Name: **Econ 410**
Spring 2004 **Test 2-MU**

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Directions:

- You have 75 minutes to complete this exam.
- When possible, begin the answer to each question (1,2,3,…) on a **separate**, clean sheet of paper.
- Your responses must be clear, concise, yet comprehensive.
- EXPLAIN EVERYTHING THOROUGHLY! Whenever appropriate, graphs are mandatory for full credit.
- One may earn up to 101 points on this exam. Your score is x/101.

Part I: (9 points each)

1. In a recent Bellarmine survey of 25 college graduates, the mean starting salary was 29 K$ (K=thousand) per year with a sample variance of 9 (K$^{2}). Construct a 95% confidence interval for mean salary.

2. In a recent Bellarmine survey of 25 college graduates, the mean starting salary was 29 K$ (K=thousand) per year with a sample variance of 9 (K$^{2}). The Bureau of Labor Statistics claims that the population average for starting salaries for college graduates is no more than 27.95 K$. Test the BLS's claim that starting salaries are no more than 27.95 K$ per year. Be certain to clearly state the appropriate hypotheses.

3. Referring to the previous problem, test the claim that starting salaries are exactly 27.95K$ per year. Be certain to clearly state the appropriate hypotheses.

Part II: (4 points each)

1. List ALL the Classical Assumptions for the linear regression model.

2. What properties make the slope coefficients "BLUE?" That is, define "B", "L", and "U."

3. Under what circumstance must the t-statistic be used?

4. State the content of the Central Limit Theorem.

5. Intuitively explain the difference between adjusted R-squared $\left(adj\ R^2\right)$ and R^2.

Part III: (9 points each)

In this part we study a regression of the stock market (Dow Jones Industrial Ave.), nominal GDP (in billion$), the prime rate (%), and the unemployment rate (%), *on consumption (in billion$)*. That is, consumption is the dependent variable and the other variables are independent. The observations are yearly from 1959-2000.
The Excel Output for this regression follows.
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999926
R Square	0.999853
Adjusted R Square	0.999837
Standard Error	24.68693
Observations	42

Recall	**Scientific**	**Notation:**	
Ex. 1:	**4E-2 =**	**$4(10)^{-2}$ =**	**0.04**
Ex. 2:	**5E3 =**	**$5(10)^{3}$ =**	**5000**

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1.53E+08	3825929	62777.34	2.53E-70
Residual	37	22549.44	609.4443		
Total	41	1.53E+08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-9.40829	19.95672	-0.47143	0.640098	-49.8444	31.02782	-49.8444	31.02782
DJIA	0.014661	0.004048	3.621623	0.000873	0.006459	0.022863	0.006459	0.022863
NGDP	0.667694	0.003657	182.599	2.77E-56	0.660285	0.675103	0.660285	0.675103
UR	-0.12713	3.401997	-0.03737	0.970392	-7.02022	6.765968	-7.02022	6.765968
Prime	-8.20681	1.442769	-5.68823	1.66E-06	-11.1301	-5.28348	-11.1301	-5.28348

1. Review the regression output. How would you classify this 'fit?' Explain.

2. Explicitly write out the sample regression line with the data provided. Then, predict Consumption when NGDP =10,000, Prime = 3%, DJIA = 10,000, and UR=5.6%.

3. i. Find the numerical value for the standard error of the regression, $s_{y|x}$.
ii. Find the numerical value for the standard error of the slope for UR. How does an increase in the standard error of the slope affect the t-statistic? Bonus point: How are $s_{y|x}$ and the standard error of the slope related?

4. Which independent variables are significant and which are not? Be sure to state all appropriate null and alternative hypotheses. Using an appropriate critical value, α , explain which hypotheses appear to be valid.

5. State the null and alternative hypotheses associated with the F-test. Specifically, how does the hypothesis associated with the F-test differ from the other hypotheses (t-tests)?

6. Find the numerical values for ESS and TSS. Use these to PROVE the calculation for R^2 .

You Must Explain Everything To Receive Credit!

Econ 410: Formula Sheet for Test 2

1. $E[aX+bY] = a\ E[X] + b\ E[Y]$
2. $\mathrm{E}[\mathrm{X}]=\sum p(X_i)X_i$
3. $\mathrm{E}[\mathrm{X}]=np$
4. $\sigma^2=\sum p(X_i)(X_i-E[X_i])^2$
5. $s^2=\sum_{i=1}^{n}\frac{(X_i-E[X_i])^2}{n-1}$
6. $\sigma^2=\sum_{i=1}^{n}\frac{(X_i-E[X_i])^2}{n}$
7. $\mathrm{var}[\mathrm{X}]=np(1-p)$
8. $z=\frac{x-\mu}{\sigma_x}$
9. $z=\frac{\bar{x}-\mu}{\sigma_x/\sqrt{n}}$
10. $t_{n-1}=\frac{\bar{x}-\mu}{s_x/\sqrt{n}}$
11. $\bar{x} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$
12. $\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$
13. $\left(\frac{z_{\alpha/2}\sigma_x}{0.5w}\right)^2=n$
14. $\left(\frac{t_{\alpha/2}s_x}{0.5w}\right)^2=n$
15. $F_{k,n-k-1} = \frac{ESS/k}{RSS/(n-k-1)}$
16. $R^2 = ESS/TSS$
17. $adjR^2=\bar{R}^2=1-(1-R^2)\left(\frac{n-1}{n-k}\right)$
18. $TSS = RSS + ESS$
19. $VIF=\frac{1}{1-R_i^2}$
20. $se(b_j) = s_{b_j}, t = \frac{b_j - B_j}{s_{b_j}}$
21. $a = \hat{\beta}_0, b_1 = \hat{\beta}_1, ..., b_k = \hat{\beta}_k$
    $A = \beta_0, B_1 = \beta_1, ..., B_k = \beta_k$

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