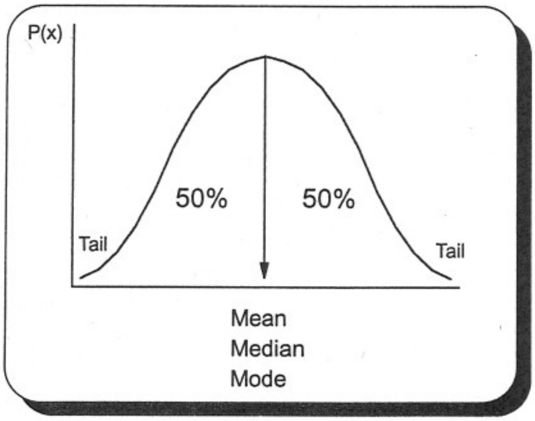
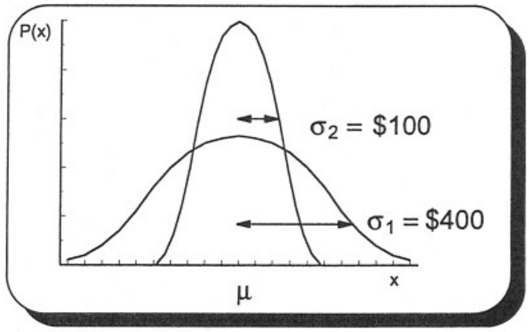
Chapter 10 Continuous Normal Probability Distributions



I. **Characteristics of normal probability distributions**
   A. **Continuous:** An infinite number of x-axis values may exist.
   B. **Symmetrical around the mean:** Each half (50%) of the curve is a mirror image of the other half.
   C. **Bell-shaped:** There is 1 peak above the mean, median, and mode.
   D. **Asymptotic:** The tail of the distribution approaches, but never touches, the x-axis.
   E. Variables dealing with size (income, weight, and intelligence) are often normally distributed.



II. **The standard deviation**
   A. 100% of the outcomes are under the normal curve.
   B. One standard deviation spans approximately 34% of the outcomes in each direction from the mean.
   C. Curves that are flat, more spread out, have a larger standard deviation.
      1. Two of Linda's video stores may each have average weekly sales of $1,800, but sales variability may differ from store 1 to store 2.
      2. As shown here, store 1 has a $\sigma = \$400$. This represents more variability in weekly sales than exists at store 2, with a $\sigma = \$100$.

III. **The standard normal distribution**
   A. Continuous probability distributions may have an infinite number of means, each with an infinite number of standard deviations. This makes it impossible to have a table for each possible mean and standard deviation.
   B. The standard normal probability distribution avoids this problem by having a mean (μ) of 0 and a standard deviation (σ) of 1. The standard normal distribution is kind of a generic distribution.
      1. Distances from the mean are measured in standard deviations.
      2. This distance (or number of standard deviations) is called z.
      3. The probability distribution associated with all possible z values is the standard normal probability distribution.
      4. This distribution is presented as a z table.
      5. Chapter 4 used the empirical rule to measure the percent of data within a set number of standard deviations of the mean. The standard normal probability distribution is the mathematical basis for the empirical rule.

IV. **In the above example, store 1 had mean weekly sales of $1,800 and a standard deviation of $400. The following example reviews how the empirical rule is used to determine the sales range for 1, 2, and 3 standard deviations. Note how a set probability is associated with each number of standard deviations.**

Given: $\mu = \$1,800$ and $\sigma = \$400$

A. $\mu \pm 1\sigma$
$\$1,800 \pm 1(\$400)$
$\$1,800 \pm \$400$
68.26% are between $1,400 and $2,200

B. $\mu \pm 2\sigma$
$\$1,800 \pm 2(\$400)$
$\$1,800 \pm \$800$
95.44% are between $1,000 and $2,600

C. $\mu \pm 3\sigma$
$\$1,800 \pm 3(\$400)$
$\$1,800 \pm \$1,200$
99.74% are between $600 and $3,000