(101)輔仁大學碩士班招生考試試題	考試日期：101 年 3 月 9 日第 3 節
	本試題共 2 頁 (本頁為第 1 頁)

科目：統計學(含計量經濟學)　　系所組：經濟所

(1) (45%) Suppose that the owner of FJU Movie Theaters would like to estimate weekly gross revenue as a function of television advertising expenditures (TVAdv) and newspaper advertising expenditures (NewsAdv). Consider the following two types of regressions.

Regression 1 (Revenue is the dependent variable)

	coefficients	standard error	t-ratio	p-value
constant	83.230	1.574	52.88	0.000
TVAdv	*A*	0.304	7.533	0.001
NewsAdv	1.301	0.321	4.053	0.010

Regression 2 (Revenue with the natural log (ln(Revenue)) is the dependent variable)

	coefficients	standard error	t-ratio	p-value
constant	4.419	0.013	330.701	0.000
ln(TVAdv)	0.083	0.008	*B*	0.000
ln(NewsAdv)	0.033	0.007	4.939	0.004

Analysis of Variance of Regression 1

	df	SS	MS	F	p-value
Regression	*C*	23.435	11.718	*D*	0.002
Error	5	2.065	*E*		
Total	7	25.500			

(a) (10%) Please find the value of A, B, C, D, E in the table.

(b) (8%) Please write down the equation for regression 1 and interpret the coefficient of television advertising expenditures.

(c) (8%) Please write down the equation for regression 2 and interpret the coefficient of newspaper advertising expenditures with the natural log.

(d) (5%) How do you compare these two models?

(e) (4%) Please compute and interpret R^2 in regression 1.

(f) (5%) Use $\alpha = 0.01$ to conduct a joint test of hypothesis to determine whether any of the regression coefficient are zero in regression 1.

(g) (5%) Construct the confidence interval of NewsAdv's coefficient in regression 1.

※ 注意：1.考生須在「彌封答案卷」上作答。
2.本試題紙空白部份可當稿紙使用。
3.考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。

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(2) (20%) FJU reported that young men in Japan watch 80 minutes of prime-time TV daily. A researcher believes that young men in Taiwan spend more time watching prime-time TV. A sample of Taiwan young men will be selected by the researcher and the time they spend watching TV in one day will be recorded.

(a) (4%) Please write down the null and alternative hypotheses.

(b) (5%) What is the Type I error in this situation? What are the consequence of making this error?

(c) (5%) What is the power in this situation?

(d) (6%) What kind of problem would you have if low power?

(3) (10%) Suppose that $E(\hat{\theta}_1) = E(\hat{\theta}_2) = \theta/2$, $V(\hat{\theta}_1) = \sigma_1^2$ and $V(\hat{\theta}_2) = \sigma_2^2$. Consider the estimator $\hat{\theta}_3 = a\hat{\theta}_1 + (2-a)\hat{\theta}_2$.

(a) (5%) Is $\hat{\theta}_3$ an unbiased estimator for θ?

(b) (5%) If $\hat{\theta}_1$ and $\hat{\theta}_2$ are independent, how should the constant a be chosen in order to minimize the variance of $\hat{\theta}_3$?

(4) (10%) Let $\{Y_1, Y_2, \ldots, Y_{50}\}$ are i.i.d. random variables, please find the limiting distribution of the sample sum according to the following condition.

(a) (5%) $Y_i \sim Poisson(3)$.

(b) (5%) $Y_i \sim \chi^2(3)$.

(5) (15%) Let $\{Y_1, Y_2, \ldots, Y_n\}$ denote a random sample from the probability density function

$$f(y|\theta) = \begin{cases} (\theta+1)y^\theta, & \text{if } 0 < y < 1, \theta > -1 \\ 0, & \text{if elsewhere.} \end{cases}$$

(a) (7%) Please find the method-of-moments estimator for θ.

(b) (8%) Please find the MLE for θ.