Economics 311 — Fall 2017
Daily Problem #18 — November 6

This problem examines the relationship between a company's advertising and its sales using weekly data. An ad that runs in week 1 probably affects sales not only in week 1 but also in weeks 2, 3, and beyond, so the relationship is likely to be dynamic with $sales_t$ being affected by adv_t, adv_{t-1}, adv_{t-2}, ….

The outreg tables below show the results of regressions of sales on zero to six lags of advertising. In the first table, there is no lagged dependent variable, so it is a simple distributed-lag model of the kind Studenmund describes in Section 12.1. In the second one lag of *sales* is included on the right-hand side along with current and lagged values of *adv*. This is a hybrid of the "distributed-lag model" and the "dynamic model" of Section 12.2. All regressions have a common sample period that omits the first 6 observations. Standard errors are reported in parentheses below the coefficients. Asterisks indicate statistical significance at the 10% (*), 5% (**), and 1% (***) levels of significance.

The lines at the bottom of the table report the Akiake Information Criterion (AIC), Schwartz-Bayesian Information Criterion (BIC), the first two estimated autocorrelations of the residuals—AC(1) and AC(2) are $\hat{\rho}_1$ and $\hat{\rho}_2$, the correlation coefficients between e_t and e_{t-1} and between e_t and e_{t-2}—and the Box-Ljung Q statistics testing whether the first [Q(1)] and whether the first two [Q(2)] autocorrelations are zero. The Q statistics are distributed as χ^2 statistics with degrees of freedom equal to the number of autocorrelations being tested (one or two). The Q statistic is an alternative to the Breusch-Godfrey LM test for serial correlation.

Which regression specification(s) do you prefer, both within each table and between the two tables, and why? (If there is more information that you would like to have in order to make a decision, tell what you want and how you would use it.)

Results with no lagged dependent variable

VARIABLES	(1) sales	(2) sales	(3) sales	(4) sales	(5) sales	(6) sales	(7) sales
adv	6.006***	2.331***	2.414***	2.700***	2.734***	2.635***	2.676***
	(0.625)	(0.845)	(0.815)	(0.814)	(0.815)	(0.821)	(0.823)
L.adv		4.936***	2.752***	2.577**	2.670**	2.701***	2.590**
		(0.843)	(1.030)	(1.018)	(1.023)	(1.024)	(1.033)
L2.adv			2.877***	1.465	1.390	1.316	1.329
			(0.831)	(1.028)	(1.032)	(1.034)	(1.036)
L3.adv				1.867**	1.280	1.335	1.285
				(0.822)	(1.029)	(1.030)	(1.033)
L4.adv					0.780	1.384	1.437
					(0.823)	(1.026)	(1.028)
L5.adv						-0.812	-0.294
						(0.823)	(1.022)
L6.adv							-0.701
							(0.821)
Constant	21.93***	20.63***	19.83***	19.24***	18.98***	19.29***	19.53***
	(0.652)	(0.630)	(0.651)	(0.692)	(0.742)	(0.804)	(0.855)
Observations	151	151	151	151	151	151	151
R-squared	0.383	0.499	0.537	0.552	0.555	0.558	0.560
AIC	513.2	483.8	473.9	470.7	471.7	472.7	474.0
BIC	519.2	492.8	486.0	485.8	489.8	493.8	498.1
AC(1)	0.149	0.0202	-0.0224	-0.0353	-0.0394	-0.0384	-0.0442
Q(1)	3.552	0.0647	0.0795	0.196	0.242	0.229	0.301
AC(2)	0.0735	-0.0319	-0.0660	-0.0518	-0.0439	-0.0534	-0.0532
Q(2)	4.422	0.227	0.773	0.620	0.544	0.673	0.741

Results with one lag of dependent variable

VARIABLES	(1) sales	(2) sales	(3) sales	(4) sales	(5) sales	(6) sales	(7) sales
L.sales	0.283***	0.131*	0.0280	-0.0236	-0.0395	-0.0329	-0.0391
	(0.0683)	(0.0735)	(0.0798)	(0.0819)	(0.0834)	(0.0837)	(0.0841)
adv	4.766***	2.362***	2.417***	2.709***	2.752***	2.653***	2.699***
	(0.664)	(0.839)	(0.818)	(0.817)	(0.818)	(0.825)	(0.827)
L.adv		4.122***	2.687**	2.625**	2.759***	2.775***	2.672**
		(0.953)	(1.049)	(1.035)	(1.043)	(1.044)	(1.051)
L2.adv			2.734***	1.533	1.497	1.408	1.438
			(0.928)	(1.058)	(1.059)	(1.063)	(1.065)
L3.adv				1.936**	1.340	1.383	1.340
				(0.859)	(1.039)	(1.041)	(1.042)
L4.adv					0.855	1.426	1.489
					(0.840)	(1.034)	(1.037)
L5.adv						-0.785	-0.239
						(0.828)	(1.032)
L6.adv							-0.732
							(0.826)
Constant	15.24***	17.74***	19.25***	19.70***	19.73***	19.90***	20.28***
	(1.728)	(1.733)	(1.765)	(1.752)	(1.752)	(1.762)	(1.813)
Observations	151	151	151	151	151	151	151
R-squared	0.447	0.510	0.537	0.553	0.556	0.559	0.561
AIC	498.6	482.5	475.8	472.6	473.5	474.6	475.7
BIC	507.7	494.6	490.9	490.7	494.6	498.7	502.9
AC(1)	-0.193	-0.113	-0.0490	-0.0135	-0.00251	-0.00750	-0.00787
Q(1)	5.938	2.042	0.379	0.0288	0.000987	0.00872	0.00954
AC(2)	0.0151	-0.0342	-0.0636	-0.0543	-0.0476	-0.0564	-0.0566
Q(2)	5.975	2.229	1.023	0.494	0.357	0.505	0.507