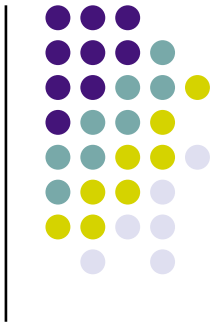
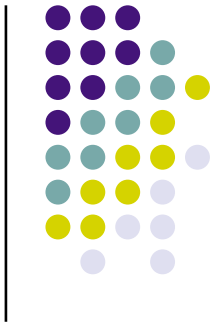
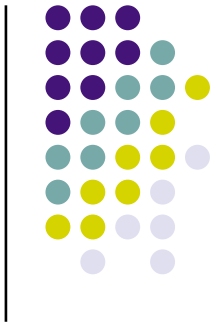


Oscillating Quintom and the Recurrent Universe



- The equation of state is less than -1/3 today.

- Cosmological constant
  Quintessence w>= -1
  Phantom w<= -1
  k-essence can have both w>=-1 and w<-1



- An evolving dark energy is indeed more favored than that with a constant equation of state.
- The phenomenological Quintom model takes the following equation of state:

$$w(\ln a) = w_0 + w_1 \cos[A \ln(a/a_c)]$$

$$X(\ln a) \equiv \rho_X(\ln a)/\rho_X(0)$$

$$= a^{-3(1+w_0)} \exp\{\frac{-3w_1}{A}[\sin(A \ln \frac{a}{a_c}) + \sin(A \ln a_c)]\}$$

$$w(\ln a) = -1 - 1.5\cos(0.032\ln a - \frac{4\pi}{9})$$

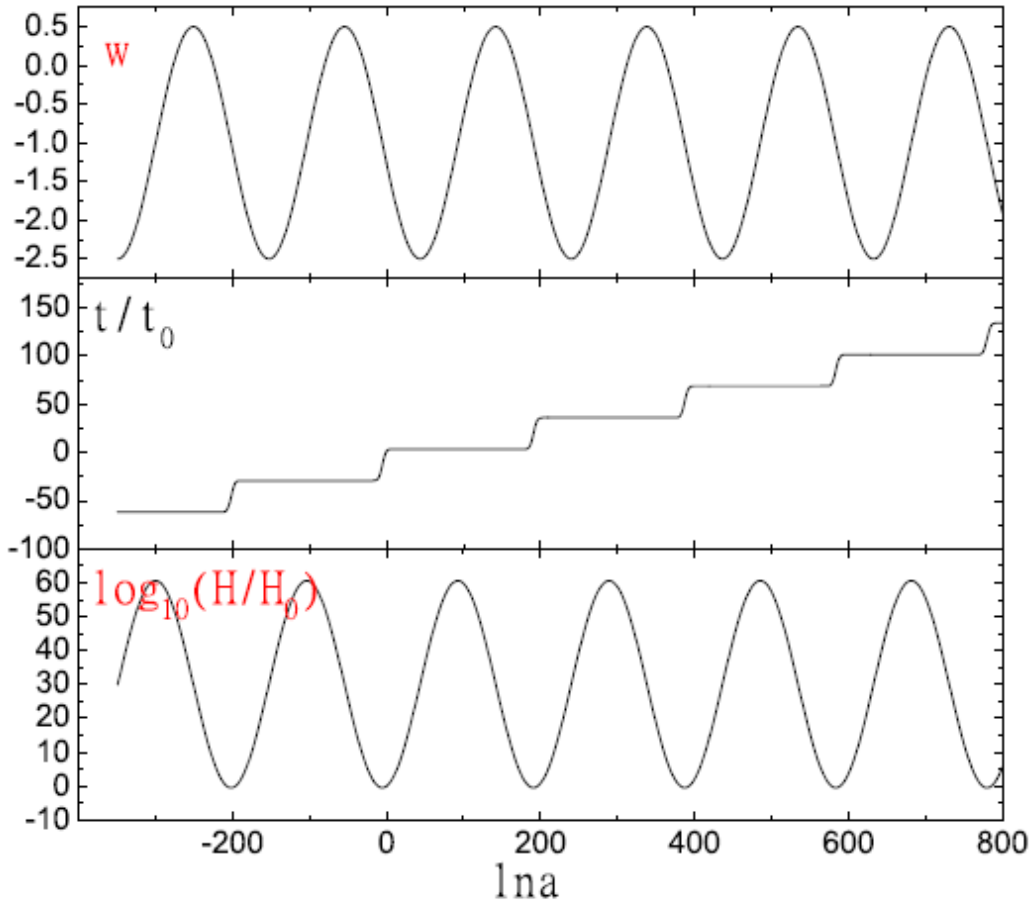


FIG. 1: Cosmological consequences with only an oscillating Quintom $w(\ln a) = -1 - 1.5\cos(0.032\ln a - \frac{4\pi}{9})$.

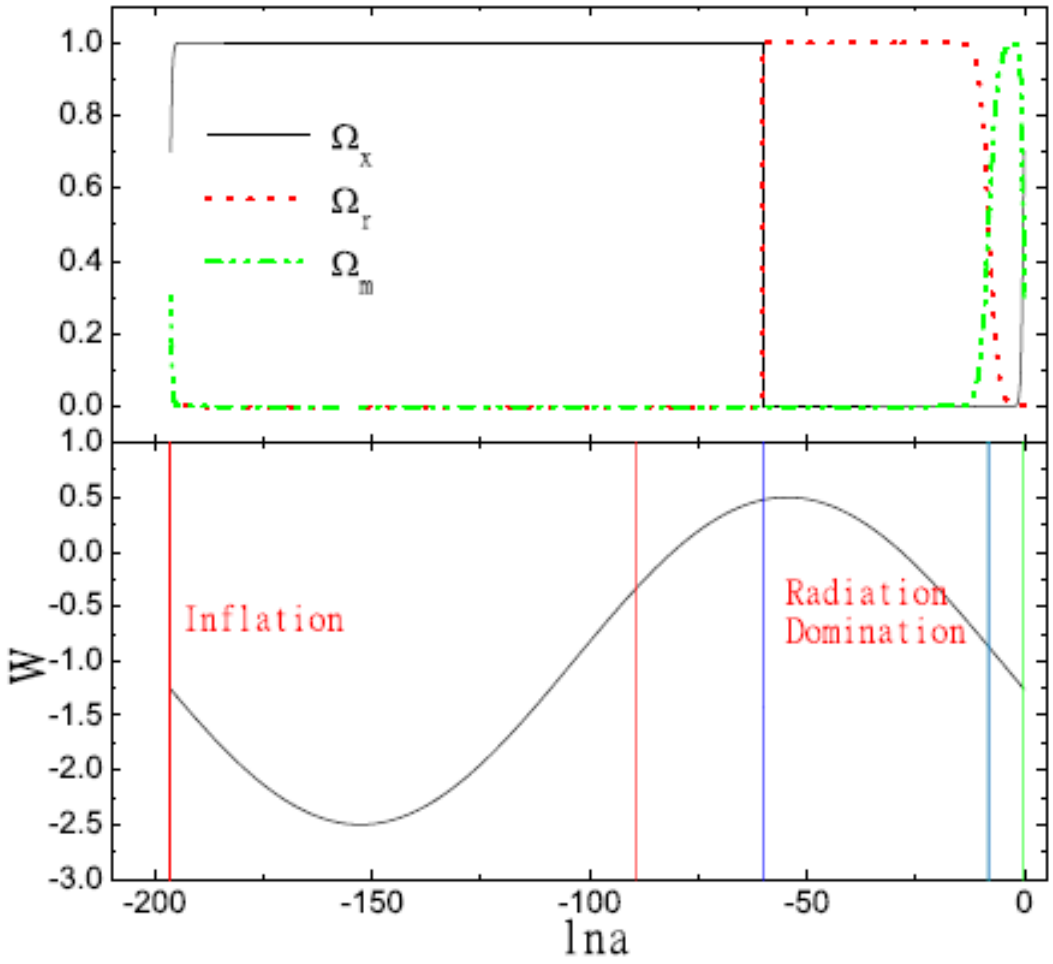


FIG. 2: Cosmological consequences with an oscillating Quintom $w(\ln a) = -1 - 1.5\cos(0.032 \ln a - \frac{4\pi}{9})$ and $\Omega_m = 0.3$, $\Omega_X = 0.7$ and $h = 0.7$ today, within only one period.

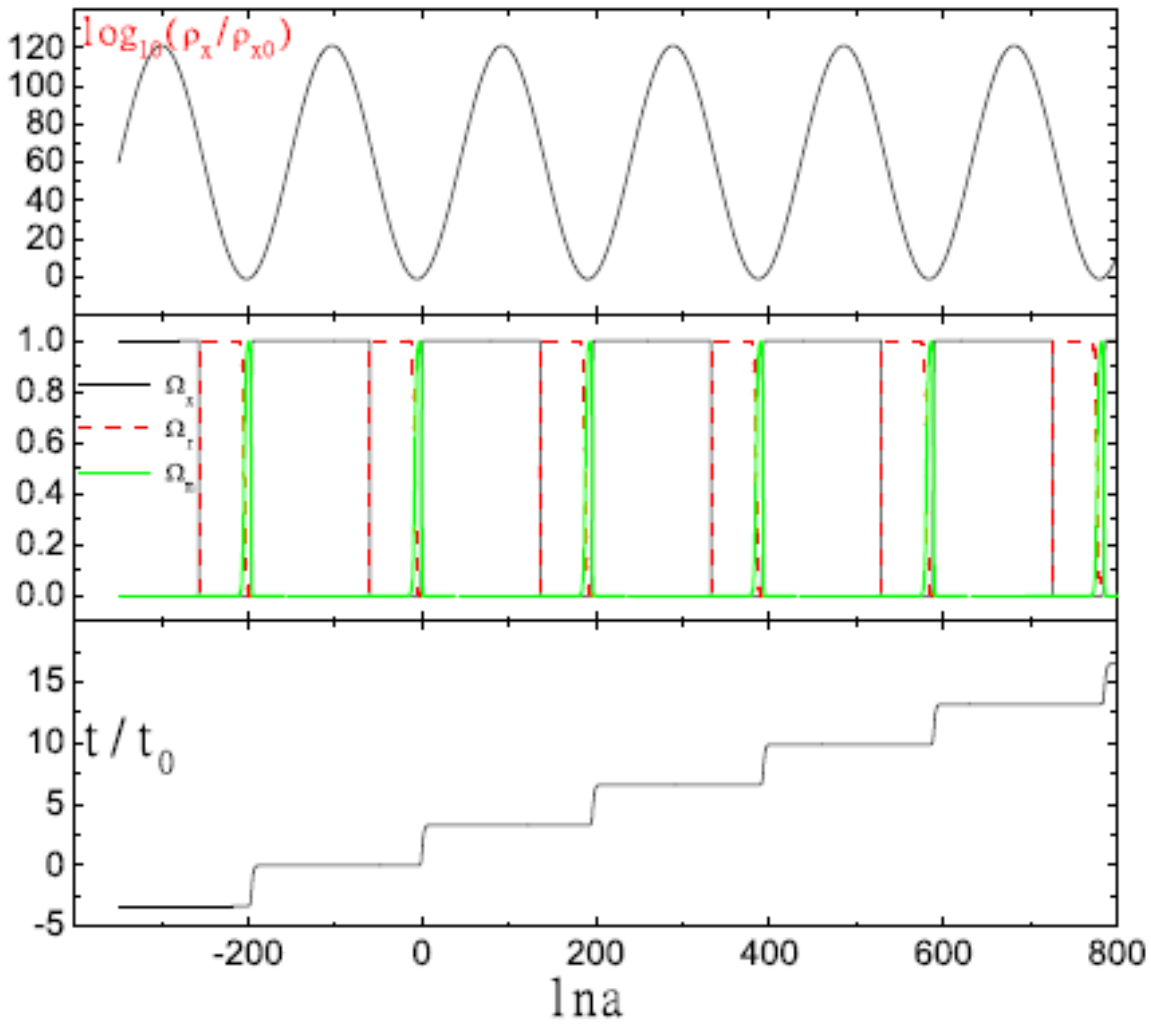
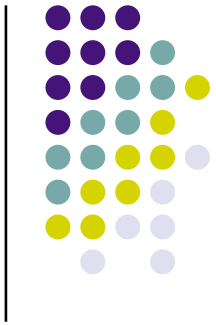


FIG. 3: Cosmological consequences with an oscillating Quintom $w(\ln a) = -1 - 1.5\cos(0.032 \ln a - \frac{4\pi}{9})$ and $\Omega_m = 0.3$, $\Omega_X = 0.7$ and $h = 0.7$ today, within several periods.

Summary



We have proposed in this paper a phenomenological model of Quintom with an oscillating equation of state. Such a model naturally unifies the early inflation and the current acceleration of the universe, leading to oscillations of the Hubble constant and a recurring universe. The model of oscillating Quintom does not lead to a big crunch nor big rip. The universe just recurs itself with the scale factor increasing always and we are only staying among one of the epochs