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**The first digit problem and scale-invariance.** (English) Zbl 0853.60002

Marcellini, Paolo (ed.) et al., Partial differential equations and applications. Collected papers in honor of Carlo Pucci on the occasion of his 70th birthday. New York, NY: Marcel Dekker. Lect. Notes Pure Appl. Math. 177, 329-340 (1996).

The author's purpose is to give a countably-additive measure-theoretic derivative of Benford's law

$$\text{Prob}[\text{first significant digit}(\text{base } 10) = k] = \log_{10}[(k+1)/k], \quad k = 1, 2, \ldots, 9,$$

[cf. *F. Benford*, Proc. Am. Philos. Soc. 78, 551-572 (1938; Zbl 0018.26502); *R. A. Raimi*, Am. Math. Monthly 83, 521-538 (1976; Zbl 0349.60014)] based on the classical scale-invariance hypothesis. By appropriate choice of measure space, the restriction to Borel subsets of $[1, 10)$, and use of arguments similar to the reviewer's ones [Proc. Am. Math. Soc. 123, No. 3, 887-895 (1995; Zbl 0813.60002)], it is shown that scale-invariance of the probability measure implies absolute continuity, and Benford's law then follows from the explicit expression of the distribution function and the resulting density.

For the entire collection see [Zbl 0834.00042].

Reviewer: T.P.Hill (Atlanta)

**MSC:**

60A10 Probabilistic measure theory

**Keywords:**

first digit problem; scale-invariance; significant-digit law; Benford's law

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