

INTRODUCTORY STATISTICS TEST NUMBER 9

Question 1: (20 points)

For each of the following questions, explain whether a confidence interval for $E(Y_h)$ or $E(Y_{h(new)})$ is appropriate:

- a) What is the average statistics grade of students who obtain a score of 530 on the graduate admission test?
- b) What will the Cramer family spend on restaurant meals next year if the family's income is \$ 40,000?
- c) What do companies with 500 full-time employees spend each year, on average, on group life insurance premiums?

Question 2: (80 points)

Economists believe that the real quantity of money demanded depends on the volume of transactions, as measured by real income, and the cost of holding money relative to other assets, as measured by the nominal interest rate. The greater the level of real income and the volume of transactions, the greater the desired stock of money should be. And the greater the interest rate, or cost of holding money, the less should be the quantity of money that people want to hold.

On the next page are some data from an interesting period in U.S. history, the 40 year period before the civil war, often referred to by those who like latin as the antebellum period. The data in the columns of the table, reading from left to right are the U.S. nominal money stock (USNMON) in millions of current dollars, the U.S. real money stock (USRMON) in millions of 1850 dollars, U.S. real Gross National Product in millions of 1850 dollars (USRGNP), the short term rate of interest in the United Kingdom (UKSTINT) in percent per annum, which can be used as a measure of the relevant interest rate for all world residents, a trend variable (TREND), a dummy variable to represent the 1820s, which some people think was different from the rest of the period in certain respects, and the U.S. Consumer Price Index (USCPI) on a base of $1850 = 100$. It is this CPI index that was used to deflate the nominal money stock to obtain the real money stock.

We want to test whether the demand for money has the characteristics that economists believe it has. In addition, we want to determine whether the inclusion of a trend variable to represent factors other than real GNP that might be more directly correlated with time, and the Dummy variable for the 1820s improve the fit.

The three regressions we need in our deliberations are at the bottom of the table. We run a regression first without either the trend or the dummy variable, then a second regression with the trend but without the dummy variable, and then a third regression that includes both trend and the dummy variable. The coefficients and standard errors apply to the independent variables in question as they are listed in the table at the top of the page, reading from left to right.

U.S. DEMAND FOR MONEY ESTIMATION: ANTEBELLUM PERIOD, 1820-1860

DATE	USNMON	USRMON	USRGNP	UKSTINT	TREND	DUMMY	USCPI
1820	85	57	645	5.0	1	1	150.0
1821	96	66	658	5.0	2	1	144.7
1822	81	54	754	4.0	3	1	150.0
1823	88	66	740	4.0	4	1	134.0
1824	88	71	757	3.5	5	1	123.4
1825	106	84	867	3.9	6	1	126.6
1826	108	85	843	4.5	7	1	126.6
1827	101	79	890	3.3	8	1	127.7
1828	114	94	941	3.1	9	1	121.3
1829	105	88	980	3.4	10	1	119.1
1830	114	97	1007	2.8	11	0	118.1
1831	155	140	1055	3.7	12	0	110.6
1832	150	137	1125	3.1	13	0	109.6
1833	168	156	1216	2.8	14	0	107.4
1834	172	157	1186	3.4	15	0	109.6
1835	246	218	1334	3.7	16	0	112.8
1836	276	232	1456	4.3	17	0	119.1
1837	232	190	1427	4.5	18	0	122.3
1838	240	201	1469	3.0	19	0	119.1
1839	215	180	1648	5.1	20	0	119.1
1840	186	168	1535	5.0	21	0	110.6
1841	174	156	1720	4.9	22	0	111.7
1842	158	152	1713	3.3	23	0	104.3
1843	194	205	1755	2.2	24	0	94.7
1844	214	224	1884	2.1	25	0	95.7
1845	241	249	2009	3.0	26	0	96.8
1846	267	273	2066	3.8	27	0	97.9
1847	281	267	2372	5.9	28	0	105.3
1848	267	264	2189	3.2	29	0	101.1

1849	329	336	2370	2.3	30	0	97.9
1850	399	399	2555	2.3	31	0	100.0
1851	435	444	2649	3.1	32	0	97.9
1852	451	456	2648	1.9	33	0	98.9
1853	546	552	2828	3.7	34	0	98.9
1854	539	502	2919	5.0	35	0	107.4
1855	565	511	3095	4.7	36	0	110.6
1856	611	563	3103	6.0	37	0	108.5
1857	498	446	3482	6.6	38	0	111.7
1858	569	540	3158	2.6	39	0	105.3
1859	652	613	3584	2.6	40	0	106.4
1860	674	634	3536	4.1	41	0	106.4

Regression Output (excl. Dummy and Trend)

Constant	-62.28
Mean Squared Error	2154.9
R Squared	0.93
No. of Observations	41
Degrees of Freedom	38

Regression Output (incl. TREND)

Constant	-58.66
Mean Squared Error	1937.4
R Squared	0.94
No. of Observations	41
Degrees of Freedom	37

	USRGNP	UKSTINT		USRGNP	UKSTINT	TREND
X Coefficient(s)	0.190	-7.26		0.28	-13.38	-7.24
Std Err of Coef.	0.008	6.57		0.04	6.75	3.15

Regression Output (incl. Dummy and Trend)

Constant	-43.97
Mean Squared Error	1966.7
R Squared	0.943273
No. of Observations	41
Degrees of Freedom	36

	USRGNP	UKSTINT	TREND	DUMMY
X Coefficient(s)	0.31	-14.30	-9.79	-22.32
Std Err of Coef.	0.06	6.94	4.96	33.30

a) Write down the three regression equations and explain which variables

are the respective dependent and independent variables.

b) Can we conclude that the quantity of money demanded is positively related to real income and negatively related to the nominal interest rate?

c) Does the inclusion of trend reduce the unexplained variance of the dependent variable?

d) What do the regression results with respect to the dummy variable tell us about the 1820s as opposed to the rest of the period?

e) Test whether the trend and the dummy variables together are statistically significant.

f) Is the regression as a whole statistically significant?

g) Calculate the variance of the dependent variable?

h) The residuals are plotted on the next page. What do they tell us about the aptness of the model?

