

# Relationship between the Power Law Distribution of the Number of TV Viewer's Contact with Commercials and Advertising Expenditure

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## Abstract

Companies spend money on advertisements in the assumption that they will reach consumers, increase awareness of their brands and products, and induce the desired consumer purchasing behavior. However, when the relationship between advertising expenditures and sales or profits was investigated, the advertising elasticity of advertising expenditures (i.e., the effect on sales or profits when advertising expenditures are increased) was reported to be low (Vacratsas and Ambler, 1999). For example, Graham and Frankenberger (2000) investigated the impact of advertising expenditures of 320 companies listed on the U.S. securities market from 1985 to 1994 on their operating profits. The analysis revealed that the rate of change in advertising expenditures in periods  $t$  and  $t-1$  has a positive impact on the operating profits of BtoC companies in period  $t$ ; however, the rate of change in advertising expenditures before  $t-2$  had a small or no impact on the operating profits (period  $t$ ).

Aaker and Carman (1982) pointed out that there is a problem of over-advertising in practice as the effects of advertising expenditures on financial performance are unclear. Then, how can companies set an appropriate amount for advertising expenses?

If the number of contacts with advertisements shows a power-law distribution, it means that there are consumers with so much advertising exposure that it seems like an outlier, while there is a heavy tail of consumers who have almost no exposure to advertisements. This study aims to reconsider the advertising activities of companies based on this power-law distribution.

The data used in the analysis are of TV commercials aired from January to March 2020 in Japan: commercial placement history of each company by TV program and the TV viewing history of 2,500 survey respondents. We calculated the number of commercials that the 2,500 survey subjects were exposed to by using television programs as a key variable in the combining process. We then analyzed the data obtained by using R's "The powerLaw" package (Gillespie, 2015). We found that the number of TV commercials contacts follows the power-law distribution.

## Keywords

TV commercials, Advertising expenditures, Financial performance, Power-law distribution

## Biographies

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**Hirohisa Hirai** is a Professor of Department of Industrial Engineering and Management at Kanagawa University, Japan. He earned his Ph.D. in Engineering at Osaka University respectively. His research is an empirical study in the areas of management accounting, firm analysis and applied statistics, especially, firm valuation. He has received paper awards at several academic societies in the areas of accounting and management.