What Can a Bayesian Say About y/x?

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- I'll show how to do Bayesian inference in a context that's simple but non-trivial.
- Talk will be mostly mathematical
- Existing knowledge of Bayesian ideas is useful but not necessary.

▶ We make noisy measurements of x and y and we want to infer $b = y/x$.

▶ The answer should be probabilistic (due to the uncertainty arising from the measurement noise).

Noise model

I want to keep the noise model simple, so let's asume:

  Noise in x and noise in y are uncorrelated Gaussian with standard deviations σ_x and σ_y (which we will assume to both be unity).

Data

We make one observation of x (call the measured value $\tilde{x}$) and one of y (call the measured value $\tilde{y}$).

Assume that we are in the low signal-to-noise regime, so $\tilde{x}$ and $\tilde{y}$ are 'a few' (e.g. not 'a few thousand'). For example, $\tilde{x} = 3$ and $\tilde{y} = 4$.

So here's a calculation that might appear reasonable to do.