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| **Project Title** Measures‬ |

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| **Abstract**  Dispersion is a statistical term that describes the size of the distribution of values expected for a particular variable. Dispersion can be measured by several different statistics, such as range, variance, and standard deviation. In finance and investing, dispersion usually refers to the range of possible returns on an investment, but it can also be used to measure the risk inherent in a particular security or investment portfolio. It is often interpreted as a measure of the degree of uncertainty, and thus, risk, associated with a particular security or investment portfolio. |

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| **Introduction**  A measure of statistical dispersion is a nonnegative [real number](https://en.wikipedia.org/wiki/Real_number) that is zero if all the data are the same and increases as the data become more diverse.  Most measures of dispersion have the same [units](https://en.wikipedia.org/wiki/Units_of_measurement) as the [quantity](https://en.wikipedia.org/wiki/Quantity) being measured. In other words, if the measurements are in metres or seconds, so is the measure of dispersion. Examples of dispersion measures include:   * [Standard deviation](https://en.wikipedia.org/wiki/Standard_deviation) * [Interquartile range](https://en.wikipedia.org/wiki/Interquartile_range) (IQR) * [Range](https://en.wikipedia.org/wiki/Range_(statistics)) * [Mean absolute difference](https://en.wikipedia.org/wiki/Mean_absolute_difference) (also known as Gini mean absolute difference) * [Median absolute deviation](https://en.wikipedia.org/wiki/Median_absolute_deviation) (MAD) * [Average absolute deviation](https://en.wikipedia.org/wiki/Average_absolute_deviation) (or simply called average deviation) * [Distance standard deviation](https://en.wikipedia.org/wiki/Distance_standard_deviation)   These are frequently used (together with [scale factors](https://en.wikipedia.org/wiki/Scale_factor)) as [estimators](https://en.wikipedia.org/wiki/Estimator) of [scale parameters](https://en.wikipedia.org/wiki/Scale_parameter), in which capacity they are called estimates of scale. [Robust measures of scale](https://en.wikipedia.org/wiki/Robust_measures_of_scale) are those unaffected by a small number of [outliers](https://en.wikipedia.org/wiki/Outliers), and include the IQR and MAD.  All the above measures of statistical dispersion have the useful property that they are location-invariant and linear in scale. This means that if a [random variable](https://en.wikipedia.org/wiki/Random_variable) X has a dispersion of SX then a [linear transformation](https://en.wikipedia.org/wiki/Linear_transformation) Y = aX + b for [real](https://en.wikipedia.org/wiki/Real_number) a and b should have dispersion SY = |a|SX, where |a| is the [absolute value](https://en.wikipedia.org/wiki/Absolute_value) of a, that is, ignores a preceding negative sign –. |

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| **Project Aim and Outline**   1. **Measures of Dispersion** 2. **Types of measure of dispersion**  * **Absolute Measure of Dispersion** * **Relative Measure of Dispersion**  1. **Absolute Measure of Dispersion** 2. **Relative Measure of Dispersion** 3. **Coefficient of Dispersion** 4. **Measures of Dispersion Formulas** |

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| **Results**  Dispersion is the state of getting dispersed or spread. Statistical dispersion means the extent to which a numerical data is likely to vary about an average value. In other words, dispersion helps to understand the distribution of the data.  Dispersion and Measures of Dispersion in Statistics  **Measures of Dispersion**  In statistics, the measures of dispersion help to interpret the variability of data i.e. to know how much homogenous or heterogenous the data is. In simple terms, it shows how squeezed or scattered the variable is.  **Types of Measures of Dispersion**  There are two main types of dispersion methods in statistics which are:   * Absolute Measure of Dispersion * Relative Measure of Dispersion   **Absolute Measure of Dispersion**  An absolute measure of dispersion contains the same unit as the original data set. Absolute dispersion method expresses the variations in terms of the average of deviations of observations like standard or means deviations. It includes range, [standard deviation](https://byjus.com/maths/standard-deviation/), quartile deviation, etc.  The types of absolute measures of dispersion are:   1. Range: It is simply the difference between the maximum value and the minimum value given in a data set. Example: 1, 3,5, 6, 7 => Range = 7 -1= 6 2. Variance: Deduct the mean from each data in the set then squaring each of them and adding each square and finally dividing them by the total no of values in the data set is the variance. Variance   **(σ2) =∑(X−μ) ^2/N**   1. Standard Deviation: The square root of the variance is known as the standard deviation i.e.   **S.D. =√σ**   1. Quartiles and Quartile Deviation: The quartiles are values that divide a list of numbers into quarters. The quartile deviation is half of the distance between the third and the first quartile. 2. Mean and Mean Deviation: The average of numbers is known as the mean and the arithmetic mean of the absolute deviations of the observations from a measure of central tendency is known as the mean deviation.   **Relative Measure of Dispersion:**  The relative measures of depression are used to compare the distribution of two or more data sets. This measure compares values without units. Common relative dispersion methods include:   1. Coefficient of Range 2. Coefficient of Variation 3. Coefficient of Standard Deviation 4. Coefficient of Quartile Deviation 5. Coefficient of Mean Deviation   **Coefficient of Dispersion**  The coefficients of dispersion are calculated along with the measure of dispersion when two series are compared which differ widely in their averages. The dispersion coefficient is also used when two series with different measurement unit are compared. It is denoted as C.D.  The common coefficients of dispersion are:   | **C.D. In Terms of** | **Coefficient of dispersion** | | --- | --- | | Range | C.D. = (Xmax – Xmin) ⁄ (Xmax + Xmin) | | Quartile Deviation | C.D. = (Q3 – Q1) ⁄ (Q3 + Q1) | | Standard Deviation (S.D.) | C.D. = S.D. ⁄ Mean | | Mean Deviation | C.D. = Mean deviation/Average |   **Measures of Dispersion Formulas**  The most important formulas for the different dispersion methods are:   |  |  | | --- | --- | | [Arithmetic Mean Formula](https://byjus.com/arithmetic-mean-formula/) | [Quartile Formula](https://byjus.com/quartile-formula/) | | [Standard Deviation Formula](https://byjus.com/standard-deviation-formula/) | [Variance Formula](https://byjus.com/variance-formula/) | | [Interquartile Range Formula](https://byjus.com/interquartile-range-formula/) | [All Statistics Formulas](https://byjus.com/statistics-formulas/) |   Ungrouped data is the data you first gather from an experiment or study. The data is raw — that is, it's not sorted into categories, classified, or otherwise grouped. An ungrouped set of data is basically a list of numbers. |

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| **Conclusions** |

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| **References**   * Peavy, J. V., Dyal, W. W., & Eddins, D. L. (1981). Descriptive statistics: Measures of central tendency and dispersion. Atlanta, GA: U.S. Dept. of Health and Human Services/Public Health Service, Centers for Disease Control. * Johnson, R., & Kuby, P. (2000). Elementary statistics. Pacific Grove: Duxbury. * (1998, March). Retrieved May 25, 2020, from<https://simon.cs.vt.edu/SoSci/converted/Dispersion_I/> * (2010, October 4). Retrieved May 12, 2020, from [http://bayes.acs.unt.edu:8083/BayesContent/class /Jon/ISSS\_SC/Module003/isss\_m3\_describingdata/node5.html](%20http://bayes.acs.unt.edu:8083/BayesContent/class%20/Jon/ISSS_SC/Module003/isss_m3_describingdata/node5.html) * Jin, G. (2019, September 18). Summary Measures for Quantitative Data. Retrieved May 29, 2020, from http://my.ilstu.edu/~gjin/hsc204-hed/Module-5-Summary-Measure-2/Module-5-Summary-Measure-25.html |