Estimation of the effect of climate on infectious disesaes

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1 Motivating Question

If climate change (through some sort of variable such as temperature or precipitation) is affecting the number of cases of infectious diseasse, it is an outstanding question how strong this effect must be to identify it from some background autocorrelated value.

How strong does the signal of climate change need to be to detect it?

2 Data & model

Assuming we have some data on observed cases of a given infectious disease. The relationship between those observed cases and actual cases is a state process with some observation error, ϵ_o. Cases themselves are now given as a state space model where the number of cases at time $t+1$ are driven by the effect of both temperature variance (consistent through time) and mean temperature (increasing through time), as well as an unobserved driver that is correlated through time with the mean temperature.

Let: - (C_t) represent the true number of cases at time (t). - (Y_t) represent the observed number of cases at time (t), which includes observational error (_o). - (T_t) represent the mean temperature at time (t), and let (V) represent the temperature variance, assumed constant over time. - (U_t) represent the unobserved driver correlated with mean temperature (T_t).