UNIVERSITY COLLEGE LONDON

Computational Modelling in Biomedical Imaging - Coursework 2

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Q1

(a)

Sample	True mean	Sample mean	True standard deviation	Sample standard deviation
sample 1	1	0.9848	0.25	0.2842
sample 2	1.5	1.4944	0.25	0.2281

The new values are as expected, lying within a 0.04 tolerance level.

(b)

The t-test results in a t-statistic of -6.99, rejecting the null hypothesis with a p-value of 7.55e-09 which is very low. We are very confident the two samples were generated from distributions with different means, which is indeed the case (means of 1 and 1.5).

(c)

i. $dim(X) = 2$ because X is made of two column vectors that are linearly independent.

ii. $Y = X\beta \rightarrow X^T Y = X^T X \beta \rightarrow (X^T X)^{-1} X^T Y = \beta \rightarrow X(X^T X)^{-1} X^T Y = X\beta$. Since $MY = X\beta$, we deduce $M = X(X^T X)^{-1} X^T$

iii.