

# PARAMETER ESTIMATION IN COMPLEX MODELS AS A NON-LINEAR OPTIMIZATION PROBLEM

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A powerful Reduced-Gradient non-linear optimization algorithm was used to estimate the parameters of a complex dynamic model. Generalized Least Squares was achieved and the statistical properties of the estimates were determined. The algorithm was applied to a model which describes normal growth in chicken broilers as well as compensatory growth that results from early age feed restriction. Normal growth was described by a Gompertz equation, whereas for a description of compensatory growth, growth rate was taken as the weight gain calculated by the first Gompertz derivative multiplied by a compensation factor which is dependent on the severity of feed restriction, and a starvation factor, which is a time-dependent exponential decay function. The standard errors for the estimated parameters were less than 3% and the predicted values did not deviate from the observed by more than 4%; most deviations were not greater than 2%.

*Key Words:* Parameter estimation, non-linear optimization, reduced gradient, Gompertz equation, compensatory growth.