

How Financial Statement Analysis Can Be Biased Through the Order Effects of Belief Updating

By Dr. James D. Krause*

ABSTRACT

According to an accepted psychological belief or theory, a long series of cues in an estimation task will bias belief adjustment toward a primacy effect in that the first cues will have more influence on the final decision. Lending institutions often provide help to the commercial loan officers to estimate the magnitude of the credit risk by using commercial software programs that produce a long list of financial ratios. Credit risk bias may result if the most important ratios are not placed first in the series of cues. The most important ratios (as determined by a pretest of highly experienced loan officers) were placed differently in the series of cues in an experiment involving bank loan officers. The primacy effect predominated even over experience.

INTRODUCTION

Hogarth and Einhorn (1992) formalized a “belief adjustment model” to explain how the order of information presented to a decision maker can influence their final decision. Building on many years of research observations, Hogarth and Einhorn’s belief adjustment model demonstrated how the following factors can bias the final decision:

- The type of task performed – whether the task is to form a “true/false” impression (evaluation task) or a magnitude of belief (estimation task)
- Length of cue series – whether the list of cues is short or long (long being defined as any list that contains more than 17 cues)
- How the cues are processed – either the final belief is formed at the end of the sequence or in an incremental manner known as a step-by-step method
- The initial anchor strength – whether the decision maker has preconceptions or the initial belief is based solely upon the cues observed
- Sophistication of the cues – whether each piece of information is simple or complex
- Type of evidence presented by the cues – whether the cues consistently confirm or deny a prior belief or whether the evidence is mixed (some cues confirm and some cues deny prior beliefs)

* D.B.A., M.S.P.A., C.P.A., Faculty, Ringling College of Art and Design

Although not previously tested, Hogarth and Einhorn's model could be applied to commercial lenders as they attempt to estimate loan risk. A bank loan officer estimates the amount of credit risk associated with a loan application to determine if the loan should be given and if so, to determine the interest rate to attach to the loan. This task contains all the above characteristics defined by the "belief adjustment model" and could result in a decision bias. A primacy effect should be observed. The cues evaluated early in the series should have a greater impact on the commercial lender's decision than the cues that appear later in the series. The theory suggests that a primacy effect results from tasks similar to credit risk estimation because they exhibit the following characteristics:

- A loan risk assessment is an estimation task because a loan officer must determine how much loan risk is involved
- The series of cues is often long as many loan aid software programs use lists of financial ratios comprised of 25 or more ratios
- When the series of cues is long, human cognitive limitations prohibit arriving at a decision after reviewing all the cues, instead the decision maker is forced to use a step-by-step mode where cues are evaluated one at a time and the belief is constantly readjusted until all the cues have been evaluated
- The initial belief anchor is often weak and is established by evaluating the cues as loan officers may know little about the perspective borrower beyond the financial statements under analysis

According to the theory, whether the cues are simple or complex is less important when the list of cues is long. Similarly, whether the cues are consistent or mixed is less important than the length of the series of cues. Given all these characteristics together, the "belief adjustment model" predicts that credit risk estimations should be affected by primacy. The cues evaluated first should affect the final judgment more than cues evaluated later in the series. If this is true, commercial lenders could be making decisions that are biased. They could be misjudging the actual credit risk. There is research evidence that a similar decision bias is robust and cannot be overcome (a recency effect). To test this premise, the researcher conducted an experiment using a commercially available loan software package, which listed 36 distinct financial ratios presented in a fixed order.

THE EXPERIMENT

The subjects of the experiment were 216 trained commercial lenders who represented a majority of banks in the local area, which were composed of local, regional, and superregional banks. A pretest was conducted involving the ten most experienced lenders who were excluded from the remainder of the experiment. These ten loan officers were shown the list of 36 ratios (with no values) in alphabetical order and were asked to place each ratio into one of three categories reflecting the ratio's importance for assessing the type of loan tested. The three

categories were “very important”, “important”, and “less important”. Amazingly, all ten subjects selected the following five ratios as being “very important”.

- Current Ratio
- Debt to Tangible Net Worth
- Funds Flow to the Prior Period Current Portion of Long-Term Debt
- Cash Flow Coverage to the Prior Period Current Portion of Long-Term Debt
- Gross Margin

Table 1 shows the actual list of financial ratios (in the order the software presents all the ratios) with the five “very important” ratios highlighted.

Table 1**Financial Ratio Representation Found on the Commercial Loan Aid Materials**

Cue Sequence	Financial Ratios
1	Working Capital
2	Quick Ratio
3	Current Ratio
4	Net Worth – Actual
5	Tangible Net Worth – Actual
6	Effective Tangible Net Worth – Actual
7	Debt/Worth
8	Debt/Tangible Net Worth
9	Debt Less Subordinated Debt
10	Adjusted Debt/Adjusted Total Net Worth
11	Total Liabilities/Total Assets
12	Interest Coverage
13	NOI/Interest Expense
14	Funds Flow Coverage
15	Funds Flow/Prior Period CPLTD
16	Cash Flow Coverage
17	Cash Flow/Prior Period CPLTD
18	Return on Assets
19	Return on Equity
20	Gross Margin
21	Operating Profit Margin
22	Net Profit Margin
23	Dividend Payout Ratio
24	Effective Tax Rate
25	Net Sales/Total Assets
26	Net Sales/Working Capital
27	Net Sales/Net Worth
28	Net Sales/Net Fixed Assets
29	Profit Before Tax/Total Assets
30	Z-Score
31	Total Assets Growth
32	Total Liabilities Growth
33	Net Worth Growth
34	Net Sales Growth
35	Operating Profit Growth
36	Net Profit Growth
Note: Darkened ratios were selected as “very important” by the ten most experienced subjects	

The remaining 206 subjects were divided up into four groups in a manner that assured an identical mix of experience based on the number of loans they had made in the past. Statistical tests were performed and it was confirmed that no significant differences existed between the four groups based on task-specific experience. Each of the four groups performed an identical task. They were to estimate the amount of loan risk for a retail establishment, operating for five years, where management integrity seemed satisfactory. Such a description did not provide a strong initial belief anchor about the firm. Therefore, any initial belief anchor had to be derived from only the financial ratios.

After reviewing one year's worth of financial data for the firm, they were to estimate the degree of loan risk, placing their estimate of loan risk on a discreet scale between "1" and "7", where "7" represented the highest risk. A very similar scale was used to nine of the ten banks from whom the subjects were drawn.

In reality, the ratios were from an actual firm that was in financial distress and was one year away from declaring bankruptcy. The loan risk should have been perceived as being relatively high. The only difference between the four groups was the order in which they were presented with the financial ratios.

- Group 1 – The financial ratios were presented in the identical order as appearing on the loan aid software from the commercial vendor who developed the software. The five "very important" ratios were scattered throughout the list in positions 3, 8, 15, 17, and 20. Hogarth and Einhorn's theory predicted that Group 1 would place less importance on the "very important" ratios appearing later in the sequence and should estimate the loan risk lower than it should be assessed.
- Group 2 – The financial ratios were reordered so the five "very important" ratios were the very last five cues in the sequence. These would then receive the least amount of attention by the commercial lenders. Group 2 should estimate the loan risk the lowest of the four groups.
- Group 3 – The financial ratios were reordered so that the five "very important" ratios were the first five cues in the sequence. These ratios should receive the most amount of attention. Group 3 should perceive the loan risk as the highest.
- Group 4 – Only the five "very important" financial ratios were shown in the sequence. This group's task did not involve a long series of cues and they should not experience the primacy effect. In fact, Hogarth and Einhorn's model predicts they would experience a recency effect due to a short series of cues. In a short series of cues, the later cues would weigh heavier on the final belief than the earlier cues. However, with only five cues that are consistent and confirming pieces of evidence, they should arrive at a correct conclusion that the loan risk is very high. Group 4 served as the benchmark for the experiment.

RESULTS

Comparisons using parametric and non-parametric tests indicated that the four groups performed exactly as predicted by the theory and all results were statistically significant with the alpha at less than the 0.01 level.

- Group 4 (who saw only the five “very important” ratios) estimated the loan risk at a mean of 6.47
- Group 3 (where the five “most important” were placed first in the list) also estimated loan risk high with a mean of 6.43; this was proof that Group 3 experienced a primacy effect
- Group 2 (where the five “very important” ratios were placed last in the list) estimated loan risk the lowest with a mean of 4.25
- Group 1 (where the five “very important” ratios were scattered throughout the list) estimated the loan risk between the other groups with a mean of 5.1

CONCLUSIONS

The primacy effect, as postulated by Hogarth and Einhorn’s “belief adjustment model” applies to the decision processes performed by commercial lenders. In addition, task-specific experience does not diminish the effects of the model. Decision biases are possible when bank loan officers perform financial statement analysis to estimate loan risk.

However, when the task is restructured so that only the few “very important” financial ratios relevant to the decision are reviewed, or when those same ratios are placed at the beginning of the list of cues, the primacy effect helps ensure that a more correct decision is made.

For practitioners in the lending industry and for commercial firms that develop loan aid materials, the findings are robust. The reader should recall that the sequence of cues used by Group 1 was identical to commercially available loan aid software. Also the reader should recall that Group 1 experienced a significant primacy effect, estimating loan risk lower than it should have. Both loan analysts and developers of loan aid software must be aware that when using a long list of financial ratios, the first few financial ratios will heavily influence judgments. Commercial software or standard analysis forms that are not ordered in the correct sequence could lead to biased results. Some financial ratios can appear good even though underlying factors indicate an unhealthy firm. If such ratios appear early in the cues, they can create a false positive anchor that will be reflected in the final loan risk estimate.

CITED REFERENCES

Hogarth, R.M. & Einhorn, H.J. (1992). Order Effects in Belief Updating: The Belief Adjustment Model. *Cognitive Psychology*, 24, 1-55.