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**Relative importance of risk sources in insurance systems. With discussion and a reply by the author.** (English) [Zbl 1081.62562](#)

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Summary: Actuaries, and other managers of uncertainty, identify factors in modeling insurance risks because they believe (1) that these factors affect the outcome of a risk or (2) that the factors can be managed, thus allowing analysts a degree of control over the insurance system. This paper shows how to use a statistical measure, the coefficient of determination, for quantifying the relative importance of a source of uncertainty. With a quantitative measure of relative importance, risk managers can sharpen their intuition about the relative importance of risk factors and become better custodians of financial security systems.

This paper shows that the coefficient of determination is intuitively appealing in assessing the effectiveness of basic risk management techniques including risk exchange, pooling, and financial risk management. A single source common to all risks reduces the effectiveness of a pool; the risk measure quantifies the relative importance of this common source. The coefficient of determination is shown to have roots in the economics as well as the statistics literature. This connection provides further motivation for using the coefficient of determination and also suggests alternative measures for quantifying relative importance. The risk measure is useful in multivariate situations in which several factors affect a risk simultaneously. The paper illustrates this usefulness by considering a pool of policies that is subject to mortality, a common disaster, and a common investment environment.

**MSC:**

**62P05** Applications of statistics to actuarial sciences and financial mathematics  
**91B30** Risk theory, insurance (MSC2010)

Cited in **8** Documents

**Full Text:** [DOI](#)

**References:**

- [1] Anderson A.W., *Transactions of the Society of Actuaries* pp 7– (1971)
- [2] Anderson T.W., *An Introduction to Multivariate Statistical Analysis* (1958) · [Zbl 0083.14601](#)
- [3] Bowers N.L., *Actuarial Mathematics*, 2. ed. (1997)
- [4] Budescu D.V., *Psychological Bulletin* 114 pp 542– (1993) · [doi:10.1037/0033-2909.114.3.542](#)
- [5] Chevan A., *American Statistician* 45 pp 90– (1991)
- [6] Frees E.W., *Transactions of the Society of Actuaries* pp 91– (1990)
- [7] Frees E.W., *Actuarial Research Clearing House* 1 pp 363– (1997)
- [8] Genizi A., *Statistica Sinica* 3 pp 407– (1993)
- [9] Gerber H., *An Introduction to Mathematical Risk Theory* (1979) · [Zbl 0431.62066](#)
- [10] Ingersoll J.E., *Theory of Financial Decision Making* (1987)
- [11] Kaas R., *Ordering of Actuarial Risks* (1994)
- [12] Kihlstrom R.E., *Econometrica* 49 pp 911– (1981) · [Zbl 0461.90018](#) · [doi:10.2307/1912510](#)
- [13] Kruskal W., *American Statistician* 41 pp 6– (1987)
- [14] Kruskal W., *American Statistician* 43 pp 2– (1989)
- [15] Levy H., *Management Science* 38 pp 555– (1992) · [Zbl 0764.90004](#) · [doi:10.1287/mnsc.38.4.555](#)
- [16] Markowitz H., *Portfolio Selection: Efficient Diversification of Investment* (1959)
- [17] Parker G., *NAAJ* 1 (2) pp 55– (1997)
- [18] Pedhazur E., *Multiple Regression in Behavioral Research*, 2. ed. (1982) · [Zbl 0920.62137](#)
- [19] Pratt J.W., *Econometrica* 32 pp 122– (1964) · [Zbl 0132.13906](#) · [doi:10.2307/1913738](#)
- [20] Pratt J.W., *Proceedings of the Second International Tampere Conference in Statistics* pp 245– (1987)
- [21] Pratt J.W., *Journal of Risk and Uncertainty* 1 pp 395– (1988) · [doi:10.1007/BF00117643](#)

- [22] Rothschild M., Journal of Economic Consequences 2 pp 225– (1970)
- [23] Saunders R.A., Life Insurance Company Financial Statements (1986)
- [24] Serfling R.J., Approximation Theorems of Mathematical Statistics (1980) · [Zbl 0538.62002](#) · [doi:10.1002/9780470316481](#)
- [25] 1990 . Social Security Technical Panel Report to the 1991 Advisory Council on Social Security .Social Security Bulletin, 53 ( 11 ) Baltimore, Md.: Social Security Administration
- [26] Williams E.J., International Encyclopedia of Statistics pp 537– (1978)
- [27] Von Neumann J., Theory of Games and Economic Behavior (1947)

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