The University of Sydney
STAT2012 Statistical Tests

Semester 2	Computer Practice Week 2	2015

Useful R codes

- To perform an one sample t-test for the hypotheses: $H_0: \ \mu = \mu_0$ against $H_1: \ \mu \neq \mu_0$, use

  ```
  t.test(x,mu=mu0,alternative=".")
  ```

  The arguments for `alternative` are `two.sided`, `less` or `greater`.
  It produces a test-statistic, p-value and 95% CI for μ.
  One may add `,conf=1-alpha` after `"."`

  ```
  t.test(x,mu=mu0,alternative=".",conf=1-alpha)
  ```

  to specify the signficiance level, for example, if `alpha=0.01`, the level is 99%.

- To check the normality assumption using a normal qq-plot, use the following `R` graphic codes

  ```
  qqnorm(x)
  qqline(x)
  ```

Important points

- If you are not familiar with the login and use of RStudio, read `Computer Practice Week 1` again.
- Mathematical symbols like σ^2 and $H_0 : \mu = 0$ can be written as `sigma2` and `H0: mu=0`. Latex commands to type exactly these symbols can be obtained from the course website.

Practice Problems

1. Suppose that x contains a sample of size 6 (data: 2,4,6,5,7,1) from a normal population. Test $H_0 : \mu = 4$ against $H_1 : \mu \neq 4$ using the t test. Draw your conclusion.

   Open the week 2 template in RStudio, save it in your directory and enter the following R codes:

   ```
   x = c(2,4,6,5,7,1)
   t.test(x,mu=4)
   ```

   within

```
<<label=Q1>>=

@
```

Save it and run it.

Based on the reported p-value, draw your conclusion of the test.

2. Perform t tests on x based on the following hypotheses:

   (i) $H_0 : \mu = 4$ against $H_1 : \mu > 4$

   (ii) $H_0 : \mu = 4$ against $H_1 : \mu < 4$

   using `t.test` with `alternative= "greater"` and `"less"` respectively.

   Draw your conclusion of the tests. Write your conclusion after

   ```
   \comment{Conclusion:}
   ```

   Comment on the relationship between the p-values for these three tests, that is, how is the p-value for the upper-sided test related to the p-values of the 2-sided test and lower-sided test respectively. Write your comment after

   ```
   \comment{Comment:}
   ```

3. Ten women go on a low-fat diet for 3 weeks. Their initial and final weights (in kg) are given in the following table.

Dieter	1	2	3	4	5	6	7	8	9	10
Before	54	62	66	68	61	84	77	70	63	61
After	51	61	59	65	58	80	70	66	61	62

   Can the promoters claim that there is a weight loss for women who go on the low-fat diet for 3 weeks? Then from the output, write your answers to (a), (c) and (d).

   (a) State the null and alternative hypotheses.

   (b) Enter the data.

   (c) Test the null hypothesis in (a) using the t test assuming normality.

   Report the *test statistic* and *p-value*.

   Draw your *conclusion* at $\alpha = 0.05$ level of significance.

   (d) Check and *comment* the normality assumption using a *qq-plot*.