

# Multi category chi-squared tests: Takeaways



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## Syntax

- Calculating the chi-squared value:

```
observed = [6662, 1179, 15128, 9592]
expected = [5257.6, 2589.6, 16558.2, 8155.6]
values = []
for i, obs in enumerate(observed):
    exp = expected[i]
    value = (obs - exp) ** 2 / exp
    values.append(value)
chisq_gender_income = sum(values)
```

- Finding the chi-squared value and p-value using scipy.stats.chisquare:

```
import numpy as np
from scipy.stats import chisquare
observed = np.array([6662, 1179, 15128, 9592])
expected = np.array([5257.6, 2589.6, 16558.2, 8155.6])
chisq_value, pvalue_gender_income = chisquare(observed, expected)
```

- Using the pandas.crosstab function to print a table that shows frequency counts:

```
import pandas
table = pandas.crosstab(income["sex"], [income["high_income"]])
print(table)
```

- Using the scipy.stats.chi2\_contingency function to generate the expected values:

```
import numpy as np
from scipy.stats import chi2_contingency
observed = np.array([[5, 5], [10, 10]])
chisq_value, pvalue, df, expected = chi2_contingency(observed)
```

## Concepts

- In a multiple category chi-squared test, we calculate expected values across our whole dataset.
- We can calculate the chi-squared value by using the following steps:
  - Subtract the expected value from the observed value.
  - Subtract the difference.
  - Divide the squared difference by the expected value.
  - Repeat for all observed and expected values and add up all the values.
- Formula for chi-squared:

$$\sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

- Finding that a result isn't significant doesn't mean that no association between the columns exists. Finding a statistically significant result doesn't imply anything about what the correlation is.
- Chi-squared tests can only be applied in the case where each possibility within a category is independent.

## Resources

- [Chi-squared test of association](#)
- [Documentation for `scipy.stats.chi2\_contingency` function](#)
- [Documentation for `pandas.crosstab` function](#)



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