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Modeling of self-regulating gene

We study the variance of the number of proteins produced in a self-regulating gene in a steady state with both one and two copies of gene. Master equations and differential equations for the first and second moments of the variable describing the number of proteins are formulated in both models. Various approximation schemes are used in order to close the set of equations for the moments. Specifically, we examine the dependence of the variance on the adiabaticity parameter measuring the relative rate of DNA-protein unbinding and protein degradation. We compare the variance obtained in models with one and two gene copies.