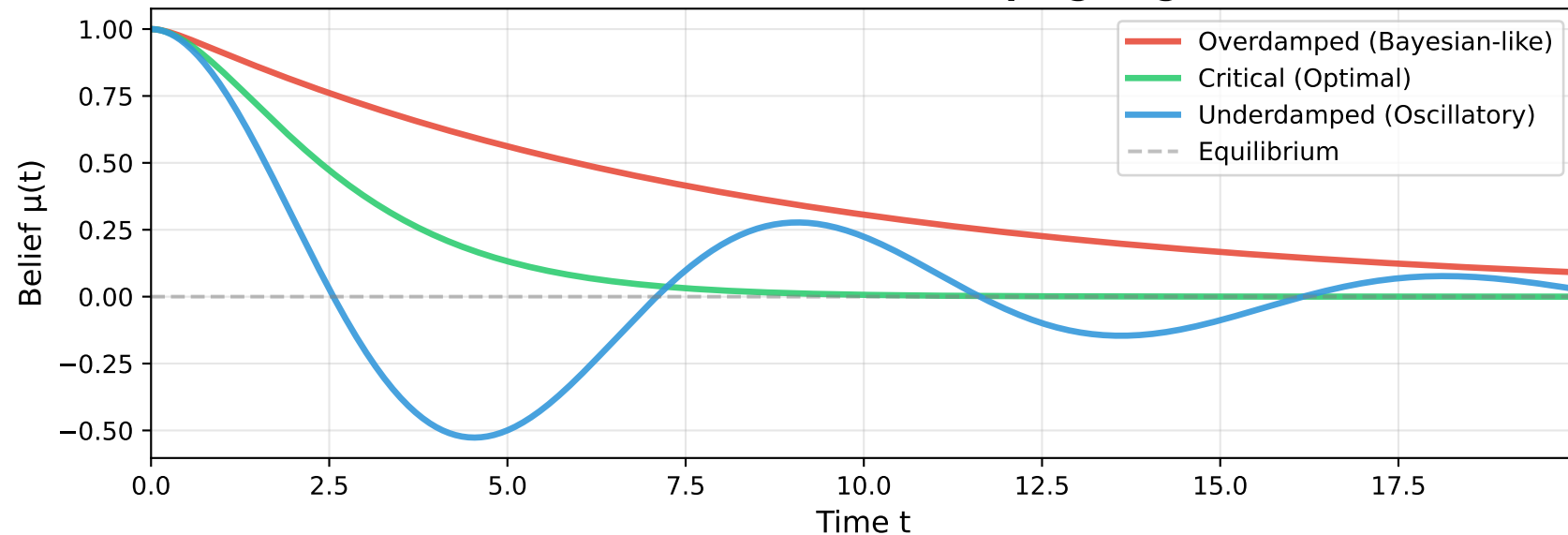
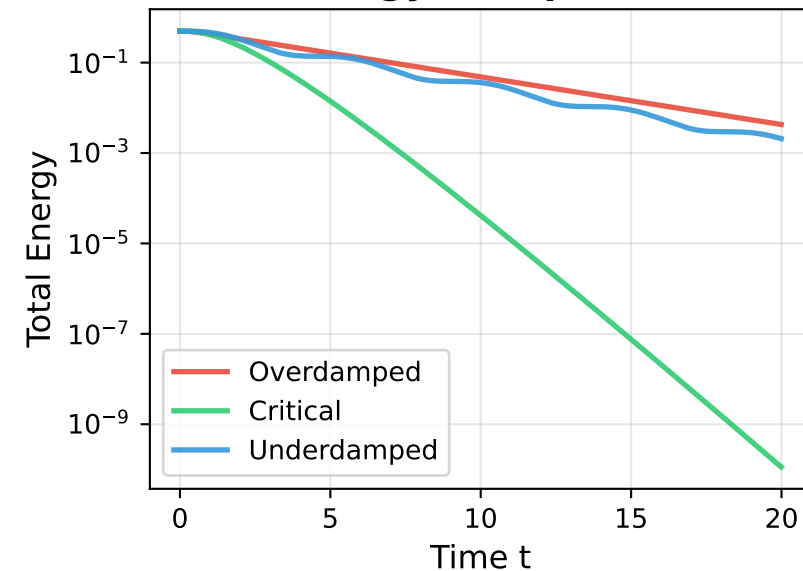


The Inertia of Belief: Damping Regimes in Epistemic Dynamics

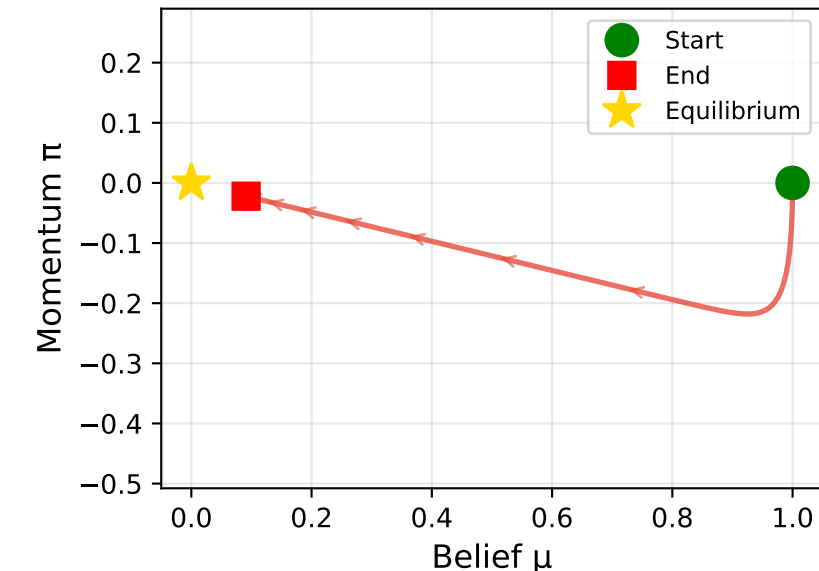
Belief Evolution: Three Damping Regimes



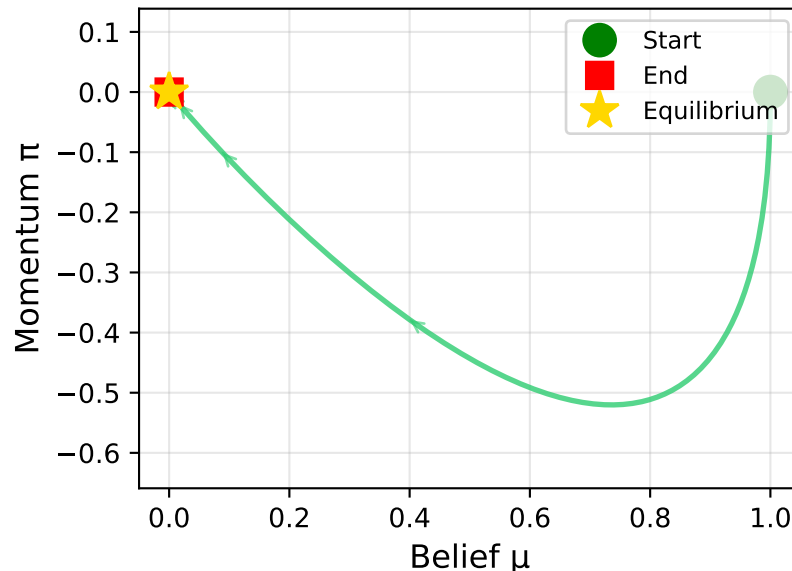
Energy Dissipation



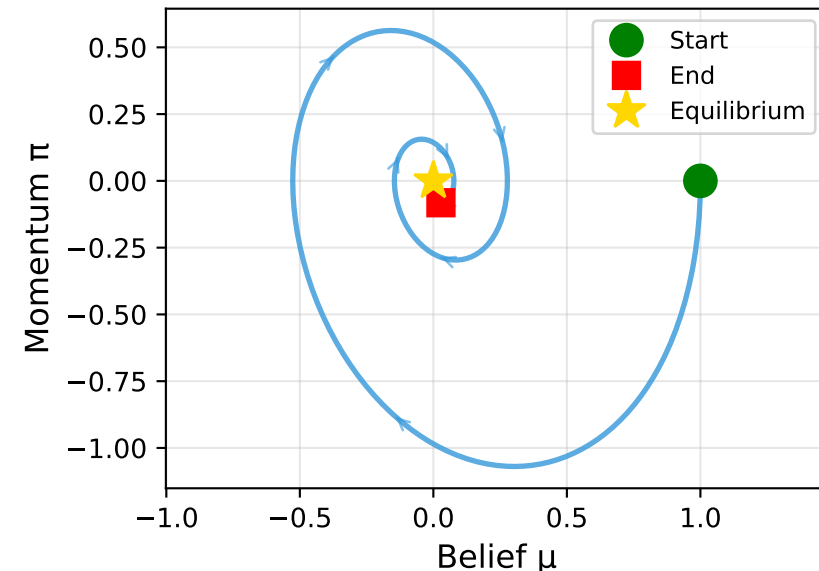
Phase Portrait: Overdamped (Bayesian-like)



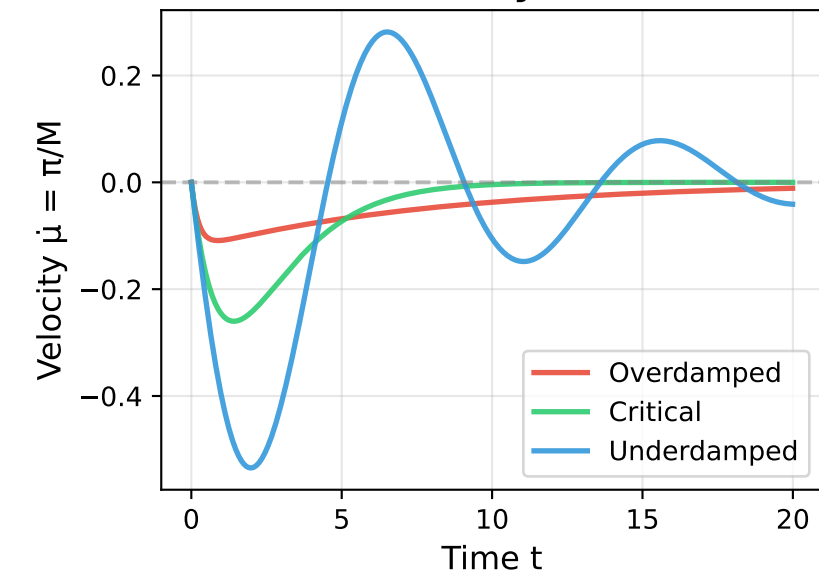
Phase Portrait: Critical (Optimal)



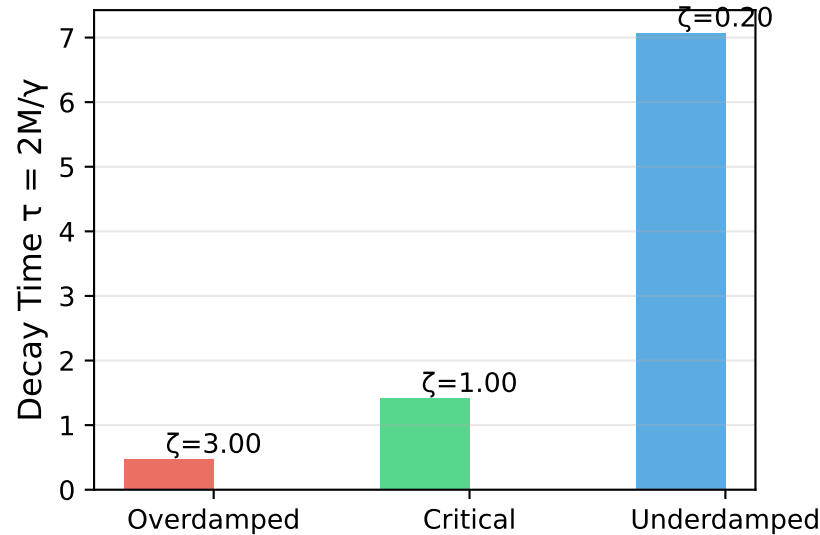
Phase Portrait: Underdamped (Oscillatory)



Belief Velocity Evolution



Characteristic Timescales



KEY PREDICTIONS FROM MANUSCRIPT:

Damped Oscillator Equation (Eq. 36):
$$M \ddot{\mu} + \gamma \dot{\mu} + K \mu = 0$$

Where $M = \Lambda$ (precision = mass)

Three Regimes (based on $\Delta = \gamma^2 - 4KM$):

- OVERDAMPED ($\Delta > 0$):**
Monotonic decay, no oscillation
 \approx Standard Bayesian updating
- CRITICAL ($\Delta = 0$):**
Fastest approach to equilibrium
 $\gamma_c = 2\sqrt{KM}$ = optimal learning
- UNDERDAMPED ($\Delta < 0$):**
Oscillatory with overshooting
Novel prediction: belief oscillation!

Frequency: $\omega = \sqrt{K/M - \gamma^2/4M^2}$

Decay time: $\tau = 2M/\gamma$