

# Large deviations for the Ornstein-Uhlenbeck process without tears

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## Abstract

Our purpose is to investigate the large deviations for the Ornstein-Uhlenbeck process without tears. We propose a new strategy to establish large deviation principles which allows us, via a suitable transformation, to circumvent the classical difficulty of non-steepness. We extend our approach to the Ornstein-Uhlenbeck process with shift, where we estimate simultaneously the drift and shift parameters. On the one hand, we prove a large deviation principle for the maximum likelihood estimates of the drift and shift parameters. Surprisingly, we find that the drift estimator shares the same large deviation principle as the one previously established for the Ornstein-Uhlenbeck process without shift. Sharp large deviation principles are also provided. On the other hand, we show that the maximum likelihood estimator of the shift parameter satisfies a large deviation principle with a very unusual implicit rate function.