ECO220Y1Y, Test #3, Prof. Murdock

February 10, 2023, 9:10 – 11:00 am

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Instructions:

- You have 110 minutes. Keep these test papers and the *Supplement* closed and face up on your desk until the start of the test is announced. You must stay for a minimum of 60 minutes.
- You may use a **non-programmable calculator**.
- There are 5 questions (most with multiple parts) with varying point values worth a total of 95 points.
- This test includes these 8 pages plus the *Supplement*. The *Supplement* contains the aid sheets and statistical tables (Standard Normal and Student t) and readings, figures, tables, and other materials for test questions. For each question referencing the *Supplement*, carefully review *all* materials. ***The Supplement will NOT be collected:*** write your answers on these test papers. When we announce the end of the test, hand these test papers to us (you keep the *Supplement*).
- Write your answers clearly, completely, and concisely in the designated space provided immediately after each question. An answer guide ends each question to let you know what is expected. For example, a quantitative analysis, a fully labelled graph, and/or sentences. Any answer guide asking for a quantitative analysis *always* automatically means that you must show your work and make your reasoning clear.
    - Anything requested by the question and/or the answer guide is required. Similarly, limit yourself to the answer guide. For example, if the answer guide does not request sentences, provide only what is requested (e.g. quantitative analysis).
    - Marking TAs are instructed to accept all reasonable rounding.
- ***Your entire answer must fit in the designated space provided immediately after each question.*** No extra space/pages are possible. You *cannot* use blank space for other questions, nor can you write answers on the *Supplement*. ***Write in PENCIL and use an ERASER as needed*** so that you can fit your final answer (including work and reasoning) in the appropriate space. Questions give more blank space than is needed for an answer (with typical handwriting) worth full marks. ***Follow the answer guides and avoid excessively long answers.***

(1) See ***Supplement for Question (1)***: *Forecasts of the directional effects of macroeconomic shocks.*

(a) [6 pts] Consider **Scenario A**. Answer by filling in the blanks.

The standardized test statistic is _________ [numeric value]. The difference _________ [is; is not] statistically significant and it gets _____ [0; 1; 2; 3] stars. The difference is _________ [numeric value] percentage points and it _________ [is; is not] economically significant. Overall, there _________ [is; is not] a significant difference.

(b) [6 pts] Consider **Scenario B**. Answer by filling in the blanks.

The standardized test statistic is _________ [numeric value]. The difference _________ [is; is not] statistically significant and it gets _____ [0; 1; 2; 3] stars. The difference is _________ [numeric value] percentage points and it _________ [is; is not] economically significant. Overall, there _________ [is; is not] a significant difference.

(c) [6 pts] Consider **Scenario C**. What would a Type I error be in that context? Answer with 1 – 2 sentences.

(d) [6 pts] Consider the sentence below. Answer with a quantitative analysis & by filling in the blank.

With a sample size of 250 and a 5% significance level, to prove that over two-thirds of economics degree holders think a rise in the Federal funds rate will lower inflation, at least ______ percent of the sample must think that.

(2) See ***Supplement for Question (2)***: *Medicaid Increases Emergency-Department Use.*

(a) [12 pts] For City X, in Table 2 below write the results for "*Percent with any visits.*" Use the same format as Taubman et al. (2013). Answer with hypotheses in formal notation, a quantitative analysis & fill in the **three outlined** cells below.

Table 2. Emergency-department use					
		Percent with any visits[1]			
	N	Percent in Control Group	Effect of Medicaid Coverage	P-value	
Panel A: Overall					
All visits	10,000				

Notes: We report the estimated effect of Medicaid on emergency department use over our study period. We report the sample size, the control mean of the dependent variable (with standard deviation for continuous outcomes in parentheses), the estimated effect of Medicaid coverage (with standard error in parentheses), and the p-value of the estimated effect. Sample consists of individuals in City X zip codes (N=10,000).

[1] For the percent-with-any-visits measures, the estimated effect of Medicaid coverage is shown in percentage points.

(b) [8 pts] For City X, in Table 2 below write the results for "*Number of visits.*" Use the same format as Taubman et al. (2013). Answer with hypotheses in formal notation, a quantitative analysis & fill in the **two outlined** cells below.

Table 2. Emergency-department use					
			Number of visits[2]		
	N		Mean Value in Control Group	Effect of Medicaid Coverage	
Panel A: Overall					
All visits	10,000				

Notes: We report the estimated effect of Medicaid on emergency department use over our study period. We report the sample size, the control mean of the dependent variable (with standard deviation for continuous outcomes in parentheses), the estimated effect of Medicaid coverage (with standard error in parentheses), and the p-value of the estimated effect. Sample consists of individuals in City X zip codes (N=10,000).

[2] The number-of-visits measure is unconditional, including those with no visits.

(3) See ***Supplement for Question (3)***: *Karlan and List (2007).*

(a) [3 pts] In Table 2B, what are the values of AAA and BBB? Answer with quantitative analyses & fill in the blanks.

AAA = __________ BBB = __________

(b) [6 pts] Next, what are the values of CCC, DDD, EEE, and FFF? Answer with quantitative analyses & fill in the blanks.

CCC = __________ DDD = __________ EEE = __________ FFF = __________

(c) [13 pts] Consider the results in **Table 2B**. For the control group, what is the 90% confidence interval estimate of the difference in the response rates between Blue states versus Red states? Next, what is the *interpretation* of that interval? <u>Answer with a quantitative analysis & 3 – 4 sentences.</u>

(d) [13 pts] Consider the results in **Table 2B**. What is the 99% confidence interval estimate of the difference in the dollars given, unconditional on giving, between those in the control group versus those seeing a high example amount? Next, what is the *interpretation* of that interval? Answer with a quantitative analysis & 3 – 4 sentences.

(4) [7 pts] See ***Supplement for Question (4)***: *Teenagers' Identity. Interpret* 0.924269. Answer with 2 – 3 sentences.

(5) See ***Supplement for Question (5)***: *Survey in ECO220Y.*

(a) [3 pts] The mean happiness of the 109 students not in commerce is 6.467890. The mean happiness of the 269 students in commerce is 6.702602. For estimating the OLS regression $\widehat{cantril} = a + b * commerce$, what is the relevant sample size (n) and what are the estimated values of a and b? Answer with the three requested values.

(b) [6 pts] Consider the OLS regression results: $\widehat{comp} = 6.541284 + 0.9271171 * commerce$. What is the *interpretation* of 6.541284 and 0.9271171? Answer with 2 – 3 sentences.

This *Supplement* has the aid sheets and statistical tables (Standard Normal and Student t) and readings, figures, tables, and other materials for test questions. For each question referencing this *Supplement*, carefully review *all* materials.

Sample mean: $\bar{X} = \frac{\sum_{i=1}^{n} x_i}{n}$ **Sample variance:** $s^2 = \frac{\sum_{i=1}^{n}(x_i-\bar{X})^2}{n-1} = \frac{\sum_{i=1}^{n} x_i^2}{n-1} - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n(n-1)}$ **Sample s.d.:** $s = \sqrt{s^2}$

Sample coefficient of variation: $CV = \frac{s}{\bar{X}}$ **Sample covariance:** $s_{xy} = \frac{\sum_{i=1}^{n}(x_i-\bar{X})(y_i-\bar{Y})}{n-1} = \frac{\sum_{i=1}^{n} x_i y_i}{n-1} - \frac{(\sum_{i=1}^{n} x_i)(\sum_{i=1}^{n} y_i)}{n(n-1)}$

Sample interquartile range: $IQR = Q3 - Q1$ **Sample coefficient of correlation:** $r = \frac{s_{xy}}{s_x s_y} = \frac{\sum_{i=1}^{n} z_{x_i} z_{y_i}}{n-1}$

Addition rule: $P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$ **Conditional probability:** $P(A|B) = \frac{P(A\ and\ B)}{P(B)}$

Complement rules: $P(A^C) = P(A') = 1 - P(A)$ $P(A^C|B) = P(A'|B) = 1 - P(A|B)$

Multiplication rule: $P(A\ and\ B) = P(A|B)P(B) = P(B|A)P(A)$

Expected value: $E[X] = \mu = \sum_{all\ x} xp(x)$ **Variance:** $V[X] = E[(X-\mu)^2] = \sigma^2 = \sum_{all\ x}(x-\mu)^2 p(x)$

Covariance: $COV[X,Y] = E[(X-\mu_X)(Y-\mu_Y)] = \sigma_{XY} = \sum_{all\ x}\sum_{all\ y}(x-\mu_X)(y-\mu_Y)p(x,y)$

Laws of expected value:

$E[c] = c$
$E[X+c] = E[X] + c$
$E[cX] = cE[X]$
$E[a+bX+cY] = a + bE[X] + cE[Y]$

Laws of variance:

$V[c] = 0$
$V[X+c] = V[X]$
$V[cX] = c^2V[X]$
$V[a+bX+cY] = b^2V[X] + c^2V[Y] + 2bc * COV[X,Y]$
$V[a+bX+cY] = b^2V[X] + c^2V[Y] + 2bc * SD(X) * SD(Y) * \rho$
where $\rho = CORRELATION[X,Y]$

Laws of covariance:

$COV[X,c] = 0$
$COV[a+bX, c+dY] = bd * COV[X,Y]$

Combinatorial formula: $C_x^n = \frac{n!}{x!(n-x)!}$ **Binomial probability:** $p(x) = \frac{n!}{x!(n-x)!}p^x(1-p)^{n-x}$ for $x = 0,1,2,\ldots,n$

If X is Binomial $(X \sim B(n,p))$ **then** $E[X] = np$ **and** $V[X] = np(1-p)$

If X is Uniform $(X \sim U[a,b])$ **then** $f(x) = \frac{1}{b-a}$ **and** $E[X] = \frac{a+b}{2}$ **and** $V[X] = \frac{(b-a)^2}{12}$

Sampling distribution of $\bar{X}$:

$\mu_{\bar{X}} = E[\bar{X}] = \mu$
$\sigma_{\bar{X}}^2 = V[\bar{X}] = \frac{\sigma^2}{n}$
$\sigma_{\bar{X}} = SD[\bar{X}] = \frac{\sigma}{\sqrt{n}}$

Sampling distribution of $\hat{P}$:

$\mu_{\hat{P}} = E[\hat{P}] = p$
$\sigma_{\hat{P}}^2 = V[\hat{P}] = \frac{p(1-p)}{n}$
$\sigma_{\hat{P}} = SD[\hat{P}] = \sqrt{\frac{p(1-p)}{n}}$

Sampling distribution of $(\hat{P}_2 - \hat{P}_1)$:

$\mu_{\hat{P}_2-\hat{P}_1} = E[\hat{P}_2 - \hat{P}_1] = p_2 - p_1$
$\sigma_{\hat{P}_2-\hat{P}_1}^2 = V[\hat{P}_2 - \hat{P}_1] = \frac{p_2(1-p_2)}{n_2} + \frac{p_1(1-p_1)}{n_1}$
$\sigma_{\hat{P}_2-\hat{P}_1} = SD[\hat{P}_2 - \hat{P}_1] = \sqrt{\frac{p_2(1-p_2)}{n_2} + \frac{p_1(1-p_1)}{n_1}}$

Sampling distribution of $(\bar{X}_1 - \bar{X}_2)$, independent samples:

$\mu_{\bar{X}_1-\bar{X}_2} = E[\bar{X}_1 - \bar{X}_2] = \mu_1 - \mu_2$
$\sigma_{\bar{X}_1-\bar{X}_2}^2 = V[\bar{X}_1 - \bar{X}_2] = \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$
$\sigma_{\bar{X}_1-\bar{X}_2} = SD[\bar{X}_1 - \bar{X}_2] = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

Sampling distribution of $(\bar{X}_d)$, paired ($d = X_1 - X_2$):

$\mu_{\bar{X}_d} = E[\bar{X}_d] = \mu_1 - \mu_2$
$\sigma_{\bar{X}_d}^2 = V[\bar{X}_d] = \frac{\sigma_d^2}{n} = \frac{\sigma_1^2 + \sigma_2^2 - 2*\rho*\sigma_1*\sigma_2}{n}$
$\sigma_{\bar{X}_d} = SD[\bar{X}_d] = \frac{\sigma_d}{\sqrt{n}} = \sqrt{\frac{\sigma_1^2 + \sigma_2^2 - 2*\rho*\sigma_1*\sigma_2}{n}}$

Inference about a population proportion:

***z* test statistic:** $z = \frac{\hat{P}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$ **CI estimator:** $\hat{P} \pm z_{\alpha/2}\sqrt{\frac{\hat{P}(1-\hat{P})}{n}}$

Inference about comparing two population proportions:

***z* test statistic under Null hypothesis of no difference:** $z = \frac{\hat{P}_2-\hat{P}_1}{\sqrt{\frac{\bar{P}(1-\bar{P})}{n_1}+\frac{\bar{P}(1-\bar{P})}{n_2}}}$ **Pooled proportion:** $\bar{P} = \frac{X_1+X_2}{n_1+n_2}$

CI estimator: $(\hat{P}_2 - \hat{P}_1) \pm z_{\alpha/2}\sqrt{\frac{\hat{P}_2(1-\hat{P}_2)}{n_2} + \frac{\hat{P}_1(1-\hat{P}_1)}{n_1}}$

Inference about the population mean:

***t* test statistic:** $t = \frac{\bar{X}-\mu_0}{s/\sqrt{n}}$ **CI estimator:** $\bar{X} \pm t_{\alpha/2}\,\frac{s}{\sqrt{n}}$ **Degrees of freedom:** $\nu = n-1$

Inference about a comparing two population means, independent samples, unequal variances:

***t* test statistic:** $t = \frac{(\bar{X}_1-\bar{X}_2)-\Delta_0}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$ **CI estimator:** $(\bar{X}_1 - \bar{X}_2) \pm t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

Degrees of freedom: $\nu = \frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1-1}\left(\frac{s_1^2}{n_1}\right)^2+\frac{1}{n_2-1}\left(\frac{s_2^2}{n_2}\right)^2}$

Inference about a comparing two population means, independent samples, assuming equal variances:

***t* test statistic:** $t = \frac{(\bar{X}_1-\bar{X}_2)-\Delta_0}{\sqrt{\frac{s_p^2}{n_1}+\frac{s_p^2}{n_2}}}$ **CI estimator:** $(\bar{X}_1 - \bar{X}_2) \pm t_{\alpha/2}\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}$ **Degrees of freedom:** $\nu = n_1 + n_2 - 2$

Pooled variance: $s_p^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$

Inference about a comparing two population means, paired data: (n is number of pairs and $d = X_1 - X_2$)

***t* test statistic:** $t = \frac{\bar{d}-\Delta_0}{s_d/\sqrt{n}}$ **CI estimator:** $\bar{X}_d \pm t_{\alpha/2}\frac{s_d}{\sqrt{n}}$ **Degrees of freedom:** $\nu = n-1$

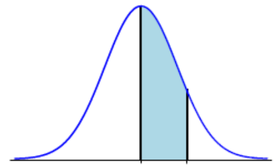
SIMPLE REGRESSION:

Model: $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$ **OLS line:** $\hat{y}_i = b_0 + b_1 x_i$ $b_1 = \frac{s_{xy}}{s_x^2} = r\frac{s_y}{s_x}$ $b_0 = \bar{Y} - b_1\bar{X}$

Residuals: $e_i = y_i - \hat{y}_i$ **Standard deviation of residuals:** $s_e = Root\ MSE = \sqrt{\frac{SSE}{n-2}} = \sqrt{\frac{\sum_{i=1}^{n}(e_i-0)^2}{n-2}}$

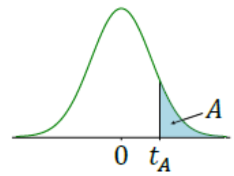
$SST = \sum_{i=1}^{n}(y_i - \bar{Y})^2 = SSR + SSE$ $SSR = \sum_{i=1}^{n}(\hat{y}_i - \bar{Y})^2$ $SSE = \sum_{i=1}^{n} {e_i}^2 = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2$

$s_y^2 = \frac{SST}{n-1}$ **Coefficient of determination:** $R^2 = (r)^2 = \frac{SSR}{SST} = 1 - \frac{SSE}{SST}$



The Standard Normal Distribution:

z	*Second decimal place in z* 0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999



Critical Values of Student t Distribution:

ν	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	$t_{0.001}$	$t_{0.0005}$	ν	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	$t_{0.001}$	$t_{0.0005}$
1	3.078	6.314	12.71	31.82	63.66	318.3	636.6	38	1.304	1.686	2.024	2.429	2.712	3.319	3.566
2	1.886	2.920	4.303	6.965	9.925	22.33	31.60	39	1.304	1.685	2.023	2.426	2.708	3.313	3.558
3	1.638	2.353	3.182	4.541	5.841	10.21	12.92	40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610	41	1.303	1.683	2.020	2.421	2.701	3.301	3.544
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869	42	1.302	1.682	2.018	2.418	2.698	3.296	3.538
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959	43	1.302	1.681	2.017	2.416	2.695	3.291	3.532
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408	44	1.301	1.680	2.015	2.414	2.692	3.286	3.526
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041	45	1.301	1.679	2.014	2.412	2.690	3.281	3.520
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781	46	1.300	1.679	2.013	2.410	2.687	3.277	3.515
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587	47	1.300	1.678	2.012	2.408	2.685	3.273	3.510
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437	48	1.299	1.677	2.011	2.407	2.682	3.269	3.505
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318	49	1.299	1.677	2.010	2.405	2.680	3.265	3.500
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221	50	1.299	1.676	2.009	2.403	2.678	3.261	3.496
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140	51	1.298	1.675	2.008	2.402	2.676	3.258	3.492
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073	52	1.298	1.675	2.007	2.400	2.674	3.255	3.488
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015	53	1.298	1.674	2.006	2.399	2.672	3.251	3.484
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965	54	1.297	1.674	2.005	2.397	2.670	3.248	3.480
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922	55	1.297	1.673	2.004	2.396	2.668	3.245	3.476
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883	60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850	65	1.295	1.669	1.997	2.385	2.654	3.220	3.447
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819	70	1.294	1.667	1.994	2.381	2.648	3.211	3.435
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792	75	1.293	1.665	1.992	2.377	2.643	3.202	3.425
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768	80	1.292	1.664	1.990	2.374	2.639	3.195	3.416
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745	90	1.291	1.662	1.987	2.368	2.632	3.183	3.402
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725	100	1.290	1.660	1.984	2.364	2.626	3.174	3.390
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707	120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690	140	1.288	1.656	1.977	2.353	2.611	3.149	3.361
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674	160	1.287	1.654	1.975	2.350	2.607	3.142	3.352
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659	180	1.286	1.653	1.973	2.347	2.603	3.136	3.345
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646	200	1.286	1.653	1.972	2.345	2.601	3.131	3.340
31	1.309	1.696	2.040	2.453	2.744	3.375	3.633	250	1.285	1.651	1.969	2.341	2.596	3.123	3.330
32	1.309	1.694	2.037	2.449	2.738	3.365	3.622	300	1.284	1.650	1.968	2.339	2.592	3.118	3.323
33	1.308	1.692	2.035	2.445	2.733	3.356	3.611	400	1.284	1.649	1.966	2.336	2.588	3.111	3.315
34	1.307	1.691	2.032	2.441	2.728	3.348	3.601	500	1.283	1.648	1.965	2.334	2.586	3.107	3.310
35	1.306	1.690	2.030	2.438	2.724	3.340	3.591	750	1.283	1.647	1.963	2.331	2.582	3.101	3.304
36	1.306	1.688	2.028	2.434	2.719	3.333	3.582	1000	1.282	1.646	1.962	2.330	2.581	3.098	3.300
37	1.305	1.687	2.026	2.431	2.715	3.326	3.574	∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Degrees of freedom: ν

Supplement for Question (1): Recall "Ordinary People Don't Think Like Economists. It's a Problem" and "Subjective Models of the Macroeconomy: Evidence from Experts and Representative Samples." In surveys, respondents complete statements like: "A rise in the Federal funds rate leads to _________ [a fall / no change / a rise] in inflation."

- **Scenario A:** In a sample of 61 experts the fraction saying a rise in the Federal funds rate leads to a fall in inflation is $\hat{P}_1 = 0.836$. In a sample of 40 experts, it is $\hat{P}_2 = 0.650$. In testing if there is a statistically significant difference, the standard error of the difference is 0.087.
- **Scenario B:** In a sample of 18,000 from the general population the fraction saying a rise in the Federal funds rate leads to a fall in inflation is $\hat{P}_1 = 0.302$. In a sample of 16,000 from the general population it is $\hat{P}_2 = 0.315$. In testing if there is a statistically significant difference, the standard error of the difference is 0.005.
- **Scenario C**: Test if there is a statistically significant difference between those who have not completed high school versus those with a high school degree thinking that a rise in the Federal funds rate will lower inflation.

Supplement for Question (2): Recall Taubman et al. (2013) "Medicaid Increases Emergency-Department Use: Evidence from Oregon's Health Insurance Experiment." The treatment group receives Medicaid insurance coverage, and the control group continues to be without health insurance. Table 2 reports some key results.

Table 2. Emergency-department use

		Percent with any visits[1]			*Number of visits*[2]		
	N	Percent in Control Group	Effect of Medicaid Coverage	P-value	Mean Value in Control Group	Effect of Medicaid Coverage	P-value
Panel A: Overall							
All visits	24,646	34.5	7.0 (2.4)	0.003	1.022 (2.632)	0.408 (0.116)	<0.001

Notes: We report the estimated effect of Medicaid on emergency department use over our study period. We report the sample size, the control mean of the dependent variable (with standard deviation for continuous outcomes in parentheses), the estimated effect of Medicaid coverage (with standard error in parentheses), and the p-value of the estimated effect. Sample consists of individuals in Portland-area zip codes (N=24,646).
[1] For the percent-with-any-visits measures, the estimated effect of Medicaid coverage is shown in percentage points.
[2] The number-of-visits measure is unconditional, including those with no visits.

Other researchers repeat the study using data for another time and City X. In the cross-sectional data with 10,000 observations, the Excel PivotTable below uses four variables, where each variable is described next.

- A variable named *id* is an identifier variable with a unique code for each person in these data.
- A variable named *group* is a nominal variable and contains either the word "control" or "treatment."
- A variable named *any_visit* is a dummy variable that is 0 if the person did not have any visits to the emergency department during the study period and 1 if they did have any such visits.
- A variable named *num_visit* is an interval variable that records the number of visits the person had to the emergency department during the study period. If the person did not visit the emergency department it is zero.

Row Labels	Count of id	Average of any_visit	StdDev of any_visit	Average of num_visit	StdDev of num_visit
control	9442	0.354056344	0.478251684	1.201652192	2.756549513
treatment	558	0.406810036	0.491679644	1.456989247	2.784436014
Grand Total	**10000**	**0.357**	**0.479138766**	**1.2159**	**2.758595326**

Supplement for Question (3): Recall Karlan and List (2007) "Does Price Matter in Charitable Giving? Evidence from a Large-Scale Natural Field Experiment." They randomly varied some aspects the letter asking for a donation. For the treatment group, the letter includes a match. The "match threshold" is the stated total amount of money available to match received donations: it takes values of $25,000, $50,000, $100,000 or is left unstated (implying that there may be no limit to the amount available to match donations). The "example amount" – a specific dollar amount used to explain how the match works – is either the person's previous highest donation amount ("low"), 25% more than that ("medium"), or 50% more than that ("high"). Various subsets of the treatment group received these different letters at random. The control group received an ordinary letter that does not mention a match. A total of 50,083 people are randomly divided among the groups. Below is an excerpt of Table 2B. Some numbers are intentionally replaced with **AAA**, **BBB**, …, **FFF** and answering questions about those requires using the Stata output on the next page.

Table 2B – Mean Responses
(Mean and standard errors)

		Match						
		Threshold				Example amount		
	Control	$25,000	$50,000	$100,000	Unstated	Low	Medium	High
Implied price of $1 of public good:	1.00	0.36	0.36	0.36	0.36	0.36	0.36	0.36
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A								
Response rate	0.018	0.022	0.022	0.022	0.022	0.021	0.022	0.023
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Dollars given, unconditional	0.813	1.060	0.889	0.903	**CCC**	0.914	1.004	0.983
	(0.063)	(0.109)	(0.091)	(0.084)	(**DDD**)	(0.080)	(0.091)	(0.084)
Dollars given, conditional on giving	45.540	49.172	39.674	41.000	**EEE**	43.107	45.239	43.251
	(2.397)	(3.522)	(2.900)	(2.336)	(**FFF**)	(2.557)	(2.932)	(2.542)
Observations	16,687	8,350	8,345	8,350	8,351	11,134	11,133	11,129
Panel B: Blue states								
Response rate	0.020	0.020	0.022	0.022	0.020	0.019	0.022	0.022
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Dollars given, unconditional	0.897	0.884	0.912	0.900	0.884	0.796	0.950	0.939
	(0.086)	(0.115)	(0.127)	(0.110)	(0.116)	(0.094)	(0.108)	(0.102)
Dollars given, conditional on giving	44.781	43.204	41.091	41.236	44.469	41.516	43.194	42.503
	(2.914)	(3.716)	(4.227)	(3.093)	(3.806)	(3.283)	(3.364)	(3.063)
Observations	10,029	5,035	4,954	4,856	4,932	6,574	6,550	6,653
Panel C: Red states								
Response rate	0.015	0.023	0.023	**AAA**	0.025	0.024	0.022	0.024
	(0.001)	(0.003)	(0.003)	(**BBB**)	(0.003)	(0.002)	(0.002)	(0.002)
Dollars given, unconditional	0.687	1.330	0.856	0.874	1.206	1.086	1.082	1.023
	(0.093)	(0.212)	(0.127)	(0.124)	(0.199)	(0.141)	(0.158)	(0.141)
Dollars given, conditional on giving	47.113	57.156	37.649	39.584	47.330	44.929	48.097	43.519
	(4.232)	(6.485)	(3.643)	(3.462)	(6.039)	(4.005)	(5.234)	(4.318)
Observations	6,648	3,309	3,385	3,487	3,413	4,549	4,579	4,466

>>>>>> *Supplement for Question (3) continues on the next page* >>>>>>

Supplement for Question (3), cont'd: From the dataset "char_give.xlsx" used to replicate Table 2B, recall the variable descriptions below. Next, see the Stata tabulation and Stata summaries after that.

```
variable name     variable label
--------------------------------------------------------------------------------
gave              =1 if gave a donation (any amount) in response to this letter,
                   0 otherwise
red_state         =1 if person lives in a Red state, 0 otherwise
max_size          Maximum size (threshold) of matching grant in letter; N/A for
                   control
amount            Dollar amount person donated in response to this letter (0 for
                   no donation)
--------------------------------------------------------------------------------
```

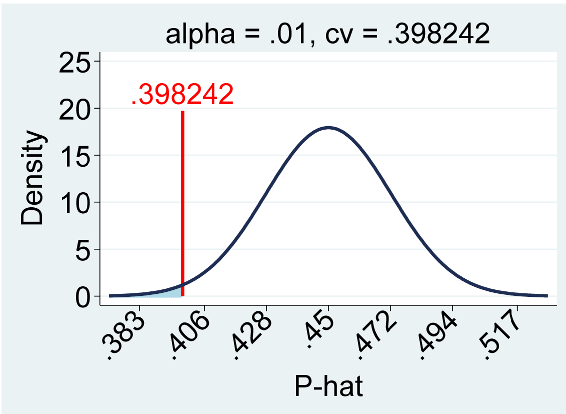
```
. tabulate gave if (red_state==1 & max_size=="$100,000")

       gave |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |      3,410       97.79       97.79
          1 |         77        2.21      100.00
------------+-----------------------------------
      Total |      3,487      100.00
```

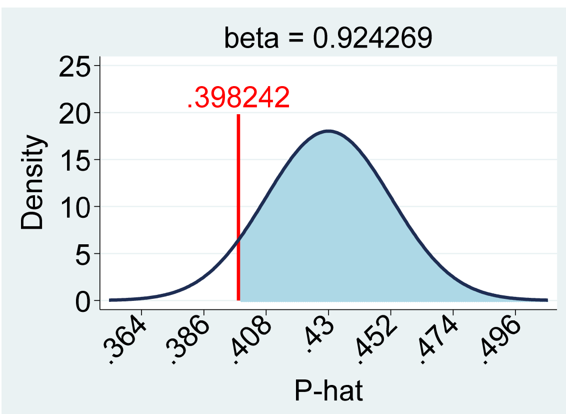
```
. summarize amount if (max_size=="Unstated"), detail

                           amount
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              0
10%            0              0       Obs               8,351
25%            0              0       Sum of Wgt.       8,351

50%            0                      Mean           1.014932
                        Largest       Std. Dev.      9.730774
75%            0            200
90%            0            200       Variance       94.68796
95%            0            200       Skewness        17.3888
99%           30            400       Kurtosis       466.7154
```

```
. summarize amount if (max_size=="Unstated" & gave==1), detail

                           amount
-------------------------------------------------------------
      Percentiles      Smallest
 1%            3              1
 5%           10              3
10%           10              3       Obs                 185
25%           20              5       Sum of Wgt.         185

50%           25                      Mean           45.81459
                        Largest       Std. Dev.      47.25831
75%           50            200
90%          100            200       Variance       2233.347
95%          125            200       Skewness        3.19706
99%          200            400       Kurtosis       19.88017
```

Supplement for Question (4): A research team seeks to prove that less than 45 percent of teenagers aged 13 to 17 years identify as male. They plan to use a one percent significance level and a random sample of 500 teenagers. Before starting, they construct the figures below to assess whether their planned sample size will yield sufficient power.

Notice that the top figure is centered at 0.45 and the bottom figure is centered at 0.43.





Supplement for Question (5): Students attending Professor Murdock's three sections of ECO220Y1Y participated in a survey during Workshop 6 in October 2022. Focus on three of the questions.

- "Please imagine a ladder, with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?" A variable named **cantril** records the answer for each of 378 students.
- "How competitive do you consider yourself to be? Please choose a value on the scale below, where the value 0 means 'not competitive at all' and the value 10 means 'very competitive'." A variable named **comp** records the answer for each of 378 students.
- "Which of these best describes your primary program of study?
    - Economics Major or Economics Specialist
    - Rotman Commerce, Accounting Specialist
    - Rotman Commerce, Management Specialist
    - Rotman Commerce, Finance and Economics Specialist
    - Other"

A variable named **commerce** is 1 if the student selected any of the three commerce programs and 0 otherwise.