Evaluating the Risk Training Program Proposal

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11 February 2019

Recommendation

The data does not support investing in a training program designed to increase managerial risk-taking on the basis that a risk-taking mindset improves firm performance. While my analysis suggests a positive change in sales growth rate as risk-taking increases, this effect is too small to have practical utility. I am also concerned with the reliability of the risk taking measures, to the point that we would be suspect of drawing any substantive conclusions from the data.

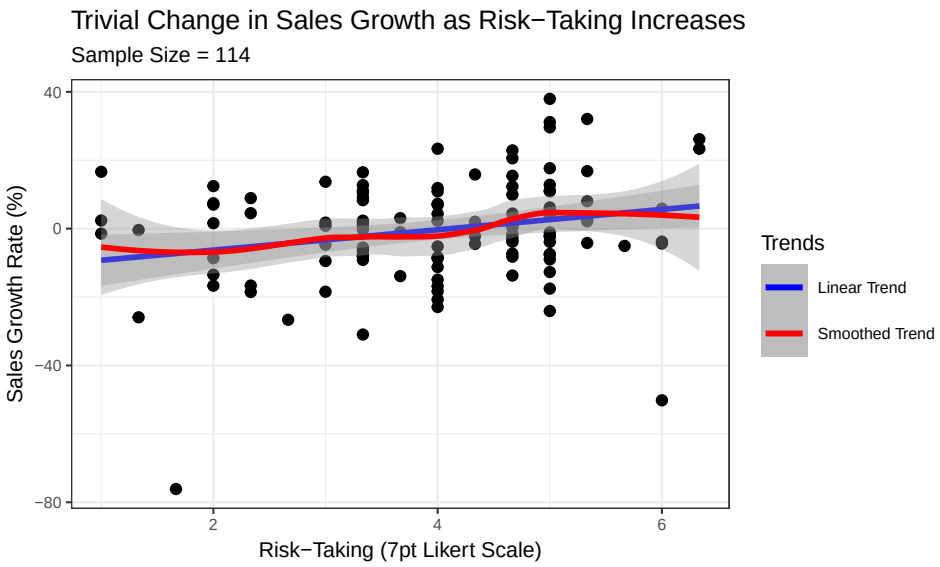
Measurement Error

My first concern is with the risk-taking measures. I used a method called Cronbach's alpha to evaluate the reliability of the measures—the extent to which the measures are capturing a similar underlying concept.

Generally, the metric we are looking for is an *inter-item correlation* larger than 0.7. At this level, the measures all share at least half of their variance, that is, they move in a similar way. The larger this value, the better.

In the data, the average inter-item correlation for the three risk taking measures is: 0.62. While only 0.08 below the recommended 0.7 threshold, this value suggests that the measures only share 38% of their variance—well below what we would expect from highly reliable measures. A reasonable conclusion is that the risk-taking measures likely suffer from material measurement error. As a result, we should be suspect about drawing substantive conclusions from any analyses of these measures, without taking additional steps to address the measurement error problem.

Visualizing the Risk-Taking—Sales Growth Rate Relationship



As the figure above shows, there is a slight increase in sales growth rate as risk-taking increases. The blue line represents the linear trend, which is equivalent to the effect argued by the consultant to be "a strong positive relationship". The red line, however, represents a *smoothed* trend, which more closely resembles the

actual relationship in the data. The grey bars surrounding both lines are the *confidence intervals*, or the margin of error around the estimated effect. As we can see from both trends, the lines stay very close to the "0%" line for sales growth rate. Visually, we can see that even though the slope increases, the margin of error suggests that the relationship could just as easily be perfectly flat—no real effect at all.

Statistical Analyses

I used two additional analyses to evaluate the consultant's claim. In my first analysis, I estimated a *Bayesian Linear Model*. In this analysis, I am replicating the consultant's model, but incorporating what I already expect about the relationship between risk-taking and sales growth rate—a small change.

	Sales Growth Rate Change
Model Intercept	-12.34
	(4.69)
Risk Taking	3.00
	(1.13)
# Observations	114

Standard deviation in parantheses.

The focal value we are interested in is the excepted change in sales growth rate as risk-taking increases by one unit (e.g., moving from a '5' to a '6'). This estimate is 3, with a standard deviation of 1.13. To determine if this effect is reasonably different from zero, we look at the ratio of the estimate to its standard deviation, and generally want this value to be greater than 2.0—the larger the ratio, generally speaking, the larger the effect in the data.

From our analysis, we observed a ratio of 2.65, which is 0.65 above our threshold level. This analysis supports our figure shown earlier—sales growth changes as risk-taking changes, but it is a trivial change.

For my final analysis, we can visualize the uncertainty in our model results. In the figure below, we see a relatively wide *95% credibility interval* around our estimated effect. Ideally, we would want this interval to be as small as possible, reflecting less uncertainty in our model. We can say that with this data, we are 95% confident that sales growth rate will change from a little over 2% to a little under 4%. In our opinion, this is too large of an estimated range, again given the data we have, to justify a significant investment in a managerial risk-taking training program.