Trouble with the Curve: How Standard Deviation Can Lead Preference Analyses Astray

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When asserting or defending preference payments,[1] experts may use standard deviations to define the ordinary course of business (OCB).[2] However, this approach is likely flawed if the expert is describing OCB using days-to-pay (DTP).[3]

First and foremost, there can be confusion regarding how to properly calculate DTP. Fortunately, the U.S. Supreme Court has already weighed in on this issue. In *Barnhill v. Johnson*,[4] the Court determined that the proper determination of a payment's aging relative to the invoice date was to measure from the invoice date to the date on which the check was honored by the transferor's bank — otherwise known as the "clearing date." Thus, the only appropriate calculation of the transferor's time to pay an invoice is to measure the days between invoice date and the date on which the check was cleared by the bank. This data can then be represented in a table, showing the aging for each payment and invoice. As is no surprise to experienced practitioners, it is this data that becomes the foundation of all preference analyses, many of which stubbornly continue to rely on a statistical analysis employing standard deviation.

While standard deviations are commonly used to describe data, their use may not be applicable when analyzing DTP data because of certain characteristics inherent to that very data. The incorrect use of standard deviations can result in incorrect assumptions about OCB, whether payments are preferential, and can skew calculations of preference claims. Further, savvy experts can easily expose inaccurate determinations of OCB, weakening the opposing party's negotiating position. This article addresses why conventional measurements of OCB can be flawed and discusses alternative approaches, which provides for more accurate analysis and can save constituents to preference claims both time and money.

Key Takeaways

#1: Standard Deviations Can Only Be Used If Data Is Normally Distributed

Using standard deviations to analyze data is only meaningful when data is *normally distributed*. Specifically, data is normally distributed when it is (1) evenly distributed around the data's arithmetic average (mean) and (2) distributed with decreasing frequency the further it is from its arithmetic average. In simpler terms, when the data is charted, its pattern will resemble a "bell" (*i.e.*, the "bell curve").

Chart 1 shows a bell curve distribution of attendee ages from a notional ABI event. The average age of attendees is 56 years with a standard deviation of ±10 years. In other words, a standard measure of distance from the average age would span a range that is 10 years less than the average age through an age that is 10 years more than the average age. Referencing Chart 1, the average age is at the center of the distribution while ±1 standard deviation covers an age range from 46-66 years.

#2: Standard Deviations Cover Standard Proportions of Data

As its name implies, standard deviations are standard. In fact, if an analysis correctly uses ±1 standard deviation, you can assume that — because math is always math — the data falling within ±1 standard deviation range includes exactly 68.2 percent of the data.[5] In other words, in Chart 1, the range of 46-66 years (*i.e.*, ±1 standard deviation) should contain *exactly* 68.2 percent of data points. In addition, the ±1 standard deviation provides exactly 68 observations in Chart 1. If a review of an analysis ever shows that very close to 68 percent of data is *not covered* by a range within ±1 standard deviation, the analysis might be flawed, possibly because the data is not normally distributed and therefore, should not be analyzed using standard deviation.

Now consider how standard deviations can impact the analysis of preference claims. Under the subjective test, an expert selects a pre-preference-period and the criteria that will defined an OCB range. Experts may use standard deviations to define the OCB range. This may seem like a reasonable approach; however, invoice payments are not always normally distributed and may be less so as a company nears bankruptcy.

#3: Invoice Payment Data Is Not Likely to Be Normally Distributed

To understand why invoice payments are not likely to be normally distributed, consider that companies tend to pay invoices according to negotiated terms (*e.g.*, net 30 days) while avoiding making payments too early. The result is that payments are highly clustered around target payment dates. There will inevitably be some invoices that are missed and only paid when a supplier realizes that the payment is late. These suppliers may only contact their customer a week after a due date is missed, or possibly longer. If there are complications related to the payment (*e.g.*, a purchase order or bill of lading is missing), payments may not actually occur for 14-21 days after the due date. Let's call these late payments "outliers." Most outliers are likely to be positive values (*i.e.*, payments made late relative to due dates); it is unlikely that a distressed company will make payments 14-21 days before a due date. This pattern of payments made mostly around a due date with outliers mostly to the right (*i.e.*, payments made past due dates) describes a customer that sometimes *stretches* payments to its vendor, even it does so unintentionally. This stretching might be more pronounced for a debtor approaching bankruptcy, particularly as liquidity constraints challenge the debtor's ability to pay trade obligations as they become due.

This payment pattern — clustered around specific dates with most outliers occurring only toward one end of the distribution — stretches or *skews* the distribution of data, as illustrated in Chart 2. If the payment data used to define OCB is skewed, standard deviations will not provide meaningful determinations of OCB.

A visual observation suggests that the data represented in Chart 2 is not normally distributed (*i.e.*, is not bell shaped).[6] For the skeptic, use ±1 standard deviation to define OCB. The data shows that the average days taken to pay invoices is 30.8 days with ±1 standard deviation of 21.6 days. Applying the same logic as before, the OCB range is defined as between 9.2-52.4 days. These results may appear reasonable; however, note that Chart 2 is not bell shaped. With consideration of Key Takeaways #1 and #3, perhaps something is amiss. In fact, some basic analysis provides two reasons for concern.

First, the average DTP should provide a value reasonably expected to occur most often (*e.g.*, if invoices are randomly drawn from a box).[7] The average DTP is 30.8 days. However, Chart 2 clearly shows that most invoices are clustered in and about the age category of 11-17 days — defying expectation.

Second, after counting the invoices that fall within the defined OCB range, the OCB range defined by ±1 standard deviation represents 83 percent of all invoices. This is important because the range within ±1 standard deviations should only describe 68 percent of the data (*see* Key Takeaway #2). In Chart 2, the OCB range contains 22 percent *more* data points than expected. What gives?

Since the reviewed data is not normally distributed, a standard deviation does not properly describe the data (*i.e.*, define the OCB range) and prevents drawing meaningful conclusions. In fact, in the above example, the defined OCB range *inflates* the number of invoices considered to be within the OCB range by 22 percent and potentially *widens* the OCB period. A distorted OCB period can lead to distorted conclusions related to whether preference period invoices were made within the OCB window. Fortunately, there is a better approach for defining OCB.

#4: Standard Deviations Measure Standard Percentages of Data;[8] If an Analysis Does Not Provide These Results, It Might Be Incorrect

What options are available to define OCB if you suspect that a standard deviation is not appropriate? Simpler approaches are available and court tested. For example, in *Jacobs v. Gramercy Jewelry Mfg. Corp. (In re Fabrikant & Sons Inc.)*, the defendant and plaintiff were in a dispute over how to characterize OCB. At the trial, the plaintiff conceded that a range of 30 days within the pre-preference period average should be tolerated as OCB, which the court ultimately used in its final decision.

While defining OCB as a 60-day window is simpler than using a standard deviation, it might not be objective. As mentioned earlier, the average is also not appropriate if the data is not normally distributed. Further, the 60-day window approach gives no consideration to the frequency of (how ordinary) payments were within the analyzed range. From the data represented in Chart 2, the OCB range would extend from 0.8 days to 60.8 days (±30 days from the 30.8-day average). In Chart 2, this approach biases payments made faster than 30.8 days, which represents two-thirds of invoices in this OCB range. Bias should be avoided in any analysis — intentional or not.

#5: Avoid Analysis That Can Be Construed as Biased

Now consider another approach (the "alterative approach") for defining the OCB that follows the spirit of a ±30 day with a bit more objectivity. First, consider the goal of defining an OCB range. This establishes a range of what is "normal" with respect to payment practices between a vendor and customer during the pre-preference period. If a party seeks to define OCB as the middle 68 percent of payments, then let this definition guide the analysis. The catch here is to objectively determine where along the distribution the OCB range should lie.

Centering the OCB range in the middle of the data distribution is reasonable. Unfortunately, as illustrated in Chart 2, the average is not useful in describing the center of a skewed distribution. However, the *mode* is a perfect tool describing the most frequently observed data point. For the considered DTP set, the mode is 17.0 (*i.e.*, this DTP appears with the highest frequency). Both visually in Chart 2 and statistically, the mode of 17.0 days is a more appropriate description of the data's mid-point (again, describing the expected payment age for invoices randomly drawn from a box).

To calculate the OCB, sequence all invoices by DTP (*i.e.*, lowest to highest). Identify the mid-point of invoices that have a DTP of 17.0 days. Next, take the 34.1 percent of the data points both sequentially above and below this mid-point. In the example data, this approach provides a DTP range from 1-37 days (*see* the table). The OCB period (shaded gray in the table) now covers 68.2 percent of the observations and objectively centers the OCB range around the data's most heavily populated DTP buckets (*i.e.*, around the mode).

Plotting the findings on Chart 3, the resulting range of 68 percent of observations that lie *equally* above and below the mode value is quite different than the result calculated using a standard deviation. Also note that the new OCB period differs significantly from the original period calculated from ±1 standard deviation. The new range is expanded to include payments made between 1-10 days, but excludes payments ranging from 37-52 days. Under the correct analytical approach, the OCB range has been reduced by five days (+10 days on the left side of the distribution less 15 days on the right side). This highlights how inapplicable and deceptive the use of standard deviation can be when applied to a data set that is not normally distributed. An inapt approach using standard deviation might broaden the OCB period beyond reason, purporting to provide more defenses.

Does the alternative approach hold up? One financial advisory firm has successfully employed this approach in numerous high-profile cases, all of which have been settled before going to trial. One explanation for this success is that opposing parties were often unable to explain unusual, contradictory results when defining OCB with standard deviation.[9] While there are no known court citations on this subject, there are large amounts of statistical research that support when standard deviations can be appropriately used to provide meaningful feedback.[10]

The determination of whether payments are avoidable preferences is complex, and the wrong approach can potentially have major financial implications for a preference case. Whether you are representing the defendant or plaintiff in a preference case, either as counsel or as a financial expert, care must be taken to vet all aspects of analysis. Preferred convention is just that: a preference that may inadvertently lead to unnecessary and avoidable bad results.

Footnotes

1 This assumes defenses of preference payments according to title 11 of the U.S. Code, as amended by the Bankruptcy Abuse Protection and Consumer Protection Act of 2005, the preference defenses under 11 U.S.C. § 547(c)(2) and (c)(4).

2 Unless otherwise mentioned, OCB refers to the definition of "under the first prong of defense" (*a.k.a.*

the subjective test, which measures OCB against the debtor's historical payments (pre-preference period) with the defending party).

[3] DTP is a convention that measures the average amount of days that a customer takes to pay its invoices. It is a common criteria used when a debtor's payment of invoices to a supplier are asserted to be in violation of 11 U.S.C. § 547.

[4] 125 S. Ct. 1386 (1992).

[5] Rounding to the nearest tenth, ±1 standard deviation will describe 68.2 percent of data, ±2 standard deviations 95.5 percent of data, and ±3 standard deviations 99.7 percent of data in a normal distribution.

[6] While this article relies on charts to illustrate concepts, empirical methods exist to test whether data is normally distributed and whether a standard deviation is a statistically significant descriptor.

[7] The expected value is a probability driven expectation of results. Since normally distributed data is symmetrical and its arithmetic average is in the center and most heavily populated part of the distribution, the arithmetic average of normally distributed data equal the expected value for that data.

[8] *See* fn.5 for the percentages of data described by ±1, ±2, and ±3 standard deviations.

[9] In one case, an expert asserted the OCB period should be covered by ±2 standard deviations. When the author's conducted its follow-up analysis, it found that this description of OCB covered a deeply negative lower boundary of DTP suggesting that the debtor paid many of its invoices early as a matter of ordinary course. In fact, very few invoices were ever paid early.

[10] For specific examples, research the "central limit theorem" in any statistical book.

Chart 1: Age Distribution of Conference Attendees

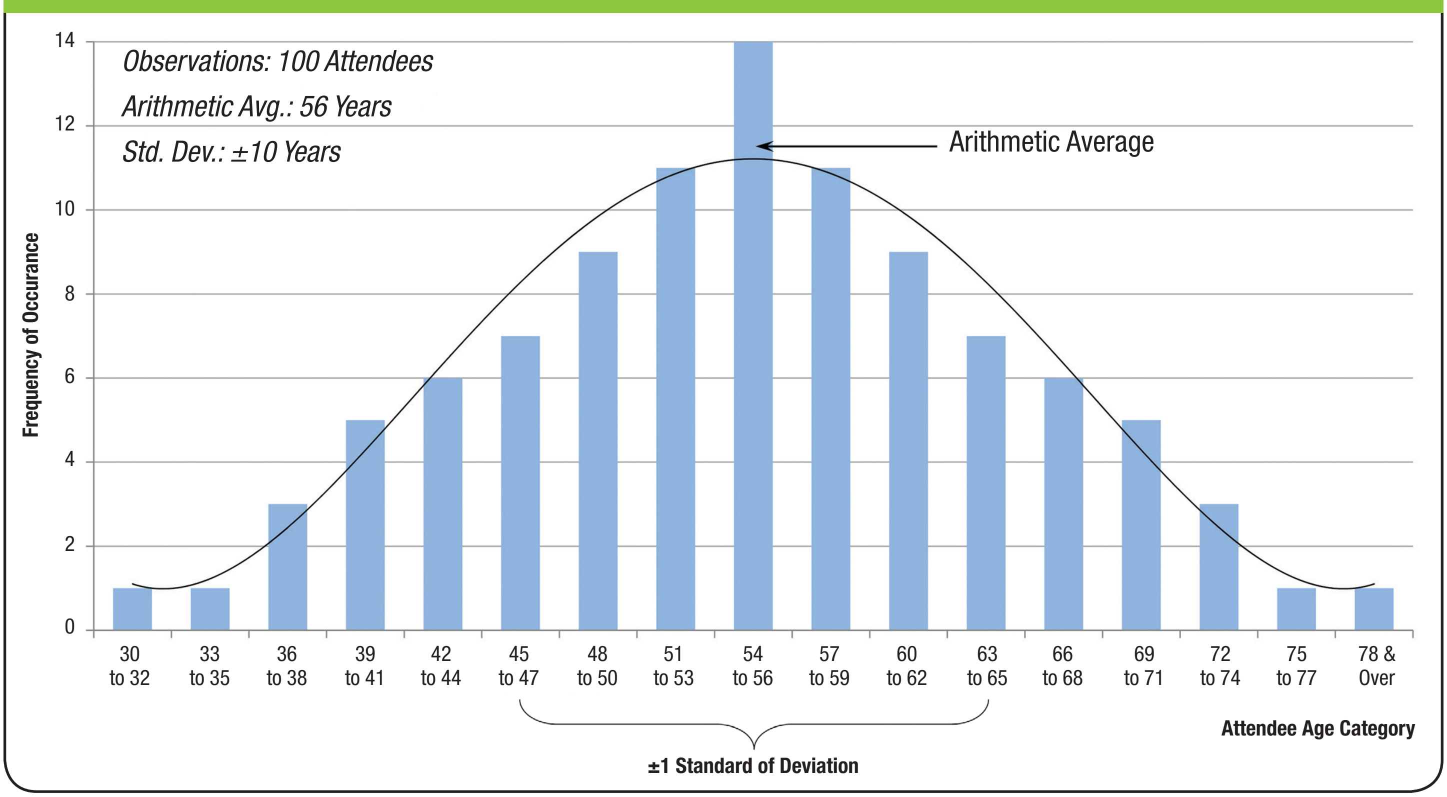
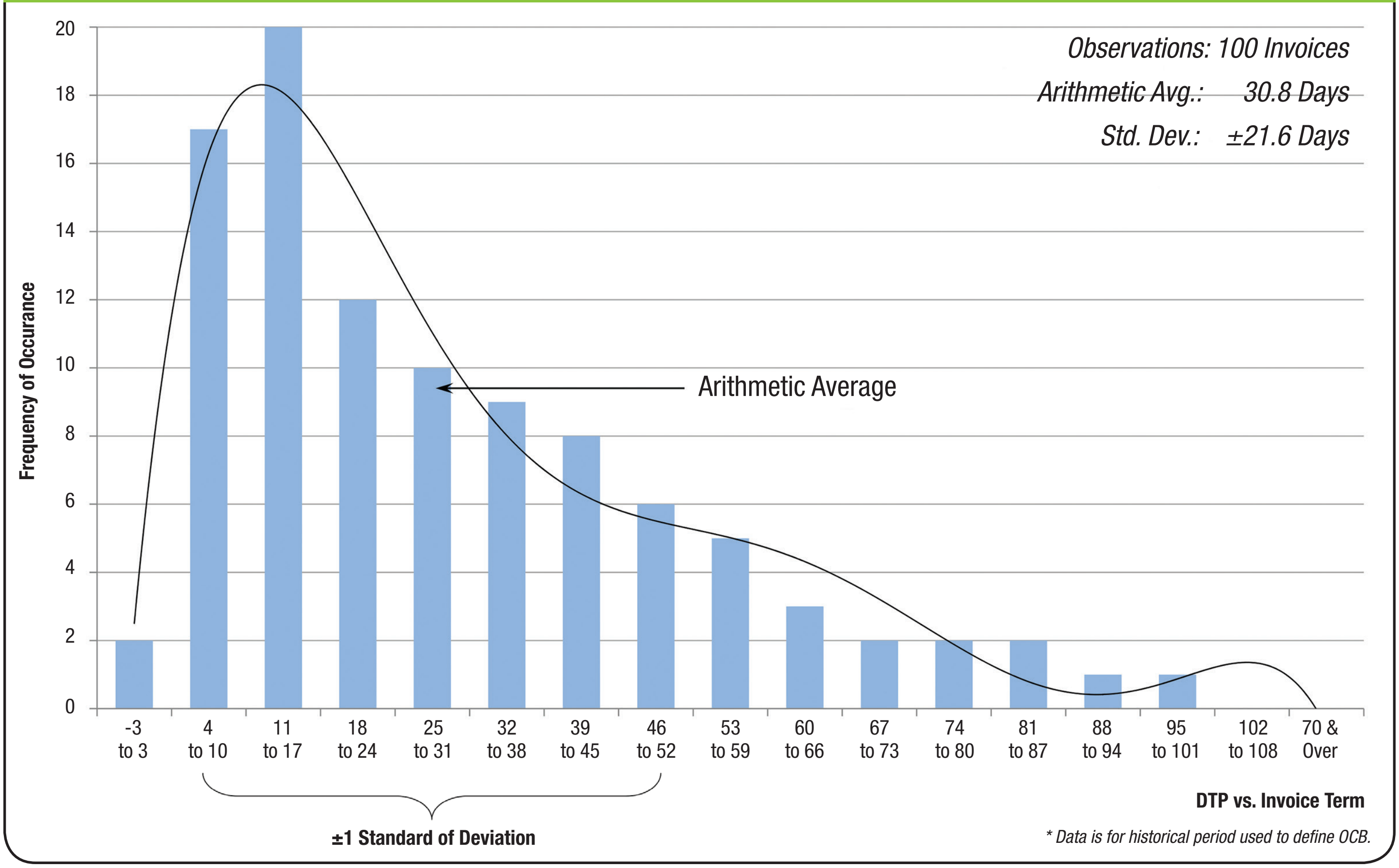


Chart 2: Invoice Payments (DTP *Less* Negotiated Term)*



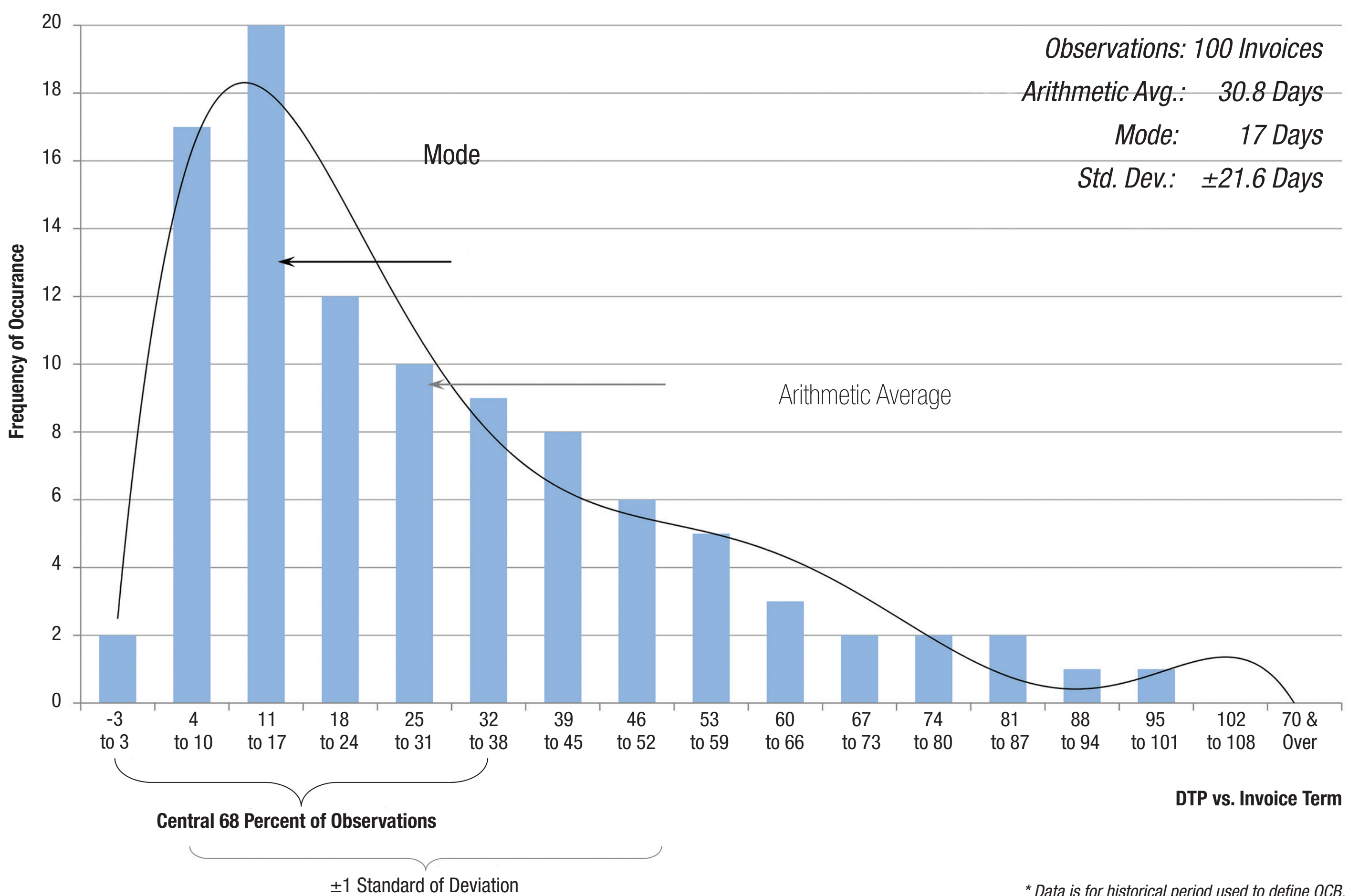
** Data is for historical period used to define OCB.*

Sequenced DTP Data

#	DTP Less Negotiated DTP	Cumulative % of Data
1	1	1.0%
2	1	2.0%
3	5	3.0%
4	7	4.0%
5	8	5.0%
6	8	6.0%
7	9	7.0%
8	9	8.0%
9	9	9.0%
10	9	10.0%
59	29	59.0%
60	29	60.0%
61	29	61.0%
62	36	62.0%
63	36	63.0%
64	36	64.0%
65	36	65.0%
66	36	66.0%
67	37	67.0%
68	37	68.0%
69	38	69.0%
70	38	70.0%
71	39	71.0%
100	101	100.0%

68% of data defining OCB; centered around the mode value

Chart 3: Invoice Payments (Actual DTP *Less* Negotiated Term)*



* Data is for historical period used to define OCB.