Quintessential Inflation in Palatini $f(R)$ Gravity

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[arXiv:**2012.06831**]

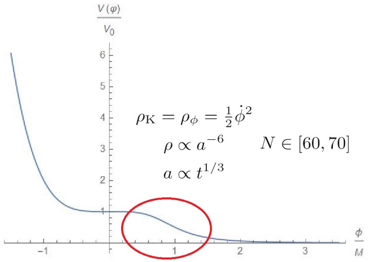


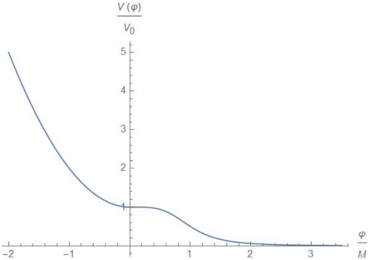
Figure: The potential of the original Peebles-Vilenkin quintessential inflation model [astro-ph/**9810509**].

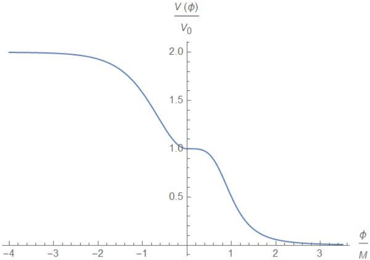
Quintessential inflation identifies the inflaton and quintessence fields.

Advantages:

1. Economical approach (one single scalar field explains both the inflationary and dark energy epochs!).
2. Heavily constrained (easily falsifiable).
3. The initial conditions of quintessence are fixed by the inflationary attractor.

The Change in the Potential





$$S_{\mathrm{J}} = \int \mathrm{d}^4x\sqrt{-g}\left[\frac{M_{\mathrm{P}}^2}{2}R + \frac{1}{4}\alpha R^2 - \frac{1}{2}g^{\mu\nu}\nabla_\mu\varphi\nabla_\nu\varphi - V(\varphi)\right] + S_m[g_{\mu\nu},\psi],$$

The Model Put to Test

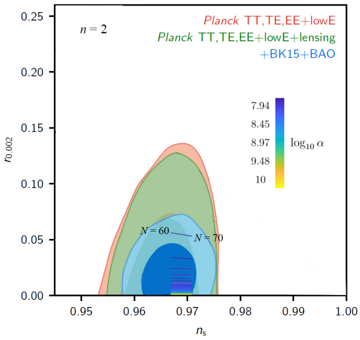


Figure: The predictions of our model superimposed on the Plank data [arXiv:**2012.06831**].

Plank data at 1σ:

1. $A_s = (2.096 \pm 0.101) \times 10^{-9}$
2. $n_s = (0.9661 \pm 0.0040)$
3. $r < 0.056$

Our data
for $N = 68$ and $\alpha = 8.7 \times 10^7$:

1. $m \sim 10^{13}\,\text{GeV}\,(\frac{1}{2}m^2 = \lambda^2 m_{\text{P}}^2)$
2. $n_s = 0.9708$
3. $r = 0.05$
4. Coincidence fixes $M \sim 10\,\text{GeV}$

$$\begin{aligned} V(\varphi) &= \frac{1}{2}m^2(\varphi^2 + M^2) \quad \varphi < 0, \\ &= \frac{\frac{1}{2}m^2 M^6}{\varphi^4 + M^4}, \quad \varphi \geq 0. \end{aligned}$$