**Question**: **From VAR model output, can you identify the carryover, direct, and (or) feedback effects? What is your interpretation of those effects?**

**Feedback:**

From the VAR output, we can identify carryover effect for flyer advertising (negative, -0.274) and revenues (positive, 0.309), and Adwords (negative, -0.147).

Adwords (0.404) and Flyer (0.003) both have positive impact on Revenues.

Revenues have positive feedback effect on Flyer ad spending (0.327), while negative feedback effect on online Adwords spending (-0.062).

Note that due to the limited sample size and data variation in our sample, some of the coefficients seem statistically insignificant. However, to see the effect of Adwords and Flyer advertising on Revenues over time (e.g., immediate and long-term effects), it is more rigorous to refer to results from Impulse Reaction Function analysis.

**Question:** **Revenues could be impacted by its own past values, hence being endogenous. How do you check for causality in this case? Discuss with your classmates.**

**Feedback:**

To check for causality between Adwords and Flyer advertising spendings and Revenues, we can do Granger causality tests. The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. In R, many packages and functions allow you to conduct such test. For example, you can use *grangertest* or *granger.test* fuction.

**Question:** **Given what we have obtained from the VAR model, do you think the current budget allocation strategy of the firm is good/close to optimum?**

**Feedback:**

Judging from IRF results, the firm seems to be in the right direction by allocating more budget onto flyer advertising and less onto Adwords, since the long term (or cumulative) effect of the former on revenues is 0.121 while the latter is 0.037.

In addition, if the firm’s objective is to generate immediate response from revenues, the firm should consider putting even more effort on Flyer spending, since it has an immediate effect in period 1 (0.083). In contrast, Adwords advertising only starts to exert influence from the second period (0.037).

We need to rely on calculations to decide the exact optimal allocation between the two types of advertising spending.