Propagating Monte Carlo Error

Team A7

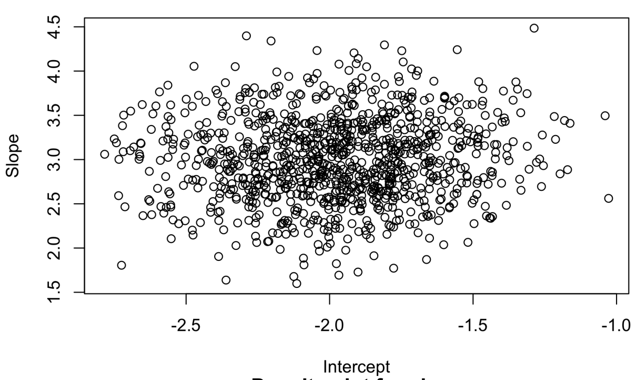
11/29/2018

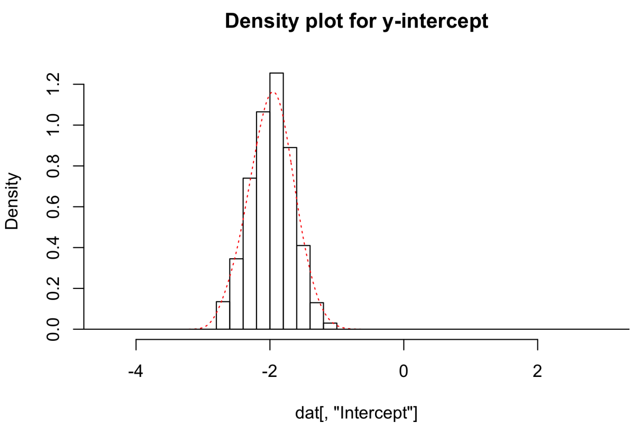
The functions we are using to generate the fake data are:

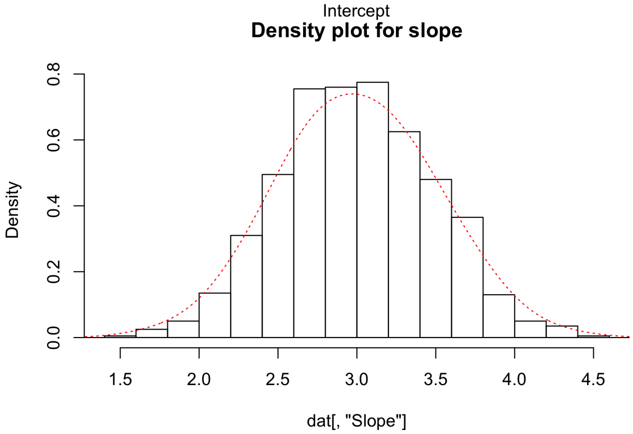
1. $f_1(x) = -2 + 3x$
2. $f_2(x) = 3$
3. $f_3(x) = 6x^2 + 3x + 3$
4. $f_4(x) = 10x + 3$
5. $f_5(x) = -4x - 6$

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

Function number 1







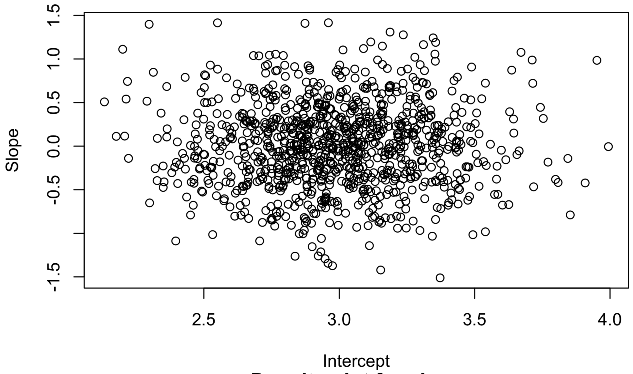
Mean of the intercept: -1.97885474413555

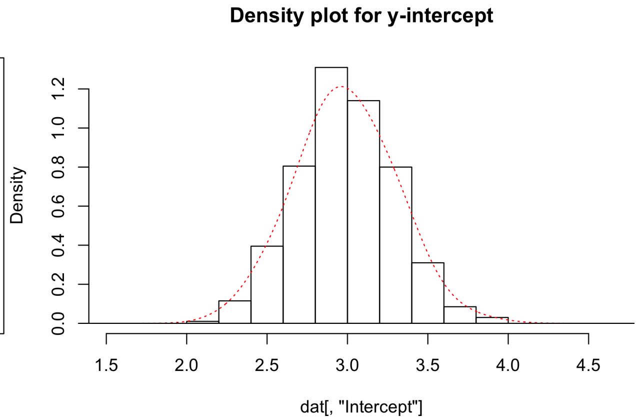
Variance of the intercept: 0.0994329885768288

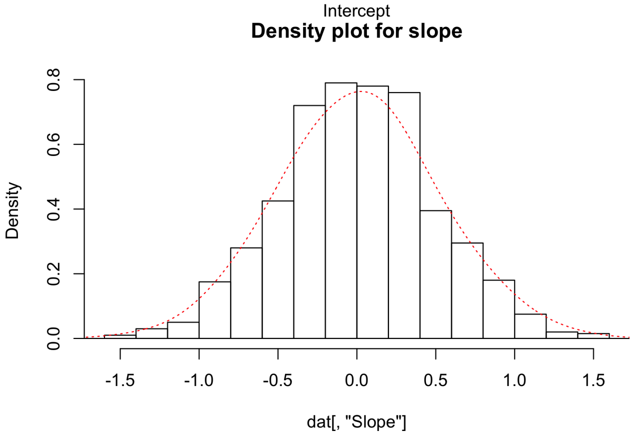
Mean of the slope: 2.999718650097

Variance of the slope: 0.228847513036646

Function number 2







Mean of the intercept: 2.98644236392284

Variance of the intercept: 0.0913059859217812

Mean of the slope: 0.00887464038583387

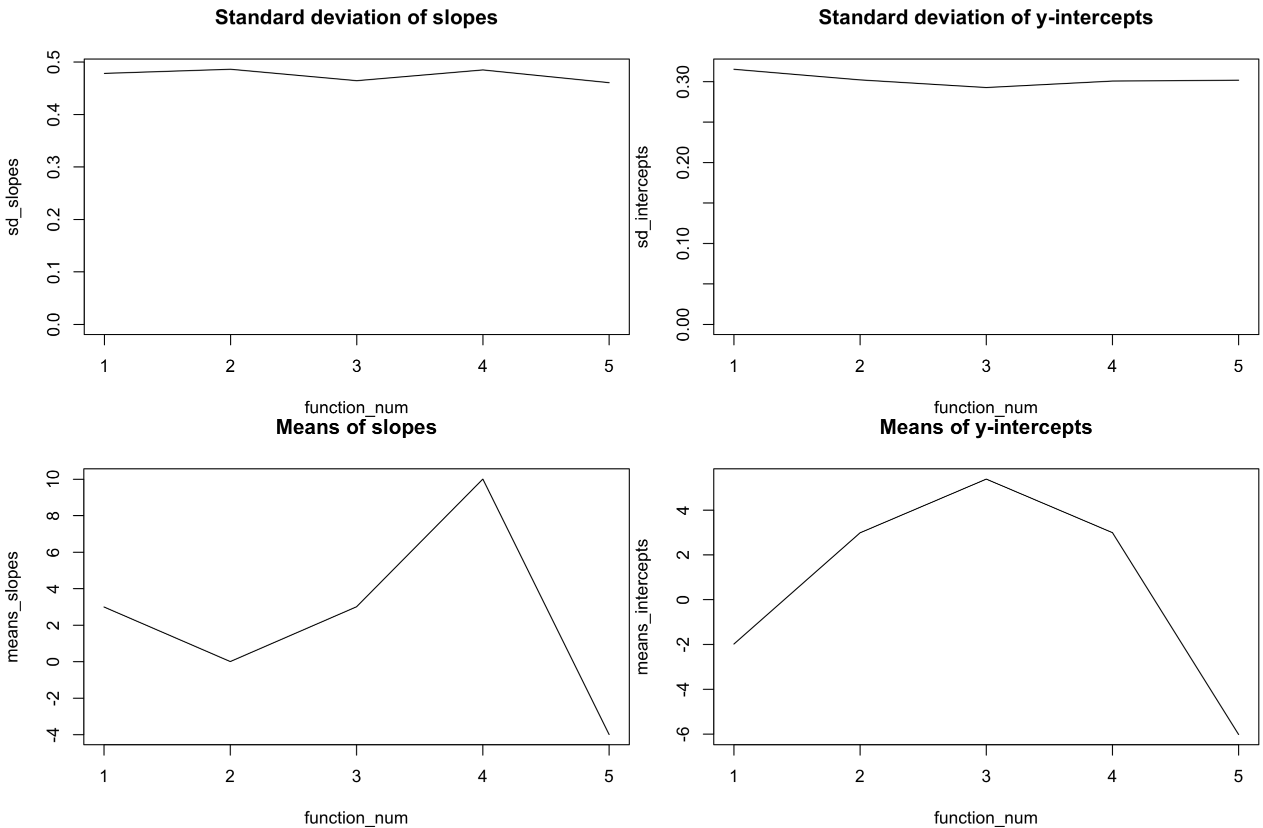
Variance of the slope: 0.236450863691525

Conclusion:

The bell shape histogram indicated that the values of $\hat{c_0}$ and $\hat{c_1}$ 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.



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 0.00144707392025031

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)) = 0.091537 + 0.225582x^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.

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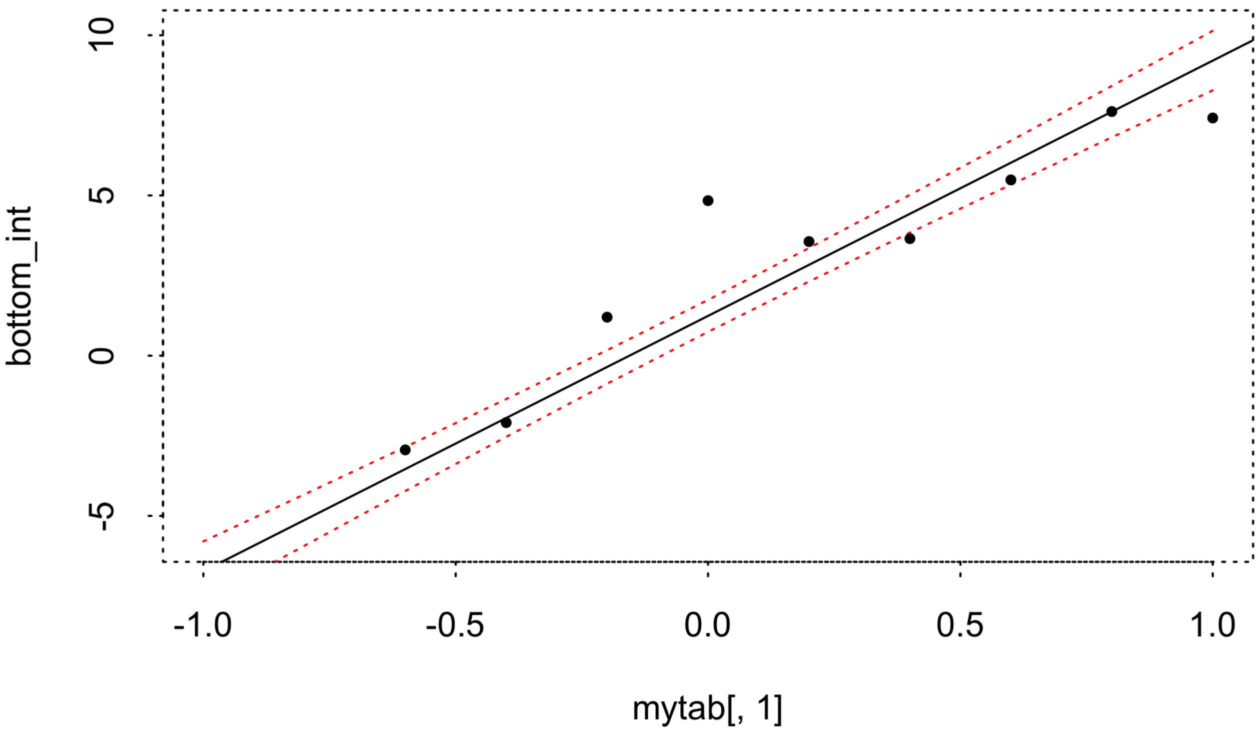

Solving the integral $\hat{I} = \int(\hat{C}_0 + \hat{C}_1 x)dx$ for $\hat{I}$, we found that $\hat{I} = 2\hat{C}_0$ Therefore $V(I) = 4V(c0)$ CI = $\hat{I} \pm z_{0.05}\hat{I}$

CI[1.88308724571407 , 3.08405268571407]

Conclusion