In this paper, we propose a method to price Collateralized debt obligations (CDO) within Merton’s structural model on underlyings with a stochastic mean-reverting covariance dependence. There are two key elements in our development, first we reduce dimensionality and complexity using principal component analysis on the assets’ covariance matrix. Second, we approximate this continuous multidimensional structure using a tree method. Trinomial-tree models can be developed for both the principal components and the eigenvalues assuming the eigenvectors constant over time and the eigenvalues stochastic. Our method allows us to compute the joint default probabilities for k defaults of stochastically correlated underlyings and the value of CDOs in a fast manner, without having lost much accuracy. Furthermore we provide a method based on moments to estimate the parameters of the model.