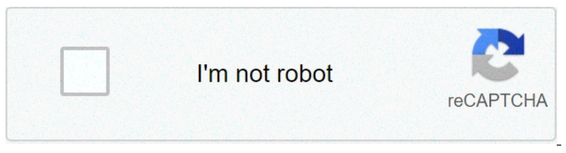

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Dispersion around the mean

Which of the following is a measure of the dispersion of returns around the mean. Measure of dispersion around the mean. Mean measures the dispersion around the expected value. Narrow dispersion around the mean. Which of the following measures the dispersion around mean sta301. The degree of dispersion of scores around the mean is known as the. Which stock has greater dispersion around the mean.

Variability, Dispersion and Central Trend Quantitative data can be described by measures of central trend, dispersion and “shape”. The central trend is described by median, mode and means (there are several means â geometric and arithmetic). Dispersion is the degree of distribution of data around this central trend and is represented by range, deviation, variance, standard deviation and standard error. This chapter responds to the parts of Section A (e) Ã¨ of the Primary ProgramÃ¨, “Describing Frequency Distributions and Measures of Trend and Central Dispersion”.Ã¨ Ã¨ This topic was examined in Question 23Ã¨ of the first article of 2015. The acceptance rate was 8%. The only candidate who passed “gave an example of a simple data set (a set of numbers) and calculated the mean, median and mode and explained the effect of an outlier.” Ã¨ Quantitative data can be described by measures of central trend, dispersion and Ã”shape.Â” This type of data is: Numerically expressed and ordered on a scale Data Intervals:Ã¨ Increase at constant intervals, but do not start from zero, e.g. temperature on the Celsius scale Data Ratio:Ã¨ data ranges that have a true zero, e.g. Pressure Binary data: yes or no answers Discrete data:Ã¨ isolated data points separated by gaps Continuous data:Ã¨ part of a continuous range Measurement of central trend This is the average of a population â that allows the population to be represented by a single value. Examples: Median is the average number in a dataset that is ordered from minimum to maximum Mode is the number that occurs most often in a dataset Arithmetic mean is the mean of a set of numerical values, Geometric mean is the mean of a set of numerical values, Geometric mean is the umpteenth row Product list gives no numbers Degree of dispersion These describe the dispersion of data around a sort of mean. Interquartile: is the highest score and the lowest Interquartile: is the difference between 75Â° and 25Â° percentile Percentile: is the percentage range in which the score falls (mean = 50Â° percentile) Deviation: the distance between an observed score and the average score. Since the difference can be positive or negative and this is cumbersome, we usually use the absolute deviation (which ignores the plus or minus sign). Variance: square deviation Standard deviation: square root of variance Measuring the mean dispersion of individual samples from the mean Returning the SD together with the mean gives an impression of how valid the mean value really is (i.e. if the SD is large, the mean is not at all valid â is not an accurate measurement of the trend central, because the data are so dispersive). Standard Error This is an estimate of the distribution of samples around the population mean. The population mean is not known â only the sample mean and the sample standard deviation are known, but if the standard deviation is large, the sample mean may be quite far from the population mean. How far is it? The SE can make an estimate. The mean absolute deviation is the mean of the absolute deviations from a central point for all data. As such, it is a synthesis of the net statistical variability in the dataset. On average, it is said, the data isÃ¨ thisÃ¨¨ different from this central point. The coefficient of variation, also known as “relative standard deviation”, is the SD divided by the mean. Being a dimensionless number, it allows comparisons between different data sets (i.e. those using different units). Standard Error (SE) = SD / square root diÃ¨ n The variability between the sample means will increase if a) there is a large variability in the individual data and b) small SE samples are used to calculate the confidence interval. Data form Vaguely refers to the shape of the bell curve of probability. Deviation is a measure of probability distribution asymmetry – the tendency of the bell curve to be asymmetric. Kurtosis or “peak” describes the amplitude and height of the peak of the bell curve, namely the trend for theto gather around the center of the curve of the bell. A normal distribution is a perfectly symmetrical bell curve, and is not distorted. Point estimate According to college, point estimate is "a unique value estimate of a population parameter. It represents a descriptive statistics of a sum measure, or a central trend measure of a given population sample". For example, in a population there is a "real" average height; the precise estimate of this average height is the average height of a sample group taken by that population. Confidence interval Â The range of values within which the result is “effective.” A 95% IC means that if a study is repeated an infinite number of times, 95% of the results would fall into this range of values. The IC gives an indication of the accuracy of the sample average as the estimate of the “truth” average of the population A large IC can be caused by small samples or by a large variance within a sample. How normal are your data? I mean, does your sample look good for the population? Do your data have a regular pattern? Are your data accurate or vague? In statistics, we answer these questions using central trend measures and dispersion measures. There are three great measures that help determine whether the data is normal and accurate. Let's explore them. Range The range of your data provides you with a good view of all covered sizes. Unlike the median, which indicates the average value, the range gives you an idea of the size of your measurements. The range is very simple to calculate. It is simply the largest measure minus the lowest measure. See the numerical distance covered by data. When compared to average, median and mode, the range also allows you to identify abnormal values. Outliers are very high or low values and far from the average, which is the general model of data. Interquartial Range The interquatile range offers a large image of data. Now, as the name suggests, the data is divided into four sections: Q1, Q2, Q3 and Q4. Q1 represents the lowest value range to the median value of the first half of the data. Q2 is the range from the median of the first half of the data to the median of the entire dataset. Q3 is the range from the data set median to the median value of the second half of the data set. Q4 is the range from the median of the second half of the data set to the maximum value. The interquartile range is Q3 “Q2. The size of the interquartile intervals allows you to understand the variability of the data set. Ideally, they would all be equal or almost equal. If they vary a lot, then your data may be distorted. As a measure of dispersion, the range provides a lot of data information. Standard deviation Perhaps one of the most widely used dispersion measures is the standard deviation. Standard deviation is a great way to have a sense of data variability. This is a measure of the proportions of the data set. It is represented by s for a sample, or for a population. In a very simple sense, the standard deviation gives the sense of how the actual values of the data set vary from the average. A high standard deviation means that the data set varies a lot, but a low standard deviation means that the data does not vary much. The less the standard deviation, the better. The average square deviation of a sample is calculated by Since you can never really know the average square deviation of a population, you can only estimate it. Change The variance is similar to the standard deviation. In fact, you can easily calculate one from the other. Essentially, variance is a more precise measure of data accuracy. It is represented by s2 for a sample and by ÏTM for a population. ♪knows the standard deviation of the data, then the variance is easily calculated as the square of the standard deviation, both for the sample and for the population. If you don’t know the standard deviation, then the formal formal Variance is a very accurate measure of data distribution. For example, let’s say we have a set of twelve measures that are all the same. In this case, the variance would be zero since the values are all very close to each other (actually the same). But if you have a data set like A = {1,1,2,3,5,6,8,9,11,12} then the variance is 14.75. This means the data is very common, especially because it is higher than the higher value. In general, you want a variance close to zero. This means that the data is very accurate. Takeaway When it comes to dispersion measurements, there are three concepts that give you an idea of how dispersed your data is. The range provides an overview of the dissemination of data. The mean square deviation gives an idea of how close the data are compared to the mean. Variance is the most accurate measure of data dispersion. I hope this post has helped to clarify the dispersion measurements. I can’t wait to see what kind of questions you have below. Good stats! A measure of variability is a synthetic statistic that represents the amount of dispersion in a data set. How are the values distributed? While a central trend measure describes the typical value, variability measures define the distance that data points tend to fall from the center. We are talking about variability in the context of a distribution of values. Low dispersion indicates that data points tend to be clustered tightly around the center. High dispersion means that they tend to distract further. In statistics, variability, dispersion and diffusion are synonyms indicating the breadth of the distribution. Just as there are multiple measures of central trend, there are several measures of variability. In this blog post, you will learn why understanding the variability of your data is critical. Then, I explore the most common measures of variability: range, interquartile range, variance, and standard deviation. It will help you determine which one is best for your data. The two graphs below graphically show the difference for distributions with the same mean but with greater and lesser dispersion. The left panel shows a distribution that is tightly grouped around the mean, while the distribution in the right panel is more widespread. Related post: Measures of Central Trend: Mean, Median, and Mode Why Understanding Variability Is Important Let’s take a step back and see first why understanding variability is so essential. Analysts often use the average to summarize the center of a population or process. While the mean is relevant, people often react even more to variability. When a distribution has less variability, the values in a dataset are more consistent. However, when the variability is greater, the data points are more dissimilar and extreme values become more likely. As a result, understanding variability helps to understand the probability of unusual events. In some situations, extreme values can cause problems! Have you seen a weather report where the meteorologist shows extreme temperatures and droughts in one area and floods in another? It would be nice to average those together! Often, we experience extreme discomfort more than average. Understand that the variability around the mean provides critical information. Variability is everywhere. Your commuting time to work varies a little every day. When you repeatedly order a favorite dish at a restaurant, it is not always the same. Parts coming out of an assembly line may look the same, but have slightly different lengths and widths. These are all examples of real variability. Some degree of variability is unavoidable. However, excessive inconsistency can cause problems. If the Morning commuting takes much longer than the average commuting time, you will be late for work. If the restaurant dish is very different from what it is usually, you may not like it at all. And, if a part is too exhausted, it did not win the function as expected. Some variation is inevitable, but problems occur at extremes. Distributions with greater variability produce observations with unusually large and small values more frequently than distributions with less variability. Variability can also help you assess the heterogeneity of the sample. Example of different quantities of variability Take a look at two hypothetical pizza restaurants. Both advertise an average delivery time of 20 minutes. When we're hungry, they both look equally good! However, this equivalence can be deceptive! To determine the restaurant you should order since you've starved, we need to analyze their variability. Suppose we studied their delivery times, calculate variability for each place and determine that their variability is different. We calculated the standard deviations for both restaurants - which is a measure we will return later in this post. How significant is this difference to get pizza to their customers promptly? The graphs below show delivery time distribution and provide the answer. The restaurant with more variable delivery times has the widest distribution curve. I used the same scales in both charts so I can visually compare the two distributions. In these graphs we consider a 30-minute wait or more to be unacceptable. We didn't starve after all! The shaded area in each chart represents the proportion of delivery times that exceed 30 minutes. Almost 16% of deliveries to the high variability restaurant exceeds 30 minutes. On the other hand, only 2% of the deliveries takes too much time with the restaurant with low variability. Both have an average delivery time of 20 minutes, but I know where I can put my order when I'm hungry! As this example shows, the central trend does not provide complete information. We also need to understand variability around the center of distribution to get the full image. Now, move to "the different ways of measuring variability! Interval Let's start with the range because it is the simplest measure of variability to calculate and the simplest to understand. The range of a dataset is the difference between the larger and smaller values in that dataset. For example, in the two data sets below, the dataset 1 has a range of 20 â€ "38 = 18 while the dataset 2 has a range of 11 â€" 52 = 41. Dataset 2 has a wider range and, therefore, more variability of DataSet 1. While the range is easy to understand, it is based on only the two most extreme values in the data set, which makes it very susceptible to abnormal values. If one of these numbers is unusually high or low, it affects the entire range even if it is atypical. In addition, the dataset size affects the range. In general, it is less likely that you observe extreme values. However, while you increase the sample size, you have more opportunity to get these extreme values. As a result, when drawing random samples from the same population, the range tends to increase while increasing the sample size. Therefore, use the range to compare variability only when the sample size is similar. For more details, read my post, the range in statistics. The Interquartile range (IQR). . and other percentages The Interquartile range is the central half of the data. To view it, think about the median value that divides the data set in half. Similarly, you can split data into quarters. Statistics refer to these quarters as quarters and indicate them from high bass such as Q1, Q2 and Q3. The lowest quarter (Q1) contains the quarter of the data set with smaller values. The upper quarter (Q4)the quarter of the data set with the highest values. The Interquartile range is the central half of the data between the upper and lower quartiles. In other words, the Interquartile range includes 50% of the data points drop between Q1 and Q3. The IQR is the red area in the graph below. The interquartile range is a robust measure of variability similarly that the median is a robust measure of the central trend. No measurement is dramatically affected by outliers because they do not depend on any value. In addition, the interquartile range is excellent for engraved distributions, just like the median. As you’ll learn, when you have a normal distribution, the standard deviation tells you the percentage of observations that fall specific distances from the mean. However, this doesn’t work for skewed distributions, and the IQR is a great alternative. I’ve divided the data below into quartiles. The interquartile range (IQR) extends from the low Q2 level to the upper limit of Q3. For this data set, the range is 21 â 39. Related post: Interquartile Range: Definition and uses and what are robust stats? Using Other Percentage When you have a skewed distribution, I find that reporting the median with the interquartile range is a particularly good combination. The interquartile range is equivalent to the region between 75 and 25 percent (75 â 25 = 50% of the data). You can also use other percentiles to determine the spread of different proportions. For example, the range between the 97.5th percentile and the 2.5th percentile covers 95% of the data. The wider this range, the higher the variability in your dataset. Related Place: Percents: Interpretations and Calculations Variance is the mean square difference of values from the mean. Unlike previous measures of variability, the variation includes all values in the calculation by comparing each value to the mean. To calculate this statistic, we calculate a set of square differences between the data points and the medium, add them, and then divide by the number of observations. So, it’s the mean square difference. There are two formulas for variance depending on whether you are calculating variance for a whole population or using a sample to estimate the variance of the population. The equations are below, and then I work through an example in a table to help bring it to life. Population Change The formula for the variance of a whole population is as follows: In the equation, Ï2 is the population parameter for variance, Ï1⁄4 is the population mean parameter, and N is the number of data points, which should include the whole population. Sample Variation To use a sample to estimate variance for a population, use the following formula. Using the above equation with sample data tends to underestimate the variability. Since it is usually impossible to measure an entire population, statisticians use the equation for sample variations much more frequently. In the equation, s2 is the variance of the sample, and M is the mean of the sample. N-1 in the denominator corrects a sample’s tendency to underestimate population variance. Sample Calculation of Sample Variance will work through an example using the formula for a sample on a data set with 17 observations in the table below. The numbers in brackets represent the corresponding number in the table column. The procedure involves taking each observation (1), subtracting the half sample (2) to calculate the difference (3), and crushing that difference (4). Then, I add up the square differences at the bottom of the table. Finally, I take the sum and divide by 16 because I’m using the sample variation equation with 17 observations (17 â 1 = 16). The variance of this dataset is 201. Since the calculations use square differences, the variation is in square units rather than in the original units of the data. While higher values of variance indicate greater variability, there is no intuitive interpretation for specific values. This limitation, various statistical tests use variance in their calculations. For example, read my post on the and ANOVA. Although it is difficult to interpret the variance itself, the standard deviation solves the problem! Standard Deviation Standard deviation is the standard or typical difference between each data point and the mean. When the values of a dataset are grouped more closely, you have a smaller standard deviation. On the other hand, when the values are more common, the standard deviation is greater because the standard distance is greater. Conveniently, the standard deviation uses the original units of the data, making interpretation easier. As a result, the mean square deviation is the most widely used measure of variability. For example, in the pizza delivery example, a standard deviation of 5 indicates that the delivery time is about 5 minutes from the mean. It is often reported together with the average: 20 minutes (n.d. 5). The standard deviation is just the square root of the variance. Remember that the variance is in units squared. So, the square root returns the value to the natural units. The standard deviation symbol as a population parameter is ÃÂ while s represents it as a sample estimate. To calculate the standard deviation, calculate the variance as shown above, and then take the square root of it. There she is! You have the standard deviation! In the variance section, we calculated a variance of 201 in the table. Therefore, the standard deviation for that dataset is 14.177. The standard deviation is similar to the mean absolute deviation. Both use the original units of the data and compare the values of the data to assess variability. However, there are differences. To learn more, read my post on Average Absolute Deviation (MAD). People often confuse the standard deviation with the standard error of the mean. Both measures assess variability, but have very different purposes. To learn more, read my post The Standard Error of the Medium. Related post: Using Standard Deviation The rule of thumb for the standard deviation of a normal distribution When data is distributed normally, or roughly so, the standard deviation becomes particularly important. You can use it to determine the proportion of values that fall within a certain number of standard deviations from the mean. For example, in a normal distribution, 68% of the values will fall within +/- 1 standard deviation from the mean. This property is part of the rule of thumb. This rule describes the percentage of data falling within a specific number of standard deviations from the mean of the bell curves. Average +/- standard deviations Percentage of data content 1 68% 2 95% 3 99.7% Let’s take another look at the pizza delivery example where we have an average delivery time of 20 minutes and a standard deviation of 5 minutes. Using the rule of thumb, we can use the mean and standard deviation to determine that 68% of the delivery times will fall between 15-25 minutes (20 +/- 5) and 95% will fall between 10-30 minutes (20 +/- 2*5). Related post: The Normal Distribution What is the best range, interquartile range or standard deviation? First of all, you’ll probably notice that I didn’t include variance as one of the options in the previous header. That’s because the variance is in square units and doesn’t provide an intuitive interpretation. So, I crossed him off the list. Let’s go over the other three measures of variability. When comparing samples of the same size, consider the use of range as a measure of variability. It’s a reasonably intuitive statistic. Just know that a single outlier can alter the flow rate. The range is particularly suitable for small samples when you don’t have enough data to calculate other measurements reliably, and the probability of getting an abnormal value is also lower. you have a distorted distribution, the median is a better measure of the central trend, and it makes sense to pair it with the interquartile interquartile range Other percentile-based intervals because all these statistics divide data set into groups with specific proportions. For normally distributed data, or even the data that are not terribly distorted, using the proven and the real combination that report the average and the standard deviation is the way to go. This combination is by far the most common. You can still integrate this approach with base percentage intervals as you need. With the exception of variations, the statistics in this post are absolute variability measures because they use the measurement units of the original variable. Read my post on the variation coefficient to learn about a relative variability measure that can be advantageous in some circumstances. Analysts frequently use variability measures to describe their data sets. Find out how to analyze descriptive statistics in Excel. If you are knowing the statistics and as the approach I use in my blog, take a look at my introduction to the publisher statistics! Ebook!

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