The Gompertz degradation model, functional equations and resu1ting distributions in one and two dimensions

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Abstract: Gompertz (1825) derived the distribution that carries his name by using a model for degradation of a man's power to resist destruction. This model can be represented as a differential equation, the solutions of which include the Gompertz distributions and the exponential distributions. Another class of solutions, improper distributions called negative Gompertz distributions, can be used with Gompertz distributions to generate a family of distributions with bathtub hazard rates Modifications of the Gompertz differential equation lead to the two extensions of Makeham (1860, 1890); another modification leads to the Weibull distributions.

The Gompertz and Gompertz-Makeham distributions have also been derived using functional equations, the first to do this was De Morgan (1860).

In this paper, two dimensional versions of the differential and functional equations are used to derive bivariate distributions.

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