Practice for Exam 2
Econ B2000, MA Econometrics
Kevin R Foster, CCNY
Fall 2011

Not all of these questions are strictly relevant; some might require a bit of knowledge that we haven't covered this year, but they're a generally good guide.

1. You might sketch a picture.
   a. For a Normal Distribution with mean 4 and standard deviation of 1, what is the area to the left of 3.3?
      0.484 0.758 0.242 0.363
   b. For a Normal Distribution with mean -13 and standard deviation of 7, what is the area to the left of -3.2?
      0.162 0.081 0.919 0.758
   c. For a Normal Distribution with mean 1 and standard deviation of 4, what is the area to the right of -6.6?
      0.829 0.029 0.971 0.057
   d. For a Normal Distribution with mean -6 and standard deviation of 2, what is the area to the right of -9.8?
      0.057 0.829 0.029 0.971
   e. For a Normal Distribution with mean -3 and standard deviation of 5, what is the area to the right of -8?
      0.691 0.317 0.841 0.159
   f. For a Normal Distribution with mean -12 and standard deviation of 5, what is the area in both tails farther from the mean (in absolute value) than -21.5? 0.057 0.029 0.971 0.351
   g. For a Normal Distribution with mean -9 and standard deviation of 5, what is the area in both tails farther from the mean (in absolute value) than -10? 0.579 0.421 0.841 0.087
   h. For a Normal Distribution with mean -13 and standard deviation of 8 what value leaves 0.22 in the right tail? -3.188 -3.607 -8.303 -11.792
   i. For a Normal Distribution with mean -7 and standard deviation of 5 what value leaves 0.24 in the right tail?
      -4.026 -6.749 -1.052 -1.125
   j. For a Normal Distribution with mean 12 and standard deviation of 2 what value leaves 0.03 in the right tail?
      15.110 16.340 13.024 14.048
2. You might sketch a picture.
   a. For a t Distribution with sample average of 1.43, standard deviation of 1.22, and 11 observations, what is the area in both tails, for a null hypothesis of zero mean? 0.133 0.181 0.412 0.266
   b. For a t Distribution with sample average of 2.9, standard deviation of 1.82, and 13 observations, what is the area in both tails, for a null hypothesis of zero mean? 0.068 0.541 0.012 0.135
   c. For a t Distribution with sample average of 3.31, standard deviation of 2.16, and 9 observations, what is the area in both tails, for a null hypothesis of zero mean? 0.009 0.160 0.530 0.080
   d. For a t Distribution with sample average of 1.47, standard deviation of 1.47, and 16 observations, what is the area in both tails, for a null hypothesis of zero mean? 0.332 0.166 0.332 0.161
   e. For a t Distribution with 20 observations and standard deviation of 2.53, what sample mean leaves 0.08 in the two tails, when testing a null hypothesis of zero? 0.922 1.844 3.689 4.666
   f. For a t Distribution with 5 observations and standard deviation of 2.78, what sample mean leaves 0.2 in the two tails, when testing a null hypothesis of zero? 0.738 1.476 4.103 2.952
   g. For a t Distribution with 20 observations and standard deviation of 0.53, what sample mean leaves 0.24 in the two tails, when testing a null hypothesis of zero? 1.211 0.606 0.642 2.422
   h. Sample A has mean 4.28, standard deviation of 0.21, and 4 observations. Sample B has mean 4.99, standard deviation of 0.33, and 23 observations. Test the null hypothesis of no difference. 0.005 0.002 0.906 0.517
   i. Sample A has mean 1.6, standard deviation of 0.68, and 9 observations. Sample B has mean 4.83, standard deviation of 2.81, and 9 observations. Test the null hypothesis of no difference. 0.360 0.009 0.010 0.004
3. You are given the following data on the number of people in the PUMS sample who live in each of the five boroughs of NYC and who commute in each specified manner (where 'other' includes walking, working from home, taking a taxi or ferry or rail).

	Bronx	Manhattan	Staten Is	Brooklyn	Queens
car	5788	2692	5526	10990	16905

bus	3132	2789	1871	4731	4636
subway	6481	13260	279	18951	14025
other	2748	10327	900	6587	4877

a. Find the Joint Probability for drawing, from this sample, a person from Queens who commutes by bus. Find the Joint Probability of a person from the Bronx who commutes by subway.
b. Find the Marginal Probability of drawing, from among the people who commute by subway, someone who lives in Brooklyn. Find the Marginal Probability, of people who commute by bus, someone who lives in the Bronx.
c. Find the Marginal Probability of drawing, from among the people who live in Staten Island, someone who drives a car to work. Find the Marginal Probability, of people in Brooklyn, who commute by subway.
d. Are these two choices (which borough to live in, how to commute) independent? Explain using the definition of statistical independence.

4. To investigate an hypothesis proposed by a student, I got data, for 102 of the world's major countries, on the fraction of the population who are religious as well as the income per capita and the enrollment rate of boys and girls in primary school. The hypothesis to be investigated is whether more religious societies tend to hold back women. I ran two separate models: Model 1 uses girls enrollment rate as the dependent; Model 2 uses the *ratio* of girls to boys enrollment rates as the dependent. The results are below (standard errors in italics and parentheses below each coefficient):

	Model 1	Model 2	t-stat	p-value
Intercept	137	1.12		
	(18)	*(0.09)*		
Religiosity	-0.585	-0.0018		
	(0.189)	*(0.0009)*		
GDP per capita	0.00056	0.0000016		
	(0.00015)	*(0.0000007)*		

a. Which coefficient estimates are statistically significant? What are the t-statistics and p-values for each?
b. How would you interpret these results?
c. Critique the regression model. How would you improve it?

5. Download the data, "PUMA_nyc_for_exam" from Blackboard, which gives PUMA data on people living in the 5 boroughs. Run a regression that models the variable, "GRPIP," "Gross Rent as Percent of Income," which tells how burdensome are housing costs for different people.
a. What are the mean, median, 25^{th}, and 75^{th} percentiles for Rent as a fraction of income? Does this seem reasonable?
b. What is the fraction spent on rent by households in Brooklyn? In Queens? Is the difference statistically significant? Between Brooklyn and the Bronx?
c. What variables might be important in explaining this ratio? Find summary statistics for these variables.
d. Run a regression and interpret the output. Which variables are statistically significant? How do you interpret their coefficients? Are these reasonable?
e. What variables are omitted? How could the regression be improved (using actual real data)? Can you estimate a better model (with squared terms, interaction terms, etc)?

6. A random variable is distributed as a standard normal. (You are encouraged to sketch the PDF in each case.)
a. What is the probability that we could observe a value as far or farther than 1.3?
b. What is the probability that we could observe a value nearer than 1.8?
c. What value would leave 10% of the probability in the right-hand tail?
d. What value would leave 25% in both the tails (together)?

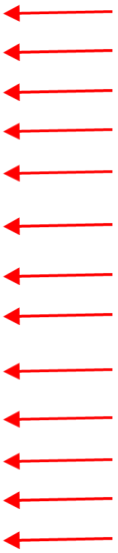
7. Using the CPS 2010 data (on Blackboard, although you don't need to download it for this), restricting attention to only those reporting a non-zero wage and salary, the following regression output is obtained for a regression (including industry, occupation, and state fixed effects) with wage and salary as the dependent variable.
a. Fill in the missing values in the table.
b. The dummy variables for veterans have been split into various time periods to distinguish recent veterans from those who served decades ago. If you knew that the draft ended at about the same time as the Vietnam war, how would that affect your interpretation of the coefficient estimates?
c. Critique the regression: how would you improve the estimates (using the same dataset)?

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.201E+13	152	5.395E+11	324.098	.000[a]
	Residual	1.639E+14	98479	1.665E+09		
	Total	2.460E+14	98631			

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1(Constant)	12970.923	2290.740		5.662	.000
Demographics, Age	2210.038	62.066	.605	____	____
Age squared	-21.527	.693	-.504	____	____
Female	-14892.950	____	-.149	-47.872	.000
African American	-3488.065	____	-.022	-7.809	.000
Asian	-2700.032	____	-.012	-2.782	.005
Native American Indian or Alaskan or Hawaiian	____	824.886	-.009	-3.442	.001
Hispanic	____	483.313	-.024	-6.847	.000
Immigrant	____	632.573	-.032	-6.728	.000
1 or more parents were immigrants	989.451	541.866	.008	____	____
immig_india	-456.482	1675.840	-.001	____	____
immig_SEAsia	821.730	1252.853	.003	____	____
immig_MidE	-599.852	2335.868	-.001	____	____
immig_China	3425.017	1821.204	.006	____	____
Education: High School Diploma	2786.569	492.533	.025	5.658	.000
Education: Some College but no degree	5243.544	528.563	.042	9.920	.000
Education: Associate in vocational	6530.542	762.525	.028	8.564	.000
Education: Associate in academic	7205.474	736.838	.032	9.779	.000
Education: 4-yr degree	17766.941	576.905	.143	30.797	.000
Education: Advanced Degree	36755.485	703.658	.227	52.235	.000
Married	4203.602	414.288	.042	10.147	.000
Divorced or Widowed or Separated	830.032	501.026	.006	1.657	.098
kids_under18	3562.643	327.103	.036	10.891	.000
kids_under6	-721.123	404.818	-.006	-1.781	.075
Union member	4868.240	976.338	.013	4.986	.000
Veteran since Sept 2001	2081.909	4336.647	.001	.480	.631
Veteran Aug 1990 - Aug 2001	-1200.688	1788.034	-.002	-.672	.502



Veteran May 1975-July 1990	-1078.953	1895.197	-.001	-.569	.569
Veteran August 1964-April 1975	-6377.461	3195.784	-.005	-1.996	.046
Veteran Feb 1955-July 1964	-7836.420	4904.511	-.004	-1.598	.110
Veteran July 1950-Jan 1955	-19976.382	10570.869	-.005	-1.890	.059
Veteran before 1950	-15822.026	12943.766	-.003	-1.222	.222

8. Using the NHANES 2007-09 data (on Blackboard, although you only need to download it for the very last part), reporting a variety of socioeconomic variables as well as behavior choices such as the number of sexual partners reported (number_partners), we want to see if richer people have more sex than poor people. The following table is constructed, showing three categories of family income and 5 categories of number of sex partners:

	number of sex partners					
family income	zero	1	2 - 5	6 - 25	>25	Marginal:
< 20,000	11	63	236	255	92	_____
20 - 45,000	7	117	323	308	117	_____
> 45,000	3	234	517	607	218	_____
Marginal:	_____	_____	_____	_____	_____	

   a. Where is the median, for number of sex partners, for poorer people? For middle-income people? For richer people?
   b. Conditional on a person being poorer, what is the likelihood that they report fewer than 6 partners? Conditional on being middle-income? Richer?
   c. Conditional on reporting 2-5 sex partners, what is the likelihood that a person is poorer? Middle-income? Richer?
   d. Explain why the average number of sex partners might not be as useful a measure as, for example, the data ranges above or the median or the 95%-trimmed mean.
   e. (5 points) (You will need to download the data for this part) Could the difference be explained by schooling effects? How does college affect the number of sex partners?

9. I provide a dataset online (stock_indexes.sav on InYourClass) with the S&P 500 stock index and its daily returns as well as the NASDAQ index and its returns, from January 1, 1980 to December 9, 2010.
   a. What is the mean and standard deviation?
   b. If the stock index returns were distributed normally, what value of return is low enough, that 95% of the days are better?
   c. What is the 5% value of the actual returns (the fifth percentile, use "Analyze\Descriptive Statistics\Explore" and check "Percentiles" in "Options")? Is this different from your previous answer? What does that imply? Explain.

10. Using the CPS 2010 data online, examine whether children are covered by Medicaid or other insurance plan. Run a crosstab on "CH_HI" whether a child has health insurance, and "CH_MC" if a child is covered by Medicaid.
   a. What fraction of children are covered by Medicaid? What fraction of children are not covered by any policy?
   b. What is the average family income of children who are covered by Medicaid? Of children who are not? What is the t-statistic and p-value for a statistical test of whether the means are equal?

11. The oil and gas price dataset online, (oil_gas_prices.sav on InYourClass, although you only need to download it for the very last part), has data on prices of oil, gasoline, and heating oil (futures prices, in this case). Compare two regression specifications of the current price of gasoline. Specification A explains the current price with its price the day before. Specification B has the price of gas on the day before but also includes the prices of crude oil and heating oil on the day before. The estimates of the coefficient on gasoline are shown below:

	Coefficient estimate	Standard error
Specification A	0.021	0.028
Specification B	0.153	0.048

   a. Calculate t-statistics and p-values for each specification of the regression.
   b. Explain what you could learn from each of these regressions – specifically, would it be a good idea to invest in gasoline futures?

c. Explain why there is a difference in the estimated coefficients. Can you say that one is more correct?

12. A random variable is distributed as a standard normal. (You are encouraged to sketch the PDF in each case.)
    d. What is the probability that we could observe a value as far or farther than -0.9?
    e. What is the probability that we could observe a value nearer than 1.4?
    f. What value would leave 5% of the probability in the right-hand tail?
    g. What value would leave 5% in both the tails (together)?
13. [this question was given in advance for students to prepare with their group] Download (from Blackboard) and prepare the dataset on the 2004 Survey of Consumer Finances from the Federal Reserve. Estimate the probability that each head of household (restrict to only heads of household!) has at least one credit card. Write up a report that explains your results (you might compare different specifications, you might consider different sets of socioeconomic variables, different interactions, different polynomials, different sets of fixed effects, etc.).
14. Explain in greater detail your topic for the final project. Include details about the dataset which you will use and the regressions that you will estimate. Cite at least one previous study which has been done on that topic (published in a refereed journal).
15. You want to examine the impact of higher crude oil prices on American driving habits during the past oil price spike. A regression of US gasoline purchases on the price of crude oil as well as oil futures gives the coefficients below. Critique the regression and explain whether the necessary basic assumptions hold. Interpret each coefficient; explain its meaning and significance.

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.252	.167		1.507	.134
	return on crude futures, 1 month ahead	.961	.099	.961	9.706	.000
	return on crude futures, 2 months ahead	-.172	.369	-.159	-.466	.642
	return on crude futures, 3 months ahead	.578	.668	.509	.864	.389
	return on crude futures, 4 months ahead	-.397	.403	-.333	-.986	.326
	US gasoline consumption	-.178	.117	-.036	-1.515	.132
	Spot Price Crude Oil Cushing, OK WTI FOB (Dollars per Barrel)	4.23E-005	.000	.042	1.771	.079

a Dependent Variable: return on crude spot price

16. You estimate the following coefficients for a regression explaining log individual incomes:

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	6.197	.026		239.273	.000
	Demographics, Age	.154	.001	1.769	114.120	.000
	agesq	-.002	.000	-1.594	-107.860	.000
	female	-.438	.017	-.184	-25.670	.000
	afam	-.006	.010	-.002	-.590	.555
	asian	-.011	.015	-.002	-.713	.476
	Amindian	-.063	.018	-.009	-3.573	.000

	Hispanic	.053	.010	.016	5.139	.000
	ed_hs	.597	.014	.226	43.251	.000
	ed_smcol	.710	.014	.272	50.150	.000
	ed_coll	1.138	.015	.379	74.378	.000
	ed_adv	1.388	.018	.355	78.917	.000
	Married	.222	.009	.092	25.579	.000
	Divorced Widowed Separated	.138	.011	.041	12.311	.000
	union	.189	.021	.022	8.951	.000
	veteran	.020	.012	.004	1.646	.100
	immigrant	-.055	.013	-.017	-4.116	.000
	2nd Generation Immigrant	.064	.012	.022	5.268	.000
	female*ed_hs	-.060	.020	-.017	-2.948	.003
	female*ed_smcol	-.005	.020	-.002	-.270	.787
	female*ed_coll	-.104	.022	-.026	-4.806	.000
	female*ed_adv	-.056	.025	-.010	-2.218	.027

a Dependent Variable: lnwage

a. Explain your interpretation of the final four coefficients in the table.
b. How would you test their significance? If this test got "Sig. = 0.13" from SPSS, interpret the result.
c. What variables are missing? Explain how this might affect the analysis.

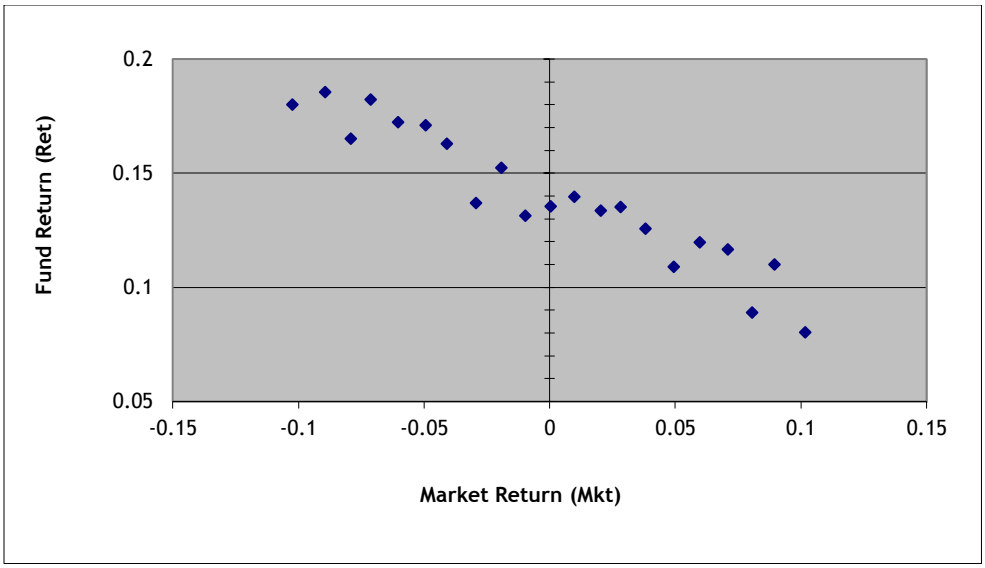
17. Fill in the blanks in the following table showing SPSS regression output. The model has the dependent variable as time spent working at main job.

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	198.987	7.556		26.336	.000
	female	-65.559	4.031	-.138	___?___	___?___
	African-American	-9.190	6.190	-.013	___?___	___?___
	Hispanic	17.283	6.387	.024	___?___	___?___
	Asian	1.157	12.137	.001	___?___	___?___
	Native American/Alaskan Native	-28.354	14.018	-.017	-2.023	.043
	Education: High School Diploma	___?___	6.296	.140	11.706	.000
	Education: Some College	___?___	6.308	.174	14.651	.000
	Education: 4-year College Degree	110.064	___?___	.183	16.015	.000
	Education: Advanced degree	126.543	___?___	.166	15.714	.000
	Age	-1.907	___?___	-.142	-16.428	.000

a Dependent Variable: Time Working at main job

18. Suppose I were to start a hedge fund, called KevinNeedsMoney Limited Ventures, and I want to present evidence about how my fund did in the past. I have data on my fund's returns, Rett, at each time period t, and the returns on the market, Mktt. The graph below shows the relationship of these two variables:



a. I run a univariate OLS regression, $Ret_t = \beta_0 + \beta_1 Mkt_t + u_t$. Approximately what value would be estimated for the intercept term, β_0? For the slope term, β_1?

b. How would you describe this fund's performance, in non-technical language – for instance if you were advising a retail investor without much finance background?

19. Using the American Time Use Study (ATUS) we measure the amount of time that each person reported that they slept. We run a regression to attempt to determine the important factors, particularly to understand whether richer people sleep more (is sleep a normal or inferior good) and how sleep is affected by labor force participation. The SPSS output is below.

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	-4.0717	4.6121		-0.883	0.377
female	23.6886	1.1551	0.18233	20.508	0.000
African-American	-8.5701	1.7136	-0.04369	-5.001	0.000
Hispanic	10.1015	1.7763	0.05132	5.687	0.000
Asian	-1.9768	3.3509	-0.00510	-0.590	0.555
Native American/Alaskan Native	-3.5777	3.8695	-0.00792	-0.925	0.355
Education: High School Diploma	2.5587	1.8529	0.01768	1.381	0.167
Education: Some College	-0.3234	1.8760	-0.00222	-0.172	0.863
Education: 4-year College Degree	-1.3564	2.0997	-0.00821	-0.646	0.518
Education: Advanced degree	-3.3303	2.4595	-0.01590	-1.354	0.176
Weekly Earnings	0.000003	0.000012	-0.00277	-0.246	0.806
Number of children under 18	2.0776	0.5317	0.03803	3.907	0.000
person is in the labor force	-11.6706	1.7120	-0.08401	-6.817	0.000
has multiple jobs	0.4750	2.2325	0.00185	0.213	0.832
works part time	4.2267	1.8135	0.02244	2.331	0.020
in school	-5.4641	2.2993	-0.02509	-2.376	0.017
Age	1.1549	0.1974	0.31468	5.850	0.000

Age-squared	-0.0123	0.0020	-0.33073	-6.181	0.000

a. Which variables are statistically significant at the 5% level? At the 1% level?
b. How much more or less time (in minutes) would be spent sleeping by a male college graduate who is African-American and working full-time, bringing weekly earnings of $1000?
c. Are there other variables that you think are important and should be included in the regression? What are they, and why?

20. You are given the following output from a logit regression using ATUS data. The dependent variable is whether the person spent any time cleaning in the kitchen and the independent variables are the usual list of race/ethnicity (African-American, Asian, Native American, Hispanic), female, educational attainment (high school diploma, some college, a 4-year degree, or an advanced degree), weekly earnings, the number of kids in the household, dummies if the person is in the labor force, has multiple jobs, works part-time, or is in school now, as well as age and age-squared. We include a dummy if there is a spouse or partner present and then an interaction term for if the person is male AND there is a spouse in the household. There are only adults in the sample. Descriptive statistics show that approximately 5% of men clean in the kitchen while 20% of women do. The SPSS output for the logit regression is:

	B	S.E.	Wald	df	Sig.	Exp(B)
female	0.9458	0.0860	120.945	1	0.000	2.5749
African-American	-0.6113	0.0789	60.079	1	0.000	0.5427
Hispanic	-0.2286	0.0765	8.926	1	0.003	0.7956
Asian	0.0053	0.1360	0.001	1	0.969	1.0053
Native American	-0.0940	0.1618	0.338	1	0.561	0.9103
Education: high school	0.0082	0.0789	0.011	1	0.917	1.0082
Education: some college	0.0057	0.0813	0.005	1	0.944	1.0057
Education: college degree	0.0893	0.0887	1.013	1	0.314	1.0934
Education: advanced degree	0.0874	0.1009	0.751	1	0.386	1.0914
Weekly Earnings	0.0000007	0.0000005	1.943	1	0.163	1.0000
Num. Kids in Household	0.2586	0.0226	131.473	1	0.000	1.2952
person in the labor force	-0.5194	0.0694	55.967	1	0.000	0.5949
works multiple jobs	-0.2307	0.1009	5.223	1	0.022	0.7940
works part-time	0.1814	0.0733	6.130	1	0.013	1.1989
person is in school	-0.1842	0.1130	2.658	1	0.103	0.8318
Age	0.0551	0.0088	38.893	1	0.000	1.0567
Age-squared	-0.0004	0.0001	22.107	1	0.000	0.9996
spouse is present	0.5027	0.0569	78.074	1	0.000	1.6531
Male * spouse is present	-0.6562	0.1087	36.462	1	0.000	0.5188
Constant	-3.3772	0.2317	212.434	1	0.000	0.0341

a. Which variables from the logit are statistically significant at the 5% level? At the 1% level?
b. How would you interpret the coefficient on the Male * spouse-present interaction term? What is the age when a person hits the peak probability of cleaning?

21. Use the SPSS dataset, atus_tv from Blackboard, which is a subset of the American Time Use survey. This time we want to find out which factors are important in explaining whether people spend time watching TV. There are a wide number of possible factors that influence this choice.
a. What fraction of the sample spend any time watching TV? Can you find sub-groups that are significantly different?
b. Estimate a regression model that incorporates the important factors that influence TV viewing. Incorporate at least one non-linear or interaction term. Show the SPSS output. Explain which variables are significant (if any). Give a short explanation of the important results.

22. This question refers to your final project.
    d. What data set will you use?
    e. What regression (or regressions) will you run? Explain carefully whether the dependent variable is continuous or a dummy, and what this means for the regression specification. What independent variables will you include? Will you use nonlinear specifications of any of these? Would you expect heteroskedasticity?
    f. What other variables are important, but are not measured and available in your data set? How do these affect your analysis?
23. Estimate the following regression:: S&P100 returns = $\beta 0 + \beta 1$(lag S&P100 returns) + $\beta 2$(lag interest rates) + ε using the dataset, financials.sav. Explain which coefficients (if any) are significant and interpret them.
24. A study by Mehran and Tracy examined the relationship between stock option grants and measures of the company's performance. They estimated the following specification:

    Options = $\beta 0+\beta 1$(Return on Assets)+$\beta 2$(Employment)+$\beta 3$(Assets)+$\beta 4$(Loss)+u

    where the variable (Loss) is a dummy variable for whether the firm had negative profits. They estimated the following coefficients:

	Coefficient	Standard Error
Return on Assets	-34.4	4.7
Employment	3.3	15.5
Assets	343.1	221.8
Loss Dummy	24.2	5.0

    Which estimate has the highest t-statistic (in absolute value)? Which has the lowest p-value? Show your calculations. How would you explain the estimate on the "Loss" dummy variable?

25. A paper by Farber examined the choices of how many hours a taxidriver would work, depending on a number of variables. His output is:

Table 4: Labor Supply Function Estimates
OLS Regression of log Hours

Variable	(1)	(2)	(3)	(4)
Constant	4.012	3.882	3.776	3.778
	(0.349)	(0.354)	(0.379)	(0.381)
log(wage)	-0.688	-0.647	-0.636	-0.637
	(0.111)	(0.112)	(0.115)	(0.115)
Night Shift	---	---	0.128	0.134
			(0.062)	(0.062)
Min Temp $<$ 30	---	---	---	0.024
				(0.058)
Max Temp $\geq$ 80	---	---	---	0.055
				(0.064)
Rainfall	---	---	---	-0.054
				(0.071)
Snowfall	---	---	---	-0.093
				(0.035)
Driver Effects	No	Yes	Yes	Yes
Day-of-Week Effects	No	No	Yes	Yes
R-squared	0.063	0.162	0.185	0.198

Note: The sample includes 584 shifts for 21 drivers. The dependent variable is log hours worked (driving time plus time between fares excluding declared breaks and breaks between fares one hour or longer). The mean of the dependent variable is 1.84. Standard errors are in parentheses.

"Driver Effects" are fixed effects for the 21 different drivers.

a. What is the estimated elasticity of hours with respect to the wage?
b. Is there a significant change in hours on rainy days? On snowy days?

26. A paper by Gruber looks at the effects of divorce on children (once they become adults), including whether there was an increase or decrease in education and wages. Gruber uses data on state divorce laws: over time some states changed their laws to make divorce easier (no-fault or unilateral divorce). Why do you think that he used state-level laws rather than the individual information (which was in the dataset) about whether a person's parents were divorced? Is it important that he documents that states with easier divorce laws had more divorces? If he ran a regression that explained an adult's wage on the usual variables, plus a measure of whether that person's parents had been divorced, what complications might arise? Explain.
27. Using the data on New Yorkers in 1910, we estimate a binary logistic (logit) model to explain labor force participation (whether each person was working for pay) as a function of gender (a dummy variable for female), race (a dummy for African-American), nativity (a dummy if the person is an immigrant and then another dummy if they are second-generation – their parents were immigrants), marital status (three dummies: one for married; one for Divorced/Separated; one for Widow(er)s), age, age-squared, and interaction effects. We allow interactions between Female and Married (fem_marr = Married * Female), and then between Age and Immigrant (age_immig = Age * Immigrant) and Age-Squared and Immigrant (agesq_immig = Age2 * Immigrant). Explain the following regression results:

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	female	-1.890	.122	240.805	1	.000	.151
	AfricanAmer	2.703	.235	132.625	1	.000	14.919
	Married	1.144	.193	35.245	1	.000	3.141

fem_marr	-4.946	.209	562.000	1	.000	.007
DivSep	.251	.568	.195	1	.658	1.285
Widow	-1.238	.131	89.790	1	.000	.290
immigrant	1.575	1.167	1.822	1	.177	4.831
immig2g	.068	.117	.338	1	.561	1.070
Age	.114	.047	5.858	1	.016	1.121
age_sqr	-.00176	.001	7.137	1	.008	.998
age_immig	-.035	.068	.263	1	.608	.966
agesq_immig	0.00027	.001	.080	1	.777	1.000
Constant	1.069	.795	1.809	1	.179	2.911

a Variable(s) entered on step 1: female, AfricanAmer, Married, fem_marr, DivSep, Widow, immigrant, immig2g, age, age_sqr, age_immig, agesq_immig.

At what age do natives peak in their labor force participation? Immigrants? Which is higher? The regression shows that women are less likely to be in the labor force, married people are more likely, African-Americans are more likely, and immigrants are more likely to be in the labor force. Interpret the coefficient on the female-married interaction.

28. Calculate the probability in the following areas under the Normal pdf with mean and standard deviation as given. You might usefully draw pictures as well as making the calculations. For the calculations you can use either a computer or a table.
    a. What is the probability, if the true distribution has mean -15 and standard deviation of 9.7, of seeing a deviation as large (in absolute value) as -1?
    b. What is the probability, if the true distribution has mean 0.35 and standard deviation of 0.16, of seeing a deviation as large (in absolute value) as 0.51?
    c. What is the probability, if the true distribution has mean -0.1 and standard deviation of 0.04, of seeing a deviation as large (in absolute value) as -0.16?

29. Using data from the NHIS, we find the fraction of children who are female, who are Hispanic, and who are African-American, for two separate groups: those with and those without health insurance. Compute tests of whether the differences in the means are significant; explain what the tests tell us. (Note that the numbers in parentheses are the standard deviations.)

	with health insurance	without health insurance
female	0.4905	0.4811
	(0.49994) N=7865	(0.49990) N=950
Hispanic	0.2587	0.5411
	(0.43797) N=7865	(0.49857) N=950
African American	0.1785	0.1516
	(0.38297) N=7865	(0.35880) N=950

30. Explain the topic of your final project. Carefully explain one regression that you are going to estimate (or have already estimated). Tell the dependent variable and list the independent variables. What hypothesis tests are you particularly interested in? What problems might arise in the estimation? Is there likely to be heteroskedasticity? Is it clear that the X-variables cause the Y-variable and not vice versa? Explain. [Note: these answers should be given in the form of well-written paragraphs not a series of bullet items answering my questions!]
31. In estimating how much choice of college major affects income, Hamermesh & Donald (2008) send out surveys to college alumni. They first estimate the probability that a person will answer the survey with a probit model. They use data on major (school of education is the omitted category), how long ago the person graduated, and some information from their college record. Their results are (assume that the coefficient is 0.253):

		pr(respond to survey)	t-statistic
Major (Dummy variable)	Architecture and Fine Arts	-0.044	1.61
	Business---general	0.046	1.72
	Business---quantitative	0.038	1.45
	Communications	0.023	1.00
	Engineering	0.086	2.51
	Humanities	-0.013	0.54

dummy variables	"Honors"	0.087	2.08
	Social Sciences	0.052	2.28
	Natural Sciences, Pharmacology	0.04	1.52
	Nursing, Social Work	0.061	1.57
	Class of 1980	0.025	1.61
	Class of 1985	-0.009	0.61
	Class of 1990	0.041	2.65
	Class of 1995	0.033	2.20
	GPA	0.027	2.59
	Upper Div. Sci. & Math Credits	0.0001	0.21
	Upper Div. Sci. & Math Grades	0.002	0.51
	HS Area Income ($000)	0.001	1.92
	Female	0.031	3.06

What is the probability of reply for a major in quantitative Business, from the Class of 1995, with a GPA of 3.1, with 31 upper-division Science & Math credits, with a 2.9 GPA within those upper-division Science & Math courses, from a high school with a 40 HS Area Income? How much more or less is the probability, if the respondent is female?

32. Consider the following regression output, from a regression of log-earnings on a variety of socioeconomic factors. Fill in the blanks in the "Coefficients" table. Then calculate the predicted change in the dependent variable when Age increases from 25 to 26; then when Age changes from 55 to 56 (note that Age_exp2 is Age2 and Age_exp3 is Age3).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.613	.376	.376	.94098

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53551.873	26	2059.687	2326.152	.000(a)
	Residual	88995.531	100509	.885		
	Total	142547.403	100535			

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	t	Sig.	
(Constant)	3.841	0.059		65.581	0.000	
Education: High School Diploma	0.106	0.008	0.040305	__?__	__?__	←
Education: AS vocational	__?__	0.015	0.051999	19.644	0.000	←
Education: AS academic	0.344	__?__	0.062527	23.574	0.000	←
Education: 4 year College Degree	0.587	0.009	0.195326	65.257	0.000	
Education: Advanced Degree	0.865	0.011	0.221309	77.658	0.000	
geog2	0.070	0.013	0.017072	5.220	0.000	
geog3	0.005	0.013	0.001232	__?__	__?__	←
geog4	-0.050	0.013	-0.01345	__?__	__?__	←

geog5	0.062	0.012	0.019974	__?__	__?__	←
geog6	-0.061	0.017	-0.01039	__?__	__?__	←
geog7	0.026	0.014	0.006106	__?__	__?__	←
geog8	0.056	0.013	0.014445	4.303	0.000	
geog9	0.102	0.012	0.030892	8.357	0.000	
Married	__?__	0.009	0.062911	17.213	0.000	←
Widowed	__?__	0.025	-0.00191	-0.697	__?__	←
Divorced or Separated	__?__	0.012	0.022796	7.042	0.000	←
female	__?__	0.006	-0.19408	-76.899	0.000	←
union	0.208	__?__	0.024531	9.808	0.000	←
hispanic	-0.106	__?__	-0.03211	-12.012	0.000	←
Af_Amer	-0.038	__?__	-0.00995	-3.774	0.000	←
NativAm	-0.100	__?__	-0.01342	-5.322	0.000	←
AsianAm	-0.061	__?__	-0.01147	-4.420	0.000	←
MultRace	0.001	0.066	1.93E-05	0.008	__?__	←
Demographics, Age	0.377	0.005	4.332516	83.265	0.000	
Age_exp2	-0.00689	0.00011	-6.70717	-65.345	0.000	
Age_exp3	0.0000384	0.0000008	2.65889	49.301	0.000	

a Dependent Variable: ln_earn

33. Use the dataset brfss_exam2.sav. This has data from the Behavioral Risk Factors Survey, focused on people under 30 years old. Carefully estimate a model to explain the likelihood that a person has smoked (measured by variable "eversmok"). Note that I have created some basic dummy variables but you are encouraged to create more of your own, as appropriate. Explain the results of your model in detail. Are there surprising coefficient estimates? What variables have you left out (perhaps that aren't in this dataset but could have been collected), that might be important? How is this omission likely to affect the estimated model? What is the change in probability of smoking, between a male and female (explain any other assumptions that you make, to calculate this)?
34. Using the CPS 2010 data (you don't need to download it for this), restricting attention to only prime-age (25-55 year-old) males reporting a non-zero wage and salary, the following regression output is obtained for a regression (including industry, occupation, and state fixed effects) with log wage and salary as the dependent variable.
    a. (17 points) Fill in the missing values in the table.
    b. (3 points) Critique the regression: how would you improve the estimates (using the same dataset)?

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11194.359	145	77.202	127.556	.000[a]
	Residual	21558.122	35619	.605		
	Total	32752.482	35764			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	8.375	.112		74.714	.000
	Demographics, Age	.078	.005	.705		
	Age squared	-.00085	.00006	-.617		
	African American	-.184	.015	-.058		
	Asian		.022	-.025	-4.620	.000

Native American Indian or Alaskan or Hawaiian		.027	-.025	-5.674	.000
Hispanic	-.051		-.020	-2.172	.030
Mexican	-.021		-.007	-.868	.386
Puerto Rican	.014		.002	.319	.750
Cuban	.007	.059	.001		
Immigrant	-.094	.019	-.039		
1 or more parents were immigrants	.001	.018	.001		
Education: High School Diploma	.219		.105	13.582	.000
Education: Some College but no degree	.333		.130	18.332	.000
Education: Associate in vocational	.362		.081	14.919	.000
Education: Associate in academic		.025	.080	14.642	.000
Education: 4-yr degree		.019	.236	28.773	.000
Education: Advanced Degree		.023	.253	33.757	.000
Married		.011	.140	25.219	.000
Divorced or Widowed or Separated		.016	.021	3.992	.000
Union member		.030	.031	7.168	.000
Veteran since Sept 2001	-.047	.094	-.002		
Veteran Aug 1990 - Aug 2001	-.053	.038	-.006		
Veteran May 1975-July 1990	.035	.048	.003		
Veteran August 1964-April 1975	.078	.129	.003		

35. Using the BRFSS 2009 data, the following table compares the reported health status of the respondent with whether or not they smoked (defined as having at least 100 cigarettes)

		SMOKED AT LEAST 100 CIGARETTES		
		Yes	No	Marginal
GENERAL HEALTH	Excellent	27775	49199	____
	Very good	58629	77357	____
	Good	64237	67489	____
	Fair	31979	26069	____
	Poor	15680	9191	____
	Marginal	____	____	

a. What is the median health status for those who smoked? For non-smokers?
b. Fill in the marginal probabilities – make sure they are probabilities.
c. Explain what you might conclude from this data.

36. Using the CPS data, run at least 4 interesting regressions to model the wages earned. Carefully explain what we can learn from each regression: does it accord with theory; if not, what does this mean? Explain what statistical measures allow us to compare different specifications.
37. For a Normal Distribution with mean 9 and standard deviation 9.1, what is area to the right of -8.3?
A. 0.8387 B. 0.9713 C. 0.1587 D. 0.0287
38. For a Normal Distribution with mean 1 and standard deviation 9.6, what is area to the right of 23.1?
A. 0.1251 B. 0.0107 C. 0.4585 D. 0.9893
39. For a Normal Distribution with mean 12 and standard deviation 7.9, what is area to the right of 30.2?
A. 0.1587 B. 0.9893 C. 0.9356 D. 0.0107
40. For a Normal Distribution with mean 5 and standard deviation 7.6, what is area to the right of 14.1?
A. 0.2743 B. 0.1587 C. 0.1151 D. 0.2301

41. For a Normal Distribution with mean -14 and standard deviation 2.8, what is area to the left of -20.4?
    A. 0.0107 B. 0.8235 C. 0.0214 D. 0.0971
42. For a Normal Distribution with mean -2 and standard deviation 3.8, what is area to the left of 2.9?
    A. 0.7007 B. 0.9032 C. 0.1936 D. 0.2578
43. For a Normal Distribution with mean 4 and standard deviation 7.1, what is area to the left of 13.2?
    A. 0.9032 B. 0.1936 C. 0.2866 D. 0.1587
44. For a Normal Distribution with mean -11 and standard deviation 5.0, what is area to the left of 0.5?
    A. 0.1251 B. 0.1587 C. 0.0214 D. 0.9893
45. For a Normal Distribution with mean -7 and standard deviation 5.1, what is area in both tails farther from the mean than -1.9?
    A. 0.3173 B. 0.0849 C. 0.6346 D. 0.9151
46. For a Normal Distribution with mean 13 and standard deviation 3.5, what is area in both tails farther from the mean than 7.8?
    A. 0.2672 B. 0.1336 C. 0.1587 D. 0.7734
47. For a Normal Distribution with mean 10 and standard deviation 5.9, what is area in both tails farther from the mean than 11.2?
    A. 0.8415 B. 0.4602 C. 0.1587 D. 0.5793
48. For a Normal Distribution with mean 1 and standard deviation 7.8, what is area in both tails farther from the mean than 18.2?
    A. 0.0278 B. 0.9861 C. 0.1587 D. 0.1357
49. For a Normal Distribution with mean -5 and standard deviation 1.6, what value leaves probability 0.794 in the left tail?
    A. NaN B. 0.2060 C. -3.6874 D. 0.8204
50. For a Normal Distribution with mean -7 and standard deviation 6.5, what value leaves probability 0.689 in the left tail?
    A. -3.7954 B. -5.3977 C. -10.2046 D. 0.4930
51. For a Normal Distribution with mean 12 and standard deviation 1.5, what value leaves probability 0.825 in the left tail?
    A. 0.1750 B. 13.4019 C. 8.9346 D. 0.9346
52. For a Normal Distribution with mean -12 and standard deviation 9.6, what value leaves probability 0.006 in the left tail?
    A. -2.5121 B. 12.1166 C. -33.6684 D. -36.1166
53. For a Normal Distribution with mean -2 and standard deviation 9.1, what value leaves probability 0.182 in the right tail?
    A. 0.9078 B. 6.2607 C. -1.1275 D. 0.8180
54. For a Normal Distribution with mean 0 and standard deviation 4.0, what value leaves probability 0.077 in the right tail?
    A. -4.0777 B. -5.7022 C. 1.4255 D. 5.7022
55. For a Normal Distribution with mean 13 and standard deviation 4.9, what value leaves probability 0.489 in the right tail?
    A. 13.1351 B. 0.0276 C. 12.9324 D. 12.8649
56. For a Normal Distribution with mean -3 and standard deviation 1.0, what value leaves probability 0.133 in the right tail?
    A. 1.1123 B. -3.6250 C. -4.1123 D. -1.8877