We constructed an earthquake forecasting model of long-term probability based on P-wave velocity perturbations from a standard layered model for Japan. We considered the perturbations as a predictive parameter that may be useful for assessing regional seismogenesis. We selected 198 epicenters of earthquakes with magnitudes of 5.0 and larger for 1961 to 2008 to estimate the conditional distribution. More than 3000 points were selected for the background distribution. P-wave variations were considered at four different depths (10, 15, 20, and 25km at each point) for both distributions. Both distributions were approximated by normal distributions with four variables. The Kullback-Leibler divergence between two distributions could be estimated to be 0.3, which suggests that an average probability of the proposed model (VP4L model) over the 198 earthquakes is 1.35 times higher than that of a stationary uniform Poisson (SUP) model. To confirm this assessment, we conducted N-, L- and R-tests of the VP4L model, where the SUP model was adopted for comparisons. The retrospective test demonstrated that the observed scores of N- and L-tests are consistent with those expected from the VP4L model. However, the average probability gain calculated from the R-score is about 1.19, which is less than the assessed value. The prospective test has been started to see how the model would perform in a truly prospective test.