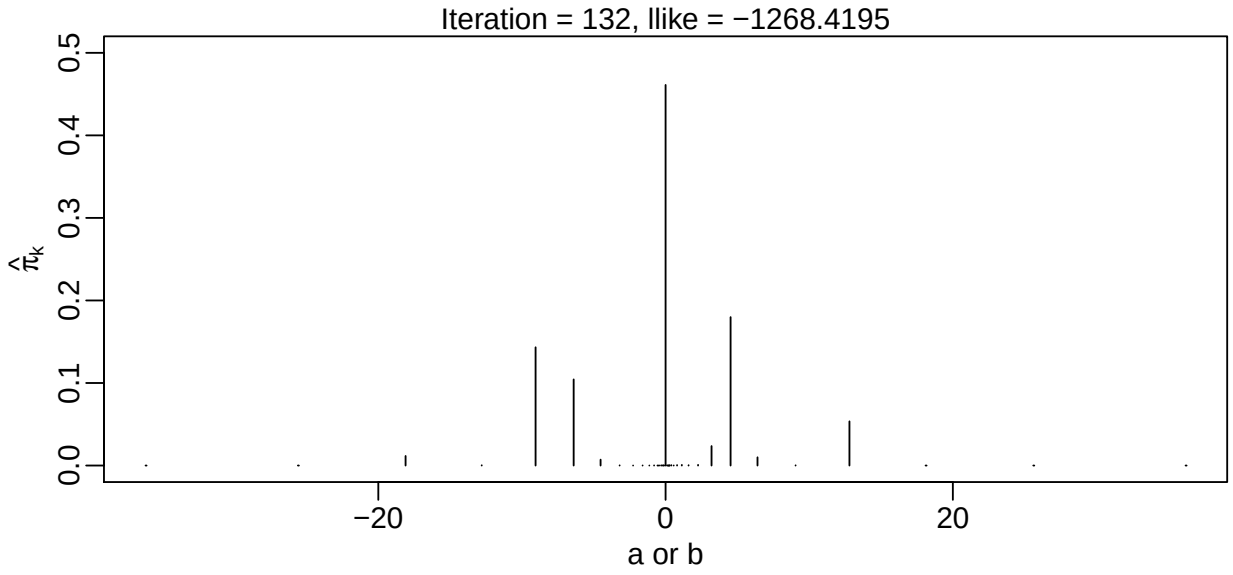

```
##  Iter = 131
## ldiff = 1.719e-06
## zdiff = 0.0001911
```



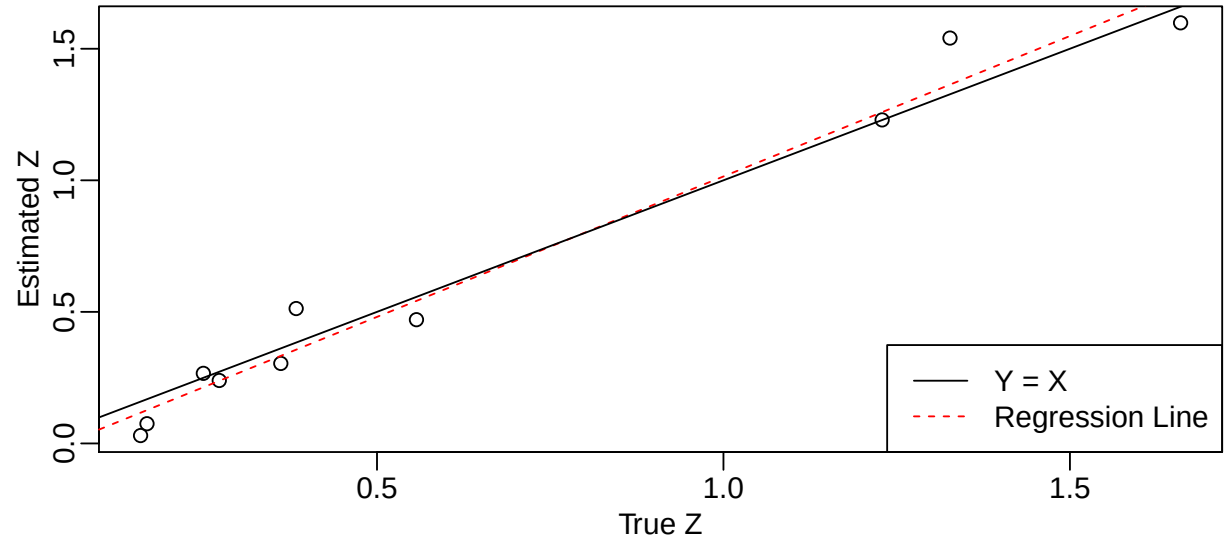


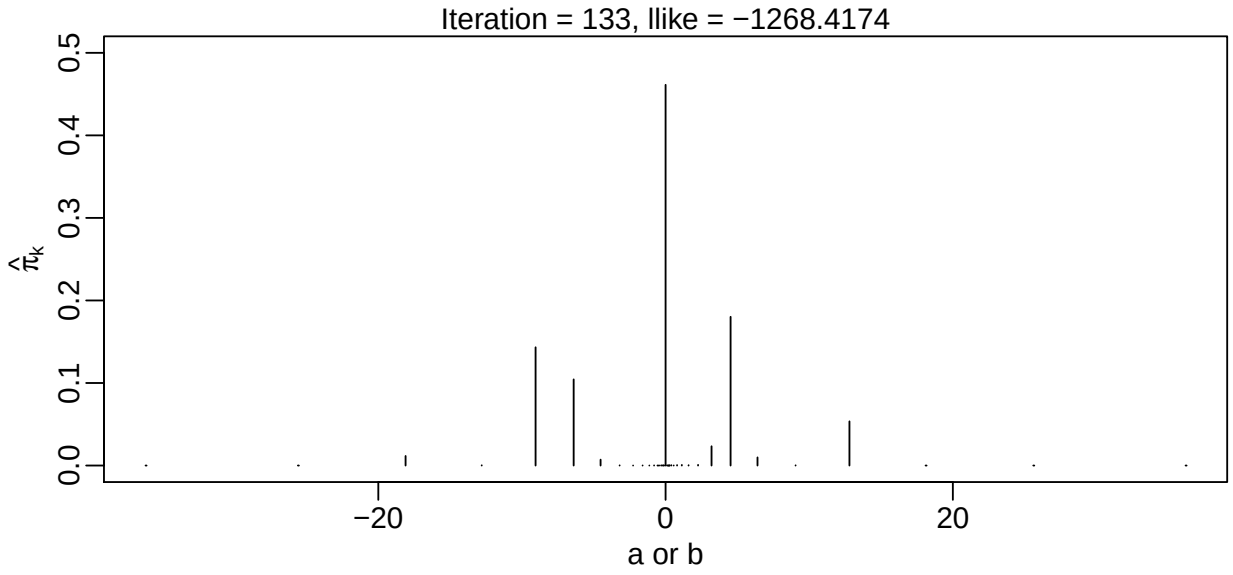

```
##  Iter = 132
## ldiff = 1.68e-06
## zdiff = 0.0002268
```



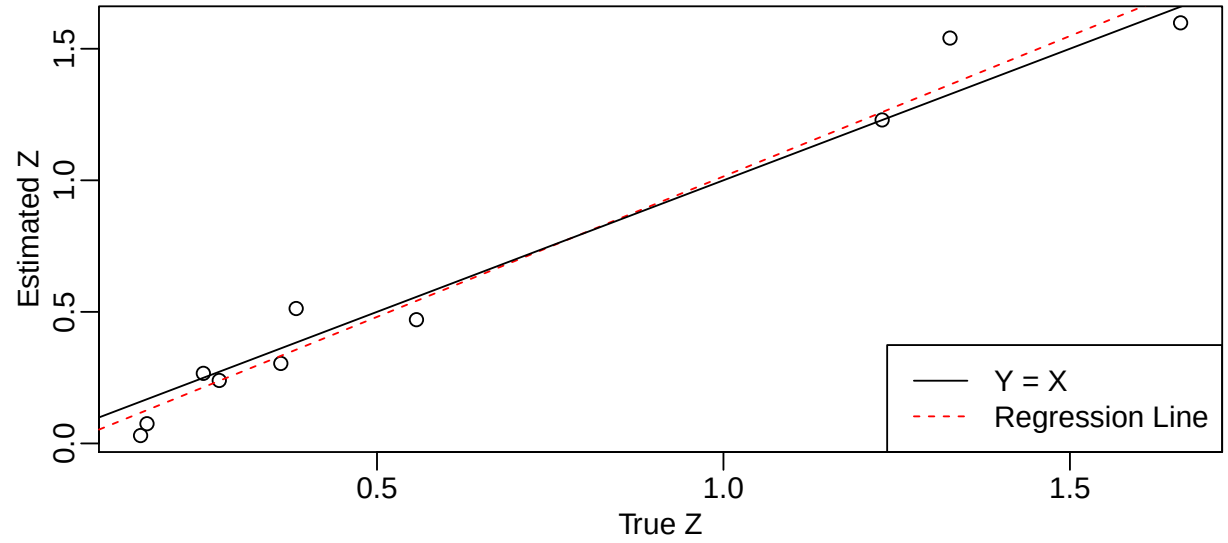


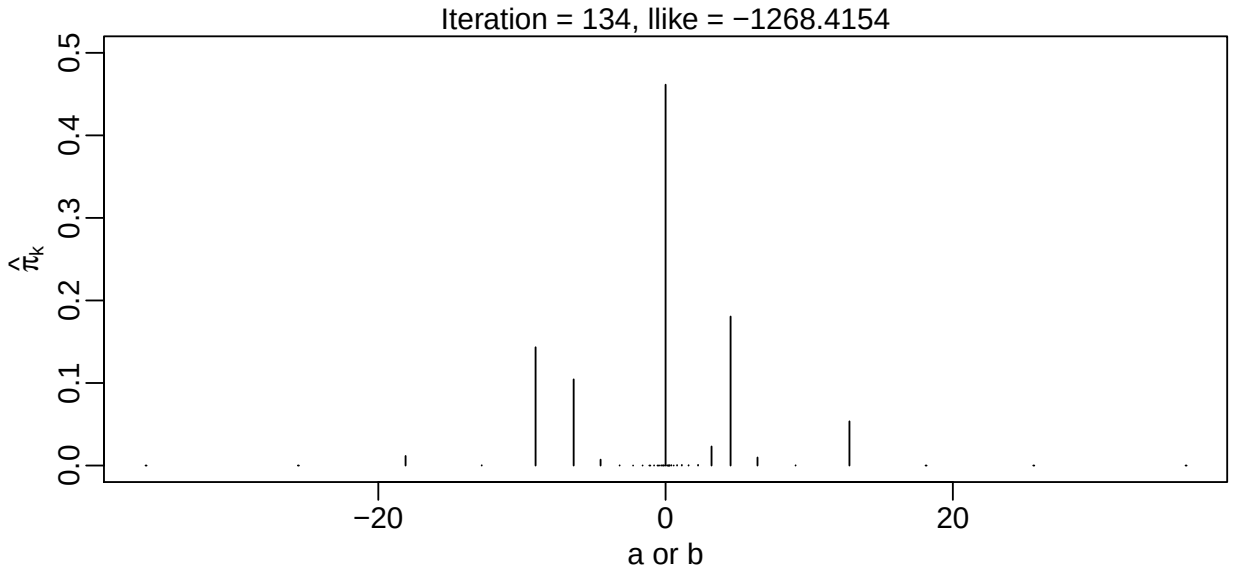

```
##  Iter = 133
## ldiff = 1.646e-06
## zdiff = 0.0007232
```



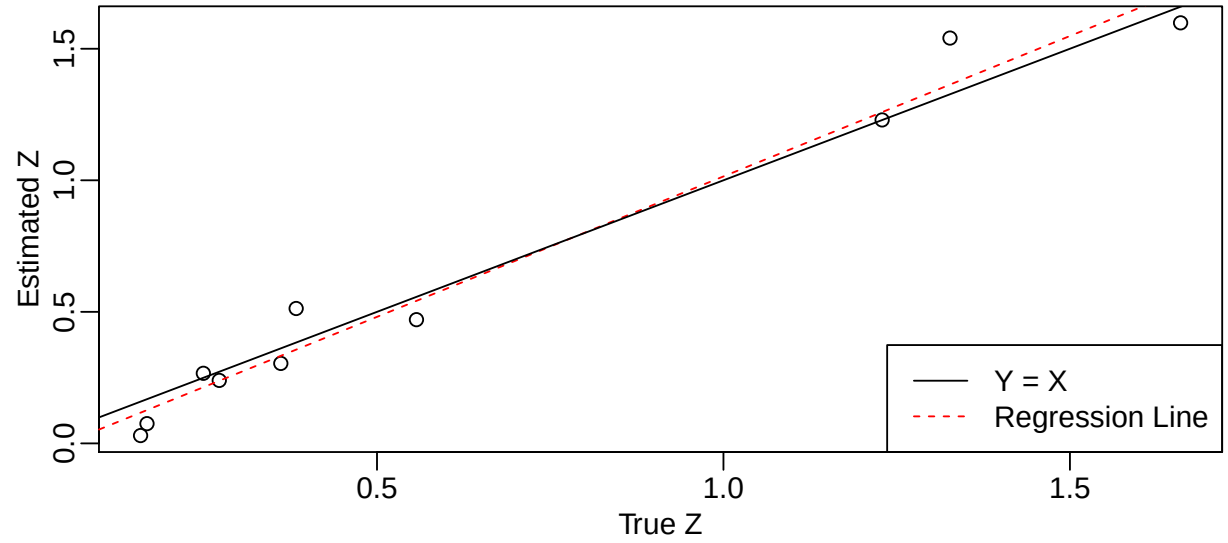


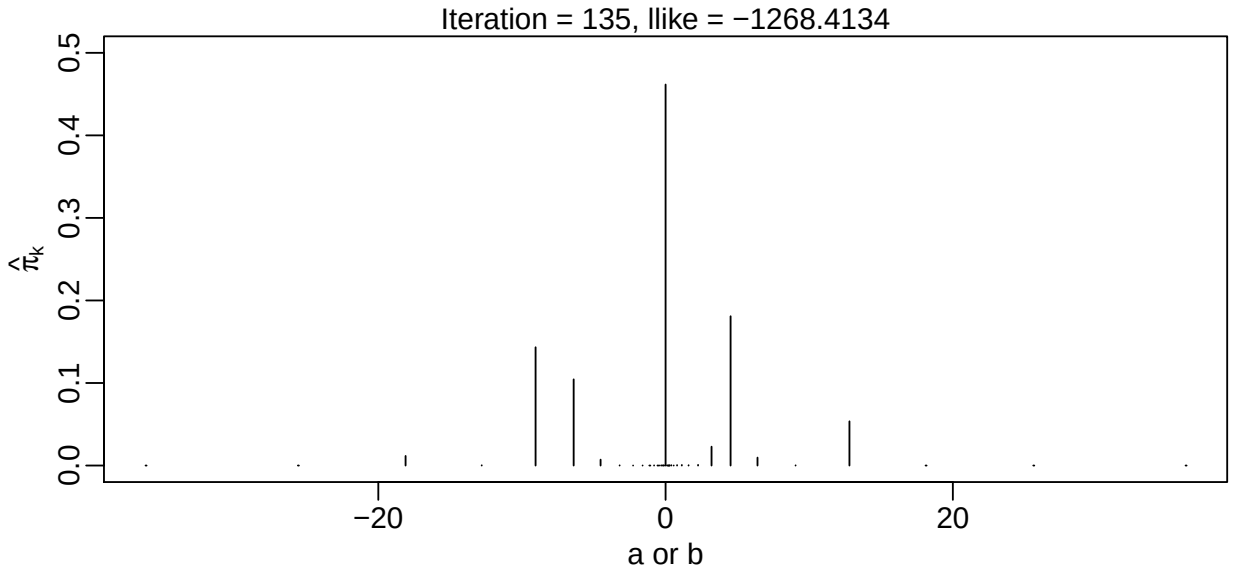

```
##  Iter = 134
## ldiff = 1.613e-06
## zdiff = 0.0001978
```



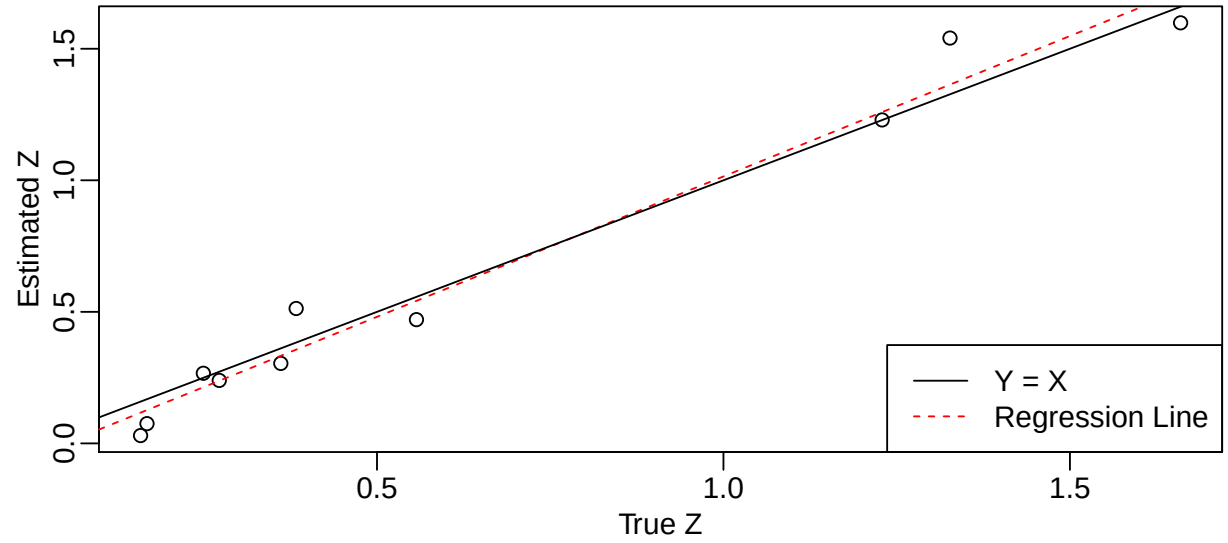


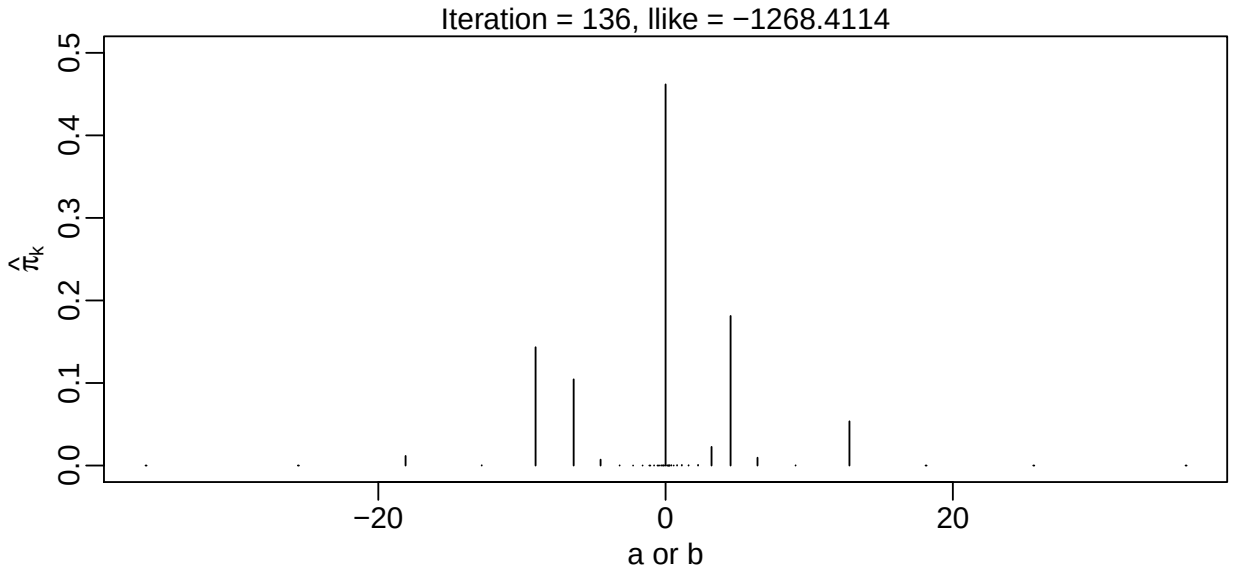

```
##  Iter = 135
## ldiff = 1.58e-06
## zdiff = 0.0006483
```



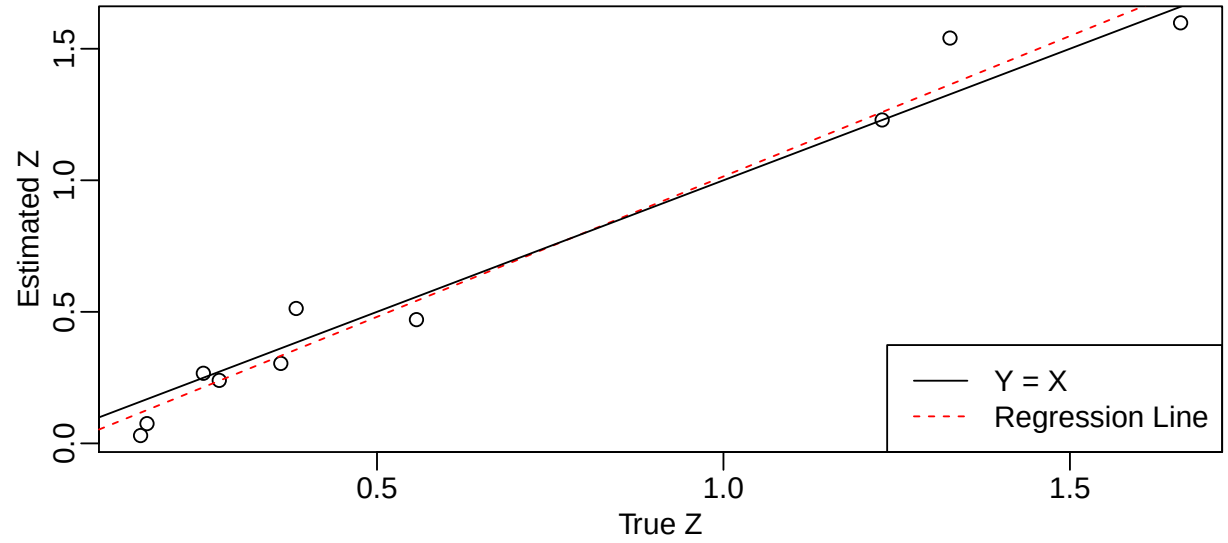


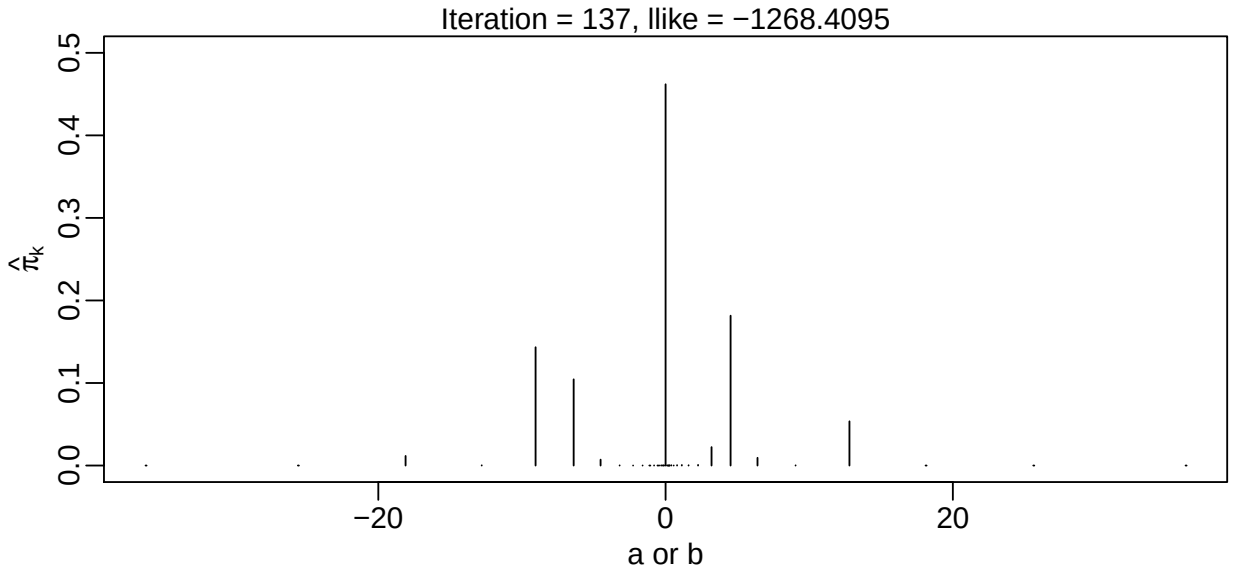

```
##  Iter = 136
## ldiff = 1.548e-06
## zdiff = 0.0001842
```



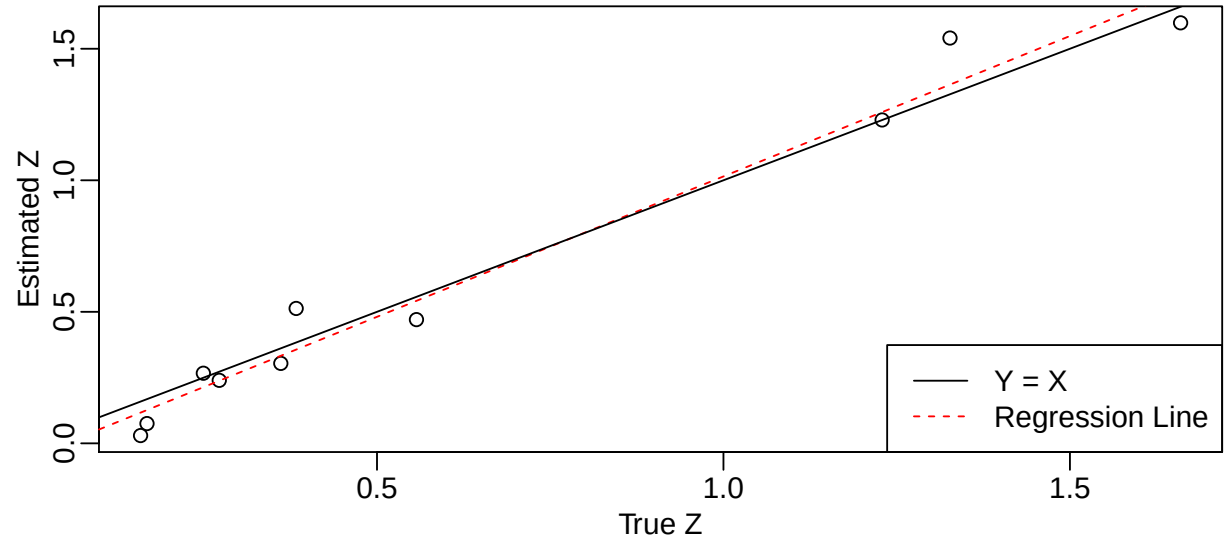


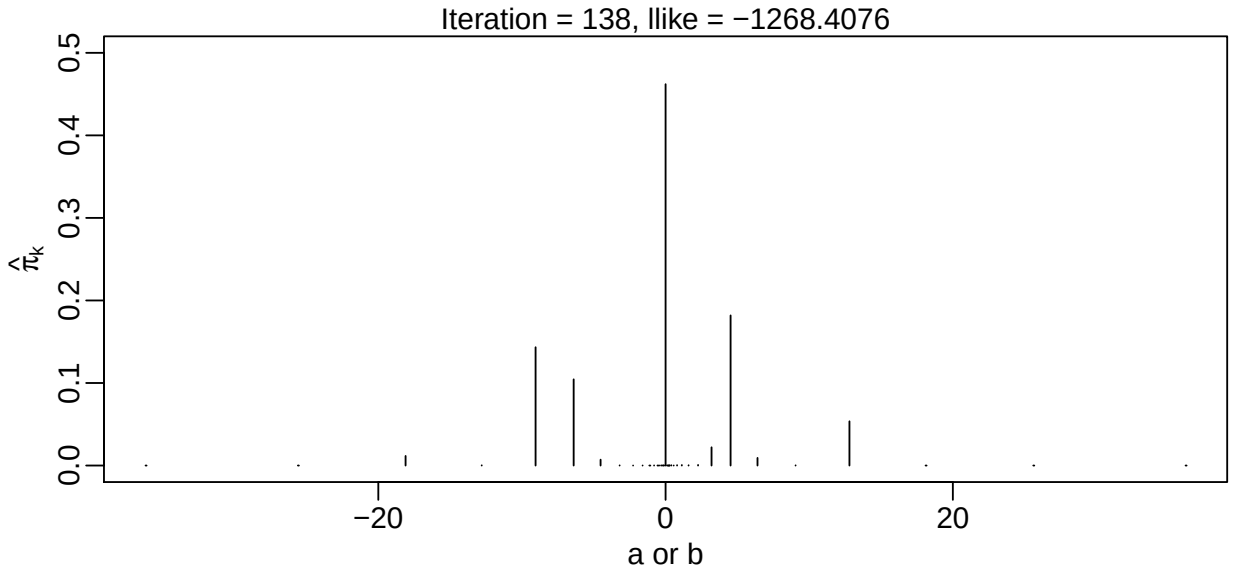

```
##  Iter = 137
## ldiff = 1.513e-06
## zdiff = 0.0002168
```



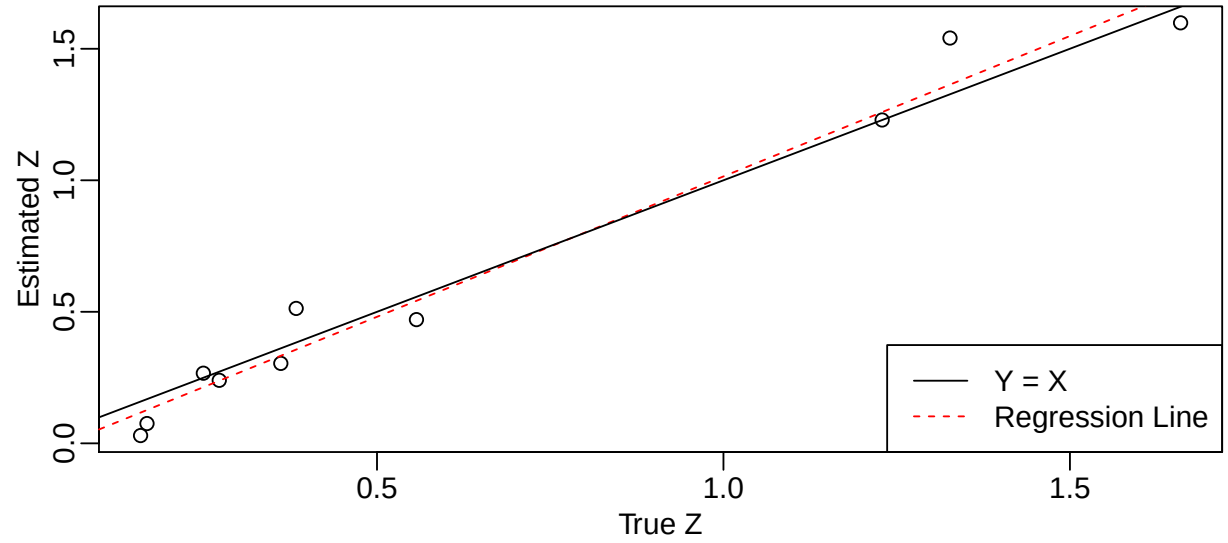


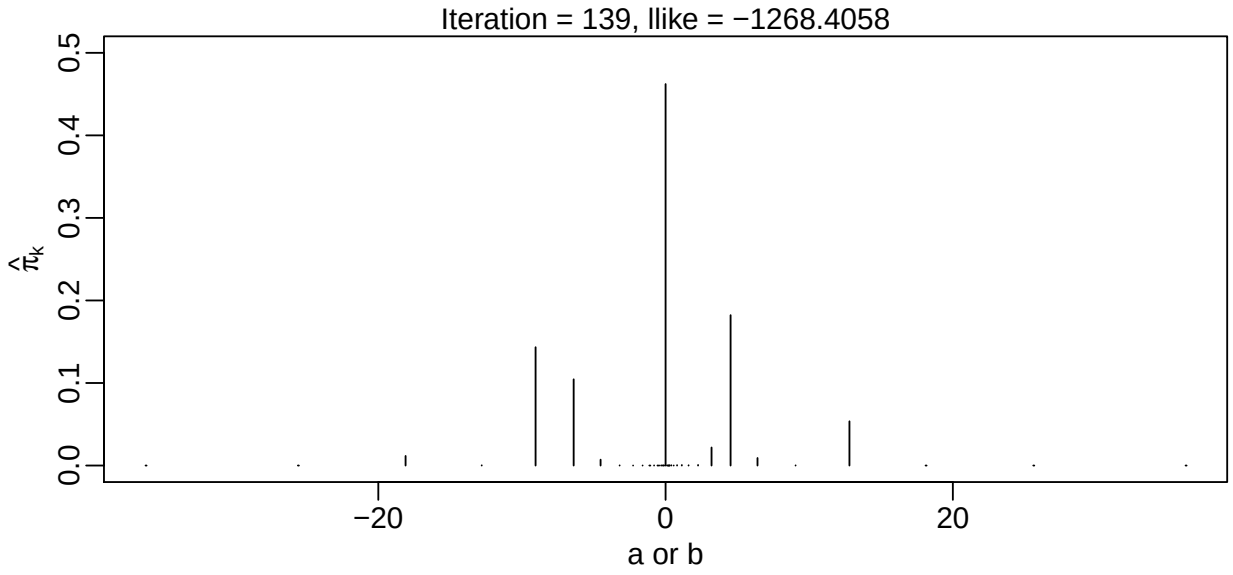

```
##  Iter = 138
## ldiff = 1.483e-06
## zdiff = 0.0006882
```



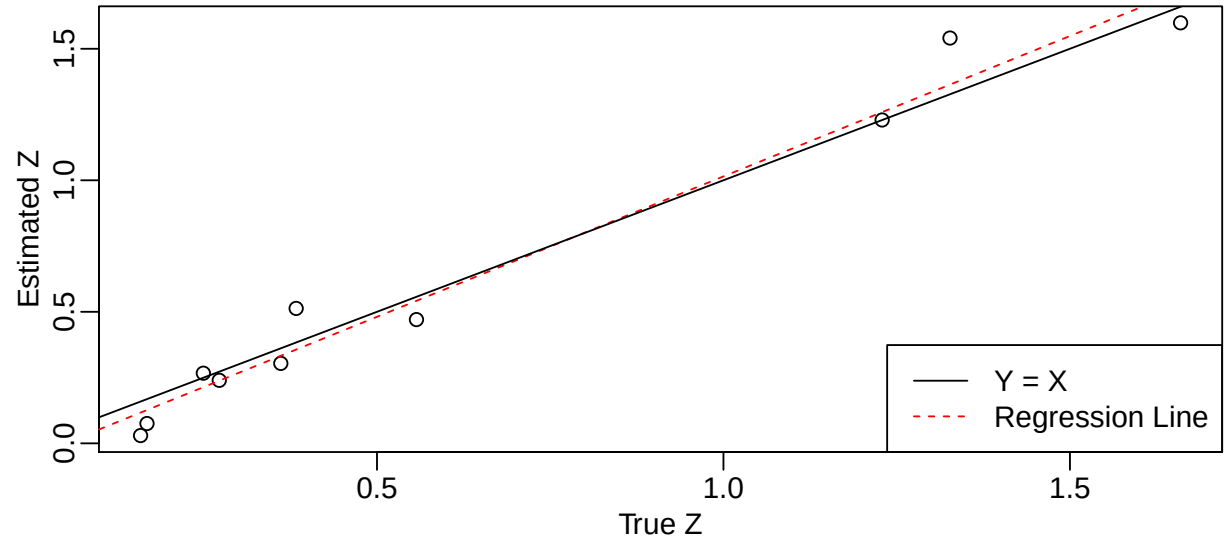


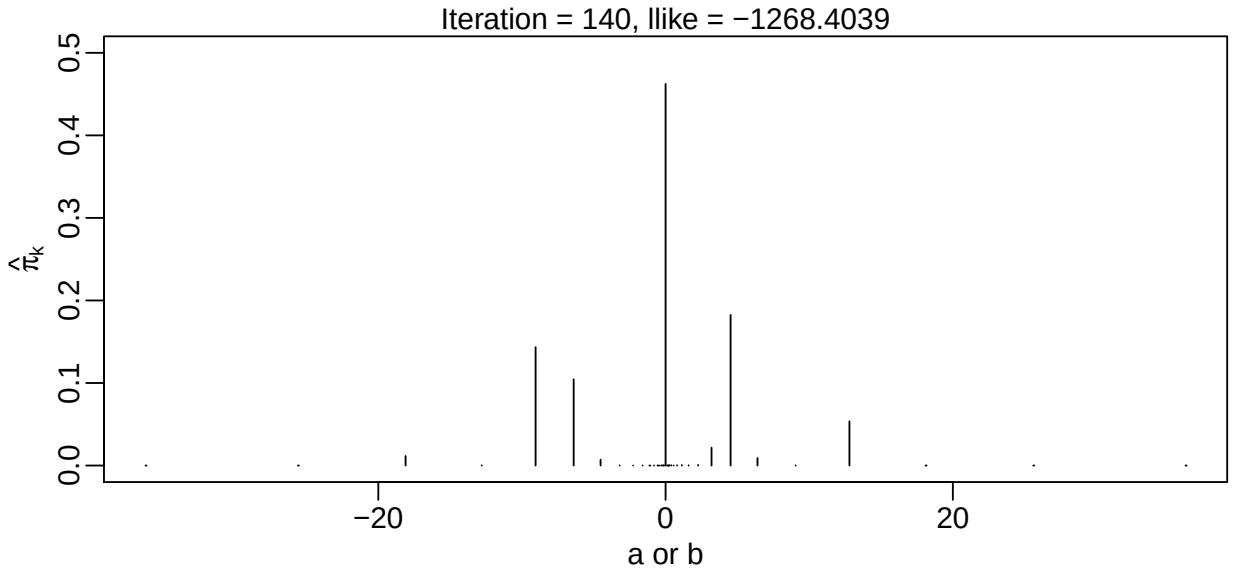

```
##  Iter = 139
## ldiff = 1.455e-06
## zdiff = 0.0001868
```



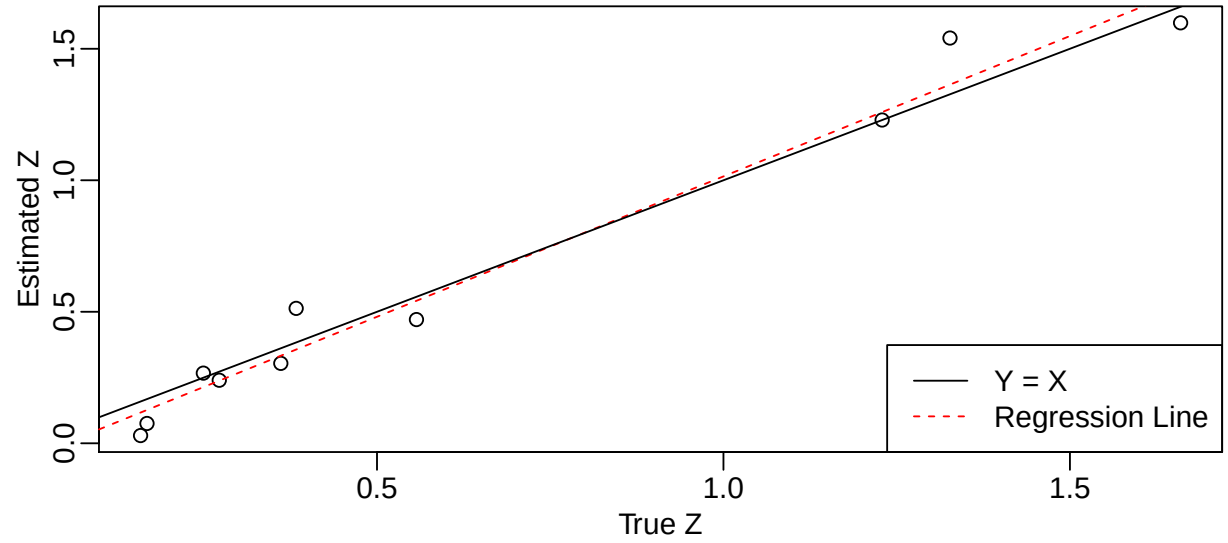


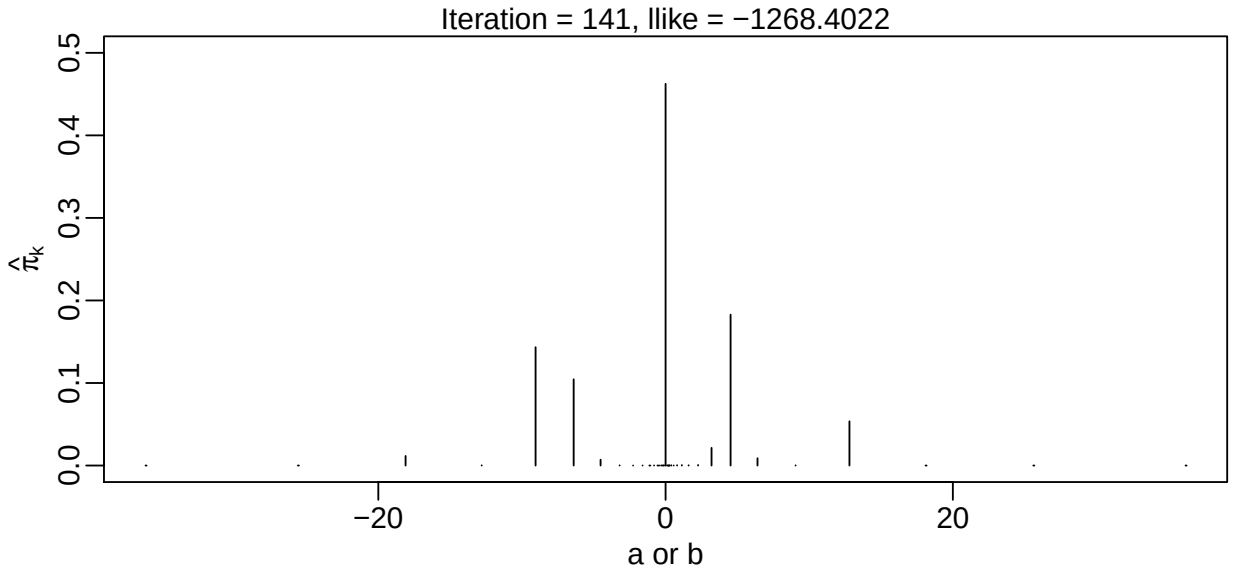

```
##  Iter = 140
## ldiff = 1.423e-06
## zdiff = 0.0002172
```



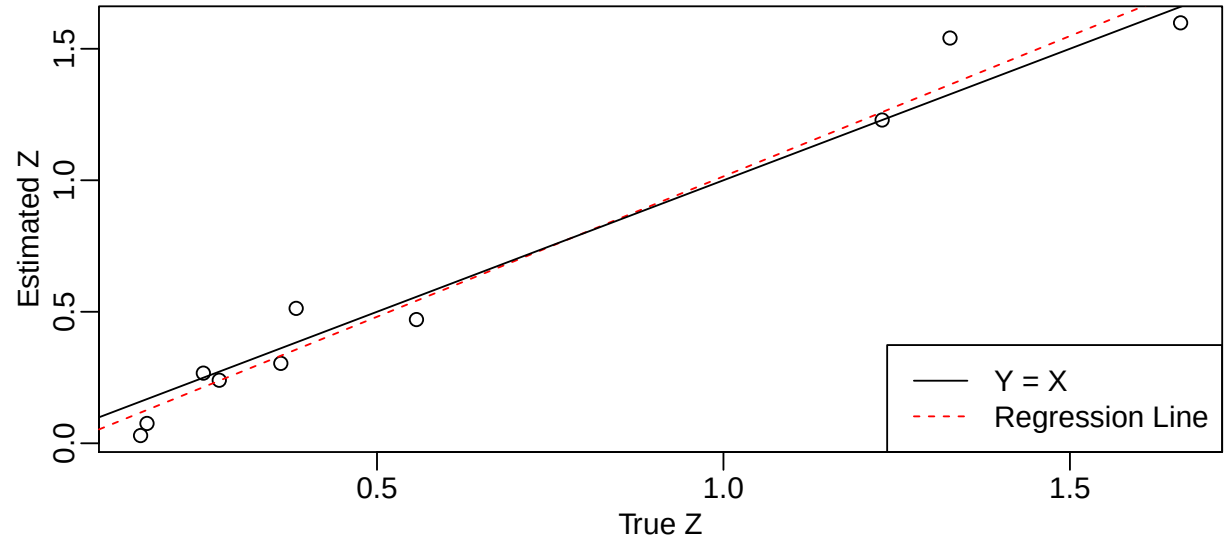


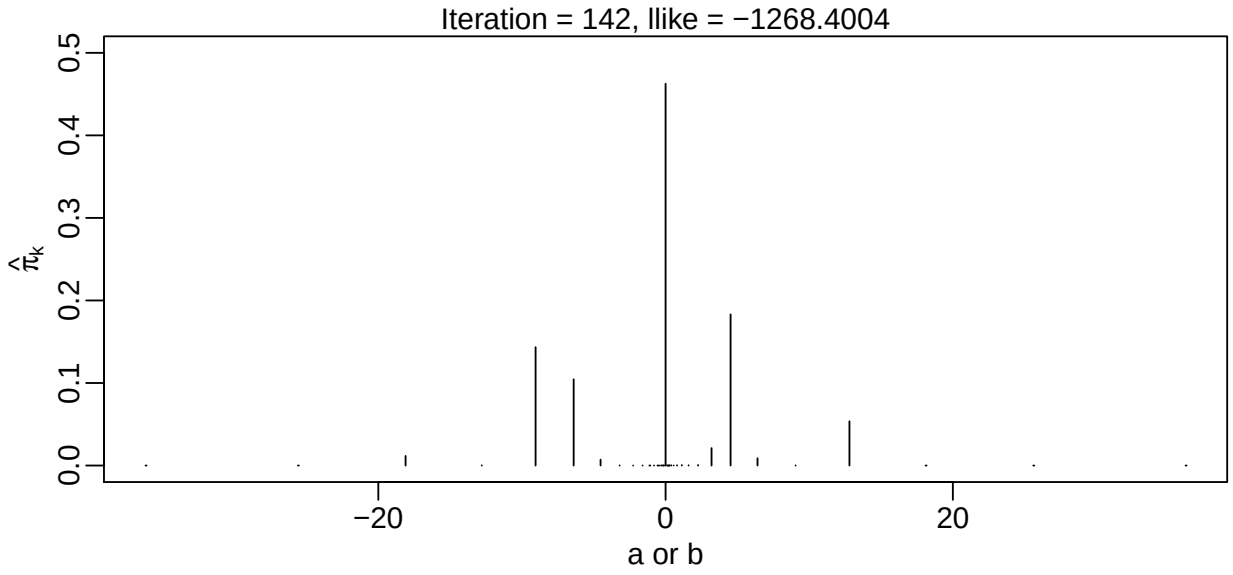

```
##  Iter = 141
## ldiff = 1.395e-06
## zdiff = 0.0006849
```



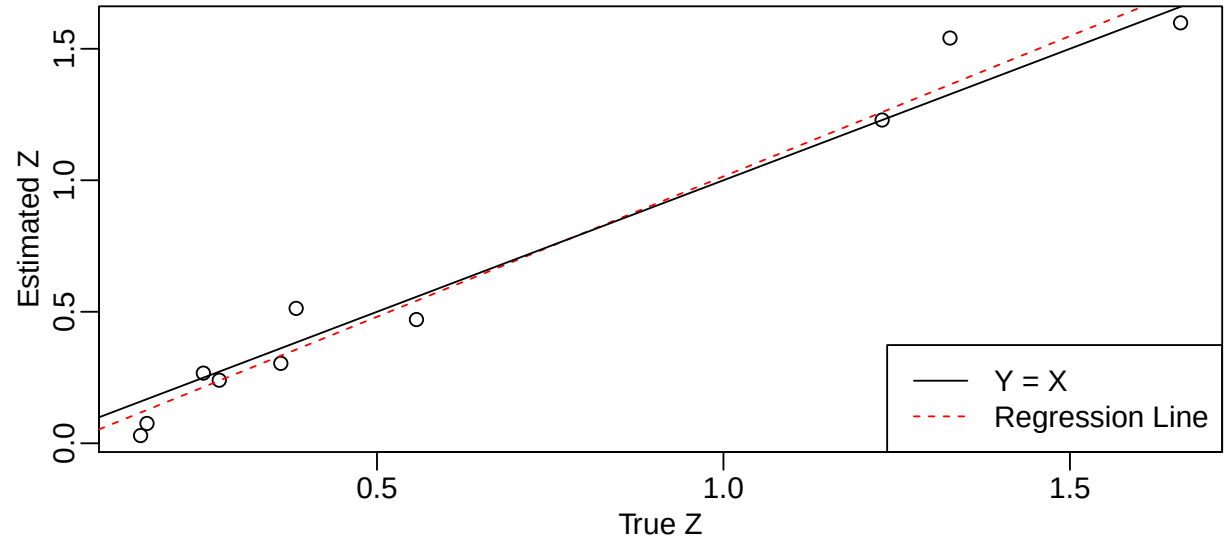


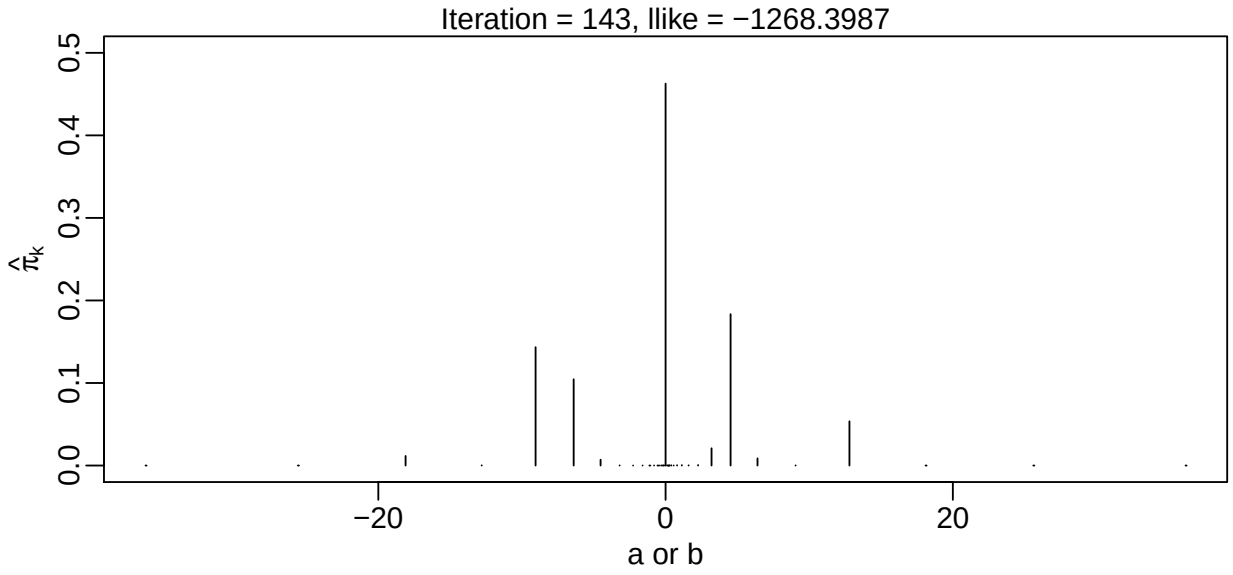

```
##  Iter = 142
## ldiff = 1.369e-06
## zdiff = 0.0001827
```



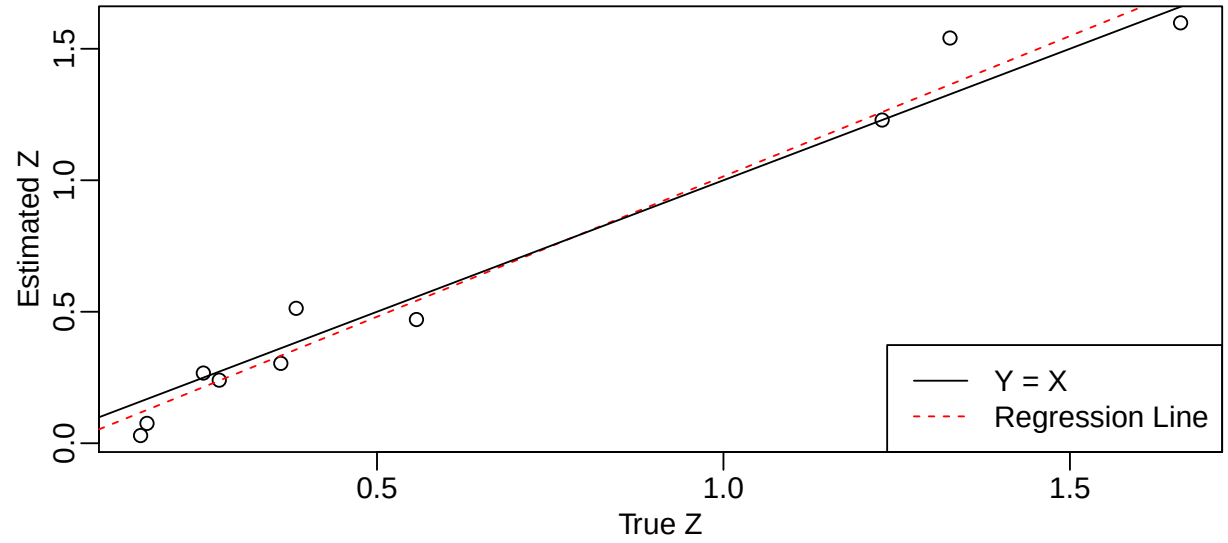


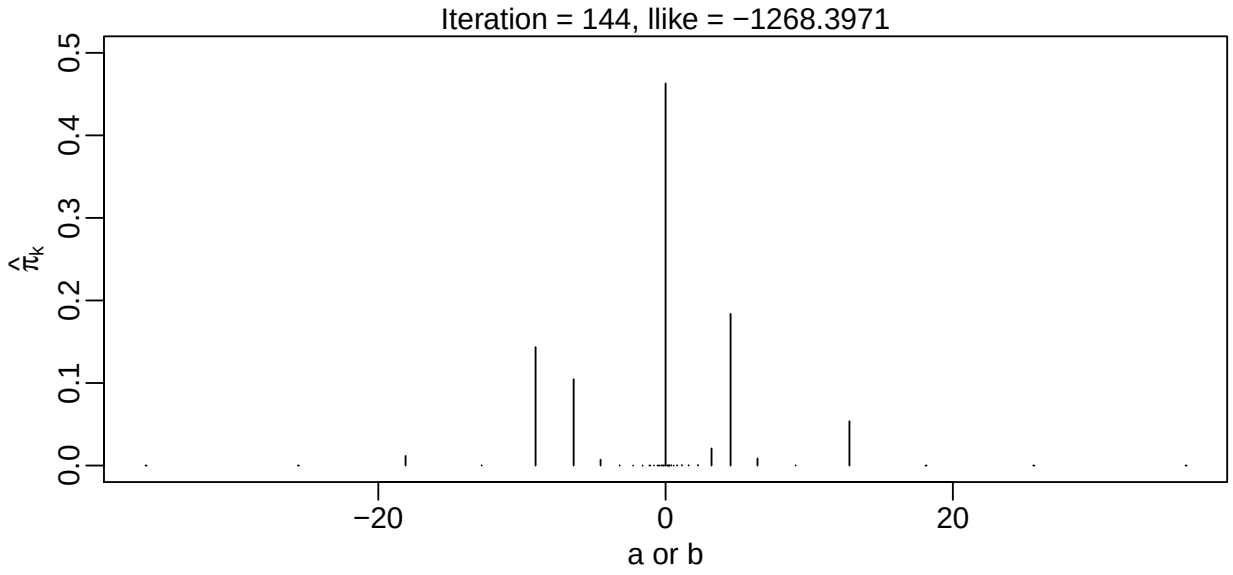

```
##  Iter = 143
## ldiff = 1.339e-06
## zdiff = 0.0002116
```



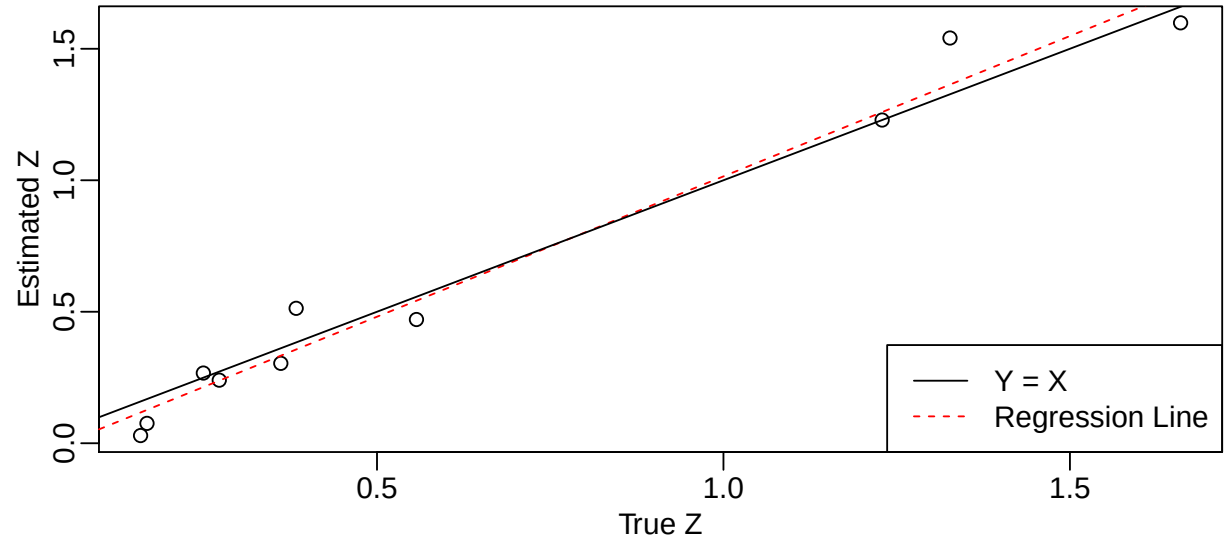


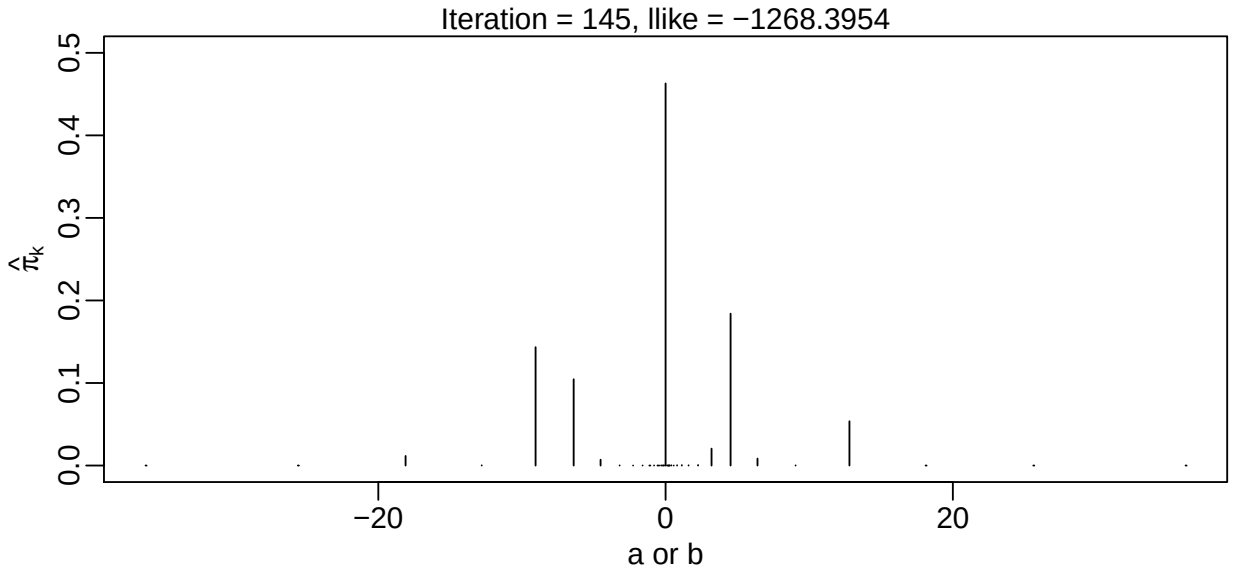

```
##  Iter = 144
## ldiff = 1.314e-06
## zdiff = 0.0006705
```



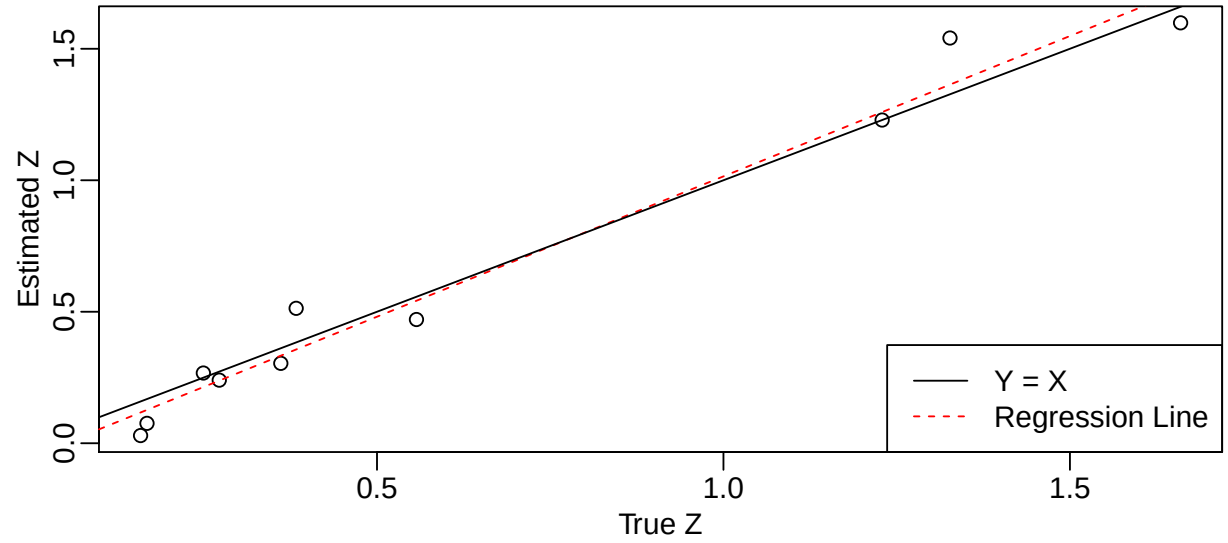


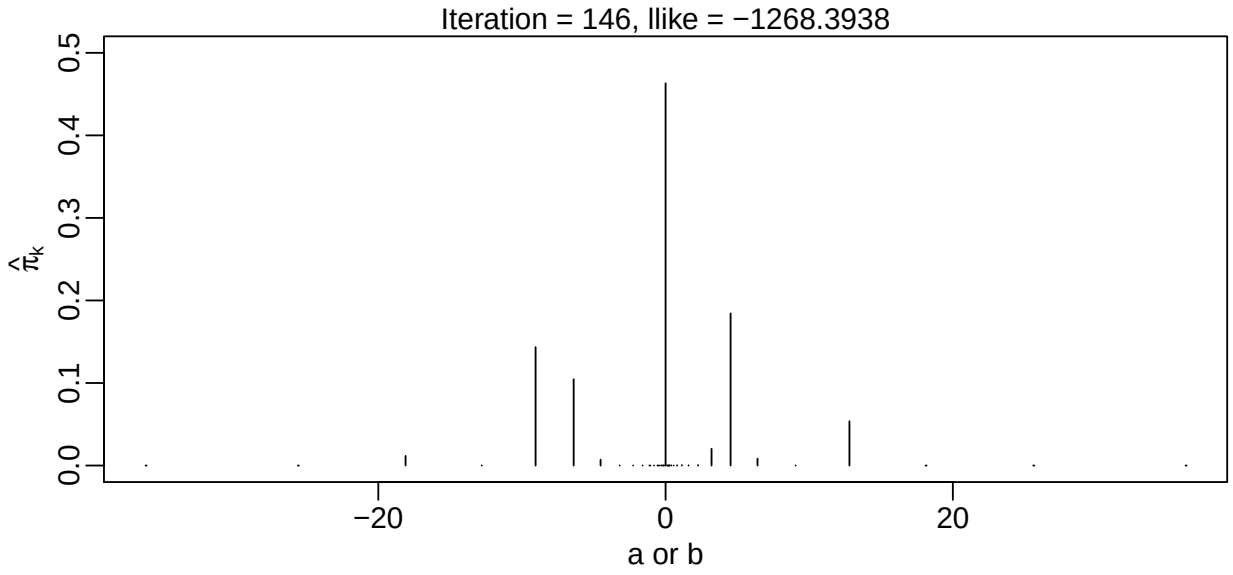

```
##  Iter = 145
## ldiff = 1.289e-06
## zdiff = 0.0001767
```



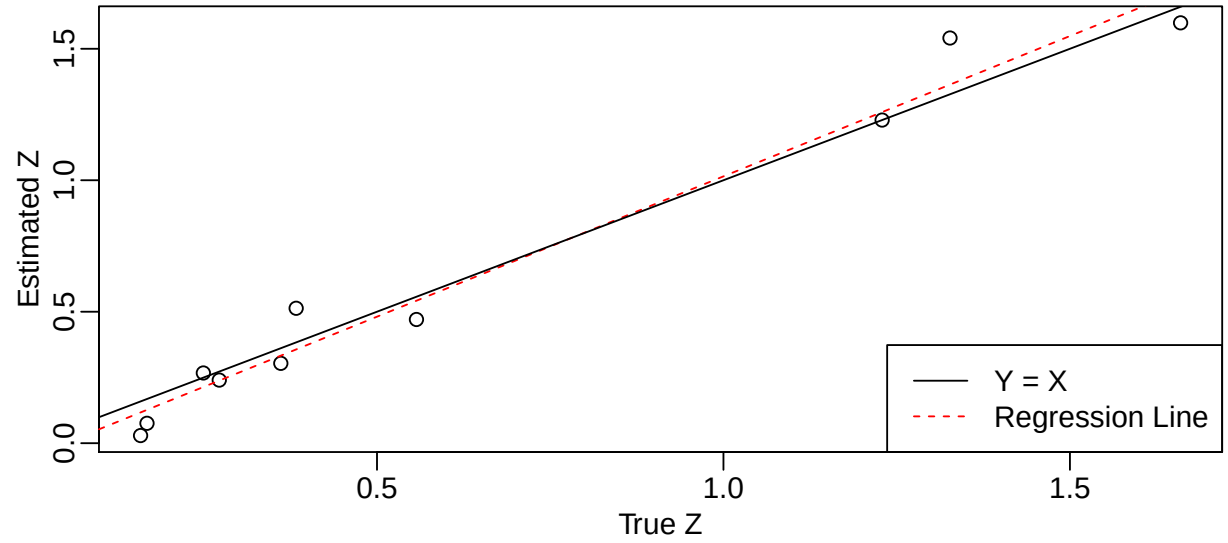


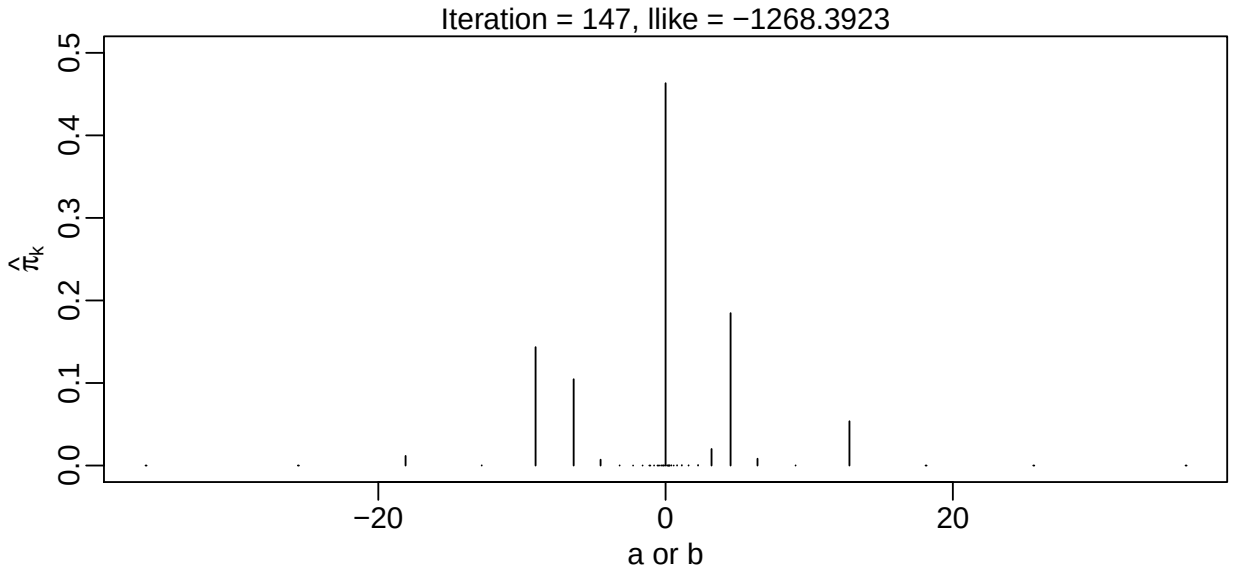

```
##  Iter = 146
## ldiff = 1.262e-06
## zdiff = 0.0002043
```



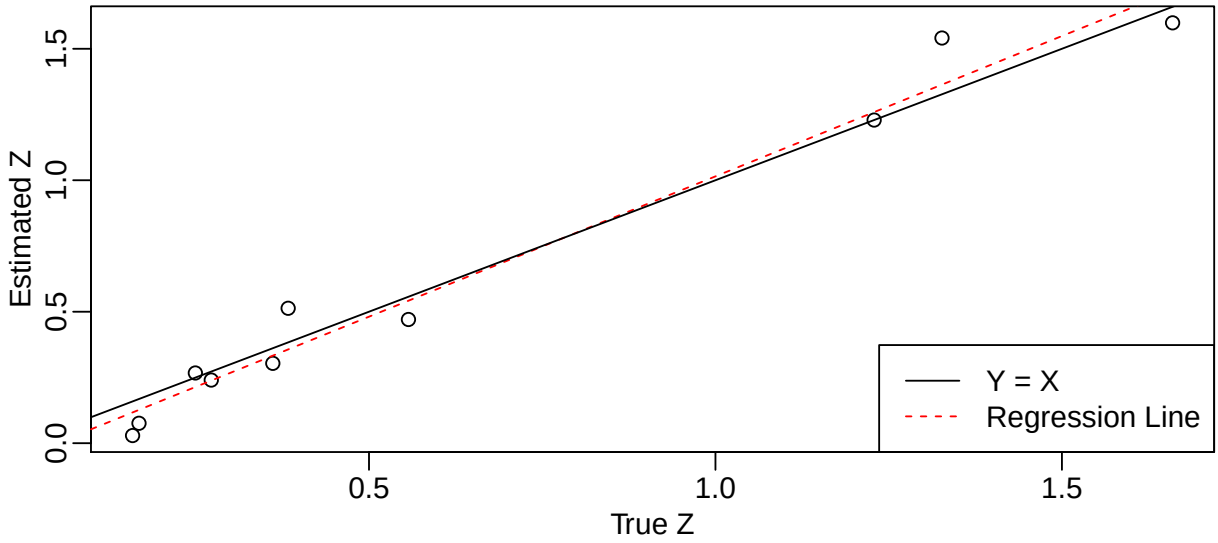


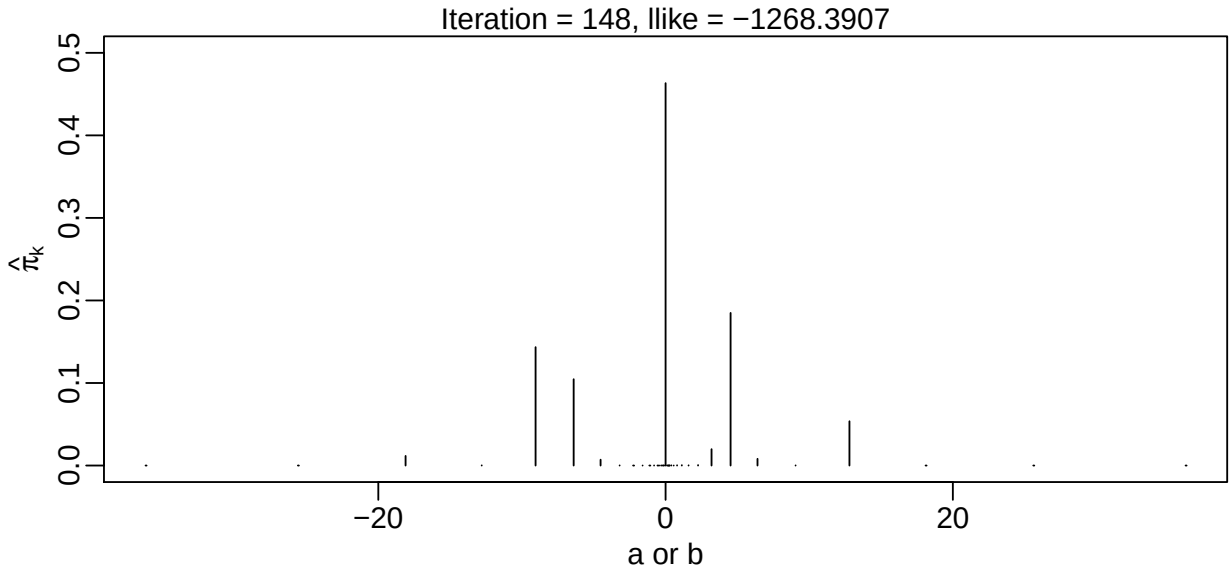

```
##  Iter = 147
## ldiff = 1.238e-06
## zdiff = 0.0006513
```



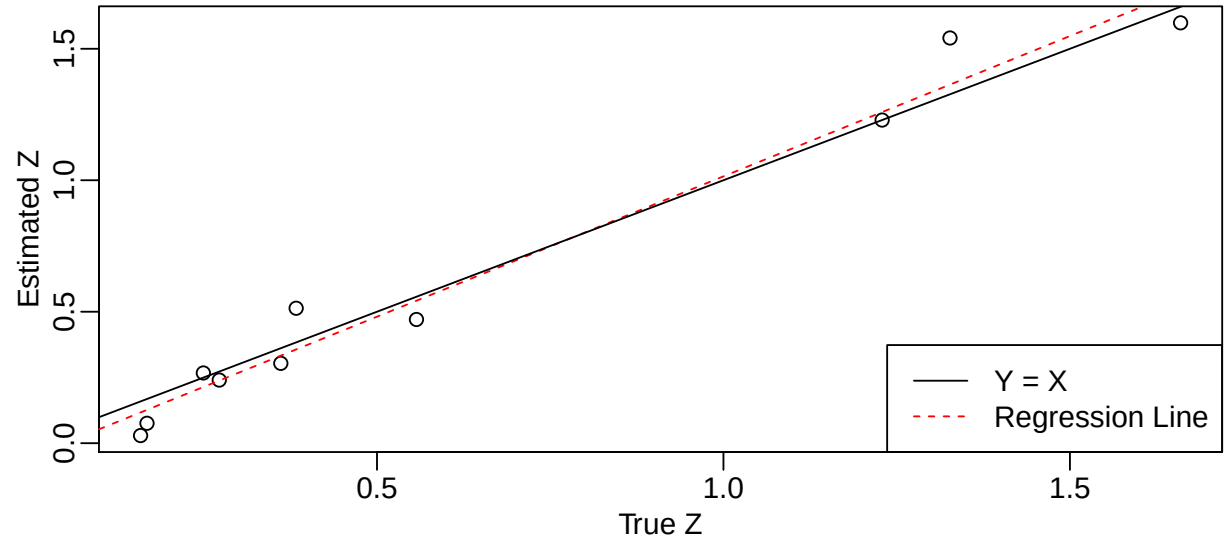


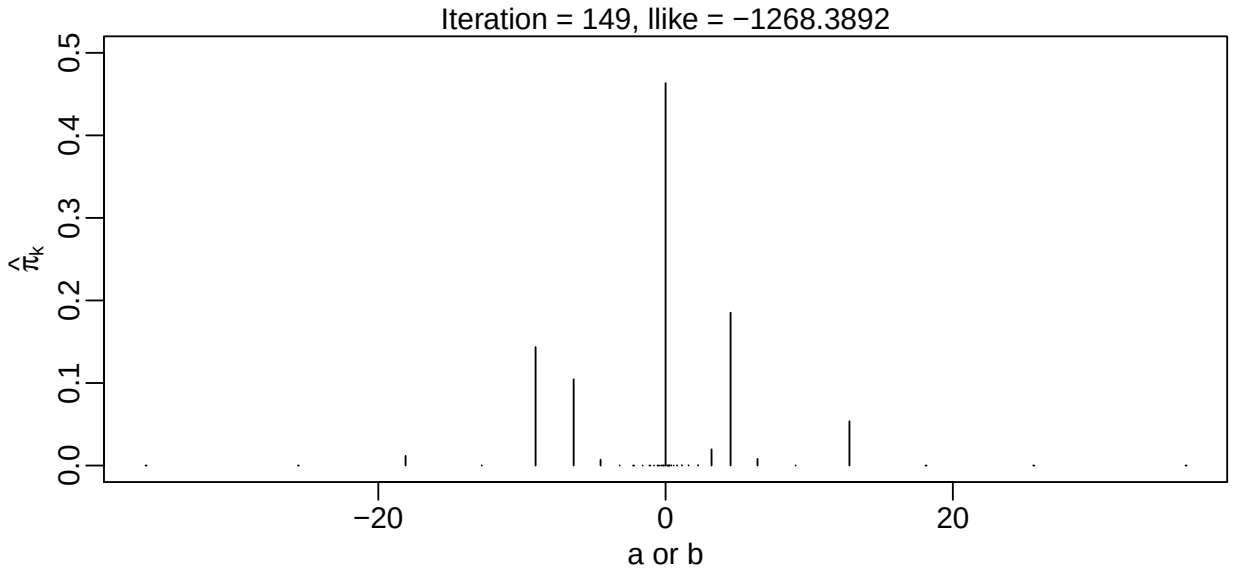

```
##  Iter = 148
## ldiff = 1.216e-06
## zdiff = 0.0001703
```



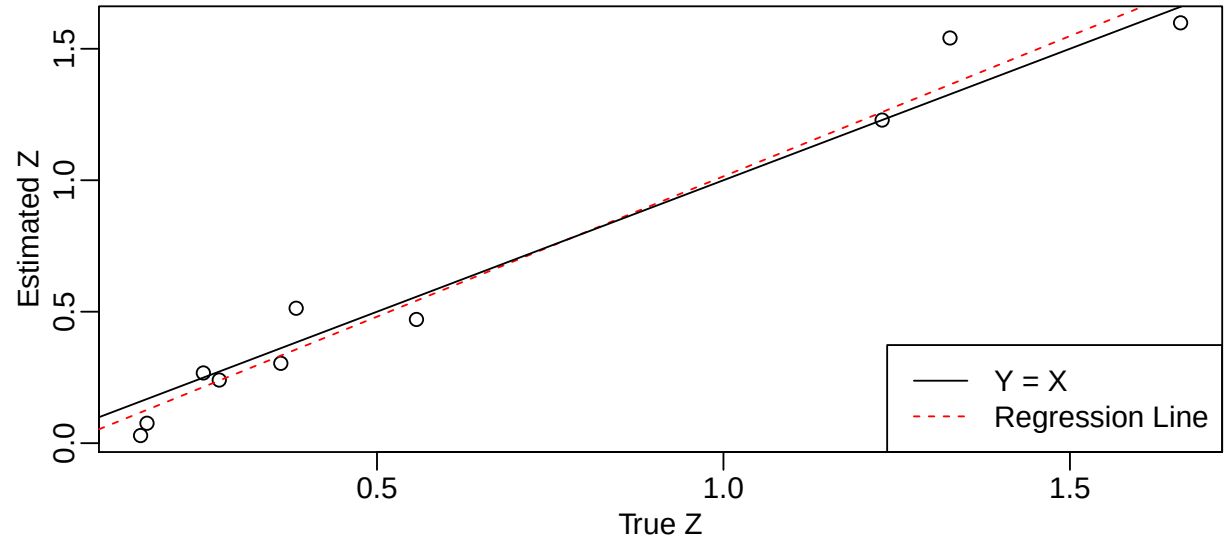


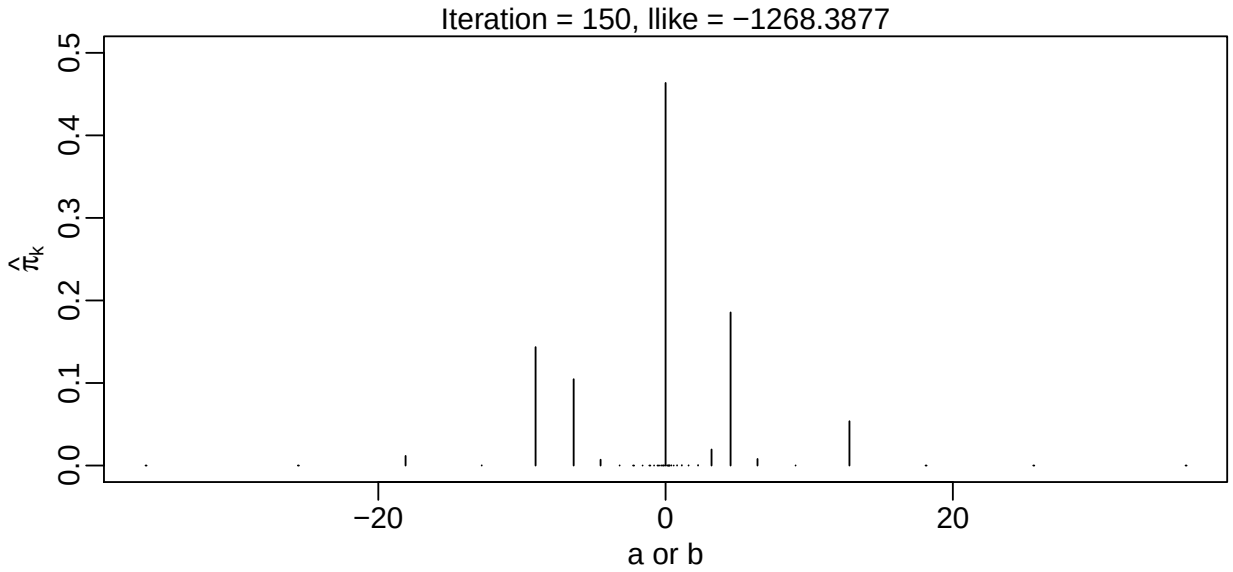

```
##  Iter = 149
## ldiff = 1.19e-06
## zdiff = 0.0001968
```



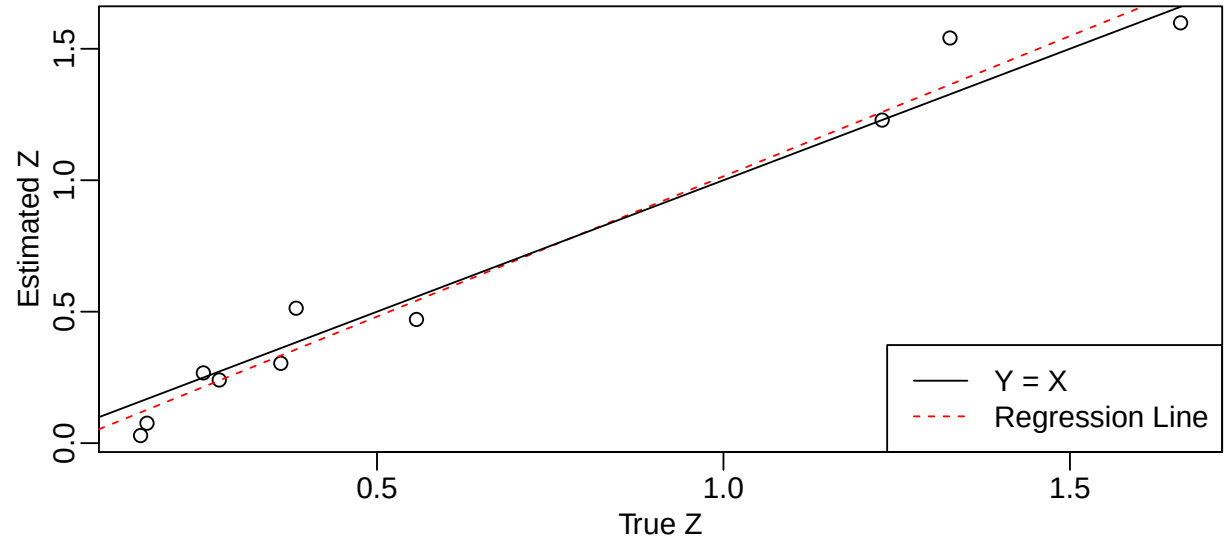


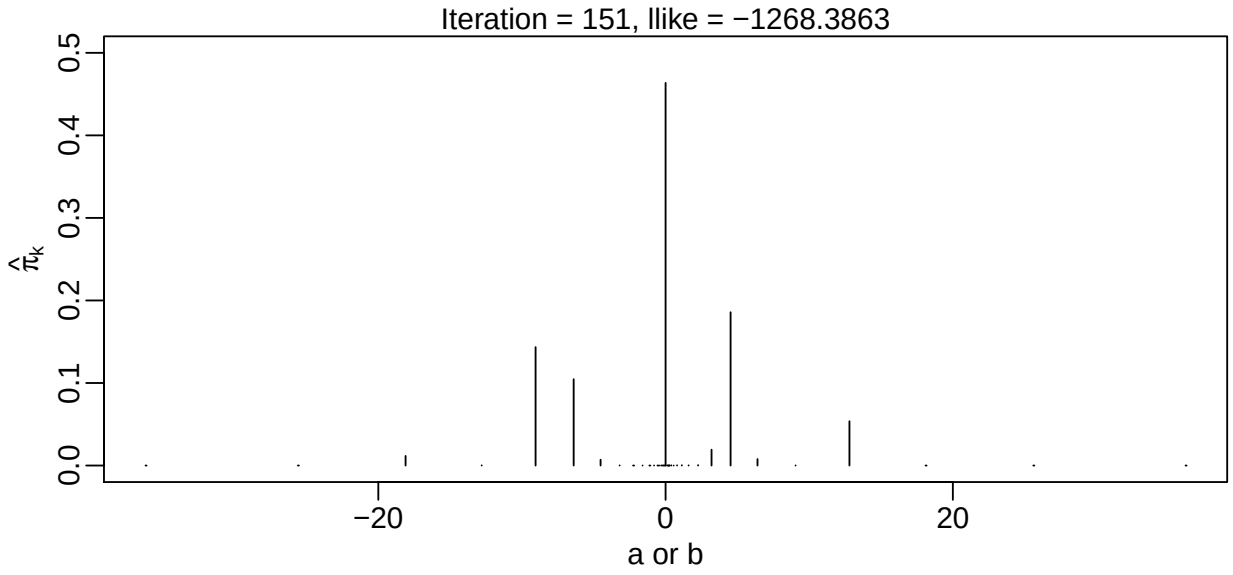

```
##  Iter = 150
## ldiff = 1.166e-06
## zdiff = 0.00022
```



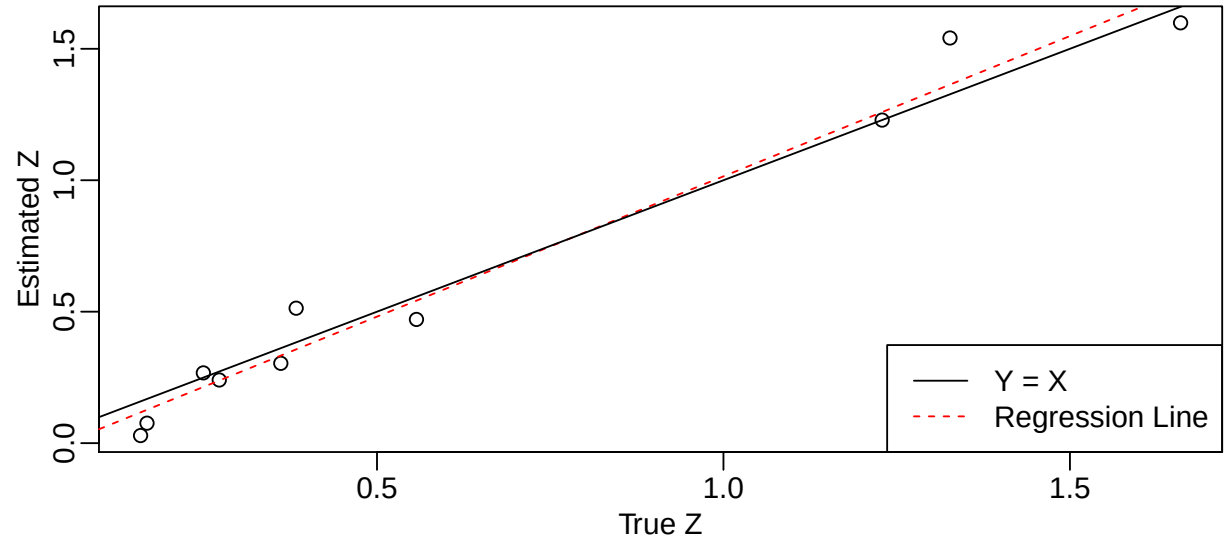


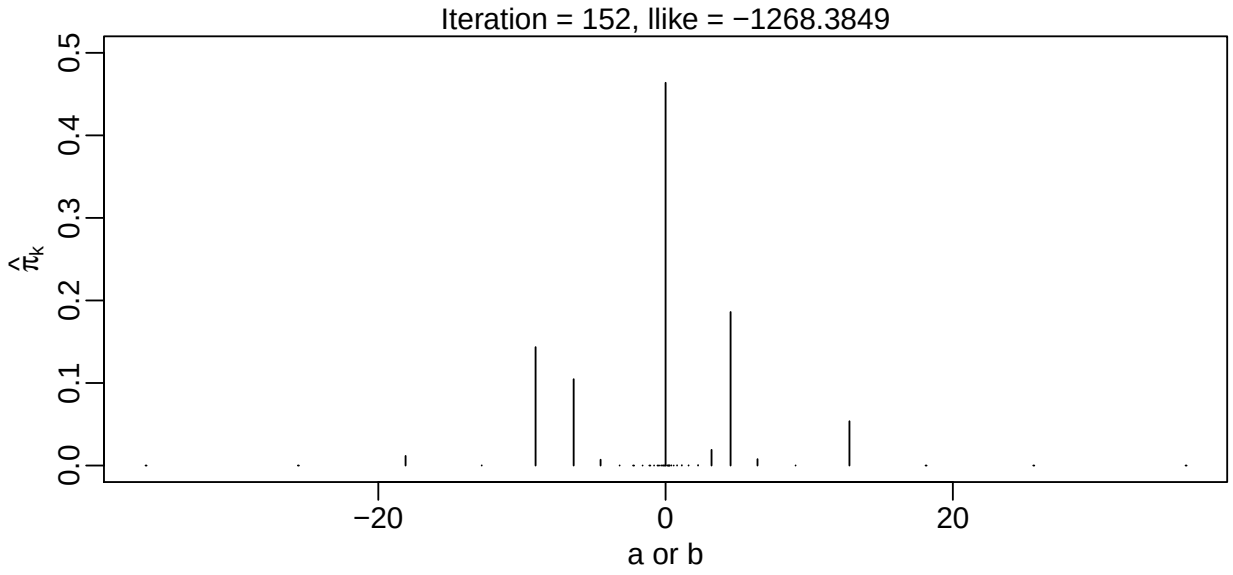

```
##  Iter = 151
## ldiff = 1.145e-06
## zdiff = 0.0006816
```



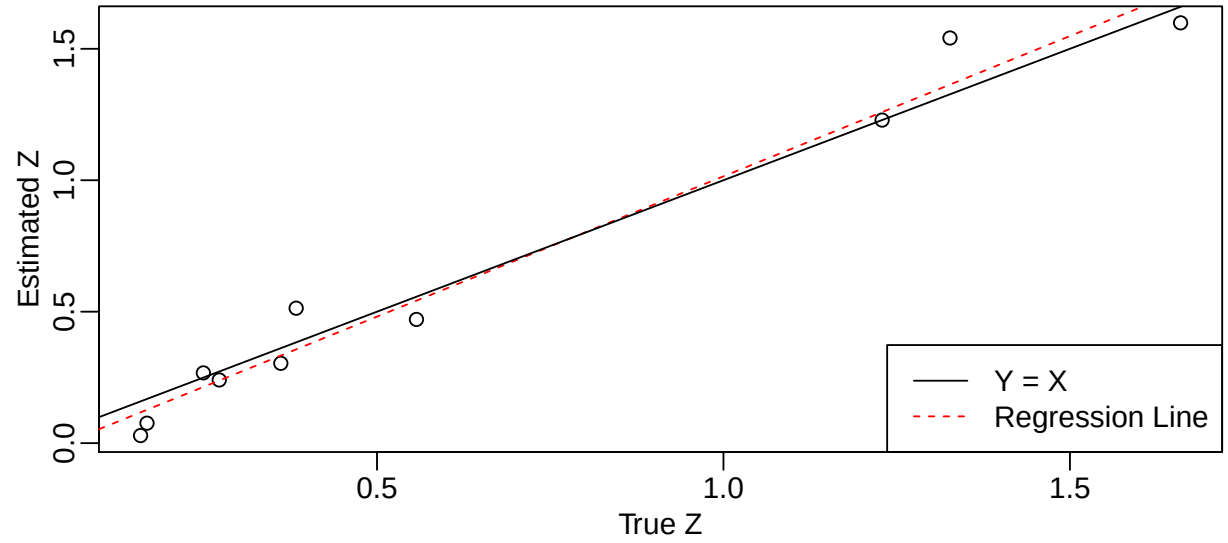


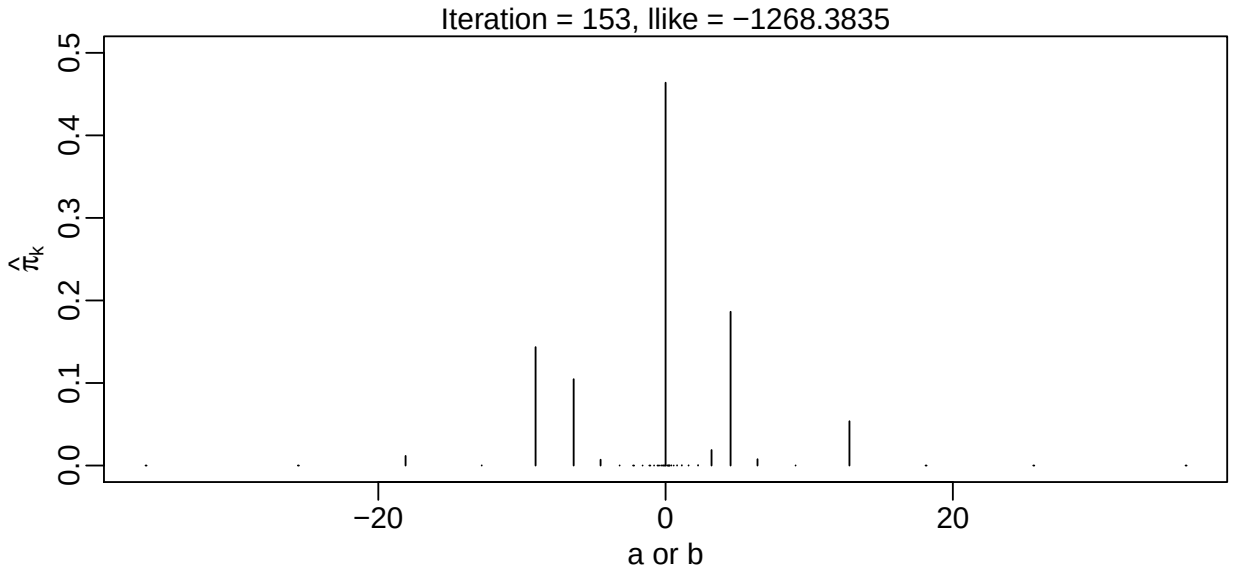

```
##  Iter = 152
## ldiff = 1.125e-06
## zdiff = 0.0001703
```



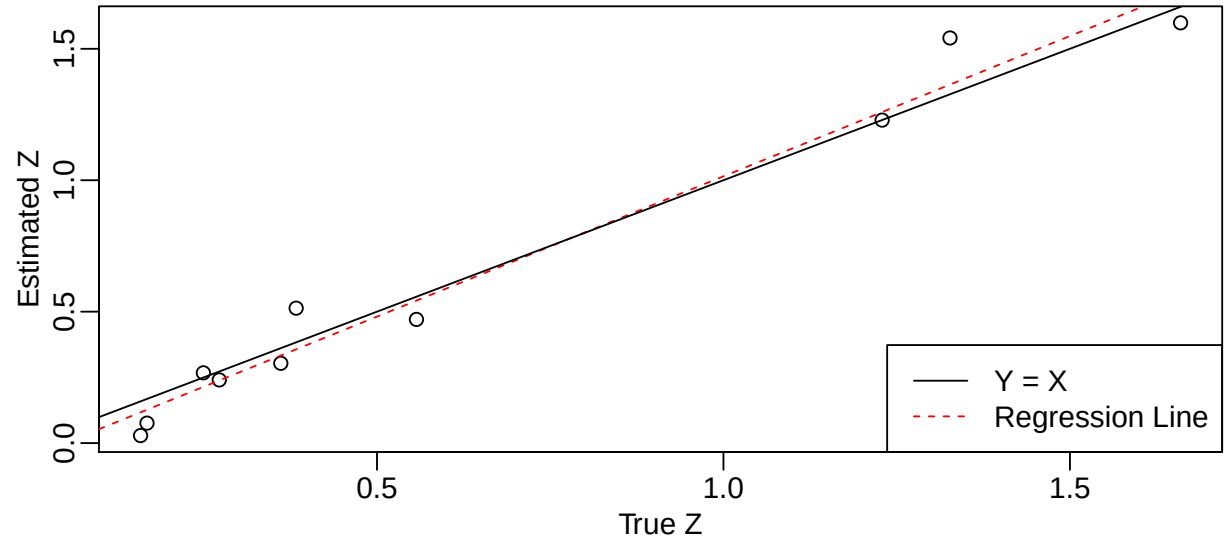


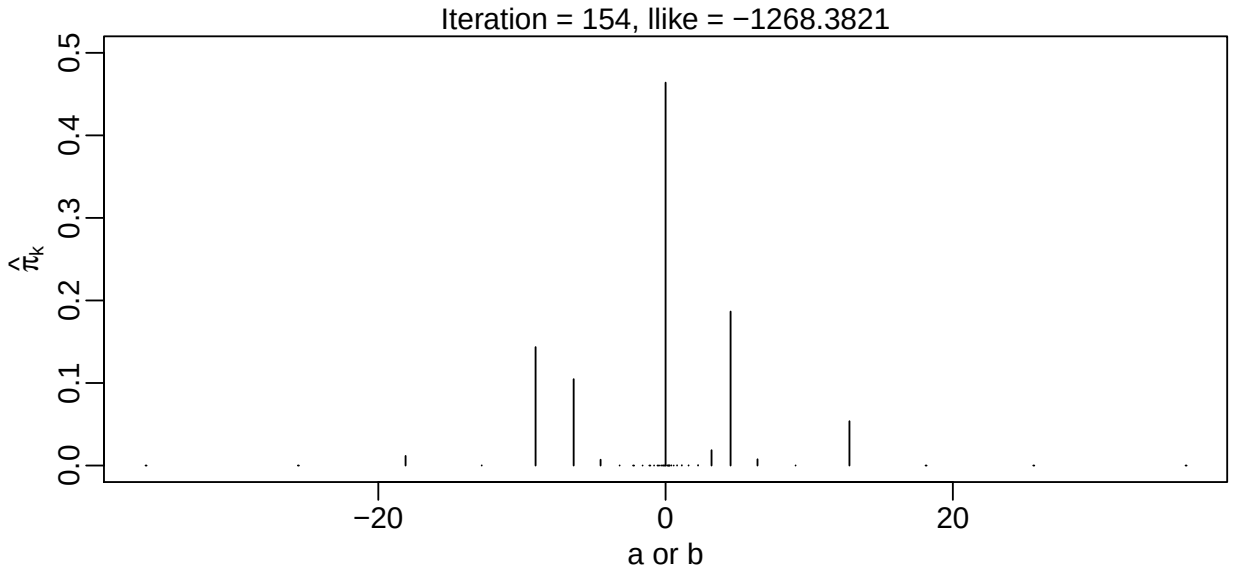

```
##  Iter = 153
## ldiff = 1.101e-06
## zdiff = 9.696e-05
```



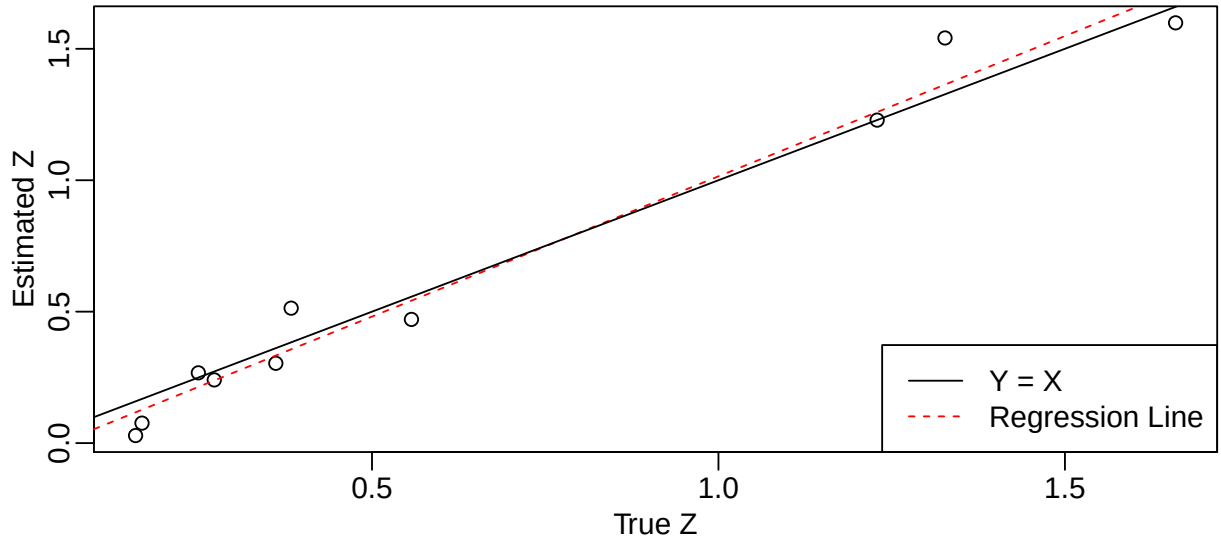


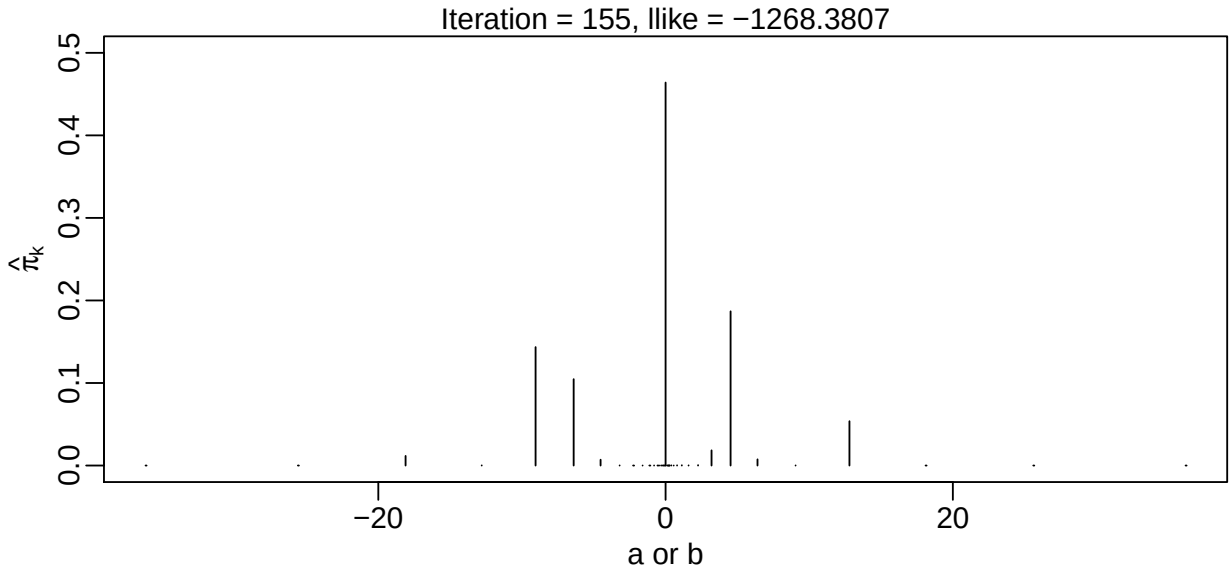

```
##  Iter = 154
## ldiff = 1.083e-06
## zdiff = 0.0006869
```



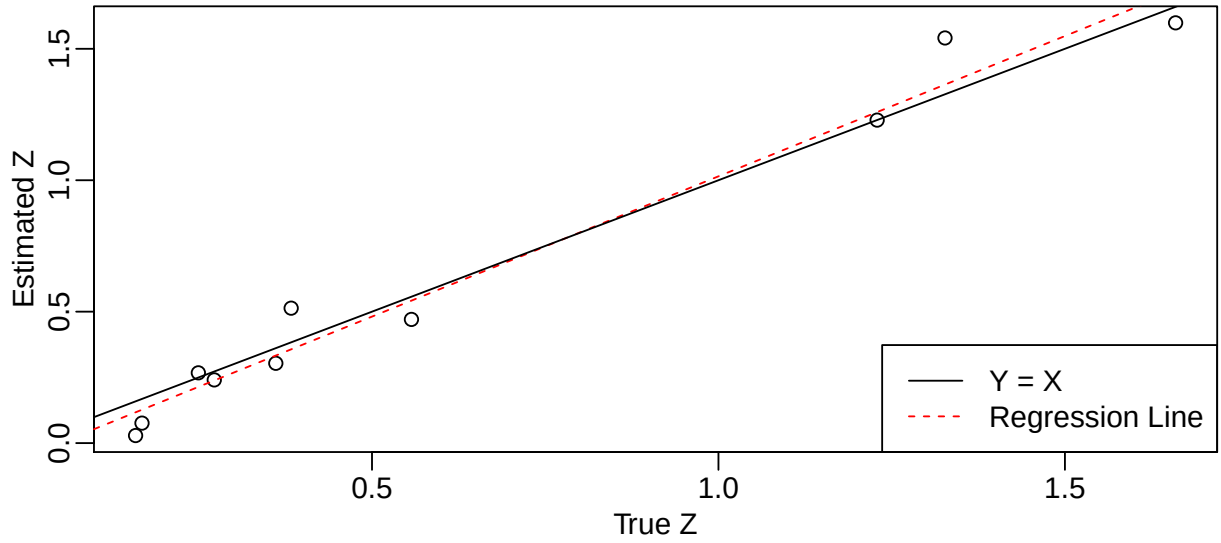


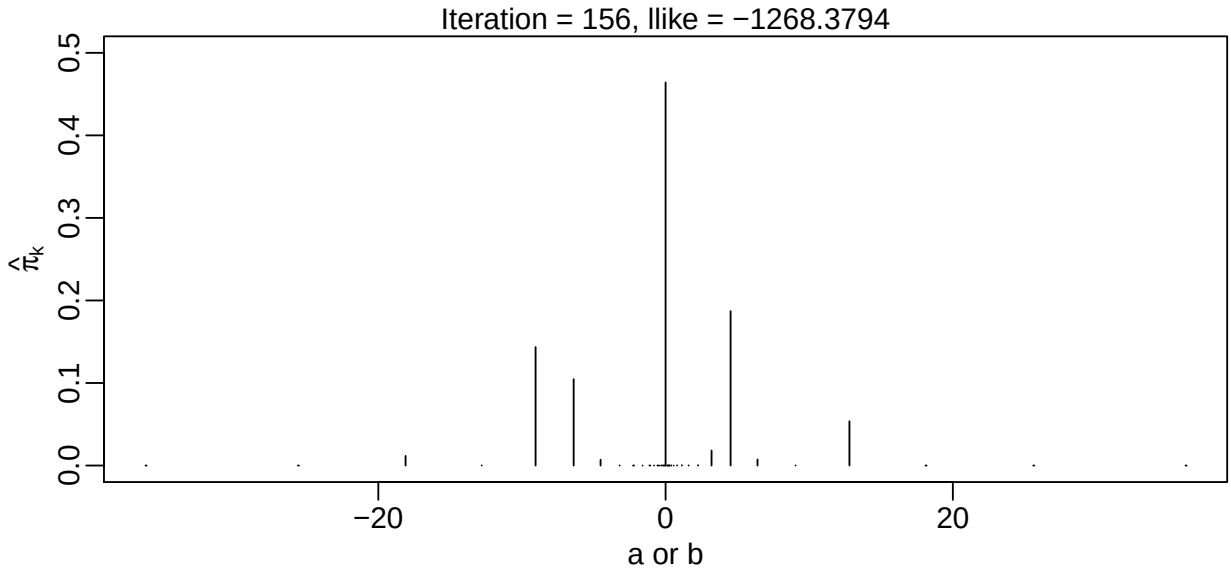

```
##  Iter = 155
## ldiff = 1.063e-06
## zdiff = 9.78e-05
```



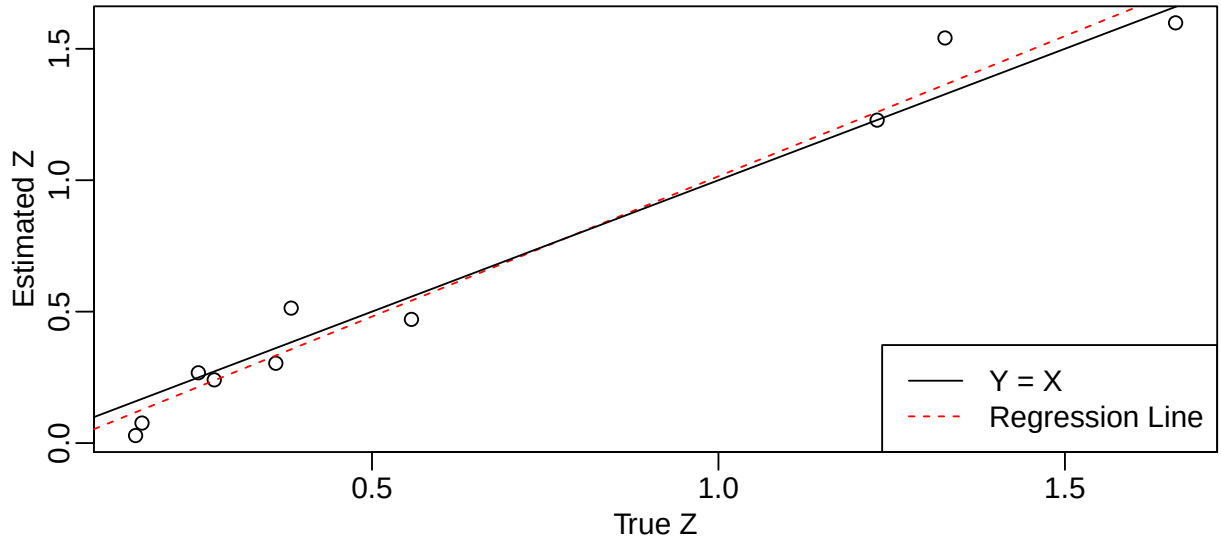


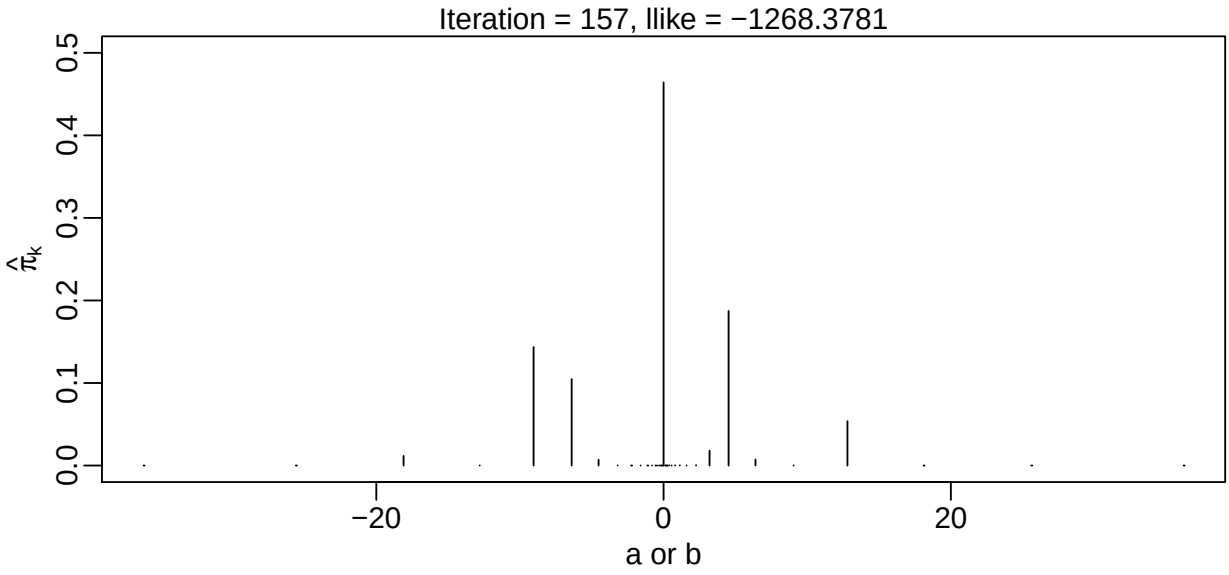

```
##  Iter = 156
## ldiff = 1.04e-06
## zdiff = 9.691e-05
```



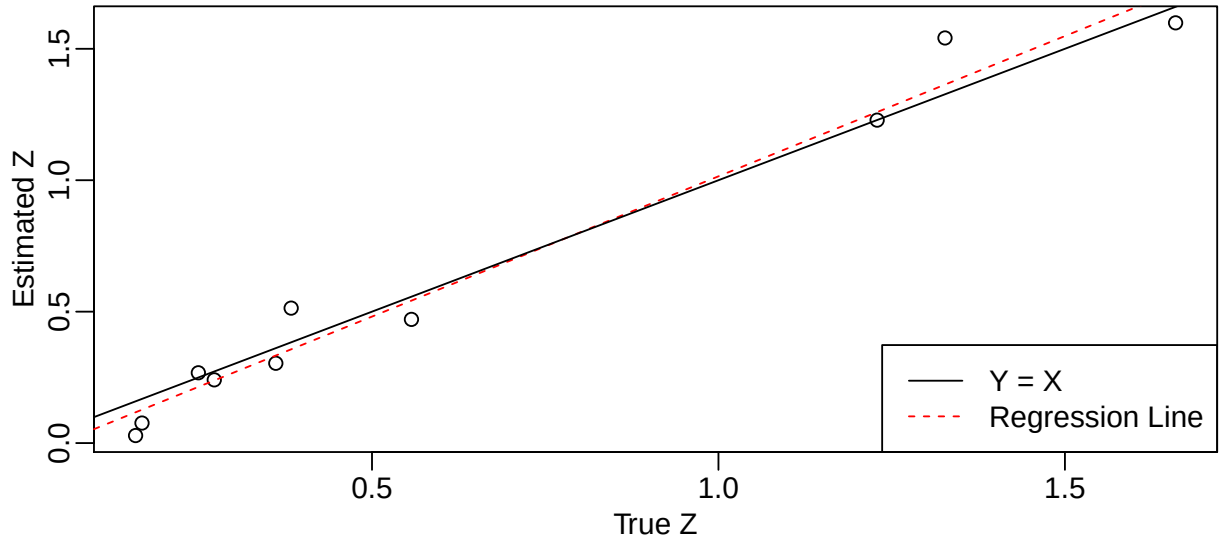


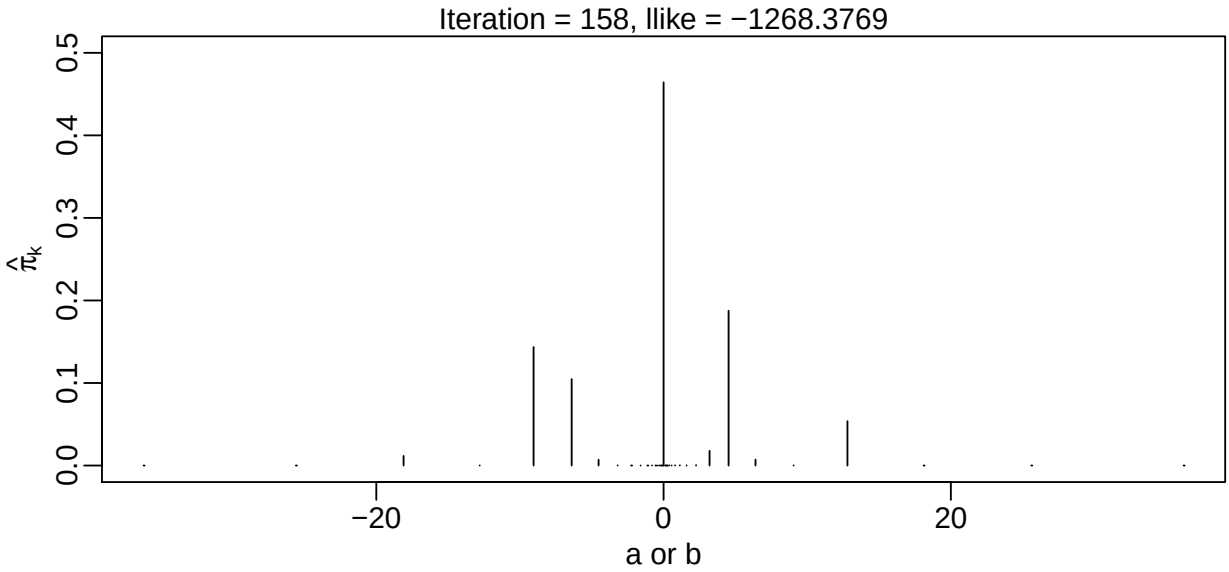

```
##  Iter = 157
## ldiff = 1.024e-06
## zdiff = 0.0007266
```



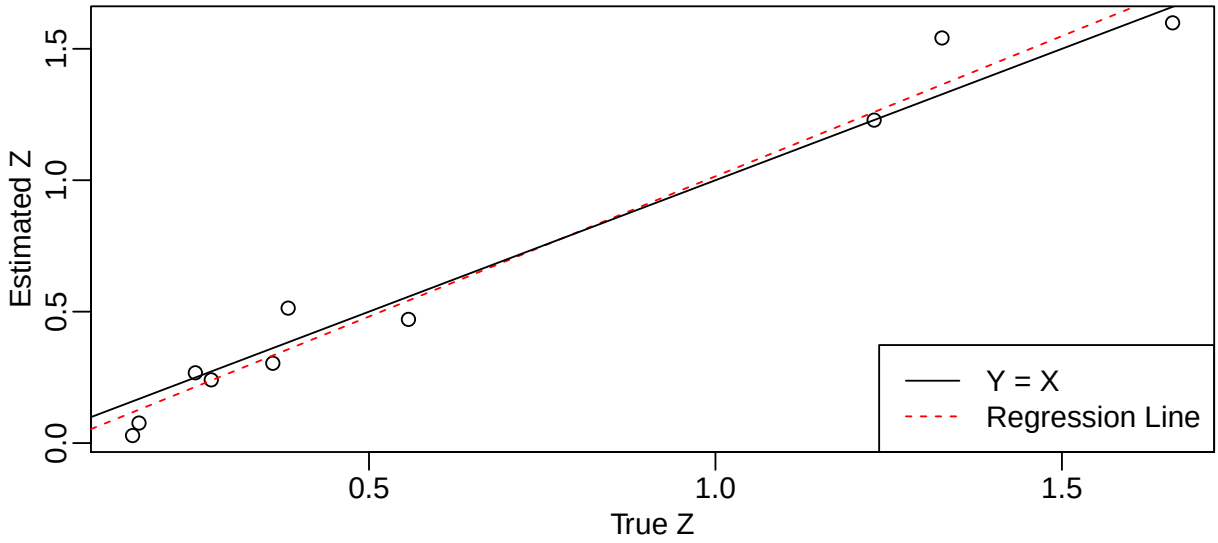


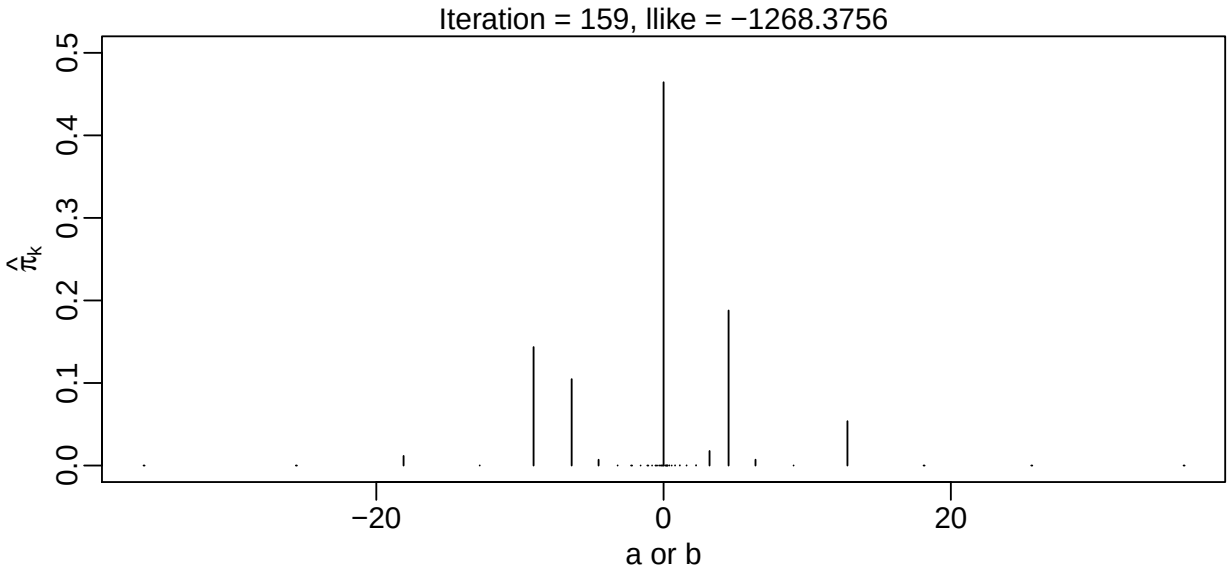

```
##  Iter = 158
## ldiff = 1.005e-06
## zdiff = 9.54e-05
```






```
##  Iter = 159
## ldiff = 9.834e-07
## zdiff = 9.429e-05
```


Estimated Z
0.0
0.5
1.0
1.5
0.5
1.0
1.5
True Z
Y = X
Regression Line


Iteration = 159, llike = −1268.3756
$\hat{\pi}_k$
0.0
0.1
0.2
0.3
0.4
0.5
−20
0
20
a or b