

# Measuring Variability: Least Squares

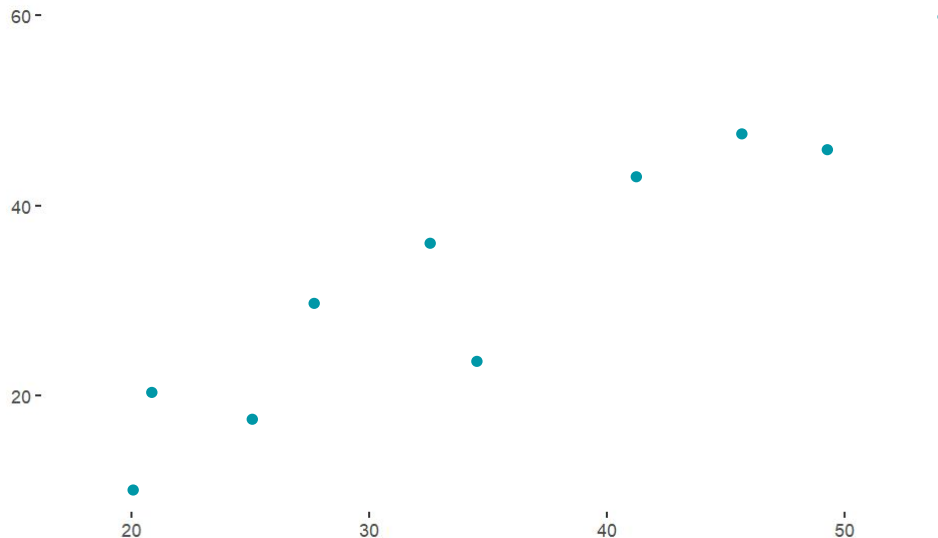


# Least Squares Method to Measure Variability.

# What is least squares?

**In simple terms, least squares is a method used to find the best-fitting line through a set of points on a graph.**

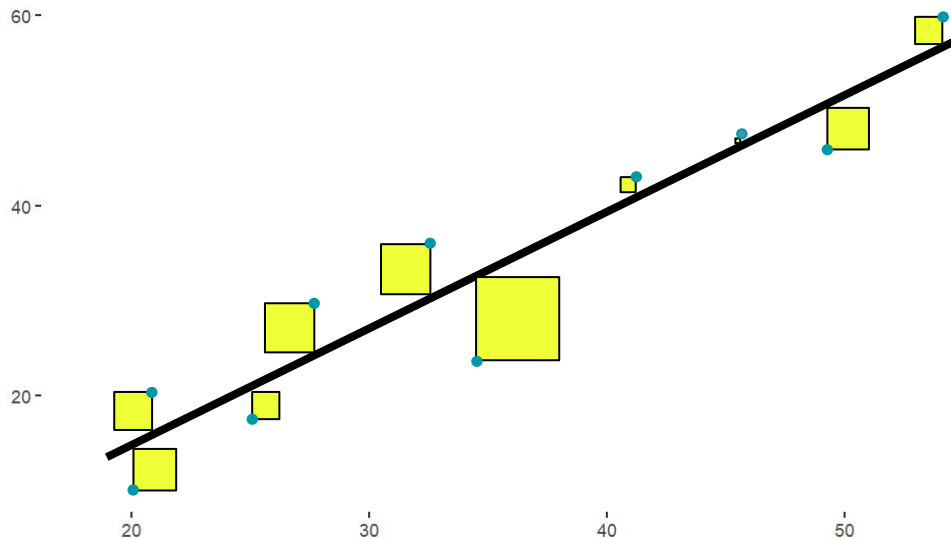
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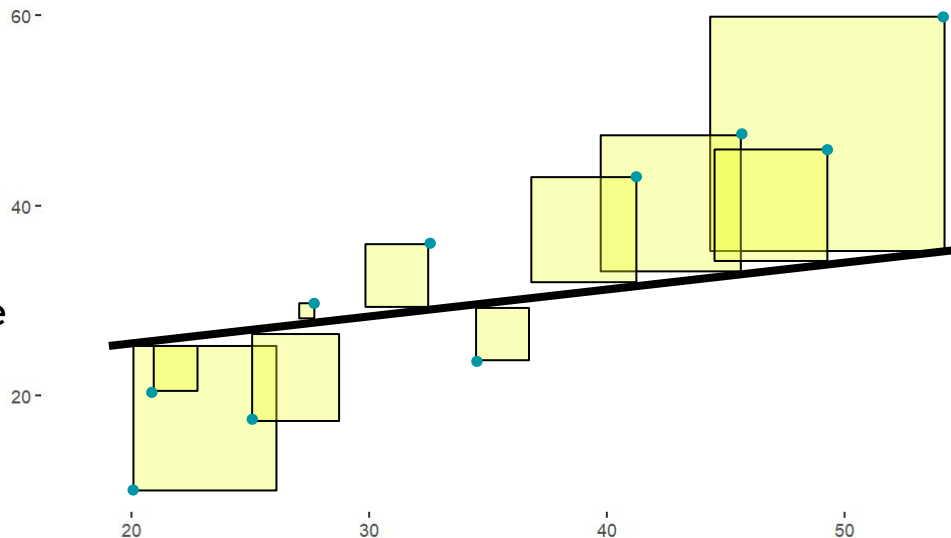
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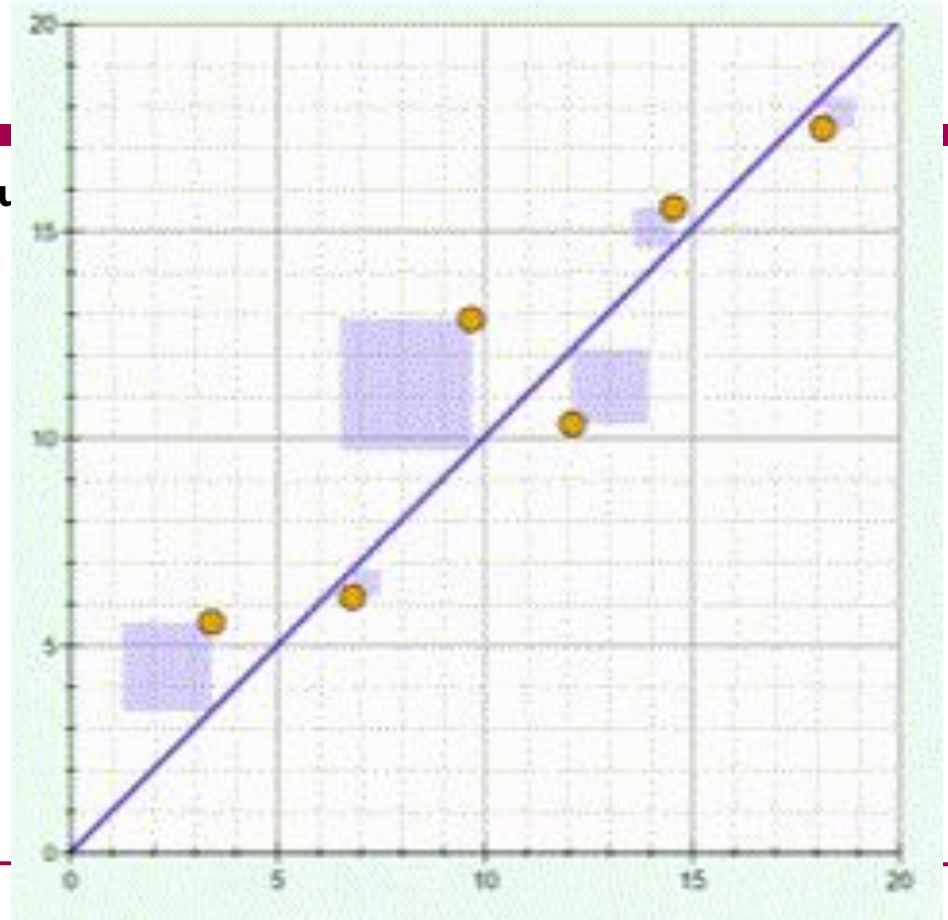
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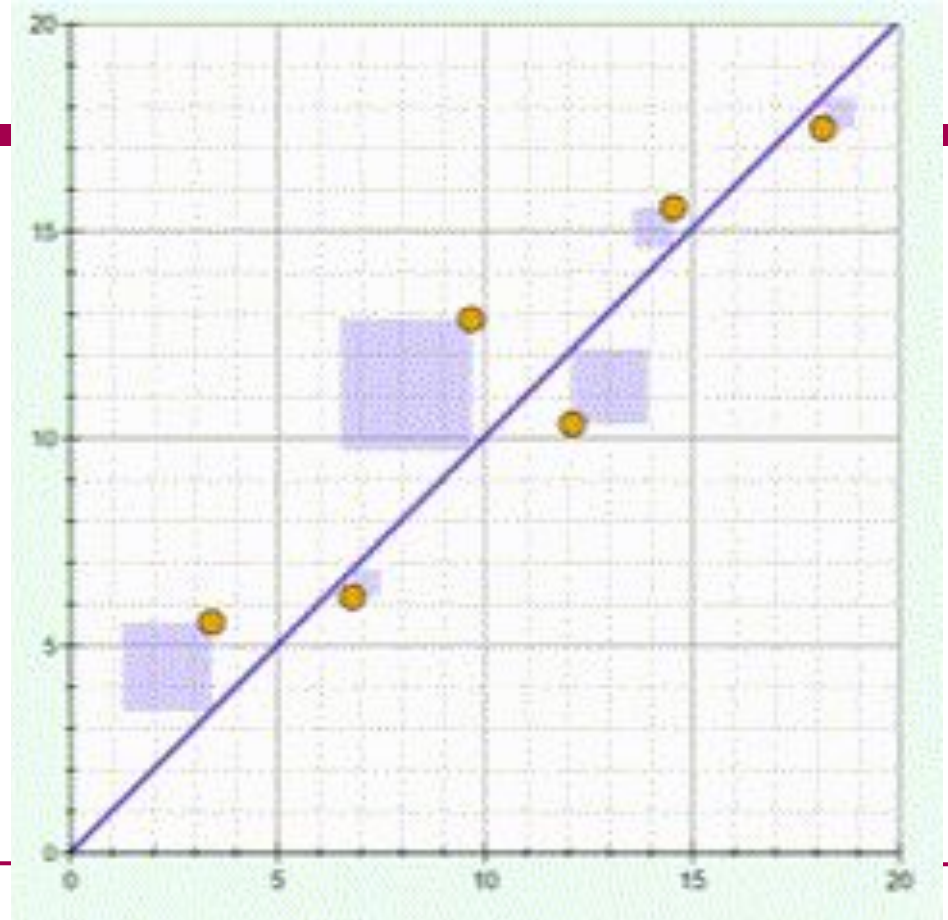
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- Say you want to draw a straight line that comes as close as possible to all those points.
- We can aim to make the squares of the vertical distances between the points and the line as small as possible.
- In other words, it minimises the errors between the actual data points and the points predicted by the line.



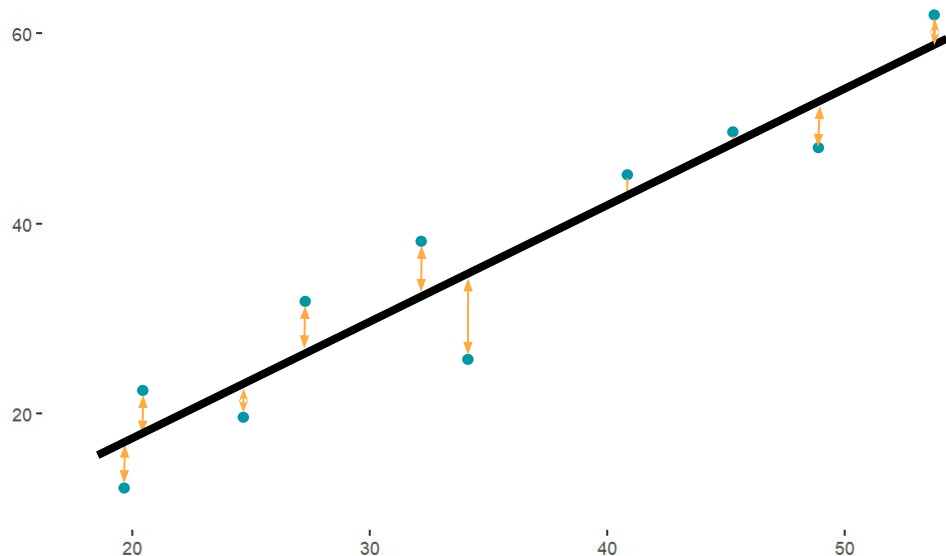
# What is least squares?

- This method is commonly used when you're trying to understand or predict the relationship between two things.
- For example, you might use least squares to find the best line that represents how pest density relates to yield.
- The result is a line that fits the data in the most balanced way, reducing the overall error between the line and the actual data points.



# Why do least squares?

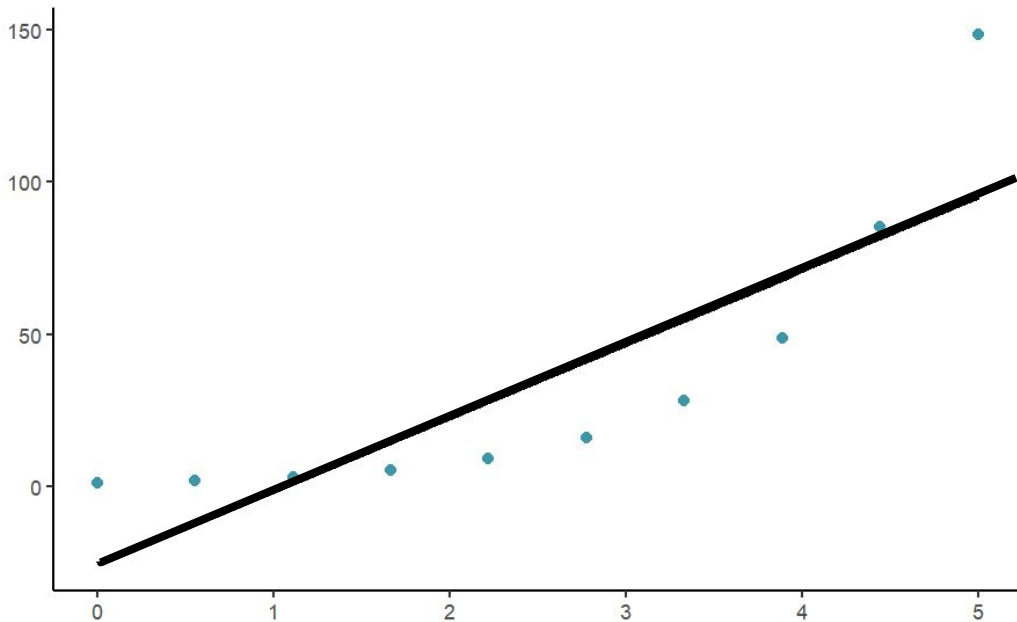
- Why do we square it and not just find the distance?
  - Least distance is a sensible measure, but doesn't penalise extreme values.
  - In many applications, we want to give more weight to points that deviate significantly from the fitted line





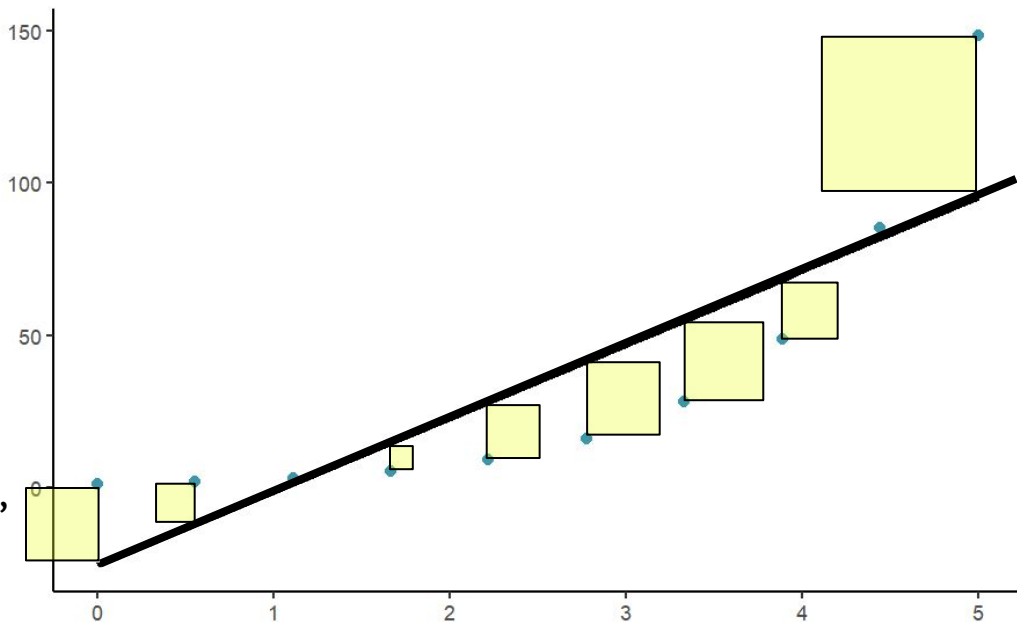
# What other methods are there?

- Least Squares may not be appropriate if you have skewed data. In one direction you might never get a big distance, and in another you could have a small distance.



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- Least Squares may not be appropriate if you have skewed data. In one direction you might never get a big distance, and in another you could have a small distance.
- There are other measures of variability where the distance is measured differently.
  - You might do this, for example, if you have skewed data or binomial data. This is measuring variability.



# Conclusion

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- Least Squares is a method to measure variability
  - It minimises the squares of vertical distances between the points and the line.
  - It is robust and widely accepted in various applications.
  - You don't need to always question the measures.
    - In the few cases where you want to question it, then you can talk to a statistician.  
We love to think carefully about when to use a different measure or not.
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