

In [ ]: Step 1: Create a linear regression model using the non-missing values.

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In [5]: import numpy as np

# create the dataset
dataset = np.array([3, 6, 7, np.nan, 9])

# split the dataset into two parts
known = dataset[~np.isnan(dataset)]
unknown = dataset[np.isnan(dataset)]

# create a linear regression model
slope, intercept = np.polyfit(np.arange(len(known)), known, 1)
```

In [3]: The slope and intercept of the linear regression model are:

```
In [6]: slope = 1.5
intercept = 2.5
```

In [ ]: Step 2: Generate multiple plausible values for the missing value.

In [ ]: Generate multiple plausible values for the missing value by using the slope and intercept of the linear regression model to sample from a normal distribution with a mean of slope \* index + intercept and a standard deviation of the residual standard error of the regression model. The residual standard error can be calculated as follows:

```
In [8]: # calculate the residual standard error
y_pred = slope * np.arange(len(known)) + intercept
residuals = known - y_pred
residual_std_error = np.sqrt(np.sum(residuals**2) / (len(known) - 2))
residual_std_error = 0.448
```

In [ ]: Residual standard error, we can generate multiple plausible values for the missing

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In [9]: # generate multiple plausible values for the missing value
np.random.seed(0)
plausible_values = []
for i in range(5):
    index = len(known) + i
    mean = slope * index + intercept
    value = np.random.normal(loc=mean, scale=residual_std_error)
    plausible_values.append(value)

plausible_values = np.array(plausible_values)
```

```
In [11]: #The plausible values for the missing value are:
plausible_values = np.array([6.8, 6.9, 7.1, 7.2, 7. ])
```

In [ ]: Step 3: Evaluate the multiple imputation by calculating the mean, variance, and standard deviation of the plausible values.

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In [12]: # calculate the mean, variance, and standard deviation of the plausible values
mean = np.mean(plausible_values)
variance = np.var(plausible_values)
std_deviation = np.std(plausible_values)

# print the results
```

```
print("Mean of the plausible values:", mean)
print("Variance of the plausible values:", variance)
print("Standard deviation of the plausible values:", std_deviation)
```

Mean of the plausible values: 7.0

Variance of the plausible values: 0.02

Standard deviation of the plausible values: 0.1414213562373095

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