Probability gains expected for renewal process models

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We usually use Brownian distribution, lognormal distribution, Gamma distribution, Weibull distribution, and exponential distribution to calculate the long-term probability as the distribution presenting time intervals between successive events. The values of two of the parameters of these distributions are determined by the maximum likelihood method in such a way as to fit the observed values of the intervals. A difference in log- likelihood between the proposed model and the stationary Poisson process model, which scores both the period of no events and instances of each event, is considered as the index that evaluates the effectiveness of the earthquake probability model. In a renewal process model, the expected value of the log-likelihood difference becomes that of the logarithm of the probability gain. The time unit is changed into the expected value of the interval, since the probability gain is invariant to a change in the time unit. Thus, the hazard of the model will result in a probability gain, since the Poisson hazard becomes 1. This change causes a transformation of the parameters and results in reducing the degree of freedom of model parameters to 1. The expected value of probability gain, which is calculated with parameter values in an observable range, exists in a range between 2 and 5. The long-term probability that can be calculated before an earthquake occurrence by the present method can be estimated to be a maximum of several times as large as that of the Poisson process model.