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The Bass Model

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The ETAS (epidemic type aftershock sequence) model is an empirical simulation approach to aftershocks statistics. It is based on Gutenberg-Richter (GR) frequency-magnitude scaling and Omori's law for the temporal decay of aftershock sequences. In addition an empirical productivity law is postulated. The BASS (branching aftershock sequence) model is the self-similar limit of ETAS. The arbitrary productivity relation in ETAS is replaced by Bath's law that on average the largest aftershock is a fixed magnitude difference delta{m} (approx 1.2) less than the main shock. A major advantage of the BASS modal is that the two unconstrained parameters K and alpha; in the ETAS productivity relation are replaced by delta{m} and the b-value in GR scaling, both directly constrained by observations. In the ETAS model Bath's law is not satisfied, it is specified in the BASS model. In the BASS limit the fraction of main shocks that have foreshocks is independent of mainshock magnitude, in ETAS the dependence is exponential which is not confirmed by observations. The primary criticism of the BASS model is that it can produce infinite numbers of aftershocks. However, this problem is easily removed by a physically acceptable limit on the upper magnitudes of aftershocks, an inverse Bath's law that an aftershock cannot be delta{m} (approx) 3 bigger than a mainshock.