



Application of probabilistic earthquake hazard event set technique in the insurance industry

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State-of-the-art natural hazard modeling, be it earthquake, tropical cyclone, winter storm or flood modeling, makes extensive use of detailed probabilistic modeling approaches. In the insurance industry, obtained modeling results were so far mainly used to determine appropriate annual risk premiums and according Loss-Frequency-Curves. It is just a recent development in the industry that event based loss information is being used for additional purposes, be it quick after event loss estimations, proper per-event capital allocation or extended portfolio management. In the following, a state-of-the-art earthquake example from the US New Madrid region is used to demonstrate the powerful combination of detailed event set based probabilistic earthquake modeling.

Early earthquake risk assessment methods often only made use of single scenario approaches, where either historical natural catastrophes (e.g. the 1906 San Francisco earthquake) were repeated for as-if calculations or likely, but not yet observed events (e.g. a hypothetical Los Angeles earthquake) were used to determine scenario losses on certain portfolio exposure (e.g. residential or industrial portfolio). Later on, probabilistic hazard modeling took over and whole families of synthetic events were calculated to obtain statistical stability in portfolio loss estimation. Although ongoing development in probabilistic earthquake hazard modeling constantly improves the model calculation (by considering various source solutions ranging from simple point sources to planar sources, suites of source parameter dependent attenuation laws, sophisticated on-site effects, as e.g. soil liquefaction or amplification effects and detailed vulnerability analysis), the results of such analysis are often limited to graphical out-

put (Loss-Frequency-Curves) and adequate premium calculation. Apparently, there is often no further use of the event loss set in the background. Recent demand on appropriate risk capital allocation, as well as quick post-event loss estimation, however, calls for new approaches. Here, the event set based technique comes into play, as it uniquely offers the possibility of (1) quick post-event loss estimation by comparing the (synthetic) event set database with the actual event and identifying portfolio losses attached to according event records and (2) appropriate risk capital allocation by event record monitoring over all portfolios within a company's insurance book. It furthermore allows proper risk-management by monitoring identified key events throughout the book. However, it is just the combination of state-of-the-art probabilistic earthquake hazard modeling (here shown for US New Madrid region) based on the event set technique, which allows above mentioned business innovation.

Although facing intensive data mining tasks, the event set based approach offers to be a unique tool for adequate risk mitigation within the insurance industry. It allows quick post-event loss estimation and provides proper portfolio management in complex risk exposure landscapes.