Homework #5

```
Populating the interactive namespace from numpy and matplotlib
```

10.4

$$\hat{\pi} \pm z_{\alpha/2}\hat{\sigma}_{\hat{\pi}} \quad where \quad \hat{\pi} = \frac{y}{n} \quad and \ \hat{\sigma} = \sqrt{\frac{\hat{\pi}(1-\hat{\pi})}{n}}$$

```
a.)(0.7752081987078175, 0.8247918012921825)
b.)(0.7791940644849777, 0.8208059355150223)
c.) The 95% confidence interval is slightly wider. However because t
he sample size is so large, there isn't much difference.
```

10.5

$$n = \frac{z_{\alpha/2}^2 \pi(1-\pi)}{E^2}$$

```
a.)  2401.0
b.)  1537.0
c.) With knowledge of the population proportion, we can use a smalle
r sample size
```

10.6

```
a.) (0.05447817427287101, 0.06372182572712899)
b.) No. There is substantial evidence that the test produces more th
an 5% false positives.
```

10.14

a.) Yes, because both $n\pi \geq 5 \ \ and \ \ n(1-\pi) \geq 5$

b.) $z = \frac{\hat{\pi}-\pi_0}{\sigma_{\hat{\pi}}}$ where $\sigma_{\hat{\pi}} = \sqrt{\frac{\pi_0(1-\pi_0)}{n}}$

```
z = 1.6970562748477156 which is more than 1.6448536269514722, thus w
e reject the null hypothesis
```

```
c.) (0.495414826293719, 0.564585173706281)
```

10.15

```
a.) (0.13509954197995744, 0.1715671246867092)
b.)  4988.0
c.) z = -37.26346145676506 which is a little bit less than 1.6448536
269514722, thus we reject the congressman's claims.
```

10.16

a.) The difference can be described as a normal distribution?

b.) yes, both $n\pi$ and $n(1-\pi)$ are bigger than 5.

10.17

$.01 = z_{\alpha/2}\sigma_{\hat{\pi}_1 - \hat{\pi}_2}$

$n_1 = n_2$

$\sigma_{\hat{\pi}_1 - \hat{\pi}_2} = \sqrt{\frac{\hat{\pi}_1(1-\hat{\pi}_1)+\hat{\pi}_2(1-\hat{\pi}_2)}{n}}$

$\rightarrow n = \frac{(\hat{\pi}_1(1-\hat{\pi}_1)+\hat{\pi}_2(1-\hat{\pi}_2))*z^2_{\alpha/2}}{.01^2}$

```
11525.0
```

10.18

```
a.) (0.0737426852600768, 0.2302573147399232)
b.) z = 3.80685852357909 which is a little bit more than -2.32634787
40408408, thus we reject the claim.
c.) The dealer should offer the warranty.
```

10.22

a.) We can see that the p-value is 0.021. This is less than 0.05, we therefore accept the research hypothesis.

b.) Yes, because the confidence interval does not include zero.

10.28

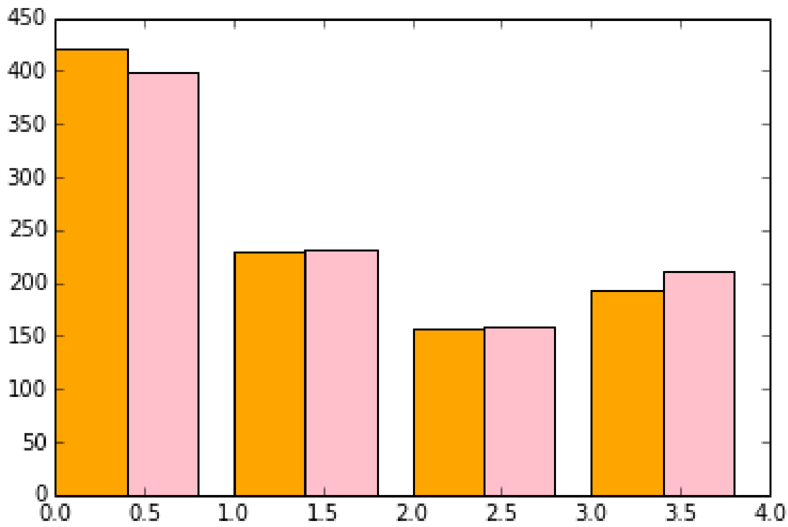
Cochran (1954) indicates that the approximation should be adequate if no E_i is less than 1 and no more than 20% of the E_i s are less than 5.

10.31

$$\chi^2 = \sum_i \left[\frac{(n_i - E_i)^2}{E_i} \right]$$

```
a.) I have chi-square at:  36.1333333333333  This is far larger tha
n  7.81472790325
b.) We therefore reject the null hypothesis and conclude that violen
ce and the seasons are correlated.
```

10.33




```
I found a chi-square level of  3.04394670237
Using a 95% confidence level, I do not reject the null-hypothesis an
d would say there is no bias in the selection
```

The raw code for this IPython notebook is by default hidden for easier reading.

To toggle on/off the raw code, click here.