



## Sample analysis: linear multiple regression

### Background

A sales director feels that some members of staff are more effective than others at completing sales. They want to better understand why this occurs. A questionnaire was given to the 44 members of staff asking the following questions:

- How skilled is your line manager? Rating from 1 (not skilled at all) through to 10 (very skilled)
- How good is the training you receive? Rating from 1 (not good at all) through to 10 (very good)
- How well do you work with colleagues? Rating from 1 (not well at all) through to 10 (very well)
- How long have you worked for this company? Reported in years

For each member of staff (N = 44) the mean number of sales completed per day over the past 6 months was calculate.

### Analyses conducted

The collected data were analysed using multiple linear regression. This type of analysis allows us to predict a continuous score outcome (mean number of sales per day) on the basis of the four questionnaire items (manager, training, colleagues and years working).

### Results

	Mean	SD	Min.	Max.
Mean sales per day (over 6 months)	23.7	6.1	14	34
How skilled is your line manager?	3.5	1.5	1	7
How good is the training you receive?	5.9	2.0	2	9
How well do you work with colleagues?	5.1	1.8	1	9
How long have you worked for this company?	6.1	2.8	1	15

Interpretation of the descriptive statistics:

- The descriptive statistics show that, on average, members of staff made 24 sales per day with sales ranging from 14 to 34 sales per day.
- The mean rating for the skill of the line manager was relatively low at 3.5 (note that 5 is the mid-way neutral response). This means that, overall, staff rated their manager's skills negatively. However, scores ranged from 1 to 7, so some managers were rated well.

- The mean rating for the training received was 5.9, so above a neutral response, and ranged from 2 to 9. This indicates that some people found the training very useful whereas others found it not useful at all.
- The mean rating for how well staff get on with colleagues was neutral at 5.1 with a wider range from 1 to 9.
- The mean number of years working for the company was 6 years and ranged from 1 to 15 years.

The multiple linear regression examined whether the four questionnaire items could significantly predict the mean number of sales made per day. The overall model, combining the four predictors, was significant ( $F(4, 39) = 8.2, p < .001$ ). This shows that, in combination, the four questionnaire items can significantly predict sales. The model explains 40% of the variability in sales achieved. This means that, while the four predictors provide a good and significant model of sales, there are likely to be other factors that were not measured in this study that can also predict sales.

Looking at each predictor individually, we can see the following:

- *Supervisor skill*: Rating of the supervisors skill was a highly significant predictor of sales ( $\beta = 1.6, t = 3.3, p = .002$ ). The higher the rating of the supervisor's skill, the higher the sales achieved.
- *Training*: Rating of the training received was a highly significant predictor of sales ( $\beta = 1.1, t = 2.9, p = .006$ ). The higher the rating of the training, the higher the sales achieved.
- *Colleagues*: Rating of interactions with colleagues did not predict sales ( $\beta = 0.6, t = 1.5, p = .113$ ).
- *Year worked at the company*: The number of years spent working for the company was a significant predictor of sales ( $\beta = 0.6, t = 2.2, p = .036$ ). The longer someone had been working for the company, the higher the sales achieved.

The significant predictors of sales, placed in order of importance from most to least, are:

1. Supervisor skill: the more skilled the supervisor, the more sales achieved
2. Training received: the higher the rating of the training, the more sales achieved
3. Years worked: the longer the employee has worked for the company the more sales achieved

**Possible issues to consider on the basis of this analysis:**

1. Generally the staff ratings of manager's skills were low, but those who rated their manager's skills highly made significantly more sales. Further training for managers might be considered.
2. Ratings of the training received were wide ranging, but those who rated the training as being good made significantly more sales. It is worth examining the training given to staff and why the ratings were so varied. Did staff members undertake different types of training? If so, it may be that some forms are more effective than others. If not, why are the views of the training so varied? Given that those who rate the training higher go on to achieve more sales, development to improve the training given should be considered.
3. Members of staff who have worked for the company for a longer time made significantly more sales. This means that staff retention is very important for the company. Perhaps a mentoring scheme could be introduced as part of the training program to help train recent employees and to enhance the job satisfaction and feeling of being valued in more established staff members.
4. The predictive model was good, but it did not perfectly predict sales. This means that other factors that were not measured in the study can also predict sales.