

## Exact and Approximate Distributions for the Product of Dirichlet Components

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*Abstract:* It is well known that  $X/(X + Y)$  has the beta distribution when  $X$  and  $Y$  follow the Dirichlet distribution. Linear combinations of the form  $\alpha X + \beta Y$  have also been studied in Provost and Cheong [S. B. Provost and Y.-H. Cheong: On the distribution of linear combinations of the components of a Dirichlet random vector. *Canad. J. Statist.* 28 (2000)]. In this paper, we derive the exact distribution of the product  $P = XY$  (involving the Gauss hypergeometric function) and the corresponding moment properties. We also propose an approximation and show evidence to prove its robustness. This approximation will be useful especially to the practitioners of the Dirichlet distribution.

*Keywords:* approximation; Dirichlet distribution; Gauss hypergeometric function;

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