

How To Measure Returns to Digital Advertising? – An Overview of Empirical Pitfalls and Current Practices [Working Title]

Supervisor: Alexander Witte <alexander.witte@uni-passau.de>
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Motivation:

Online advertising expenditure has eclipsed its offline pendants over the past decades. Digital advertising expenditures in the US alone amounted to \$211.20 billion in 2021 (eMarketer, 2021). eMarketer, a market research company that provides insights and trends in advertising, predicts that the market will grow by another 50% until 2025 with spend figures surpassing \$300 billion, thus amounting to more than three-quarters of all media-spending. Given these spend figures, it seems like marketers deem online channels the most profitable way of distributing their ad campaigns to consumers.

An important driver of this shift of advertising dollars from offline to online channels is that technology enables firms to collect an unprecedented amount of consumer data. This data enables firms (1) to target ads to consumers based on their online behaviour to reduce wasteful advertising, and (2) to measure advertising outcomes on an individual level. In an offline context, e.g., a billboard standing next to a soccer field hosting a famous derby, marketers could not target specific consumer groups nor ascertain the effects this ad had in driving sales. In contrast, online, each banner can be personalised to meet the preferences of individual website visitors and clicks on individual banners can most certainly be attributed to subsequent conversions. In fact, metrics such as clicks (or click-through-rate) have become a standard measure of ad effectiveness in the industry.

Despite these technology-driven advantages several challenges exist in measuring the causal effect of ad exposure on sales. In other words, whether or how advertising dollars spent are linked to actual sales. After all, standard metrics to assess return on online advertising such as clicks are just intermediate proxies for actual sales and consequently revenue. In fact, empirical research has shown that overreliance on these intermediate metrics can lead to inefficient allocation of marketing budget (Blake, Nosko, & Tadelis, 2014): Showing ads predominantly to consumers that have high conversion (e.g., clicking or purchasing) probability surely leads to more conversions. However, it may be that these consumers had converted even in absence of the ad (e.g., because they might be already informed about the company or product), and so this *selection bias* leads to overestimating a campaign's effectiveness. Hence, the value generated by ad exposure should not be measured as conversions per sé, but as *marginal* conversions attributable to the ad exposure as this is what yields incremental value. Such endogeneity issues, i.e., correlation between the explanatory variable (ad exposure) and unobserved heterogeneity (e.g., purchase intent), are one example of the empirical challenges marketers face when inferring insights from observational data sets.

Goal:

This thesis seeks to answer questions related to endogeneity and other empirical pitfalls in measuring the return to online advertising. Thus, the goal of this thesis is to provide an overview of key empirical challenges associated with the validity of statistical models used to measure advertising returns. Moreover, the thesis should discuss methodological avenues through

which marketers can address them to ensure optimal return on investment. To this end, the following non-exhaustive (and of course non-compulsory) list of questions provide a preliminary starting point:

- What drives the effectiveness of online advertising compared to its offline pendant?
- Why is measuring return to advertising economically important? What is the average return to investments in advertising that advertisers need to achieve for profitable marketing campaigns (if such data is readily available)?
- What is the harm created by biased estimates of advertising outcomes (i.e., why should we care)? Which stakeholder group faces the cost of such harm? Which stakeholders might be the beneficiaries of biased metrics of advertising return?
- What are the key empirical challenges of statistically inferring returns to advertising using observational data? How could endogeneity of advertising expenditure arise (i.e., driven by consumer behaviour or firm decisions)?
- Which methodological solutions (e.g., controlled experiments) can be used to address these challenges and how should they be implemented to obtain meaningful estimates?
- Which challenges remain unsolved even under methodologies alternative to drawing inferences from observational data? How could these be solve?

Suggested References:

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