no improvement of $\chi^2_{total,min}$ compared to the case of 3 bins, which indicates there is no more turning points of w_{de} in this region.

TABLE II: The best-fitted parameters for Model I.

parameters	h	$\Omega_b^{(0)}$	$\Omega_m^{(0)}$	z_1	z_2	$w(0)$	$w(z_1)$	$w(z_2)$	$w(1.8)$	w_L
best-fitted values	0.688	0.049	0.279	0.44	1.07	-0.63	-1.57	2.28	-16.84	{-1}

B. Model II

As data points with $z > 1$ are rather less than those with $z < 1$, to see clearly the evolution behavior of EoS in the region of low redshift, we now focus on the region with $z \in (0, 0.9)$, avoiding the possible turning point around $z = 1$, and set the divided points as: $(0, z_1, 0.9, \infty)$, i.e.,

$$w_{de}(z) = \begin{cases} w(0) + \frac{w(z_1)-w(0)}{z_1} z \ , & 0 < z \leq z_1 \\ w(z_1) + \frac{w(0.9)-w(z_1)}{0.9-z_1}(z - z_1) \ , & z_1 < z \leq 0.9 \\ -1 \ , & 0.9 < z < \infty \end{cases} \tag{27}$$

In this case, we obtain the best-fitted tuning point $z_1 = 0.45$, and the best-fitted $w_{de}(z)$ is shown in Fig. 1 (the red, dashed line) which almost coincides with the best-fitted $w_{de}(z)$ of Model I in $z \in (0, 0.9)$. This indicates that the data favor $w_{de}(z)$ to turn its evolution direction around $z = 0.45$, and favor an EoS with crossing the cosmological constant ($w = -1$) [29]. Then we obtain 1σ and 2σ errors of parameters by using the MCMC method. Here we have fixed $z_1 = 0.45$ in the process to obtain the errors of the parameters. Note that the errors of the parameters $w_{de}(z_i)$ also represent errors of whole $w_{de}(z)$ in each bin, the 1σ and 2σ errors of $w_{de}(z)$ shown in Fig. 2 are obtained by connecting the corresponding error ranges of $w_{de}(z_i)$. If another parameter set of $w_{de}(z)$ (as introduced in section II) was used, one will get the same result as that of Fig. 2.

We see from the top left panel of Fig. 2 that there are deviations of w_{de} from -1 around $z = 0$ and $z = 0.45$ beyond 1σ, and around $z = 0.9$ the deviation is beyond 2σ. We decorrelate the parameters in $w_{de}(z)$ by using the technique introduced in section II. The uncorrelated errors are shown in the bottom left panel of Fig. 2. In that case, there are no