

Relationship between Variables

CORRELATION AND COVARIANCE

Computer Skills for Medical Students
The University of Jordan
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The Relationship between variables

Correlation and Covariance

- Covariance and correlation describe how two variables are related.
 - Variables are positively related if they move in the same direction
 - Variables are inversely related if they move in opposite directions.

Both **covariance** and **correlation** indicate whether variables are positively or inversely related.

Correlation also tells you the degree to which the variables tend to move together.

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Covariance

- Covariance determines:
 - How two variables are related.
 - Whether variables are positively or inversely related.
 - A positive covariance means the variables are positively related, while a negative covariance means the variables are inversely related.
- For example: The covariance between market returns and economic growth is 1.53. Since the covariance is positive, the variables are positively related—they move together in the same direction

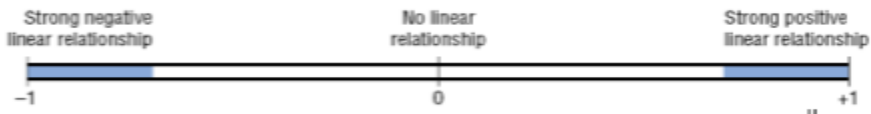
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Correlation

- Correlation determines:
 - How two variables are related.
 - Whether variables are positively or inversely related.
 - The degree to which the variables tend to move together.
- Correlation standardizes the measure of interdependence between two variables and, consequently, tells you how closely the two variables move.

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- The correlation measurement, called a correlation coefficient, will always take on a value between -1 and $+1$:
- *If the correlation coefficient is one*, the variables have a perfect positive correlation. This means that if one variable moves a given amount, the second moves proportionally in the same direction.
- *If correlation coefficient is zero*, no relationship exists between the variables. If one variable moves, you can make no predictions about the movement of the other variable; they are uncorrelated.
- *If correlation coefficient is -1* , the variables are perfectly negatively correlated (or inversely correlated) and move in opposition to each other. If one variable increases, the other variable decreases proportionally.



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For example:

- The correlation between market returns and economic growth is 0.66.

A correlation coefficient of .66 tells you two important things:

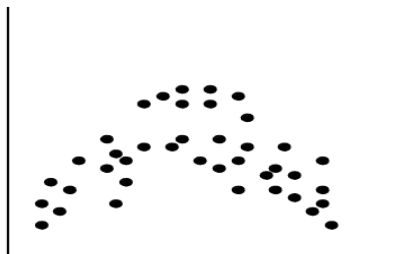
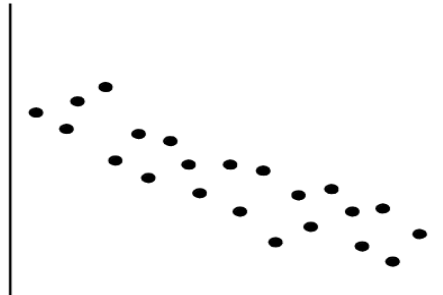
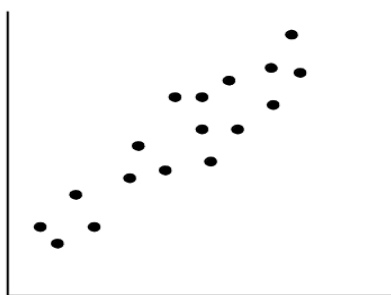
- Because the correlation coefficient is a positive number, market returns and economic growth are positively related.
- Because .66 is relatively far from indicating no correlation, the strength of the correlation is strong.

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Evaluating Correlation Visually

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Positively and Negatively Correlated Data



- The left half fragment is positively correlated
- The right half is negative correlated

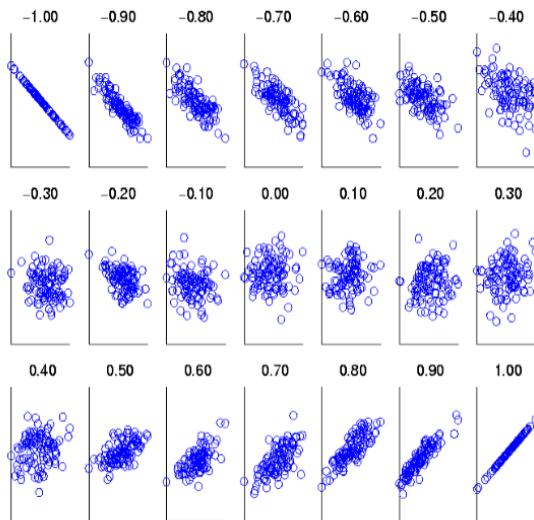
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Uncorrelated Data



Visually Evaluating Correlation



Scatter plots showing the similarity from -1 to 1.

Correlation and Covariance in Excel

- To find the correlation , you can use the **Correl** function

=Correl (range of x-variable, range of y-variable)

- To find the covariance , you can use the **Covar** function

=Covar(range of x-variable, range of y-variable)