

# ASTP720: Homework 5

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My fit of the data with no weights is shown in Figure 1. The numbers for  $\alpha$ ,  $\beta$ , and  $\gamma$  seem to be in the same ballpark as those presented in by Groenewegen's study of Cepheid variable stars. Groenewegen quotes  $\alpha = 1.840 \pm 0.118$  and  $\beta = 2.243 \pm 0.137$  as the best estimates for the period-luminosity relationship. So, the fit for  $\beta$  from the method of linear least-squares is at least within the uncertainty for Groenewegen's estimate, which is decent given he used MCMC. My fit for  $\gamma$  seems to be pretty far off of most of Groenewegen's estimates.

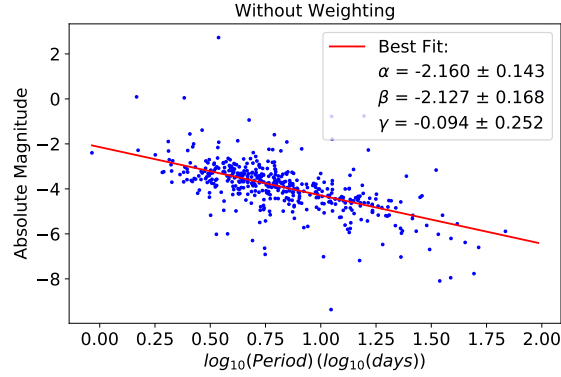


Figure 1: The red line represents the linear fit to the data with the model  $M = \alpha + \beta x + \gamma[Fe/H]$

For the fit in Figure 2, I included a weight in the parameter estimation that was matrix with  $1/\sigma^2$  along the diagonal, where  $\sigma$  is the uncertainty in the measured absolute magnitude. This weighting only seemed to affect the error in the fit parameters and didn't change the values of the parameters themselves.

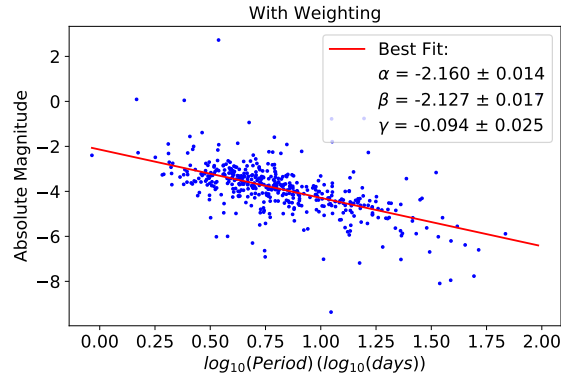


Figure 2: Same as previous figure, but it was fit with a weight based on the uncertainty in the absolute magnitude.