Propagating Monte Carlo Error

Team A7

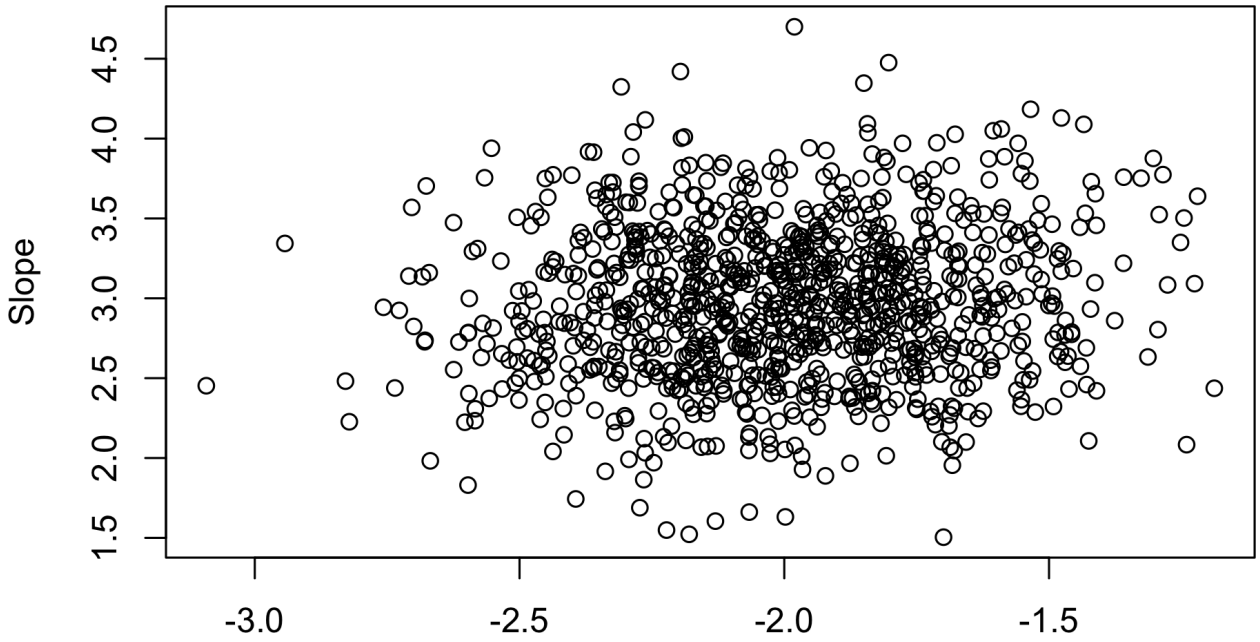
11/29/2018

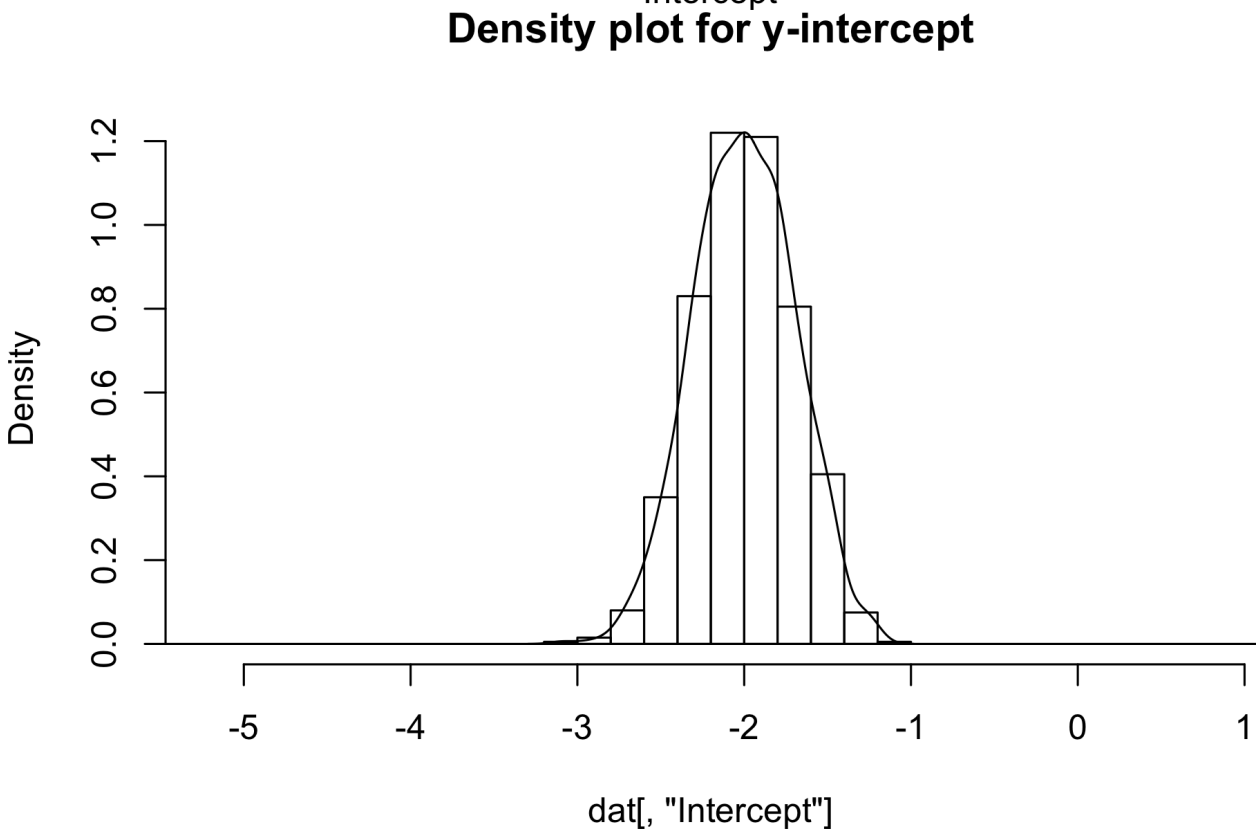
The functions we are using to generate the fake data are:

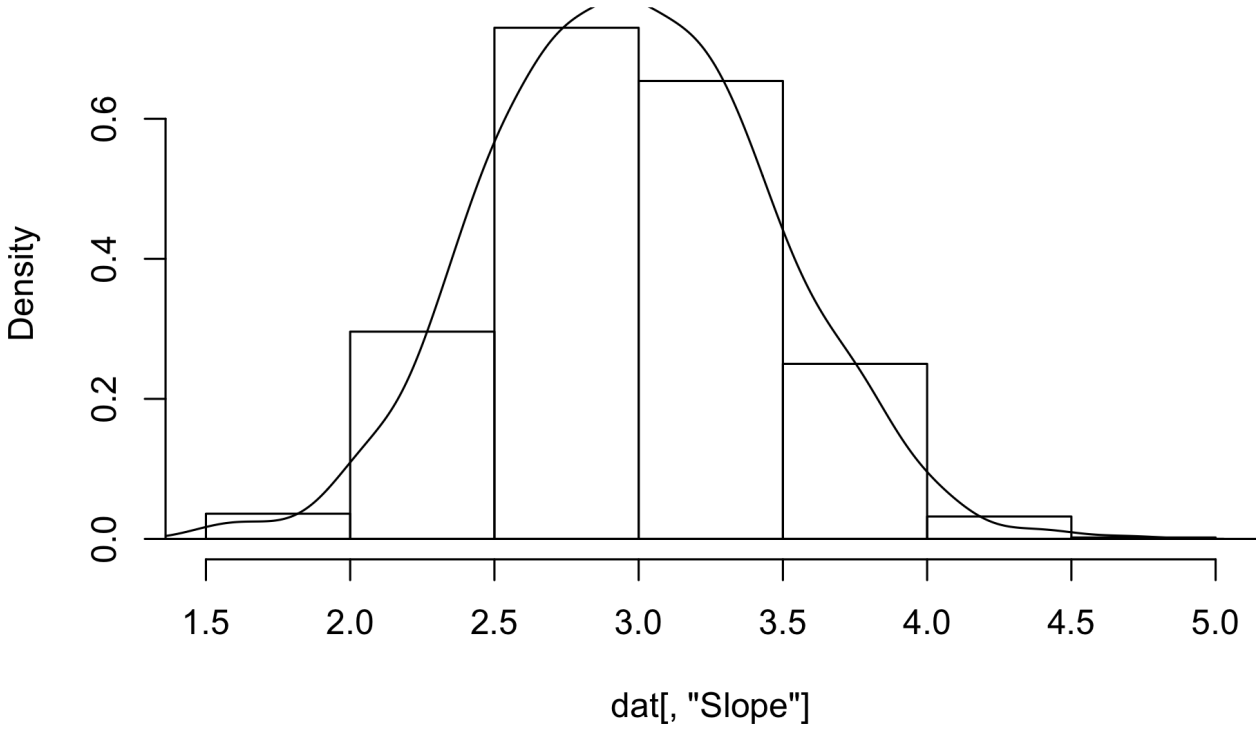
1. f1(x) = -2 + 3x
2. f2(x) = 3
3. f3(x) = 6x^2 + 3x + 3
4. f4(x) = 10x + 3
5. f5(x) = -4x - 6

Generation and plotting of the 1000 c0 and c1 values from fake data

Function number 1







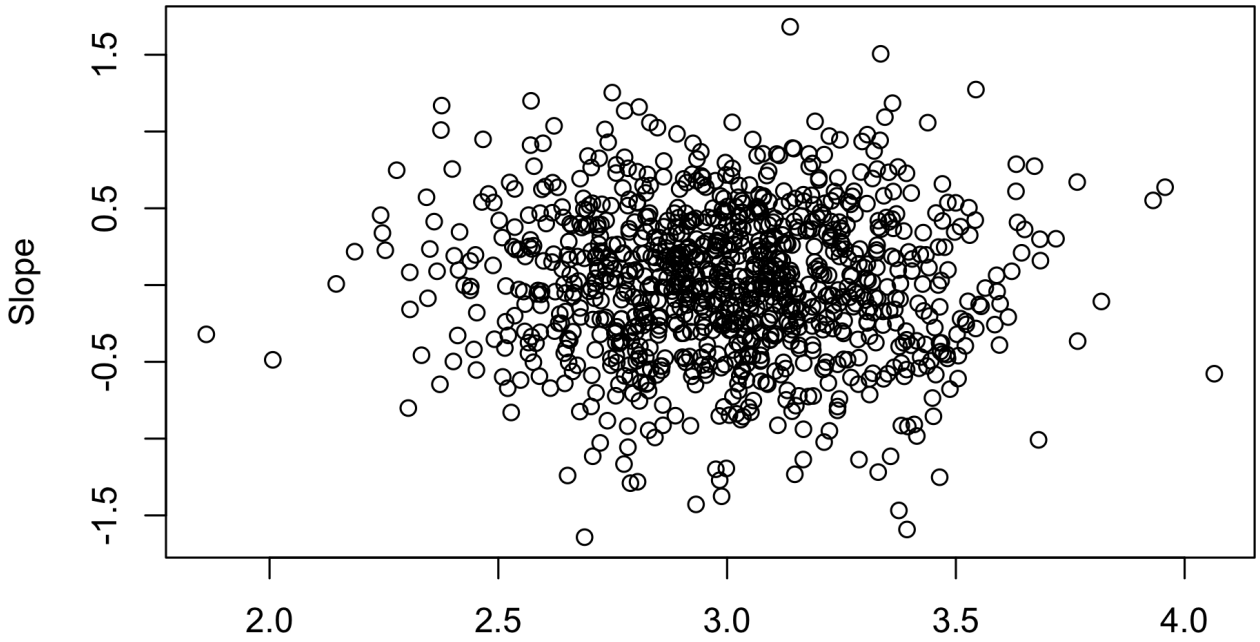
Mean of the intercept: -1.99926132547461

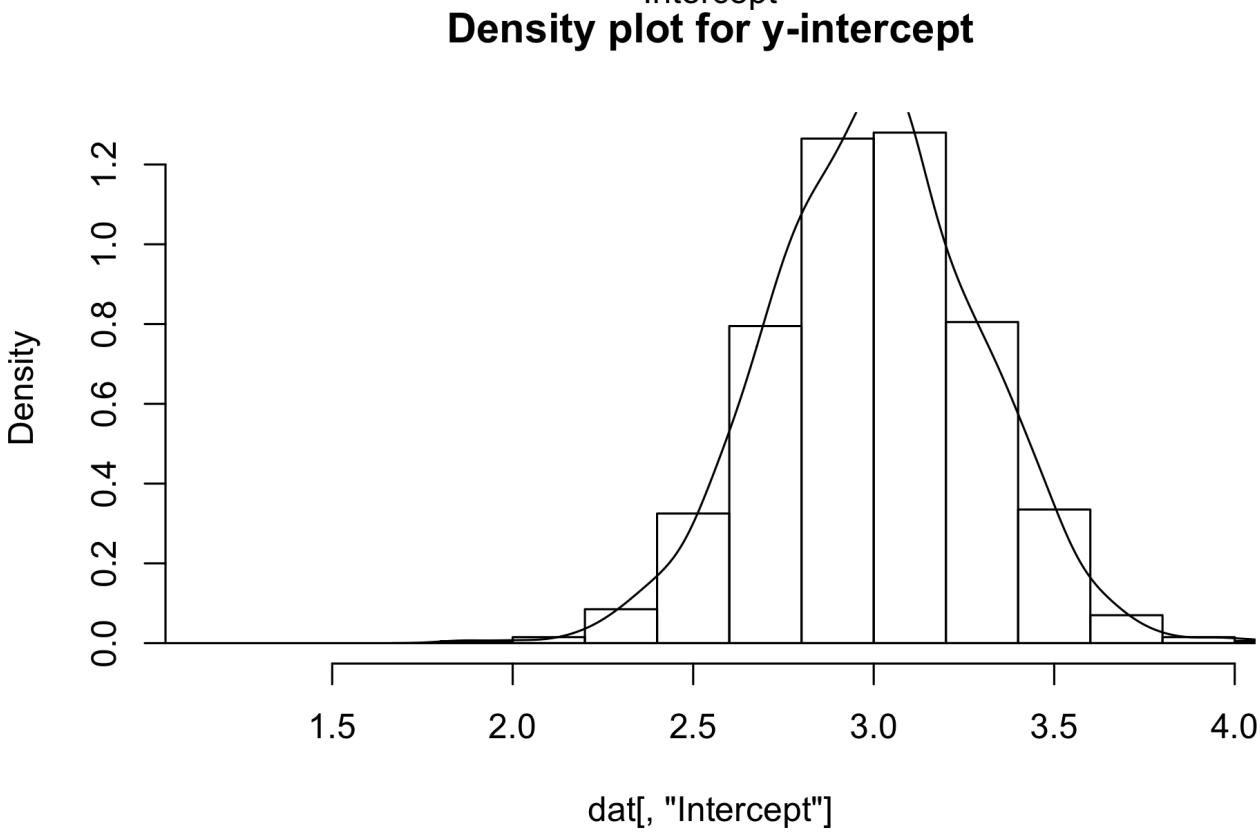
Variance of the intercept: 2.96992044881108

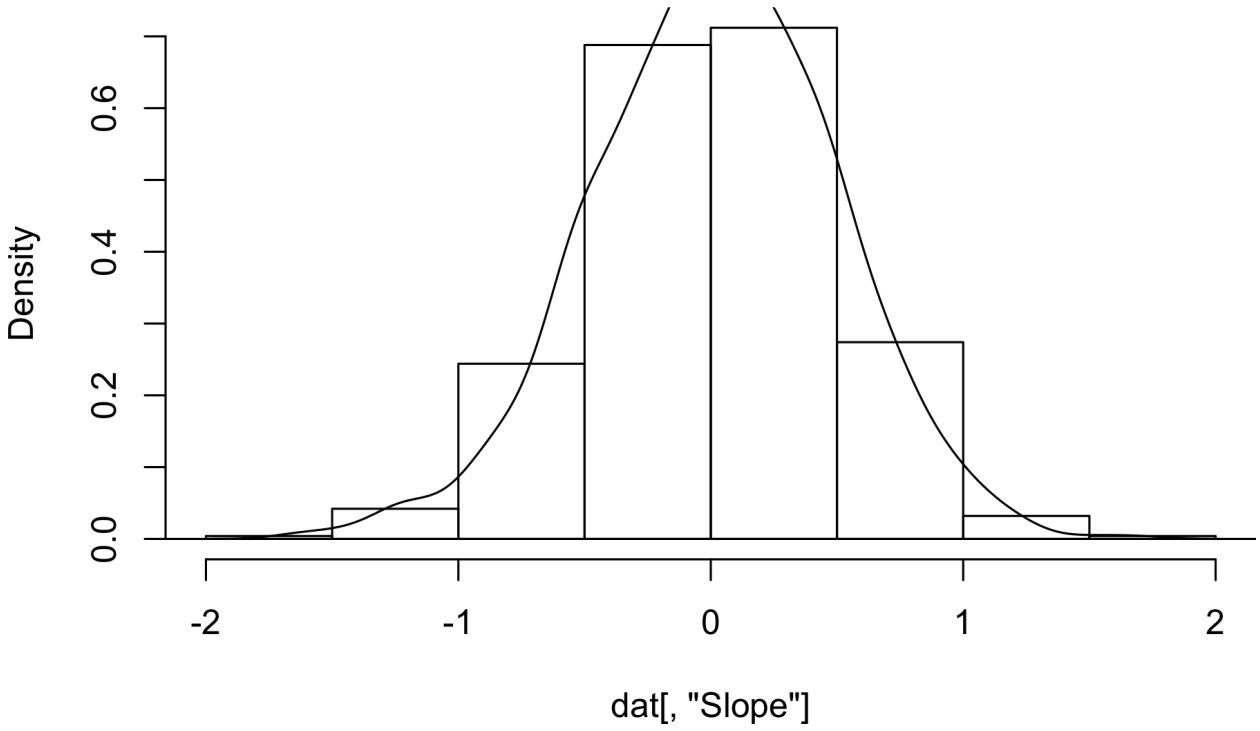
Mean of the slope: 0.483959374186498

Variance of the slope: 0.30181130600151

Function number 2







Mean of the intercept: 3.00024185480543

Variance of the intercept: 0.013039786697529

Mean of the slope: 0.483591839830539

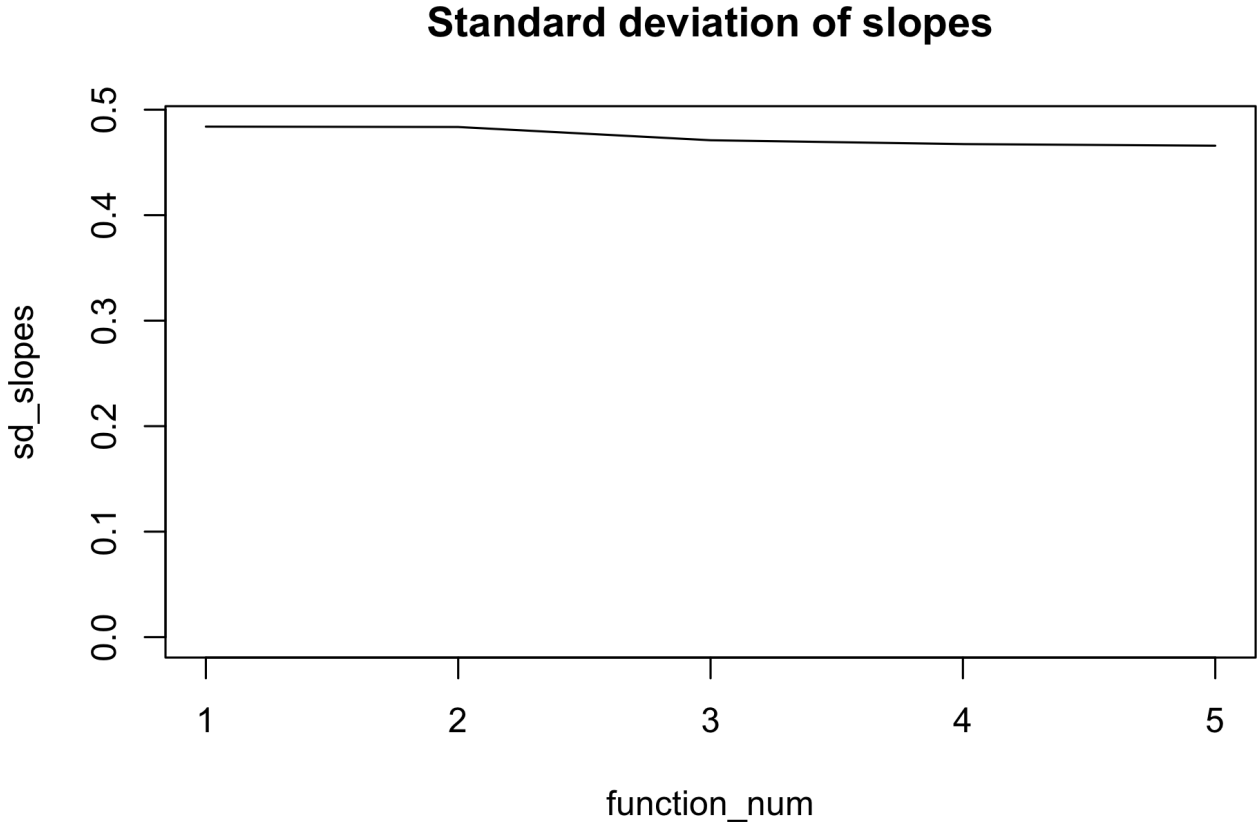
Variance of the slope: 0.292096482244477

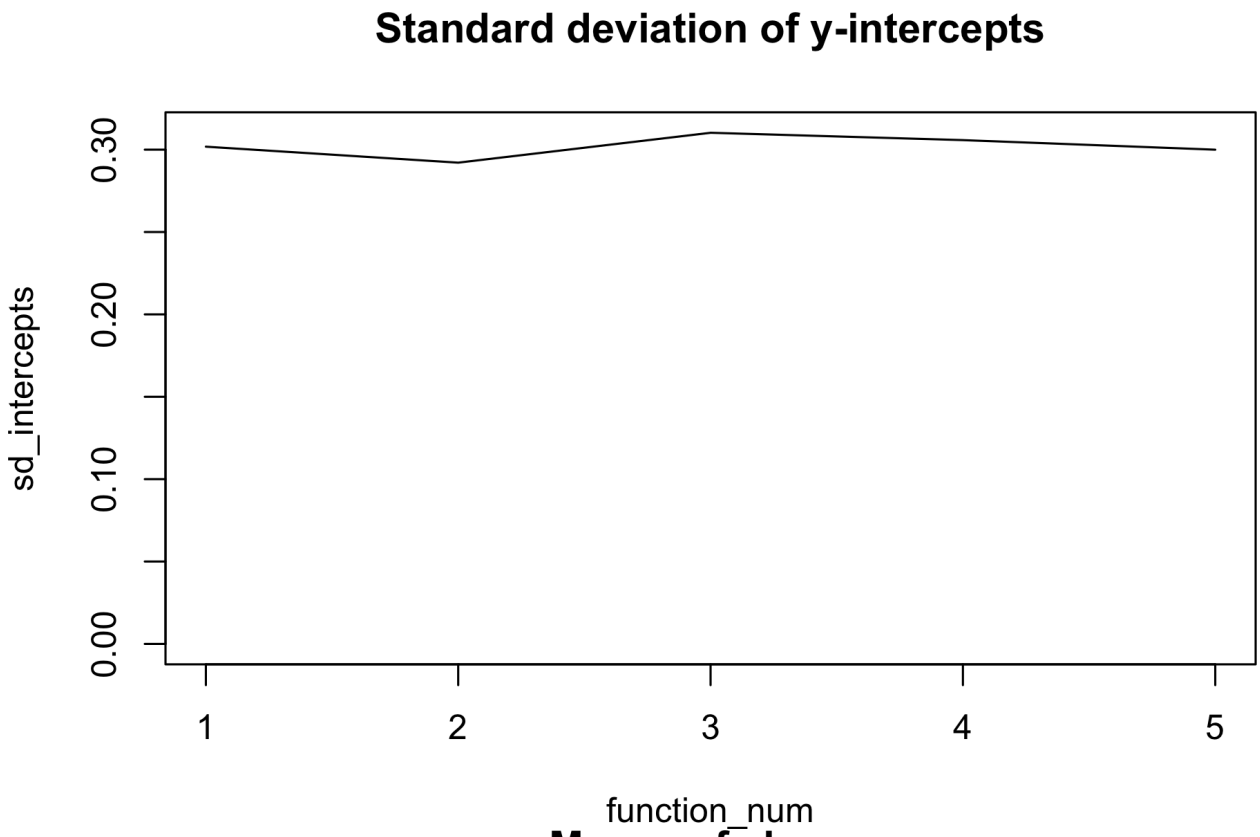
Conclusion:

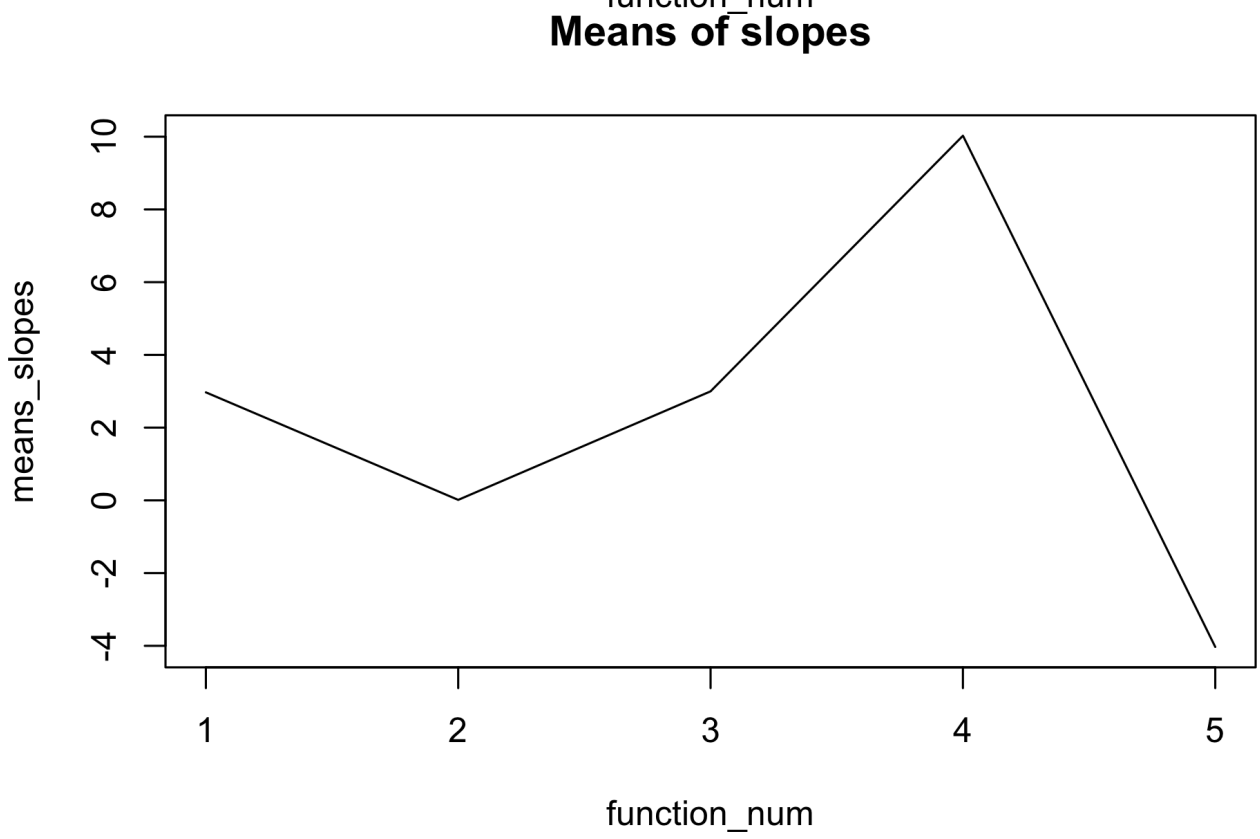
The bell shape histogram indicated that the values of c0 and c1 are normally distributed.

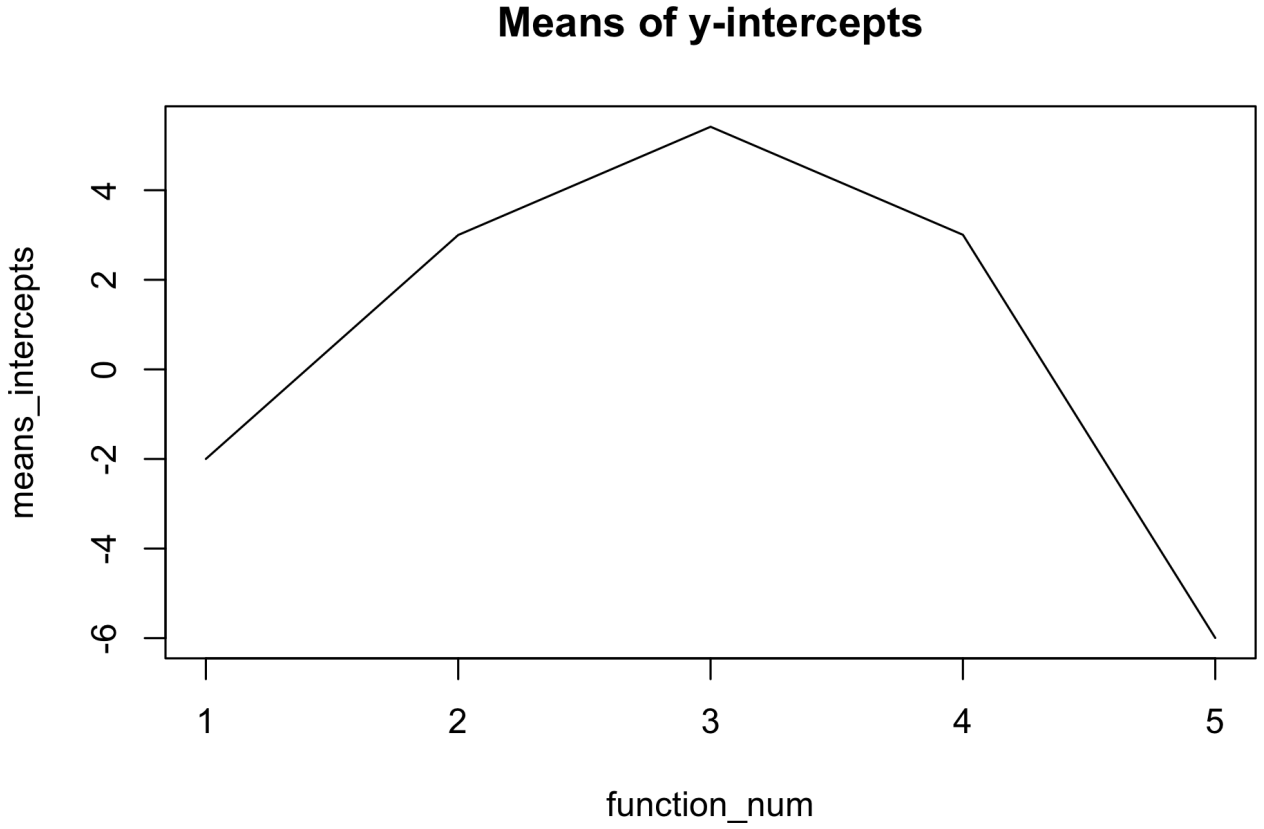
Calculation of the standard deviation and mean value of c0 and c1 for every function.

We plotted the values found for analyzing the influence of f(x) on mean and variance.




Standard deviation of y-intercepts
sd_intercepts
0.00
0.10
0.20
0.30
1
2
3
4
5
function_num


Means of slopes
means_slopes
-4
-2
0
2
4
6
8
10
1
2
3
4
5
function_num



Conclusion:

Mean depends on f(x) Variance does not.

We now calculated the covarience of c0 and c1. Since this value is related to the variances, we know that the choice of f(x) will not influence the result.

Covariance between slope and intercept 0.00727576959054957

Conclusion:

The value found for the convariance is negligible, and so the values of c0 and c1 are independent.

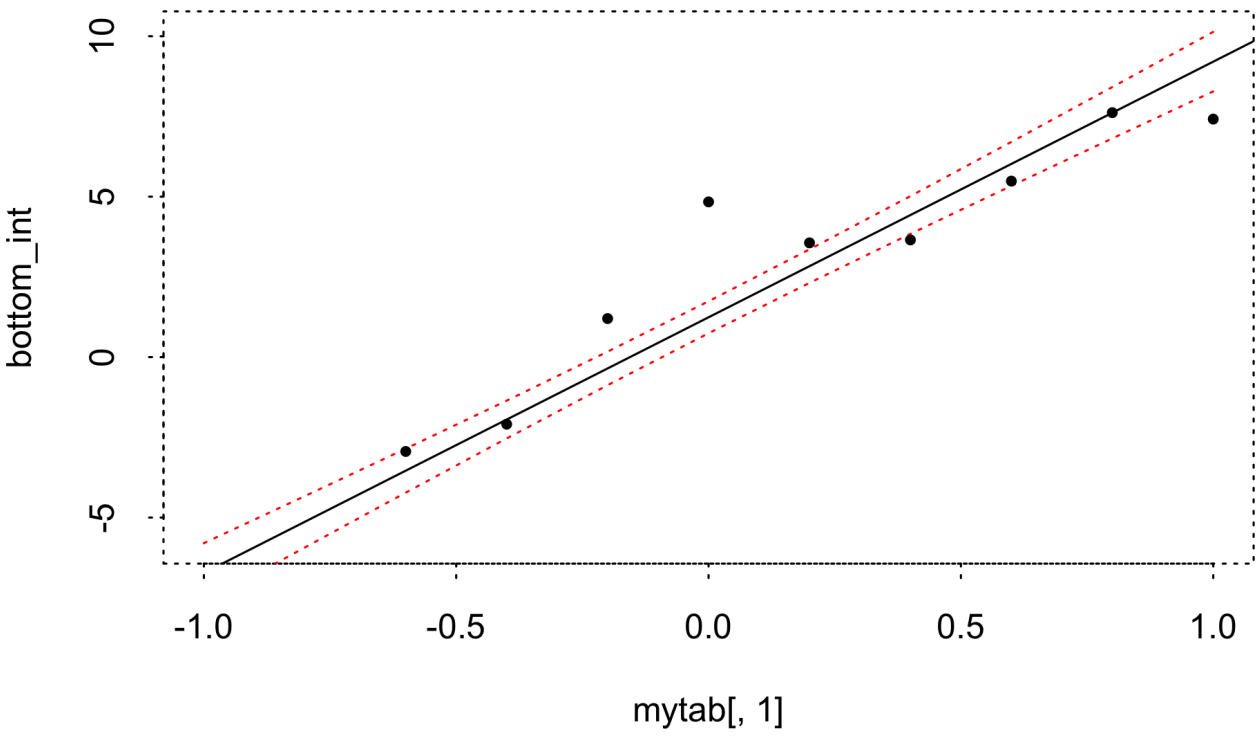
From the covarience and varience values found we found the formula for the varience of the linear model, depending on the choice of x.

V(f(x)) = 0.091193 + 0.225024x^2 + 0

From the previous variance formula, we calculated the 90% confidence interval for the linear model. We plotted the interval together with the best fit linear model and the original data.

```
## Warning in plot.window(...): "lt" is not a graphical parameter
```

```
## Warning in title(...): "lt" is not a graphical parameter
```



Conclusion