Exploratory Plots

Alejandro C. Frery

2023-10-16

Gamma-SAR entropy

We will see how the Shannon entropy of the Gamma-SAR model varies. It is given by

$$
\begin{aligned}
H_{\Gamma_{\text{SAR}}}(L_0,\mu) &= L_0 - \ln(L_0/\mu) + \ln\Gamma(L_0) + (1-L_0)\psi^{(0)}(L_0) && (1)\\
&= \left[L_0 - \ln L_0 + \ln\Gamma(L_0) + (1-L_0)\psi^{(0)}(L_0)\right] + \ln\mu. && (2)
\end{aligned}
$$

where $L_0 \geq 1$ is known, and $\mu > 0$ is the mean. We see that, given L_0, the entropy of a random variable following the Gamma-SAR model depends on the logarithm of the mean μ.

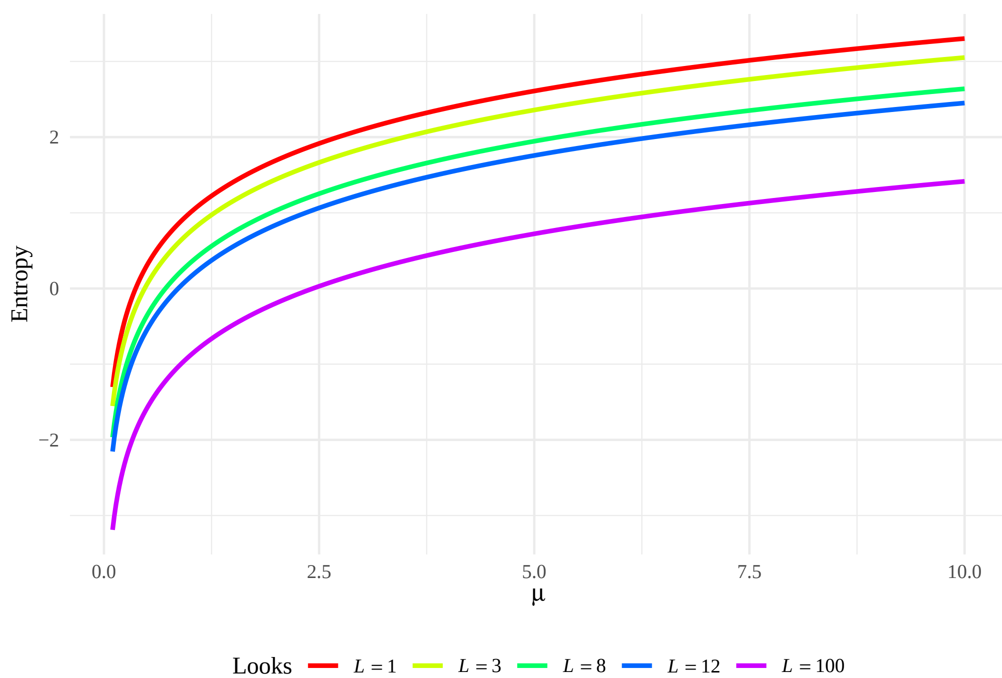

Figure 1: Simulation of entropy for Gamma SAR

GI0-SAR Entropy

The Shannon entropy of the GI0-SAR model is given by

$$H_{G_I^0}(\mu,\alpha,L_0) = \underbrace{L_0 - \ln L_0 + \ln\Gamma(L_0) + (1-L_0)\psi^{(0)}(L_0) + \ln\mu}_{H_{\Gamma_{\text{SAR}}}} - \ln\Gamma(L_0-\alpha) + (L_0-\alpha)\psi^{(0)}(L_0-\alpha) - (1-\alpha)\psi^{(0)}(-\alpha) + \ln(-1-\alpha) + \ln\Gamma(-\alpha) - L_0 \quad (3)$$

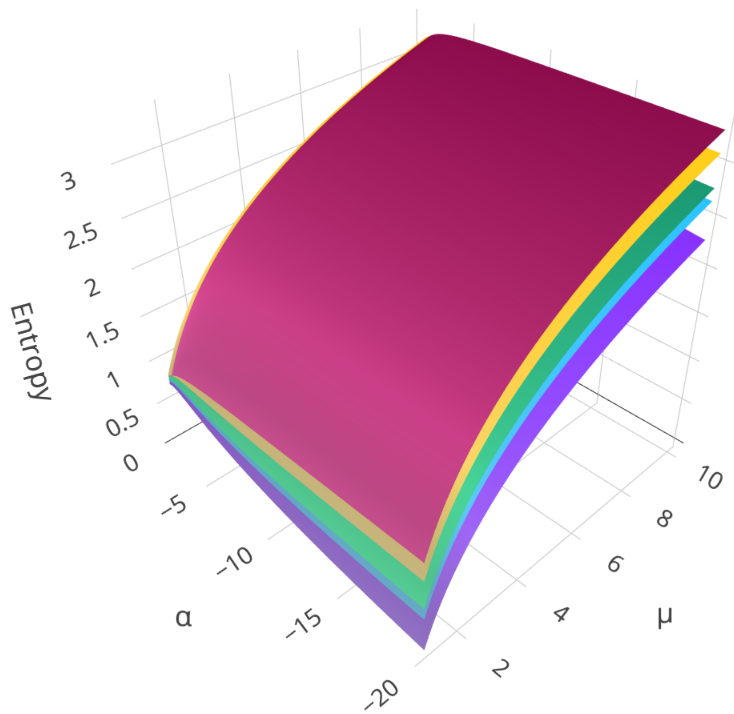

Figure 2: Simulation of entropy for G_I^0.

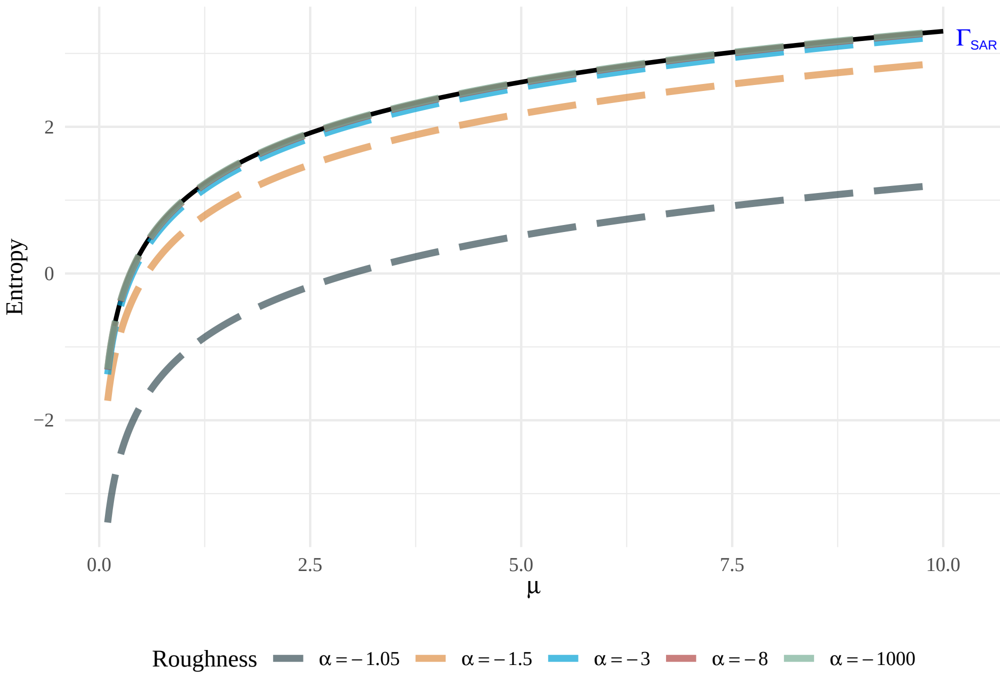

Figure 3: $H_{G_I^0}$ converges to the $H_{\Gamma_{\text{SAR}}}$ as α takes large negative values and $L = 1$.

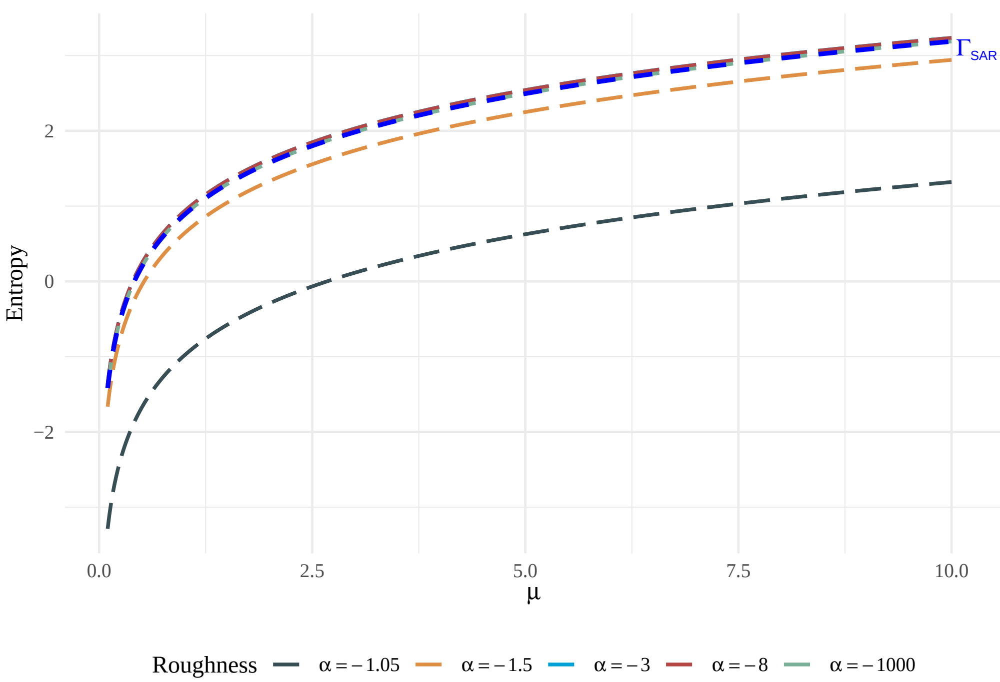

Figure 4: $H_{G_I^0}$ converges to the $H_{\Gamma_{\text{SAR}}}$ as α takes large negative values and $L = 2$.

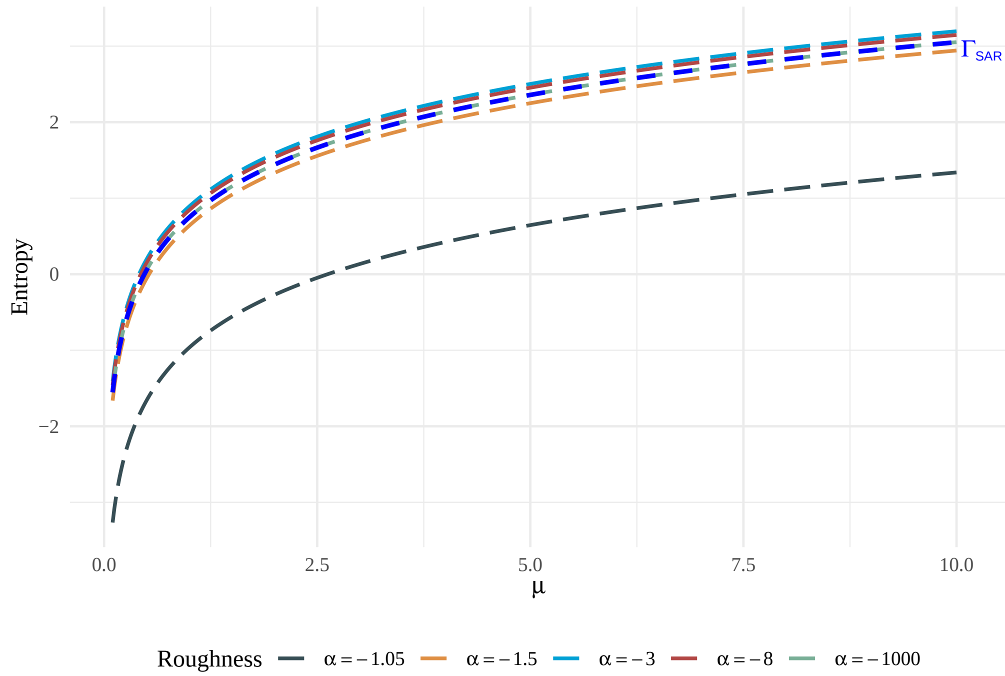

Figure 5: $H_{G_I^0}$ converges to the $H_{\Gamma_{\mathrm{SAR}}}$ as α takes large negative values and $L = 3$.

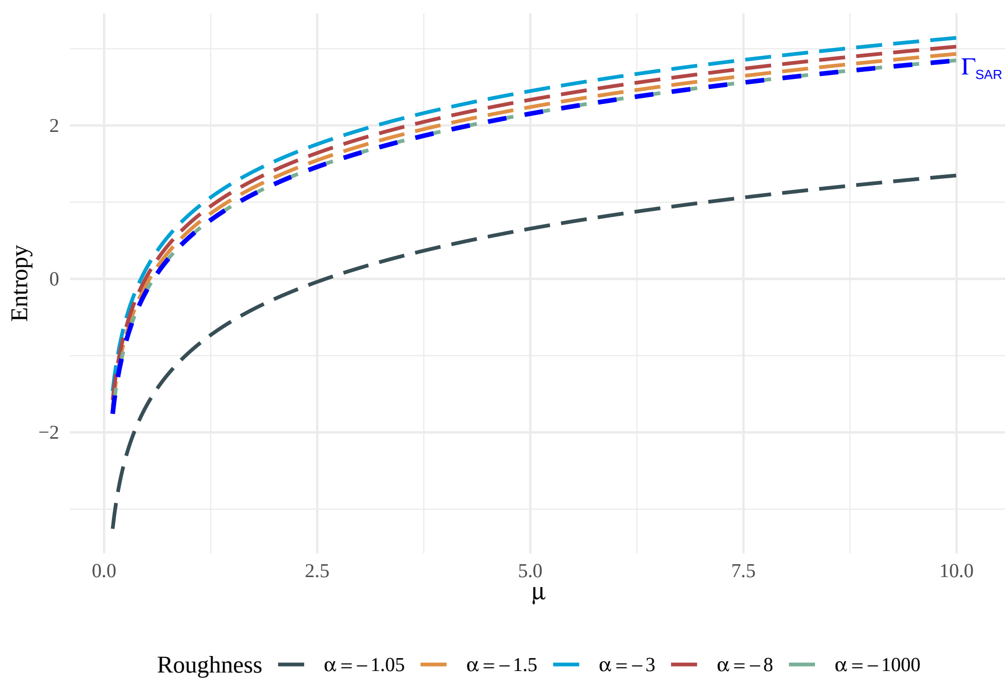

Figure 6: $H_{G_I^0}$ converges to the $H_{\Gamma_{\mathrm{SAR}}}$ as α takes large negative values and $L = 5$.

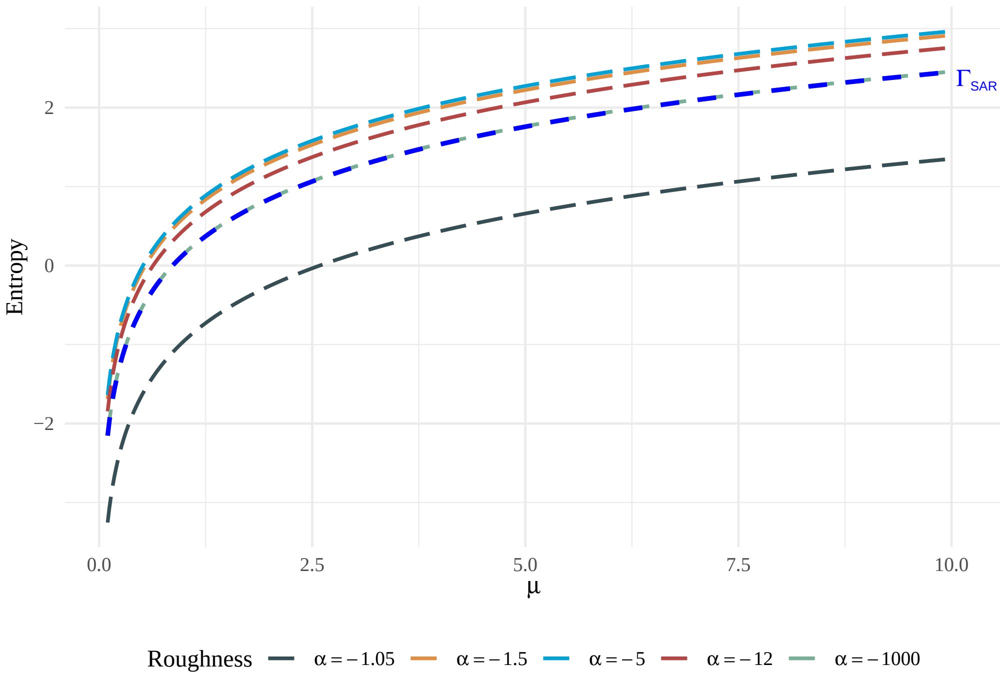

Figure 7: $H_{G_I^0}$ converges to the $H_{\Gamma_{\text{SAR}}}$ as α takes large negative values and $L = 12$.

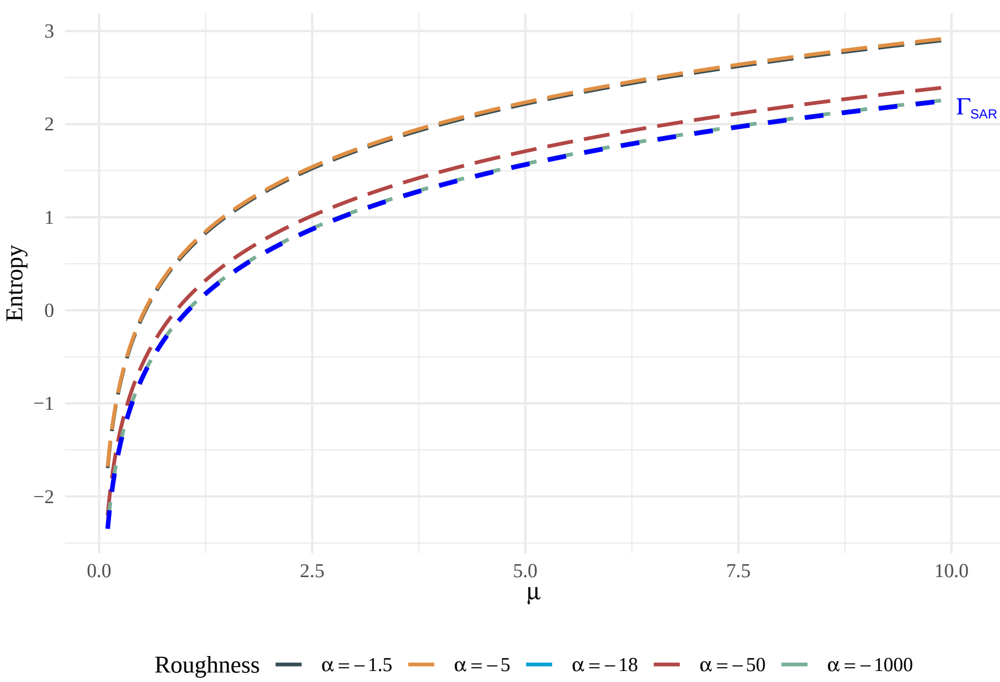

Figure 8: $H_{G_I^0}$ converges to the $H_{\Gamma_{\text{SAR}}}$ as α takes large negative values and $L = 18$.

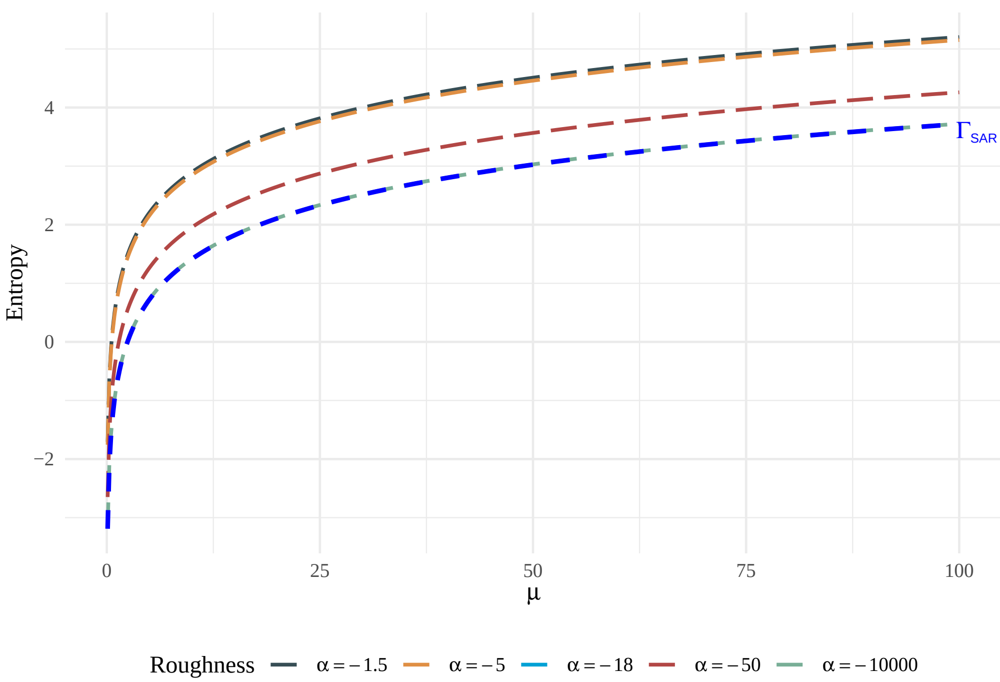

Figure 9: $H_{G_I^0}$ converges to the $H_{\Gamma_{\rm SAR}}$ as α takes large negative values and $L = 100$.