

Centro de Investigação em Matemática e Aplicações
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A Delta approximation method on estimation for SDE mixed models

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Resumo: Stochastic differential equations (SDE) appropriately describe a variety of phenomena occurring in random environments, such as the growth dynamics of individual animals. Using appropriate weight transformations and a variant of the Ornstein-Uhlenbeck model, one obtains a general model for the evolution of cattle weight. The model parameters are the average transformed weight at maturity α , a growth parameter β , and a measure of environmental fluctuations intensity σ . We briefly review our previous work on estimation and prediction issues for this model and some generalizations, considering fixed parameters. In order to incorporate individual characteristics of the animals, we consider cases that the parameters α or β or both α and β are Gaussian random variables varying from animal to animal, which results in SDE mixed models. We estimate parameters by maximum likelihood, but, since a closed-form expression for the likelihood function is usually not possible, we approximate it using our proposed delta approximation method. Using simulated data, we estimate the model parameters and compare them with existing methodologies, showing that the proposed method is a good alternative. It also overcomes the existing methodologies requirement of having all animals weighed at the same ages; thus, we apply it to real data, where such a requirement fails.



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