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THE NUMBERS | By Jo Craven McGinty

To Find Fraud, Just Do the Math

When forensic accountants began sifting through refunds issued by a national call center, something didn't add up: There were too many fours in the data. And it was up to the accountants to figure out why.

Until recently, such a subtle anomaly might have slipped by unnoticed. But with employee fraud costing the country an estimated $300 billion a year, forensic accountants are increasingly wielding mathematical weapons to catch cheats.

"The future of forensic accounting lies in data analytics," said Timothy Hedley, a fraud expert at KPMG, the firm that did the call-center audit.

In the curious case of the call centers, several hundred operators across the country were authorized to issue refunds up to $50; anything larger required the permission of a supervisor. Each operator had processed more than 10,000 refunds over several years. With so much money going out the door, there was opportunity for theft, and KPMG decided to check the validity of the payments with a test called Benford's Law.

According to Benford's Law — named for a Depression-era physicist who calculated the expected frequency of digits in lists of numbers — more numbers start with one than any other digit, followed by those that begin with two, then three, and so on.

"The low digits are expected to occur far more frequently than the high digits," said Mark J. Nigrini, author of Benford's Law: Applications for Forensic Accounting, Auditing, and Fraud Detection and an accounting professor at West Virginia University. "It's counter-intuitive."

Most people expect digits to occur at about the same frequency. But according to Benford's Law, ones should account for 30% of leading digits, and each successive number should represent a progressively smaller proportion, with nines coming last, at under 5%.

In their call-center probe, Mr. Hedley and his colleagues stripped off the first digits of the refunds issued by each operator, calculated the frequencies and compared them with the expected distribution.

"For certain people answering the phones, the refunds did not follow Benford's Law," Mr. Hedley said. "In the 'four' category, there was a huge spike. It led us to think they were giving out lots of refunds just below the $50 threshold."

Bingo.

The accountants identified a handful of operators — fewer than a dozen — who had issued fraudulent refunds to themselves, friends and family totaling several hundred thousand dollars.

That's a lot of $40 refunds. But before running the Benford analysis, neither the company nor its auditors had evidence of a problem.

Getting the accounting profession to adopt Benford's Law and similar tests has been a slow process, but Mr. Nigrini has spent two decades inculcating Benford's Law, promoting it through articles, books and lectures.

"It has the potential to add some big-time value," said Kurt Schulzke, an accounting professor at Kennesaw State University in Georgia. "There has not been much innovation in the auditing profession in a long time, partly because they have ignored mathematics."

Now, the Association to Advance Collegiate Schools of Business emphasizes the importance of analytical capabilities. Off-the-shelf forensic-accounting software such as IDEA and ACL include Benford's Law tests. Even the Securities and Exchange Commission is reviewing how it can use such measures in its renewed efforts to police fraud.

Recently, at the invitation of the agency, Dan Amiram, an accounting professor at Columbia University, and his co-authors Zahn Bozanic of Ohio State University and Ethan Rouen, a doctoral student at Columbia, demonstrated their method for applying Benford's Law to publicly available data in companies' income statements, balance sheets and statements of cash flow. For example, a look at Enron's fraudulent accounting from 2000 showed a clear variation from Benford's Law.

Auditors, who are employed by companies to examine their accounts, are given free access to data that can reveal potential fraud. Investors and other individuals don't have that luxury. But, Mr. Amiram said, they all have the same goals: "To make capital markets more efficient and make sure bad guys are not cheating anyone."

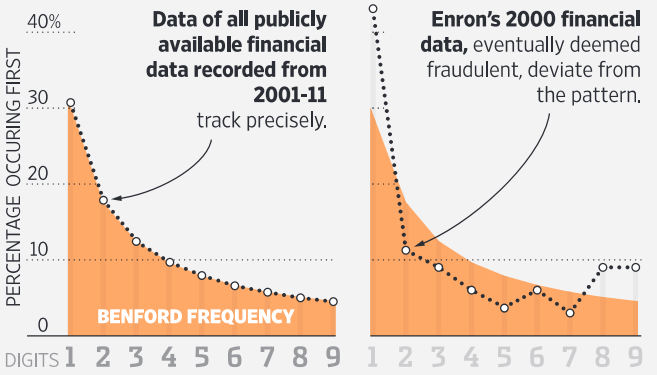
Benford's Law isn't a magic bullet. It isn't appropriate for all data sets. And it simply identifies anomalies in data, which must be explained with further investigation. In many cases, there are reasonable explanations for incongruities.

And with so much attention now paid to Benford's Law, it might occur to some hucksters to try to evade detection while still cheating. But Mr. Nigrini said it isn't that simple.

"While you are doing your scheme, you don't know what the data look like," he said. "It's a little tricky to beat Benford's."

Who's No. 1?

Benford's Law expects 30.1% of numbers in a list of financial transactions to begin with '1.' Each successive digit should represent a progressively smaller proportion. Below, orange indicates the expected Benford frequencies. When digits stray from the pattern, fraud may be to blame.



Source: Dan Amiram, Columbia University

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