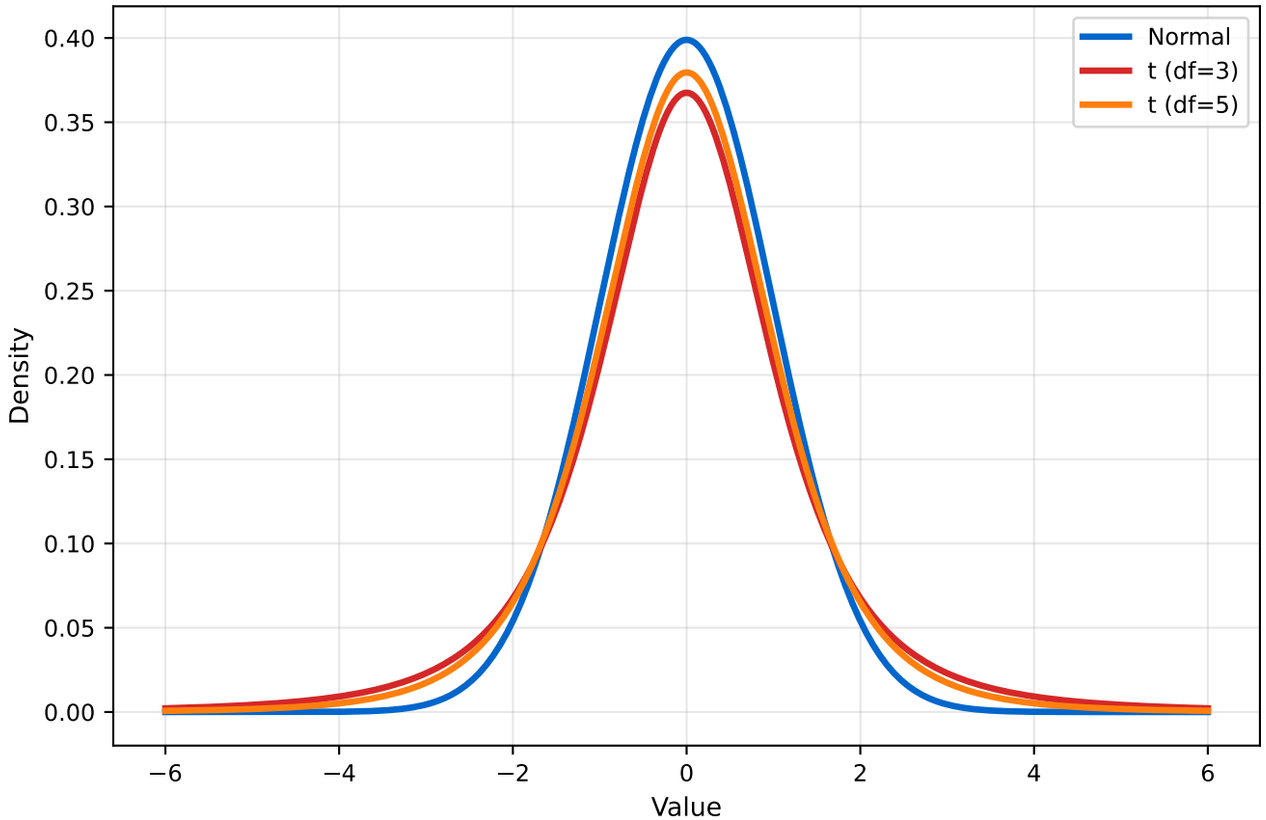
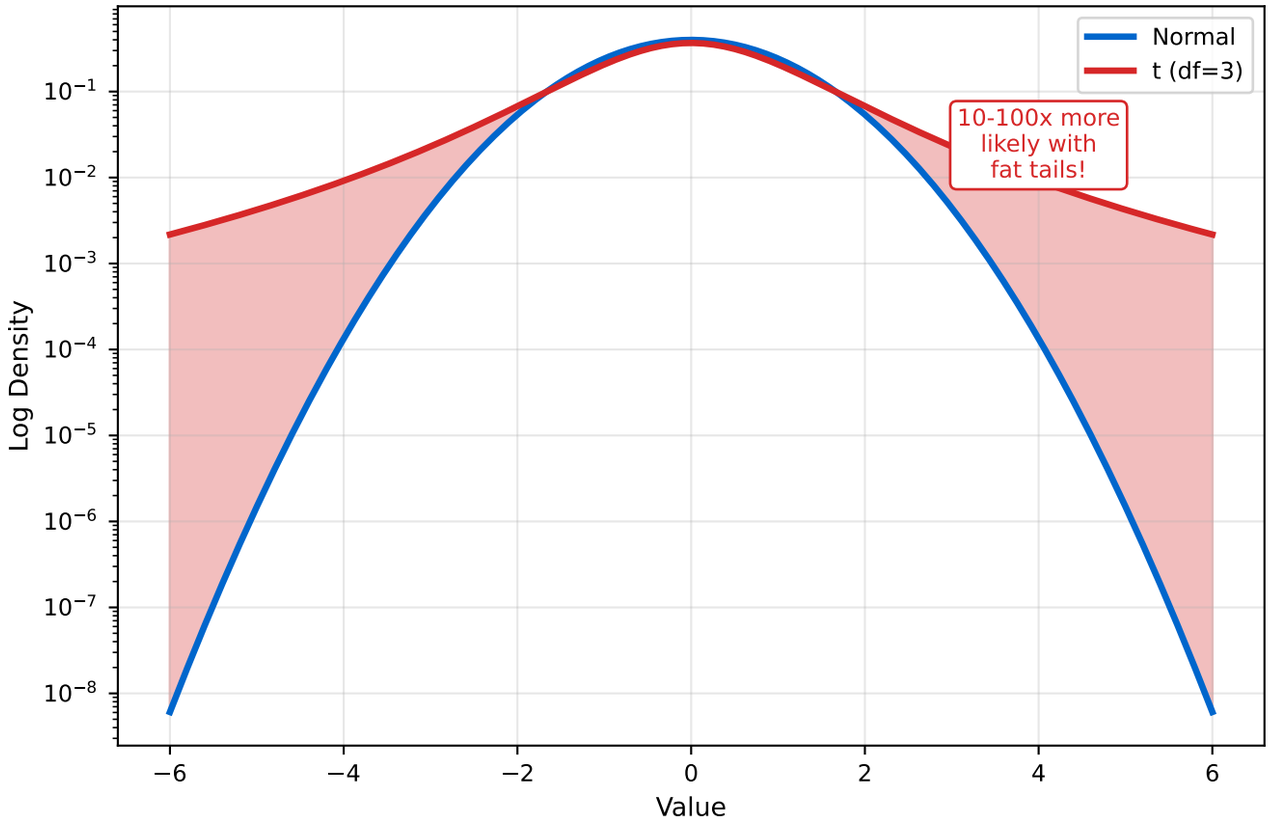
Fat Tails in Finance: Why Normal Distributions Fail

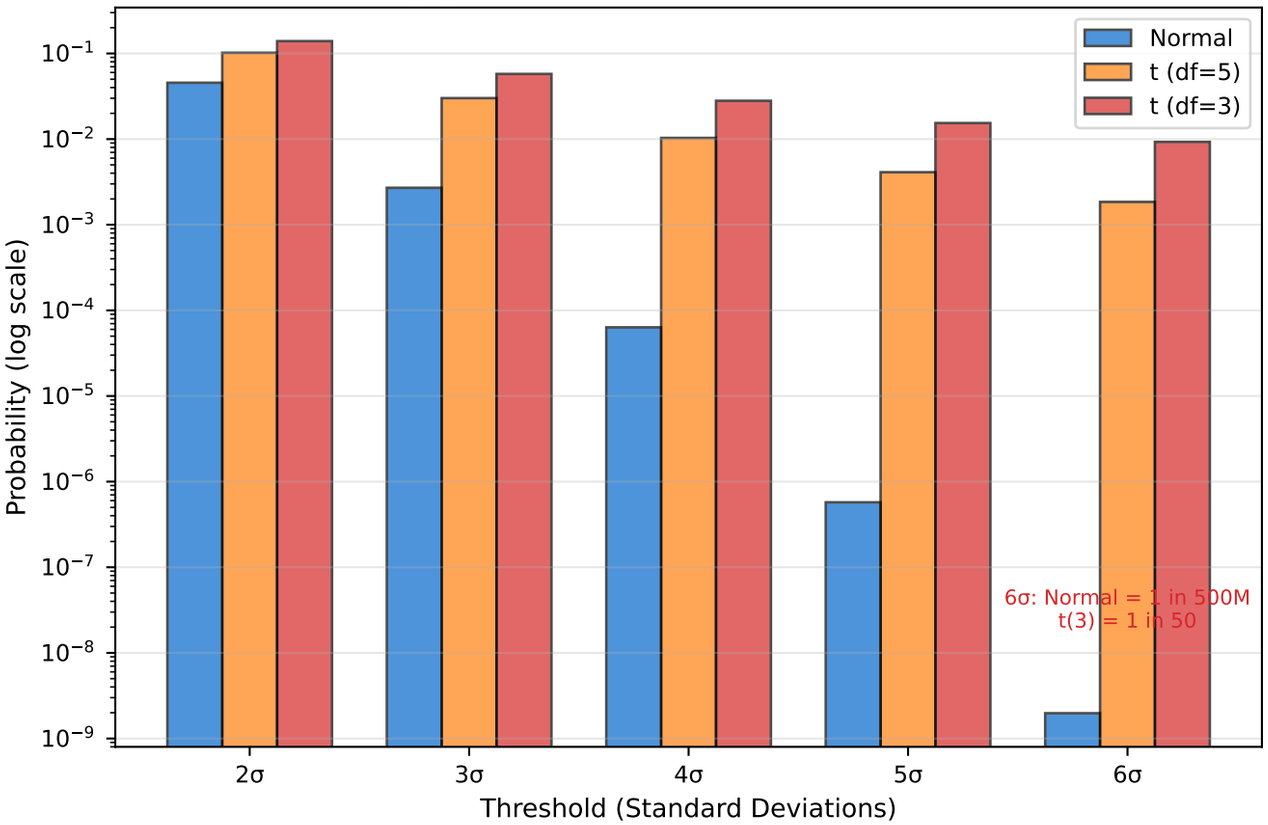
Normal vs Student-t Distributions



Tail Probability (Log Scale)



P(|X| > kσ) - Extreme Event Probability



Real-World Implications

Black Monday (1987): -22.6% in one day

25+ sigma event under Normal
(Should occur once per billion years!)

2008 Crisis: Multiple 5+ sigma days

Normal predicts: once per 14,000 years

Flash Crash (2010): -9% in minutes

Risk models completely failed

Key Lesson: Never trust Normal for risk management!