Summary

- The Tchebyscheff's inequality or theorem is named after Russian mathematician Pafnuty Chebyshev
- In Probability Theory, Chebyshev's inequality (also spelled as Tchebysheff's inequality) guarantees that in any probability distribution, "nearly all" values are close to the mean
- The inequality states that - no more than $1/k^2$ of the distribution's values can be more than k standard deviations away from the mean
- The inequality has great utility because it can be applied to completely arbitrary distributions
- According to the inequality, let X be a random variable for which E(X) and V(X) exists. Then, for any positive number k,

$$P\{|x-\mu| \geq k\sigma\} \leq \frac{1}{k^2} \quad \text{OR} \quad P\{|x-\mu| \leq k\sigma\} \geq 1-\frac{1}{k^2}$$

- The advantage of this theorem is that the theorem applies to any data set regardless of the shape of the distribution of the data
- With Tchebychev's inequality, at least 75% of the data will fall within 2 standard deviations of the mean
- At least 88.8 % of the data will fall within 3 standard deviations
- Chebyshev does not expect the variable to non-negative but needs additional information to provide a tighter bound. Chebyshev inequality is tight – this means with the information provided, the inequalities provide the most information they can provide