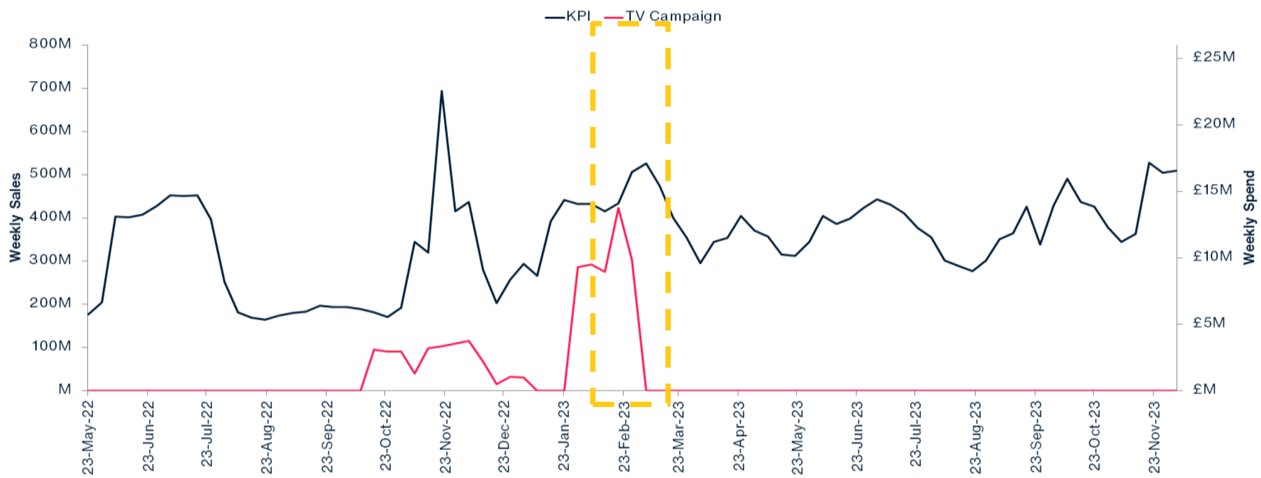
Lagged & Leading effects

Marketing's impact on sales does not always occur at the time of the activity – sometimes there may be a ***leading effect*** where we see an impact before the marketing activity (i.e. a consumer may know a promotion or new product update is imminent so sales drop in advance), or a ***lagged effect*** which occurs sometime after the marketing (e.g. where sales occur the following week or where you are promoting ahead of stock availability).

To accurately measure the impact of marketing you need to be aware of, and test for, both lagged and leading effects. Whilst both lead and lag effects occur when there is a ***mismatch*** between KPI reaction and media activity, lagged effects often tend to be more identifiable. The chart below shows an example where advertisement was shown on TV, but the resulting increase in sales was not observed until the following week.



A lagged effect indicates that the impact occurs in a later period ***((t+n)),*** while a leading effect suggests that the impact precedes the media activity and occurs in an earlier period ***((t-k)).***

Activity with both a Lag & Lead effects	$$y_t = \alpha + \beta_0 x_{t+n} + \beta_1 x_{t-k} + \varepsilon_t$$
Activity with no Lag or Lead effects	$$y_t = \alpha + \beta_0 x_t + \varepsilon_t$$