

How to Identify 5 Examples of Positively Skewed Distributions

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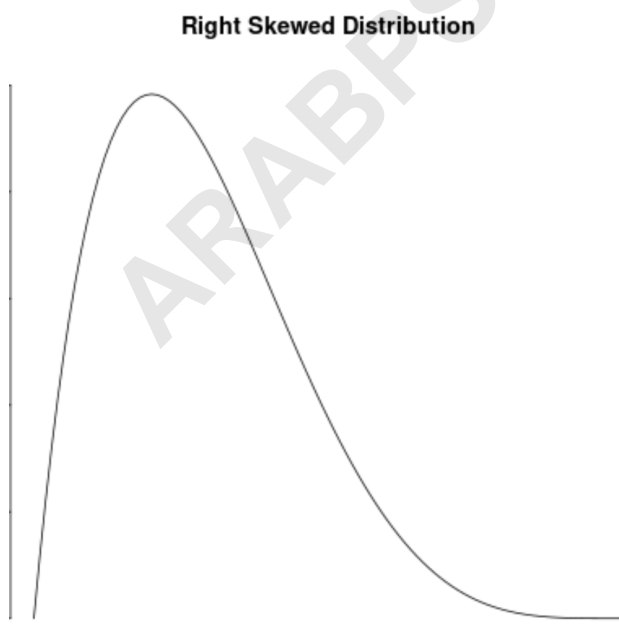
In the field of statistics and data analysis, understanding the shape of a probability distribution is fundamental. One of the primary measures used to quantify this shape is **Skewness**. Skewness describes the degree of asymmetry present in a distribution, quantifying how much the data deviates from the perfect symmetry of a normal (or Gaussian) distribution. This statistical measure is crucial because it informs us about the relative positioning of the mean, median, and mode, offering insights that summary statistics like the average alone cannot provide.

Defining Positive Skewness (Right Skew)

A distribution is classified as **positively skewed**, or **right-skewed**, when its tail extends significantly towards the higher values (the right side) of the data range. This type of asymmetry indicates that the vast majority of data points cluster around the lower values, while a smaller number of extremely high values--known as outliers--pull the distribution's tail to the right. Consequently, the mean is greater than the median in a positively skewed dataset.

The presence of a long right tail usually signifies that there is a theoretical or practical upper limit to the minimum values, but no strict upper bound on the maximum values. This pattern is exceedingly common in real-world scenarios where quantitative measurements are bounded by zero but can potentially increase indefinitely, such as wealth, sales figures, or reaction times.

Visualizing this concept is often the easiest way to grasp it. When plotted on a histogram, a positively skewed distribution appears to lean heavily to the left, with the primary mass concentrated there, while the few extreme high values create a gradual slope heading rightward.



The Relationship Between Mean, Median, and Mode

One of the defining characteristics of a positively skewed distribution lies in the ordering of its three primary measures of central tendency: the mean, the median, and the mode. Unlike a symmetric distribution where these three values are typically equal, in a right-skewed dataset, they are pulled apart by the influence of the high-value outliers.

Specifically, the **mode**, which represents the most frequently occurring value, will be the smallest of the three measures, residing near the peak of the curve on the left. The **median**, or the 50th percentile, will be located to the right of the mode. Finally, the **mean** (average) will be the largest value because it is disproportionately affected by the extreme values in the extended right tail. This hierarchical relationship--Mode < Median < Mean--is a statistical signature of positive skewness.

Understanding this relationship is vital for accurate data analysis. If a researcher were only to report the mean of a highly positively skewed dataset (such as income), they would present a misleading picture, as the mean would suggest a central value significantly higher than what the typical individual experiences (represented better by the median or mode).

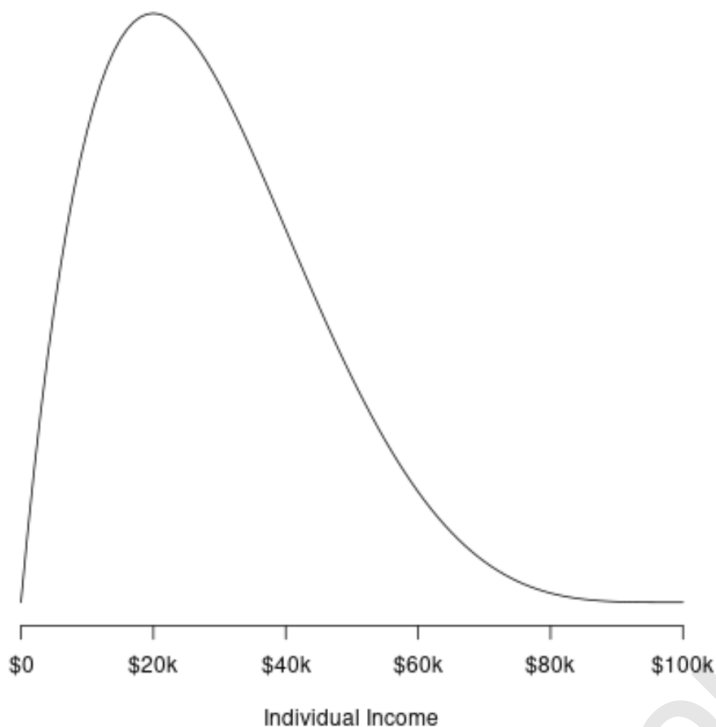
Example 1: The Distribution of Personal Income

The distribution of individual or household income across virtually all nations, including the U.S., provides one of the most classic and widely recognized examples of a positively skewed distribution. The vast majority of the population earns an income that falls within a moderate range, perhaps clustering between \$20,000 and \$60,000 annually, representing the high-frequency portion of the curve.

However, this pattern is abruptly altered by the existence of a small fraction of individuals who earn extraordinarily high salaries--those in the top 1% or 0.1%. These high-net-worth individuals, earning millions or billions, constitute the long right tail of the income distribution. While they are few in number, their large values exert a strong pull on the mean income, dragging it far above the median income.

For example, if the median household income in a region is \$65,000, the mean income might be \$85,000, reflecting the impact of high-earning outliers. This skew is crucial for economic policymakers to recognize, as it highlights inequality and the non-representative nature of the average income figure for the typical citizen.

Distribution of Individual Incomes

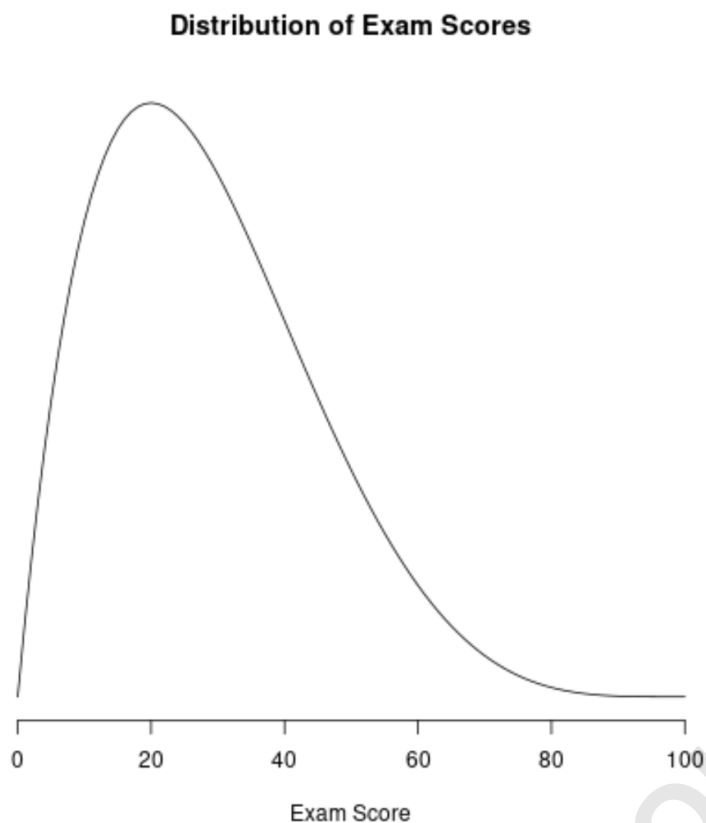


Example 2: Exam Performance and Difficulty

When educational institutions administer a particularly challenging or difficult examination, the resulting grade distribution often exhibits positive skewness. If the test material is exceptionally rigorous, most students will struggle, resulting in scores clustered at the lower end of the grading scale, near the minimum possible value (often zero).

In this scenario, the scores are predominantly low, forming the steep left side of the histogram. However, there will inevitably be a small contingent of highly prepared, academically gifted, or lucky students who manage to perform exceptionally well, achieving scores in the upper ranges (90% to 100%). These high scores create the distinctive long right tail, pulling the overall average score upward but leaving the bulk of the scores significantly lower than the mean.

This pattern signals to educators that the assessment was likely too difficult for the general student population, or that the teaching method failed to prepare the majority adequately. Conversely, if an exam were too easy, the scores would likely be clustered at the high end, resulting in a negatively skewed distribution.



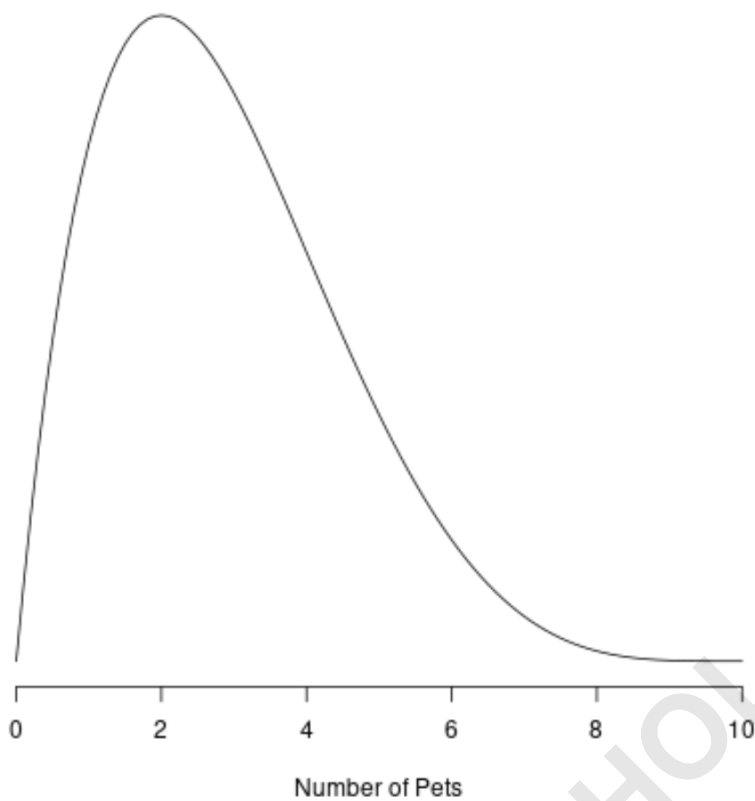
Example 3: Household Pet Ownership Statistics

Analyzing demographic data regarding the number of pets owned by households in a specific city or region also typically reveals a right-skewed pattern. Most households adhere to conventional standards of pet ownership, having zero, one, or perhaps two common pets (dogs, cats). These high-frequency counts form the bulk of the distribution near the zero axis.

It is relatively rare to encounter households that maintain large numbers of animals, such as those with five or more pets, or individuals who run small, unofficial rescues or farms. Yet, these few instances of extreme pet accumulation--owning seven, eight, nine, or more animals--are the statistical outliers that extend the right tail of the distribution.

Because the distribution is bounded by zero (one cannot own a negative number of pets) but is theoretically unbounded at the high end, the presence of these extreme collectors ensures that the mean number of pets is higher than the median, confirming the positive skew. This observation is relevant for city planning, veterinary services, and animal control resources.

Distribution of Number of Pets



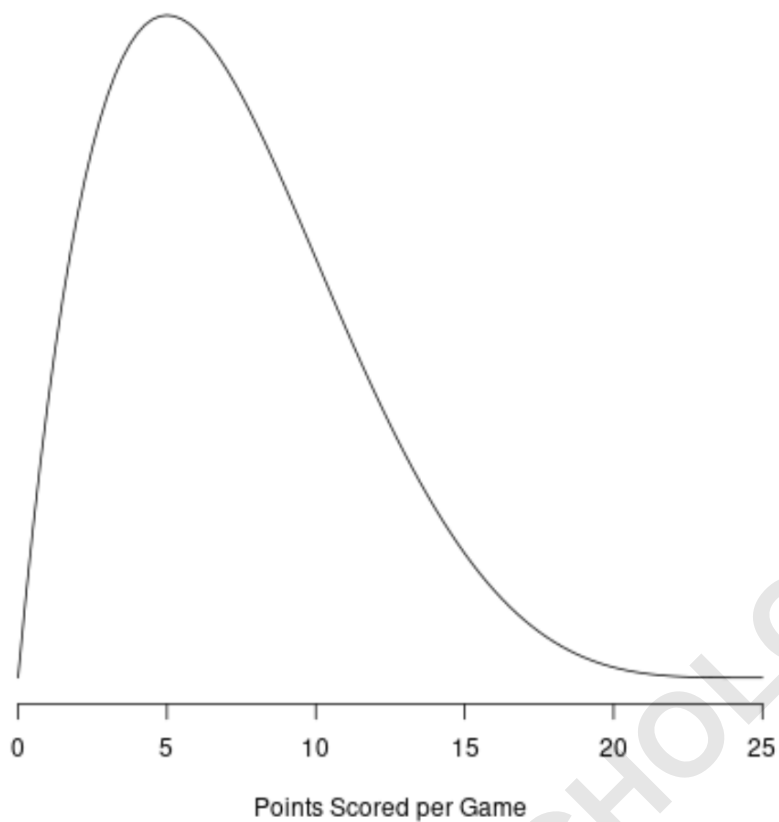
Example 4: Analyzing Professional Sports Performance Data

In professional sports, particularly basketball, the distribution of points scored per game by NBA players over a season is another clear illustration of positive skewness. The majority of players--including role players, bench depth, and defensive specialists--score a moderate amount of points, often falling between 5 and 10 points per contest. This large group anchors the distribution near the low end.

However, the right tail is dramatically extended by the league's few elite superstars and high-volume scorers. These exceptional athletes consistently register 25, 30, or even 40+ points per game, significantly deviating from the average player's scoring output. These extreme performances function as the high-end outliers that characterize the right skew.

If one were to calculate the average points per game for all players, this mean value would be inflated by the performances of the top scorers, failing to represent the typical scoring contribution of a player in the league. This skewness is inherent in competitive environments where success metrics often follow the Pareto principle, where a small percentage of contributors achieve the vast majority of the results.

Distribution of Points Scored per Game



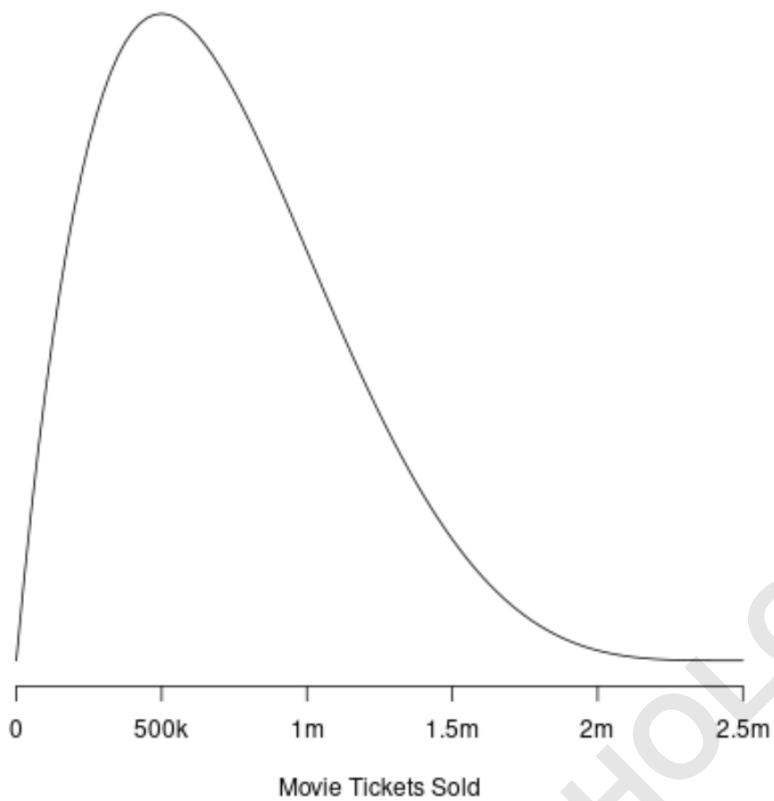
Example 5: Global Box Office Sales Dynamics

The economics of the film industry provide an excellent example of positive skewness when examining the distribution of tickets sold or total revenue earned per movie released. A vast number of films produced annually--including independent features, documentaries, and poorly received studio pictures--are commercial disappointments, selling relatively few tickets and quickly disappearing from theaters. These films cluster near the minimum (zero) total ticket sales, forming the tall peak on the left.

In contrast, a tiny handful of films achieve global "blockbuster" status. These are the major studio releases that capture the zeitgeist, selling millions upon millions of tickets worldwide. The immense financial success of these few high-performing titles creates an extremely long and heavy right tail in the box office sales distribution.

This distribution is so profoundly skewed that relying on the mean revenue figure to assess the typical success of a movie is statistically meaningless. The mean is pulled skyward by the success of films like *Avatar* or *Avengers: Endgame*, while the median movie is likely a financial flop. This skew is why the film industry is often characterized as a high-risk, hit-driven business.

Distribution of Movie Tickets Sold



Implications for Data Modeling and Interpretation

Recognizing positive skewness is not merely an academic exercise; it has critical implications for practical data analysis and modeling. Many statistical techniques, particularly those based on linear regression or parametric testing, assume that the underlying distribution of the data (or residuals) is roughly normal or symmetric.

When confronted with highly skewed data, analysts must employ specific corrective measures. These may include utilizing non-parametric tests, transforming the data (e.g., using logarithmic or square root transformations) to approximate normality, or relying on robust statistics like the median instead of the mean for central tendency. Failing to account for significant skewness can lead to biased models and erroneous conclusions, particularly when predicting extreme events or outcomes.

In summary, positive skewness is a ubiquitous feature of datasets constrained by a lower bound but influenced by rare, high-magnitude events. Understanding its mechanism--where the Mode < Median < Mean--is essential for accurately interpreting real-world phenomena ranging from economics to ecology.

5 Examples of Negatively Skewed Distributions

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