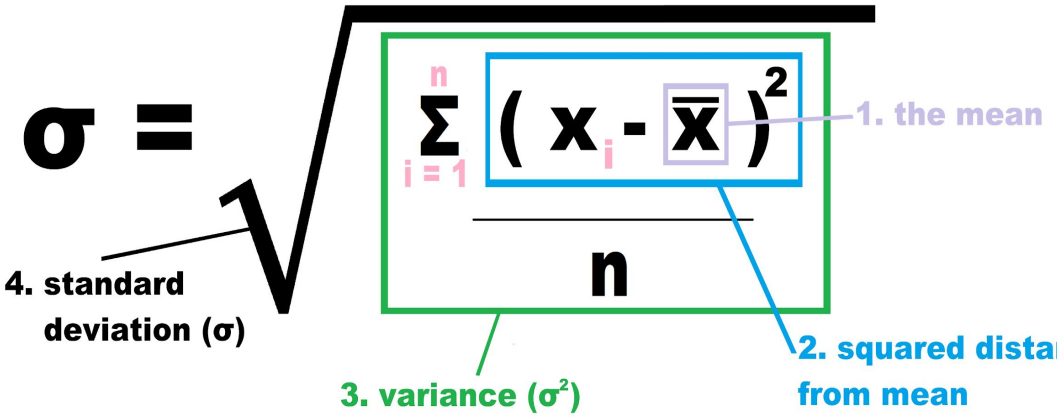
Covariance

Variance

- Variance is the average squared difference of the values from the mean.
- Standard Deviation is the square root of Variance.



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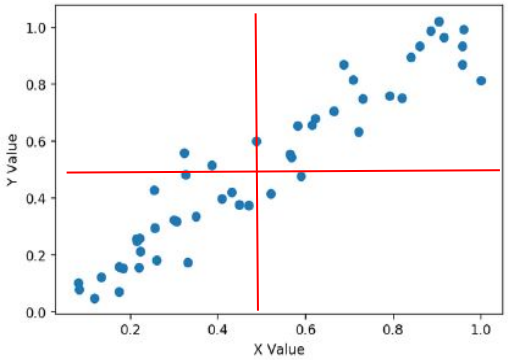
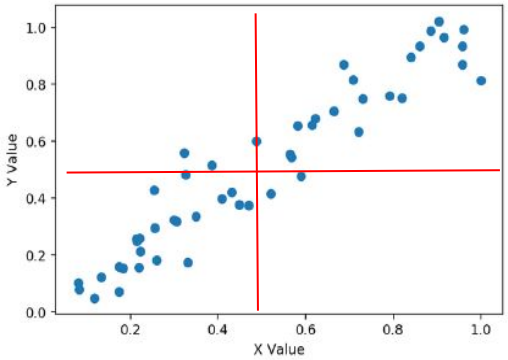
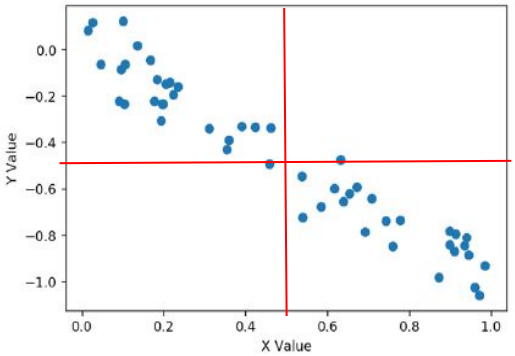
Variance

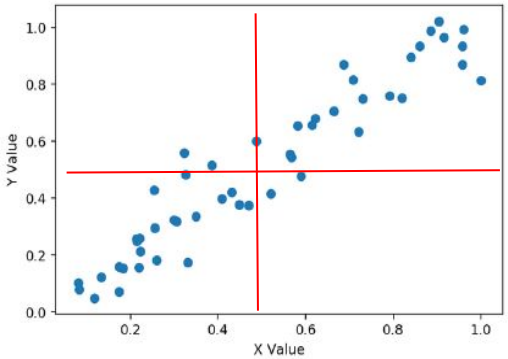


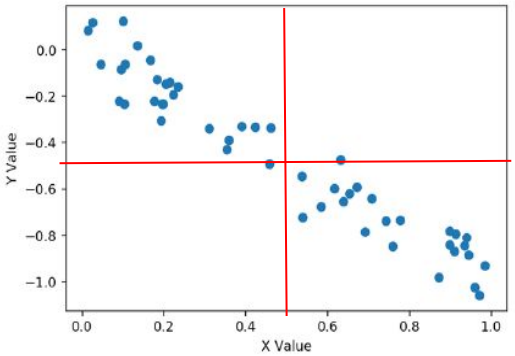
Variance

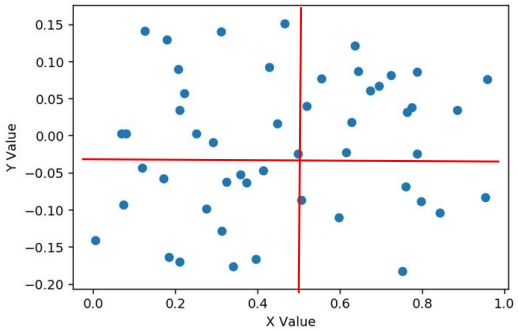




Variance







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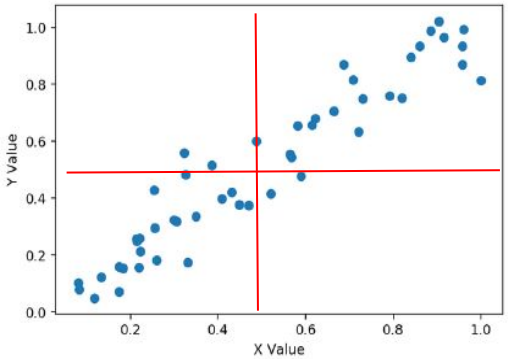
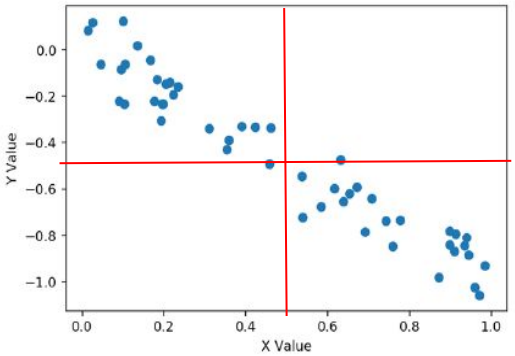
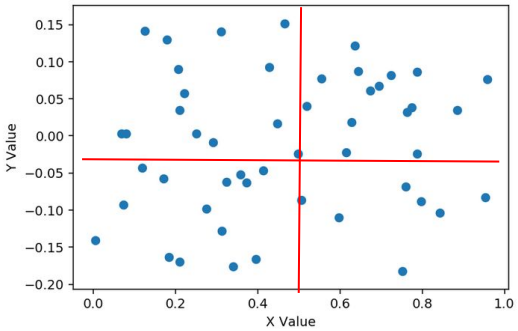
Variance







- Variance cannot be used for more than 1 variable
- Covariance is used for high dimension

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Covariance

$$\mathbf{Cov(X,Y)=} \frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{N}$$

Covariance

$$\text{Cov}(X,Y) = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{N}$$

Ex : Whether Economic Growth and Nifty Returns have a positive relationship or inverse relationship ?

Covariance

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Ex : Whether Economic Growth and Nifty Returns have a positive relationship or inverse relationship ?

Economic Growth (in %)	Nifty Returns (in %)
5.1	8
5.5	12
7	14
6.6	10

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Economic Growth (in %)	Nifty Returns (in %)
5.1	8
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7	14
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$\bar{x}$ = (5.1 + 5.5 + 7 + 6.8) / 4
= 24.4/4
= 6.1

$\bar{y}$ = (8 + 12 + 14 + 10) / 4
= 44/4
= 11

Covariance

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Ex : Whether Economic Growth and Nifty Returns have a positive relationship or inverse relationship ?

xi	yi	$x_i - \bar{x}$	$y_i - \bar{y}$
5.1	8	-1	-3
5.5	12	-0.6	1
7	14	0.9	3
6.6	10	0.5	-1

Covariance

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Cov(x,y) =

$(-1)(-3)+(-0.6)1+(0.9)3+(0.5)(-1)/4$

$= (3-0.6+2.7-0.5)/4$

$=4.6/4$

$=1.15$

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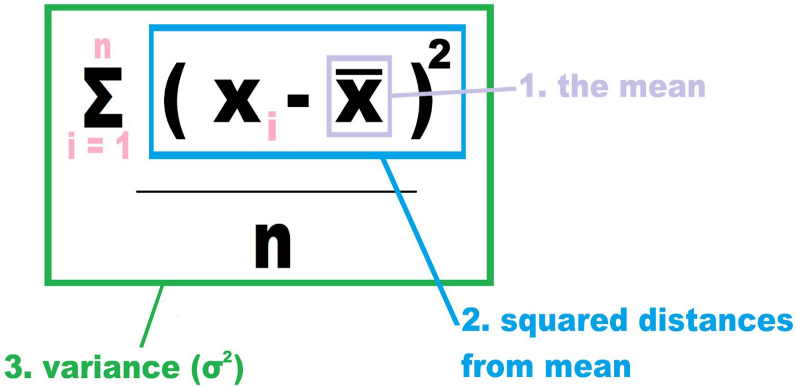

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Covariance

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Linear Relationship between two variables

Covariance

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Linear Relationship between two variables

It can take any value

Covariance

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Linear Relationship between two variables

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Positive, Negative or Zero Covariance

Covariance

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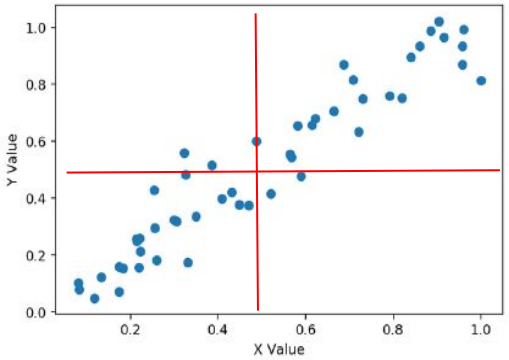

Positive Covariance

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Covariance

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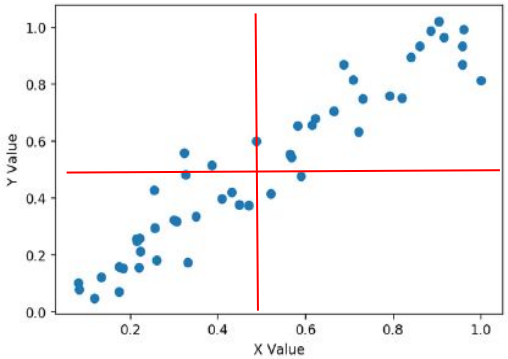
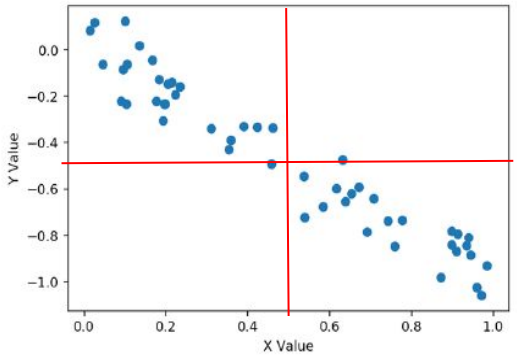


Positive Covariance



Negative Covariance

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Covariance

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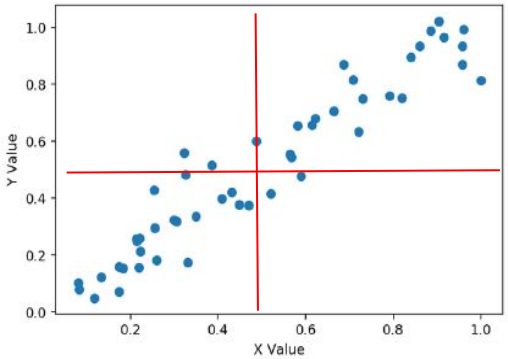
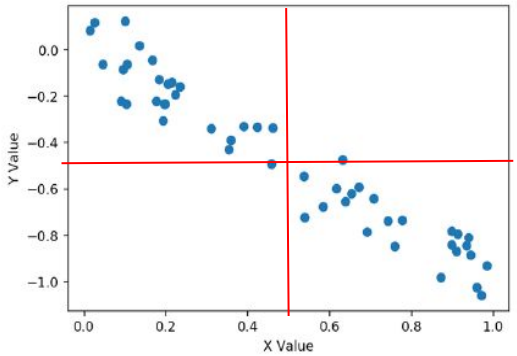
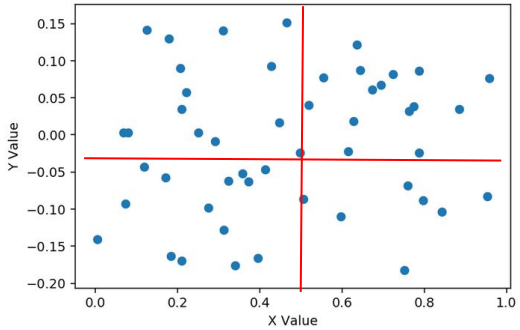


Positive Covariance



Negative Covariance



Zero Covariance

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Covariance

$$\text{Cov}(X,Y) = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{N}$$

Linear Relationship between two variables

It can take any value

Positive, Negative or Zero Covariance

Covariance can be 0.000045 or 30 million

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Covariance can be 0.000045 or 30 million

Correlation

Thank You!