A Novel Analysis of the Redshift Dependence of the Masses of the Supermassive Black Holes of a Sample of Quasars

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A type of active galactic nucleus is the quasar, or quasi-stellar radio source. Quasars are integral to understanding the formation and evolution of galaxies. This research was conducted by utilizing data from Grier, C. J. et al. 2019 and the Sloan Digital Sky Survey and leveraging a suite of analytical methods. The research focus of this paper was to determine the nature of the quantitative relationship between the redshift of a sample of quasars and the masses of the supermassive black holes of these quasars and thereby determine how a quasar's supermassive black hole mass evolves as the quasar ages over time. The hypothesis of the paper was that there will be an identifiable quantitative relationship between quasar redshift and quasar supermassive black hole mass. With a correlation coefficient of approximately 0.27, the quantitative relationship between the two variables was weak but positive. However, the quantitative relationship between quasar redshift and quasar supermassive black hole mass was statistically significant with a p-value of approximately 0.000008. Because of how there was a roughly linear relationship between these two variables, linear regression as opposed to non-linear regression was run. Only about 7% of the variation in quasar supermassive black hole mass could be explained by quasar redshift.

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