V. CONCLUSIONS AND DISCUSSIONS

In this paper we have investigated the dynamical behavior of the EoS of DE in the region of low redshift in a nearly model-independent way. The redshift in that region is binned and w_{de} in each bin is approximated by a linear expansion of redshift z, and in the large redshift region we set w_{de} to be a constant w_L. While fitting the model with some observational data which include SnIa, BAO, CMB and Hubble evolution data, we leave the divided points of bins as free parameters. If the evolution of w_{de} is not monotonous, or is not linear enough in the region under consideration, the best-fitted divided points will represent the turning points, where w_{de} changes its evolving direction significantly. In this way we can explicitly reconstruct w_{de} by using a few bins, and the errors of parameters from observational data will be small due to the small number of bins. First we have tried to find the turning points within the region of redshift $z \in (0, 1.8)$, and set $w_L = -1$ in the region $z \in (1.8, \infty)$ (Model I). Our results show that the data favor two turning points of w_{de} in $z \in (0, 1.8)$, and w_{de} may have an oscillation form [30]. Our results are consistent with those by the UBE method in [27].

Since the main data points are in $z \in (0, 1)$ and our result in Model I shows there may be a turning point around $z \sim 1$, to see clearly the dynamical behavior of EoS in that region, we have focused on the region $z \in (0, 0.9)$ in Model II. We have found one turning point only in $z \in (0, 0.9)$, the reconstructed w_{de} in the best-fitted model is almost the same as that reconstructed in Model I in $z \in (0, 0.9)$. We have also obtained the errors of w_{de} at 1σ and 2σ in $z \in (0, 0.9)$. In both correlated and uncorrelated estimates with a fixed $w_L = -1$ or a floating constant w_L, we found that there is a 2σ deviation of w_{de} from -1 around $z = 0.9$.

It is interesting to see whether the deviation of EoS from -1 around $z = 0.9$ is physical, or is caused by some unknown technical causes in fitting. If it is physical, it then clearly shows that DE is dynamical. But in UBE of w_{de} there seems no such distinct deviation around $z = 0.9$, it may be due to the difference between the discontinuity of w_{de} in the piecewise constant case and the continuity in LS case [31]. In [16], where the cubic-spline method is used, there is also no such an explicit deviation around $z = 0.9$, but it is likely due to its set of EoS in the last bin $w_L = w(1)$: to fit well with the data of $z > 1$, $w(1)$ should be much minus, which would suppress the reconstructed w_{de} around $z = 1$. Of course, it is also possible that such a big deviation around $z = 0.9$ is due to the non-smoothness of