

Final Examination

Answer all questions in the 3 (three) bluebooks provided. Make certain you write your name, your student ID number, and your TA's name on all your bluebooks, as well as noting the bluebook (A, B, or C).

This exam is 90 minutes long, although you will be given 120 minutes to complete it. Point allocations are proportional to time allocations. Partial credit will be awarded if the written material indicates understanding of how to answer the question (i.e., gibberish will not be given credit).

Bluebook A: 30 minutes, hypothesis testing

A.1 (8 minutes) A major videocassette rental chain is considering opening a new store in an area that currently does not have any such stores. The chain will open if there is evidence that at least 5,000 of the 20,000 households in the area are equipped with videocassette recorders (VCRs). It conducts a telephone poll of 900 randomly selected households in the area and finds that 270 have VCRs. Do the data provide sufficient evidence for the company to open a store in this area? Use $\alpha = .05$. Hint: $(0.433^2) = 0.1875$.

A.2 (10 minutes) One method of treating a major form of blindness in elderly people uses laser beams to seal abnormal blood vessels in the eye. When the method was tried on 224 patients, only 14% went blind in 1 year. In a control group of the same number of untreated patients, 42% went blind in 1 year. Assume the control group contained the same number of patients as the treated group. Create the 90% confidence interval for $P_1 - P_2$.

A.3 (12 minutes) A new weight-reducing technique, consisting of a liquid protein diet, is currently undergoing tests by the Food and Drug Administration (FDA) before its introduction into the market. A typical test performed by the FDA is the following: The weights of a random sample of four people are recorded before they are introduced to the liquid protein diet. The four individuals are then instructed to follow the liquid protein diet for 3 weeks. At the end of this period, their weights (in pounds) are again recorded. Let μ_1 be the true mean weight of individuals before starting the diet and let μ_2 be the true mean weight of individuals after 3 weeks on the diet, and let x_D be the measured difference in weight. The summary information is as follows: $\bar{x}_D = 5, s_D = 2.0$

a) Test to determine if the diet is effective at reducing weight. Use $\alpha = .10$.

b) State the assumption(s) that is(are) necessary for this test to provide valid inferences.

Bluebook B: 30 minutes, regression

Consider the following regression results for a regression of the 10 year real interest rate (the 10 year constant maturity interest rate adjusted by US inflation rate) on the US government budget surplus to GDP ratio.

Dependent Variable: USRGB

Method: Least Squares

Date: 12/08/03 Time: 17:37

Sample(adjusted): 1961:1 2003:2

Included observations: 170 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.022682	0.002013	11.26556	0.0000
USBUSGDP	-0.433316	0.081769	-5.299265	0.0000
R-squared	0.143217	Mean dependent var		0.028098
Adjusted R-squared	0.138117	S.D. dependent var		0.024365
S.E. of regression	0.022619	Akaike info criterion		-4.728317
Sum squared resid	0.085956	Schwarz criterion		-4.691425
Log likelihood	403.9069	F-statistic		28.08221
Durbin-Watson stat	0.153143	Prob(F-statistic)		0.000000

a) Interpret the coefficient on USBUSGDP in words (note that the interest rate and the budget surplus to GDP ratio are all expressed in decimal form, i.e., 10% is 0.10).

b) Show how to calculate the S.E. of regression using the output above.

c) If the USBUSGDP were -10% (i.e., running a budget surplus of **-10%** of GDP), what would your prediction of the interest rate be?

d) Suppose you thought that the behavior of interest rates was systematically different when the President was a Republican versus when it was a Democrat. Define a variable REP_PRES that takes on a value of 1 when the President is a Republican, and 0 otherwise, and then run the regression to obtain:

Dependent Variable: USRGB

Method: Least Squares

Date: 12/08/03 Time: 17:16

Sample(adjusted): 1961:1 2003:2

Included observations: 170 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.023075	0.002419	9.538688	0.0000
USBUSGDP	-0.002034	0.138292	-0.014707	0.9883
REP_PRES	-0.008605	0.004376	-1.966476	0.0509
REP_PRES*USBUSGDP	-0.782286	0.185339	-4.220838	0.0000
R-squared	0.226289	Mean dependent var		0.028098
Adjusted R-squared	0.212306	S.D. dependent var		0.024365
S.E. of regression	0.021624	Akaike info criterion		-4.806774
Sum squared resid	0.077621	Schwarz criterion		-4.732990
Log likelihood	412.5758	F-statistic		16.18342
Durbin-Watson stat	0.212219	Prob(F-statistic)		0.000000

Interpret in words the coefficient on USBUSGDP. Is this coefficient estimate statistically significant?

e) What is the effect of a one percentage point increase in the budget surplus to GDP ratio on the real interest rate when the President is from the Republican party?

Bluebook C, comprehensive

C.1 True/False/Explain and Calculation

a) (6 minutes) The Central Limit Theorem states that the sampling distribution of the sample mean is approximately normal if and only if the population from which we are sampling is normally distributed.

b) (12 minutes) Consider this table of the probabilities of quarterly growth rates of GDP.

Tabulation of DY and DYLAG

Sample: 1967:1 2003:2

Included observations: 146

Tabulation Summary

Variable	Categories
DY	2
DYLAG	2
Product of Categories	4

		DYLAG		Total
		[-0.05, 0)	[0, 0.05)	
DY	[-0.05, 0)	0.05	0.10	0.15
	[0, 0.05)	0.10	0.75	0.85
Total		0.15	0.85	1.00

- i) What is the unconditional probability of negative growth next quarter?
- ii) What is the probability of negative growth next quarter if this quarter's growth is positive?

C.2 Interpreting a Wage Regression (12 minutes)

A researcher uses data on 1000 randomly selected individuals to estimate the following model by least squares:

$$y = \beta_0 + \beta_1 x + \varepsilon$$

where y is an individual's wage. He selects 1 independent variable to predict an individual's wage rate. The coefficient on x is significantly different from 0 at the 5% level.

- a) What is the probability of obtaining this finding when the coefficient β_1 of the true regression is actually 0?
- b) Is this a Type I error or a Type II error?