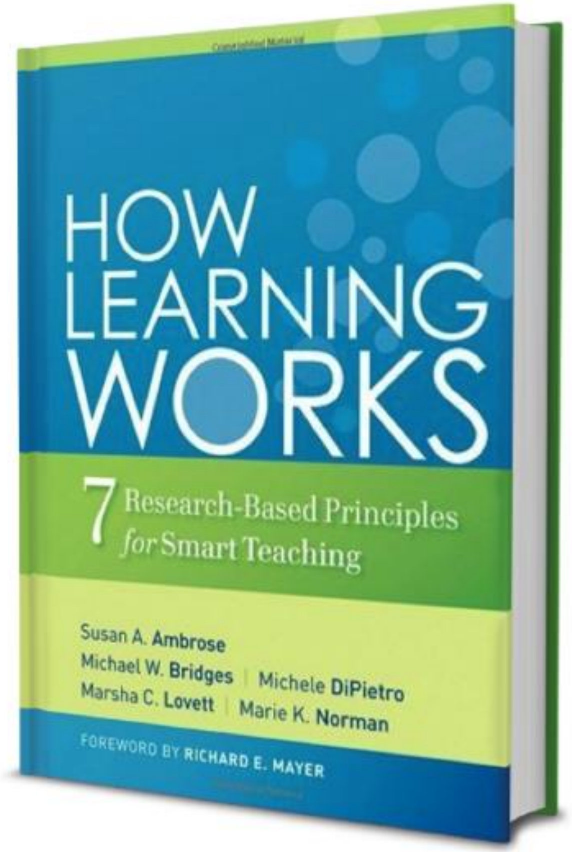
CONCEPT MAP ASSIGNMENT AND COMPETITION IN APPLIED STATISTICS

RYAN PHELPS: DEPARTMENT OF ECONOMICS AND FINANCE

Calls for Deep Processing and Scaffolding



How Learning Works: Seven Research-Based Principles for Smart Teaching

- Susan A. Ambrose
- Michael W. Bridges
- Michele DiPietro
- Marsha C. Lovett
- Marie K. Norman

Overview

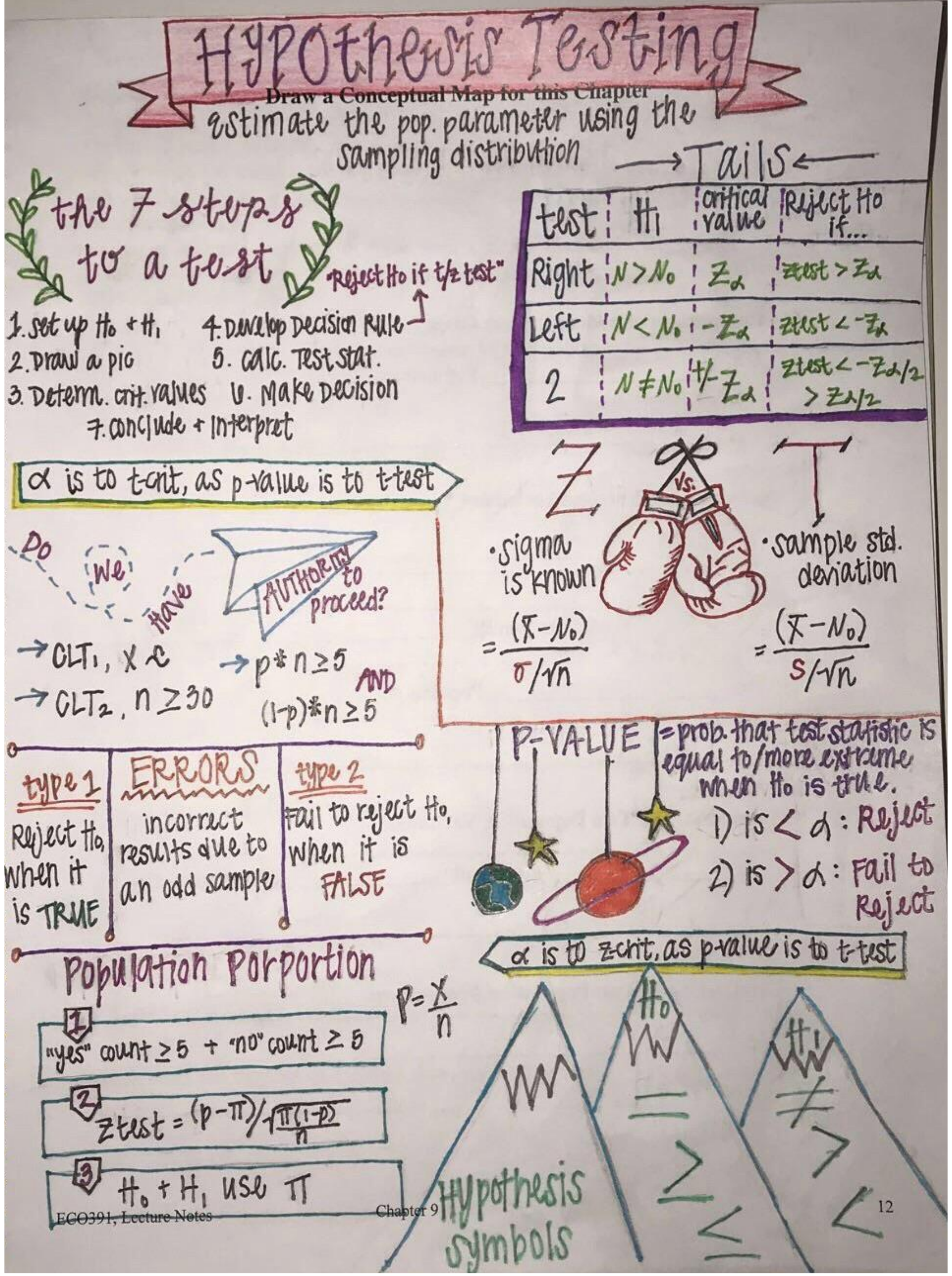
- Scaffold
  - Module Tour
  - Contest
- GOAT Concept Map Examples

Module Tour

- https://d2l.sfasu.edu/d2l/home

The Contest

- Grade Concept Maps
- Choose the Best
- Correct All Errors
- Upload to a News Announcement
  - Link to a Discussion Board
  - Most Popular Gets 45 out of 35 Points



Hypothesis Testing

Draw a Conceptual Map for this Chapter

estimate the pop. parameter using the sampling distribution

the 7 steps to a test

1. set up Ho + H1
2. Draw a pic
3. Determ. crit. values
4. Develop Decision Rule → "Reject Ho if t/z test"
5. calc. Test stat.
6. Make Decision
7. conclude + Interpret

Tails

test	H_1	critical value	Reject Ho if...
Right	$N > N_0$	Z_α	$Z_{test} > Z_\alpha$
Left	$N < N_0$	$-Z_\alpha$	$Z_{test} < -Z_\alpha$
2	$N \neq N_0$	$+/- Z_\alpha$	$Z_{test} < -Z_{\alpha/2}$ $> Z_{\alpha/2}$

α is to t-crit, as p-value is to t-test

Do we have AUTHORITY to proceed?

→ CLT1, X ~

→ CLT2, $n \geq 30$

→ $p * n \geq 5$ AND $(1-p) * n \geq 5$

Z vs. T

- sigma is known $= \frac{(\bar{X} - N_0)}{\sigma / \sqrt{n}}$
- sample std. deviation $= \frac{(\bar{X} - N_0)}{S / \sqrt{n}}$

ERRORS

incorrect results due to an odd sample

type 1: Reject Ho, when it is TRUE

type 2: Fail to reject Ho, when it is FALSE

P-VALUE = prob. that test statistic is equal to/more extreme when Ho is true.

1) is < α : Reject
2) is > α : Fail to Reject

Population Porportion

$p = \frac{x}{n}$

1. "yes" count ≥ 5 + "no" count ≥ 5
2. $Z_{test} = (p - \pi) / \sqrt{\frac{\pi(1-p)}{n}}$
3. $H_0 + H_1$ use π

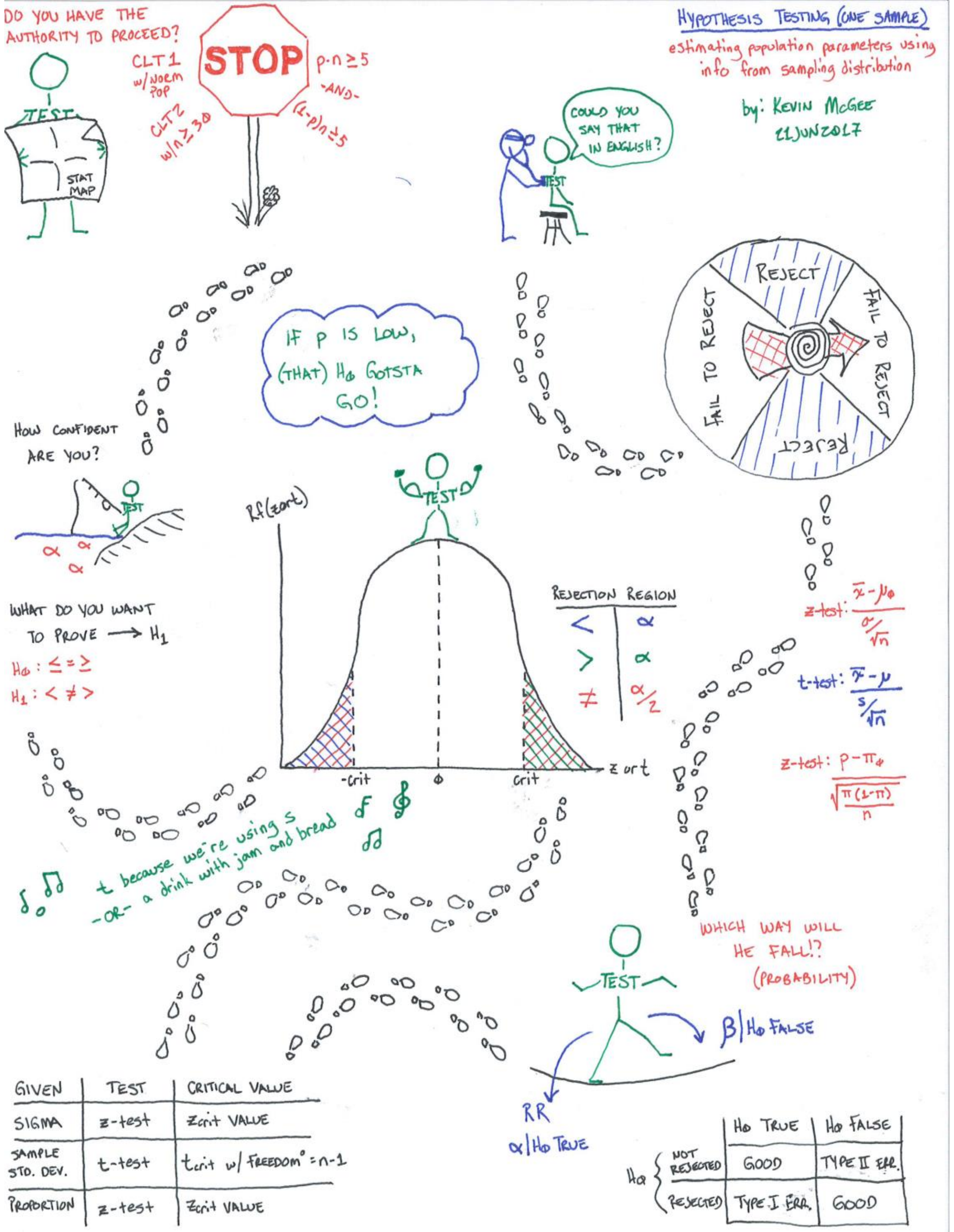
α is to z-crit, as p-value is to t-test

Hypothesis symbols

Ho: = ≥ ≤

H1: ≠ > <

ECO391, Lecture Notes   Chapter 9   12



HYPOTHESIS TESTING (ONE SAMPLE)

estimating population parameters using info from sampling distribution

by: KEVIN McGEE
21JUN2017

DO YOU HAVE THE AUTHORITY TO PROCEED?

TEST

STAT MAP

STOP

CLT 1 w/ NORM POP

CLT 2 w/ $n \geq 30$

$p \cdot n \geq 5$ -AND- $(1-p)n \geq 5$

TEST: COULD YOU SAY THAT IN ENGLISH?

IF p IS LOW, (THAT) H_0 GOTSTA GO!

REJECT / FAIL TO REJECT / REJECT / FAIL TO REJECT

HOW CONFIDENT ARE YOU?

α α α

WHAT DO YOU WANT TO PROVE → H_1

$H_0: \leq = \geq$

$H_1: < \neq >$

Rf(z or t)

-crit 0 crit z or t

REJECTION REGION

<	α
>	α
≠	α/2

z-test: $\frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$

t-test: $\frac{\bar{x} - \mu}{s / \sqrt{n}}$

z-test: $\frac{p - \pi_0}{\sqrt{\frac{\pi(1-\pi)}{n}}}$

t because we're using s -OR- a drink with jam and bread

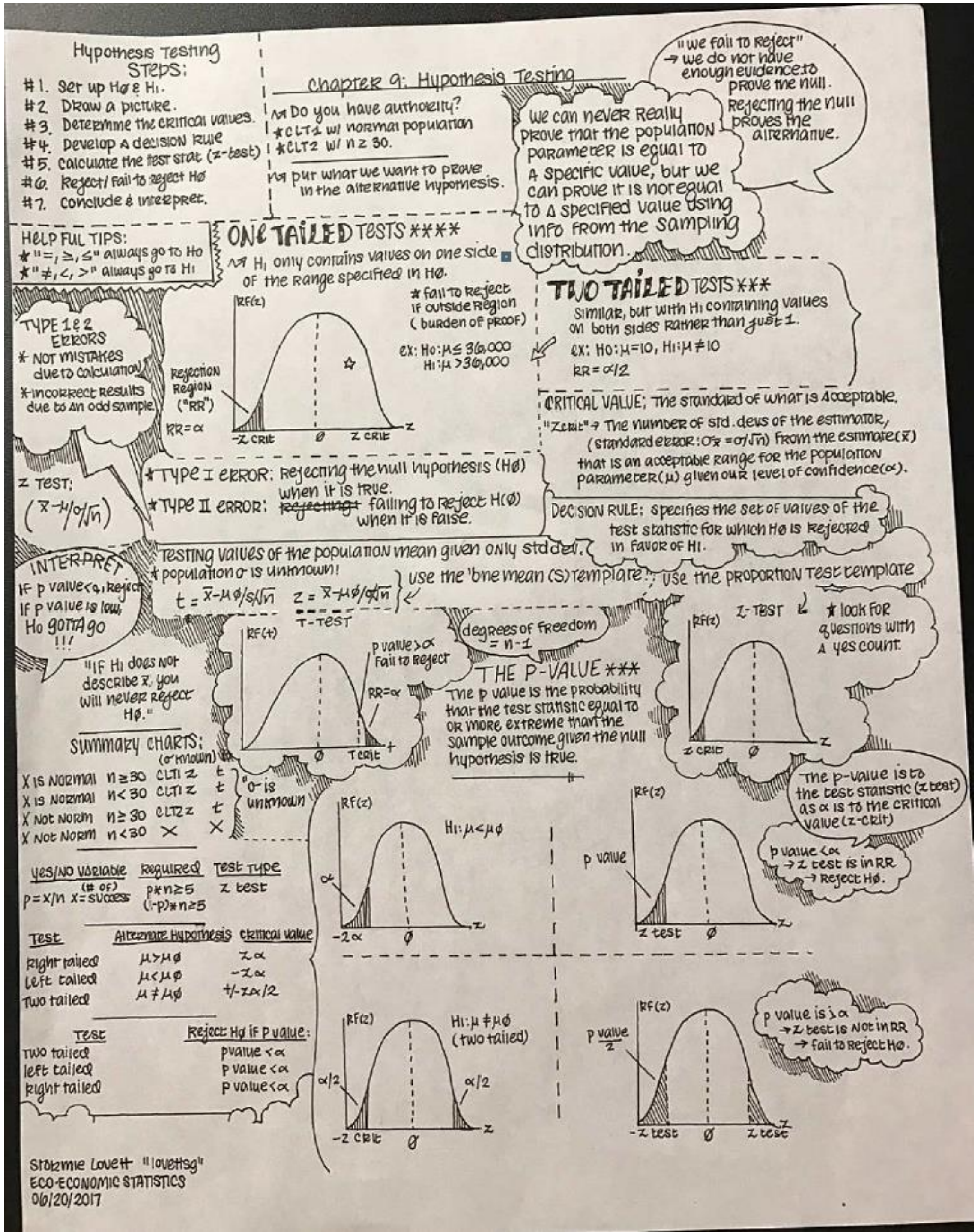
WHICH WAY WILL HE FALL!? (PROBABILITY)

RR α | Ho TRUE

β | Ho FALSE

GIVEN	TEST	CRITICAL VALUE
SIGMA	z-test	Zcrit VALUE
SAMPLE STD. DEV.	t-test	tcrit w/ FREEDOM° = n-1
PROPORTION	z-test	Zcrit VALUE

		Ho TRUE	Ho FALSE
Ho	NOT REJECTED	GOOD	TYPE II ERR.
	REJECTED	TYPE I ERR.	GOOD



Hypothesis Testing Steps:

#1. Set up Hø & H₁.
#2. Draw a picture.
#3. Determine the critical values.
#4. Develop a decision rule
#5. Calculate the test stat (z-test)
#6. Reject/ Fail to reject Hø
#7. Conclude & interpret.

Chapter 9: Hypothesis Testing

↗ Do you have authority?
★CLT1 w/ normal population
★CLT2 w/ $n \geq 30$.

↗ put what we want to prove in the alternative hypothesis.

We can never really prove that the population parameter is equal to a specific value, but we can prove it is not equal to a specified value using info from the sampling distribution.

"we fail to reject"
→ we do not have enough evidence to prove the null.
Rejecting the null proves the alternative.

HELPFUL TIPS:
★ "=, ≥, ≤" always go to Ho
★ "≠, <, >" always go to H₁

ONE TAILED TESTS ****

↗ H₁ only contains values on one side of the range specified in Hø.

★ fail to reject if outside region (burden of proof)

ex: $Ho: \mu \leq 36{,}000$
$H_1: \mu > 36{,}000$

TWO TAILED TESTS ***

Similar, but with H₁ containing values on both sides rather than just 1.

ex: $H_0: \mu = 10$, $H_1: \mu \neq 10$
$RR = \alpha/2$

TYPE 1 & 2 ERRORS
* Not mistakes due to calculation
* incorrect results due to an odd sample.

★ TYPE I ERROR: Rejecting the null hypothesis (Hø) when it is true.
★ TYPE II ERROR: ~~rejecting~~ failing to reject H(ø) when it is false.

CRITICAL VALUE: The standard of what is acceptable.
"Zcrit" → The number of std. devs of the estimator, (standard error: $\sigma_{\bar{x}} = \sigma/\sqrt{n}$) from the estimate ($\bar{x}$) that is an acceptable range for the population parameter (μ) given our level of confidence (α).

DECISION RULE: specifies the set of values of the test statistic for which Hø is rejected in favor of H1.

z TEST:
$(\bar{x}-\mu/\sigma/\sqrt{n})$

Testing values of the population mean given only std dev.
★ population σ is unknown!

$t = \bar{x}-\mu\phi/s/\sqrt{n}$ $z = \bar{x}-\mu\phi/\sigma/\sqrt{n}$ } use the 'one mean (S) template'; use the proportion test template

T-TEST

Z-TEST ★ look for questions with a yes count.

INTERPRET
If p value < α, reject
If p value is low, Ho gotta go !!!

"If H₁ does not describe x̄, you will never reject Hø."

degrees of freedom = n-1

THE P-VALUE ***

The p value is the probability that the test statistic equal to or more extreme than the sample outcome given the null hypothesis is true.

The p-value is to the test statistic (z test) as α is to the critical value (z-crit)

SUMMARY CHARTS:

		(σ known)	
X is Normal	$n \geq 30$	CLT1 z	t
X is Normal	$n < 30$	CLT1 z	t
X Not Norm	$n \geq 30$	CLT2 z	t
X Not Norm	$n < 30$	×	×

"σ is unknown"

Yes/No variable	Required	Test Type
$p = x/n$ x = (# of) success	$p*n \geq 5$ $(1-p)*n \geq 5$	z test

Test	Alternate Hypothesis	Critical value
Right tailed	$\mu > \mu\phi$	$z\alpha$
Left tailed	$\mu < \mu\phi$	$-z\alpha$
Two tailed	$\mu \neq \mu\phi$	$+/- z\alpha/2$

Test	Reject Hø if p value:
Two tailed	p value < α
left tailed	p value < α
right tailed	p value < α

p value < α
→ z test is in RR
→ Reject Hø.

p value is ≥ α
→ z test is not in RR
→ fail to reject Hø.

Stormie Lovett "lovettsg"
ECO-ECONOMIC STATISTICS
06/20/2017

Thank you!

- **QUESTIONS?**