Ph20.7: Linear and Non-linear Regression: The Hubble plot using Type-1a Supernovae

Sophie Li

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1 Initial Plots

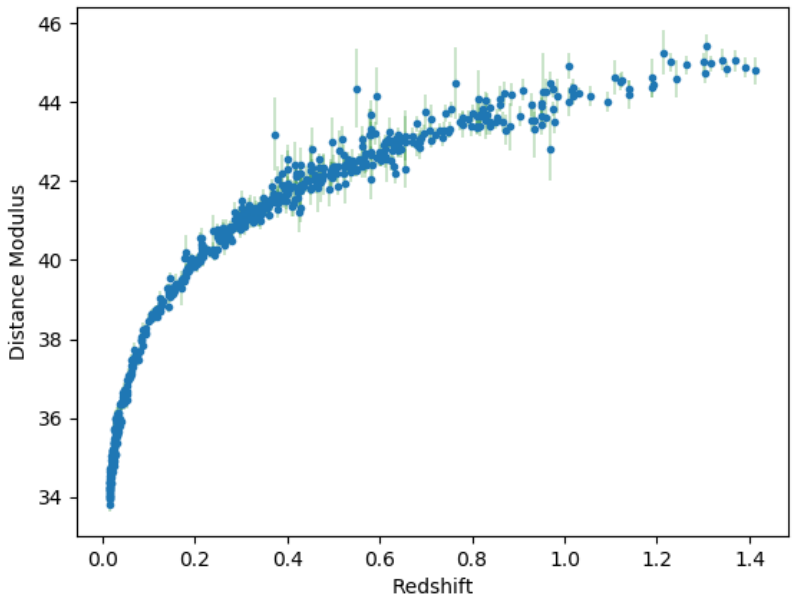

Figure 1: Red shift vs. Distance Modulus

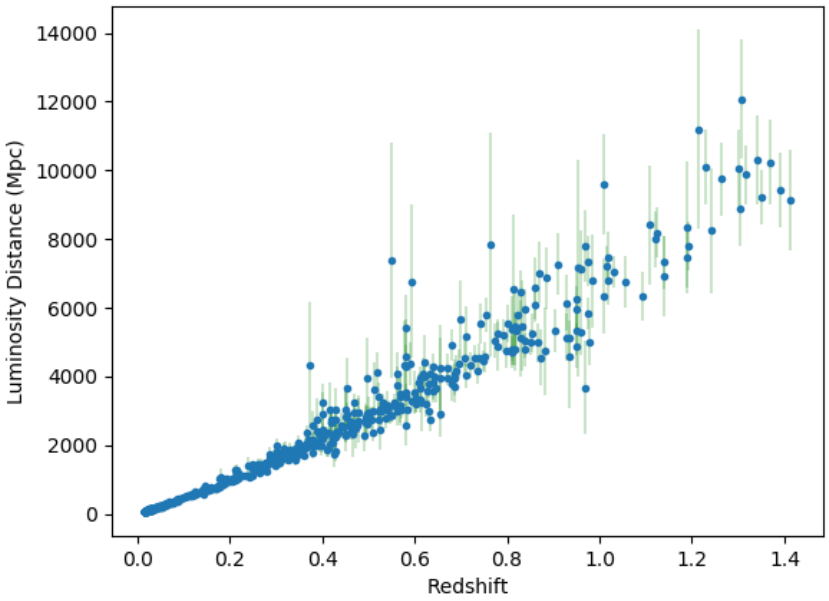

Figure 2: Red shift vs. Luminosity Distance

2 Linear Hubble's Law

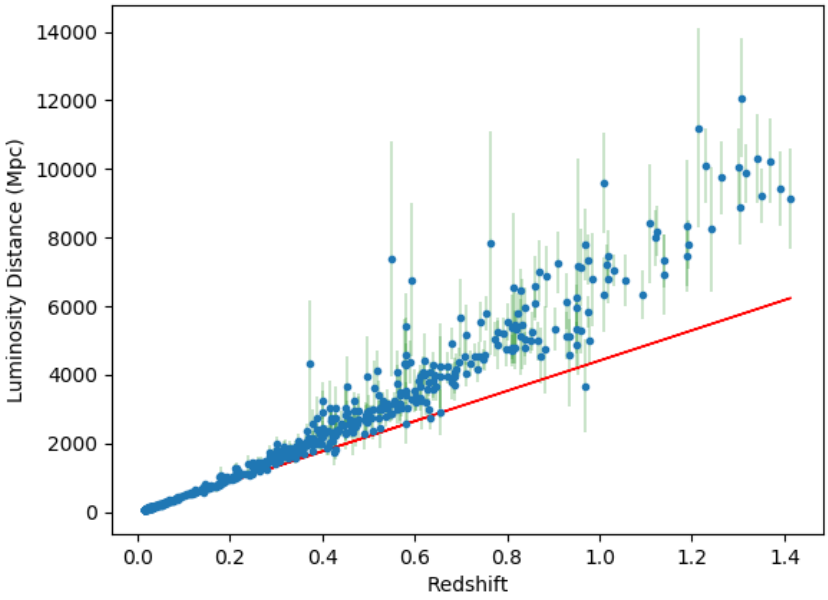

Figure 3: Linear Hubble's Law to Red shift vs. Luminosity Distance

For the linear Hubble's Law we got a $H_0 = 67.19$.

3 Non-linear Hubble's Law

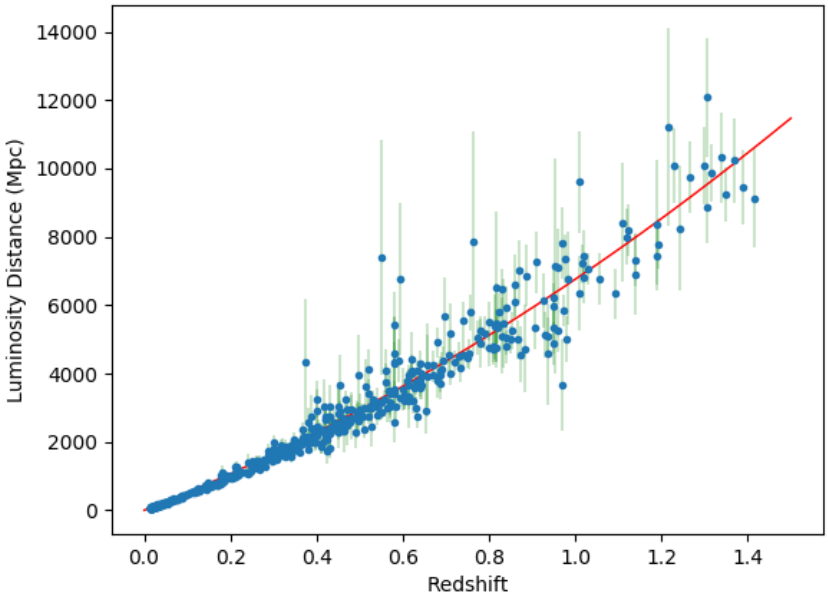

Figure 4: Non-linear Hubble's Law to Red shift vs. Luminosity Distance

For the non-linear Hubble's law we got $H_0 = 60.19$ and $q = 0.2861$

4 FLRW Metric Expression

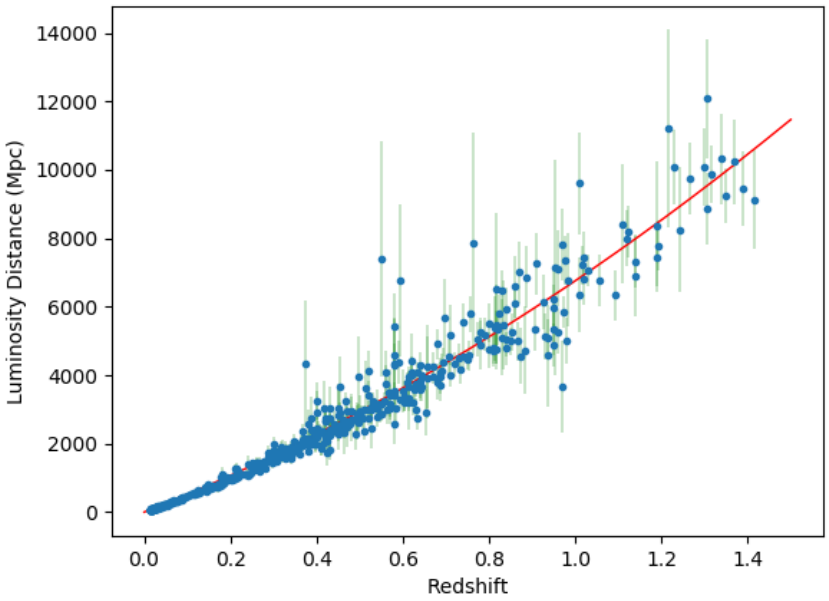

Figure 5: Non-linear Hubble's Law to Red shift vs. Luminosity Distance

For the FLRW metric experession for luminosity distance we got $H_0 = 62.12$ and $\Omega_M = 0.3679$. From the fit we have that the value of Ω_M has $\sigma^2 = 0.0021706$. This means that for $\Omega_\Lambda = 1 - \Omega_M$, this means that for Ω_Λ there is a statistical significance of 13.57. This is a very high value for statistical significance and thus strongly suggests that $\Omega_\Lambda > 0$ and thus that the universe is expanding.