Multivariate count data can be found in many areas such as biology, epidemiology, psychology, actuarial science, economy, etc. In this paper, we propose a novel copula-based model for analyzing the dependencies in count time series data. Discrete marginal copulas are used to estimate and obtain the volatility dependencies among the count correlated data. Particularly, our proposed copula-based volatility model is very effective and efficient for modeling high-dimensional discrete asset returns data. Moreover, the proposed copula-based volatility model can capture both the linear and nonlinear dependencies between asset returns variables efficiently. Parameters of the proposed model are estimated by the method of inference function for margins. Simulation study is applied to highlight the validity of our theoretical results. (Received September 17, 2019)