Non-negative matrix factorization (NMF) is an intuitive, non-negative, and interpretable approximation method. Canonical NMF approach could derive some basic components to represent original data, while probabilistic NMF approaches try to introduce some reasonable constraints to optimize the canonical NMF model. However, both of them cannot handle ground-truth bases discovering and model order determination problems. In general, the model order of basis matrix needs to be pre-defined. The model order determines the capability and accuracy of data structure discovering. However, how to accurately infer the model order of basis matrix has not been well investigated. In this paper, we propose a method called non-informative hierarchical Bayesian non-negative matrix factorization (NHBNMF) to automatically determine the model order and discover the data structure. They are achieved through hierarchical Bayesian inference model, maximum a posteriori (MAP) criterion, and non-informative parameters. In NHBNMF method, we first introduce a structure with two-level parameters to enable the entire model to approach the distributions of ground-truth bases. Then we use non-informative parameter scheme to eliminate the hyper-parameter to enable automatic searching. Finally, the model order and ground-truth bases are discovered by using MAP criterion and L_2-norm selection. The experiments are conducted based on both synthetic and real-world datasets to show the effectiveness of our algorithm. The results demonstrate that our algorithm can accurately estimate the model order and discover the ground-truth bases. Even for the complicated FERET facial dataset, our algorithm still obtained interpretable bases and achieved satisfactory accuracy of the model order estimation.