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FAQ: "Should I Buy Earthquake Insurance?" – A Berkeley Case-Study

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For structural engineers in earthquake-prone regions, a frequently asked question (FAQ) from homeowners is: Should I buy earthquake insurance? While in many ways the answer to this question is a subjective one, there *are* quantitative methods that can be used to support a decision. Much of the data, analytical approaches, and computational tools needed to tackle this FAQ are readily available from the fields of seismology, engineering, and decision analysis. In light of the considerable uncertainties involved, the methodologies are necessarily probabilistic in nature.

For a woodframe house in Berkeley, California, this paper documents a quantitative methodology used to decide whether or not to purchase a California Earthquake Authority (CEA) insurance policy for the ensuing year. The probabilistic approach makes use of the following:

1) a probabilistic seismic hazard curve for the site and corresponding "deaggregations" of the ground motion hazard, both obtained from the website of the USGS;
2) appropriately chosen historical ground motion recordings from the online Pacific Earthquake Engineering Research (PEER) Strong Motion Database;
3) a commercially available nonlinear dynamic analysis program for two-dimensional structures;
4) probabilistic relationships (based on experimental test data) between seismically-induced drifts in woodframe elements and their resulting states of physical damage, which are obtained from the recent CUREE-Caltech Woodframe Project;
5) probabilistic estimates of the cost to repair various levels of physical damage, also obtained from the CUREE project; and finally,
6) simple decision analysis concepts.

In presenting the details of this application of a quantitative and probabilistic methodology, succinct descriptions of each of the components listed above are provided. Also included are discussions of alternative approaches available for combining these components (e.g., Monte Carlo simulation versus First-Order Second-Moment methods) and outstanding issues.