ECO 5375-701 Professor T. Fomby
Economic & Business Forecasting Fall 2016

EXERCISE 11
KEY

Purpose of Exercise: To learn how to construct **combination forecasts** and to use them in out-of-sample forecasting exercises. The combination methods examined here are the **simple average**, the **Nelson Method**, and the **Granger-Ramanathan Method**. Use the SAS program **combo.sas** that you can find in the "exercises" subdirectory of the class website to answer the questions posed in this exercise. You are to turn in this exercise on **Tuesday, November 29.**

Consider the following data on actual hog prices and forecasts from (1) an econometric model and (2) an ARIMA model. The source of the data is J. A. Brandt and D. A. Bessler, "Price Forecasting and Evaluation: An Application in Agriculture," Journal of Forecasting (July-Sept. 1983), pp. 237-248.

Period	Actual Prices	Econometric Model	ARIMA
7601	47.99	50.66	48.80
7602	49.19	46.37	49.06
7603	43.88	44.00	46.73
7604	34.25	39.96	39.77
7701	39.08	42.38	35.33
7702	40.87	41.65	39.42
7703	43.85	41.24	40.82
7704	41.38	49.81	45.08
7801	47.44	47.18	43.76
7802	47.84	48.67	45.83
7803	48.52	44.91	47.22
7804	50.05	52.39	47.21
7901	51.98	52.15	51.64
7902	43.04	52.63	50.39
7903	38.52	42.41	42.17
7904	36.39	41.30	37.96

Using the above data, calculate optimal combination weights based on (i) the Nelson regression method and (ii) the Granger-Ramanathan regression method. (See below for a sketch of the SAS code you can use to calculate the weights.)

Nelson weights: Econometric Model weight = **_0.15815____**, ARIMA weight =

_1 – 0.15815 = 0.84185____.
(Note: These weights should add to one.)

Granger-Ramanathan weights: Intercept = **_2.88917____**,
Econometric Model weight =**_0.25473_____**, ARIMA weight =
_0.66104_____.

(Note: The intercept is a bias adjustment. The weights on the two competing models need not add to one.)

Simple Average weights: Econometric Model weight = **__0.5____**,
ARIMA weight = **__0.5____**.

Now consider the following data as your out-of-sample data for examining the usefulness of the combination weights determined in part (a).

Period	Actual Prices	Econometric Model	ARIMA
8001	36.74	43.51	35.17
8002	31.18	39.72	36.59
8003	46.23	37.23	34.34
8004	46.44	44.38	47.80
8101	41.13	44.85	47.12
8102	43.62	41.50	40.45
8103	50.42	44.21	45.95
8104	43.24	51.06	45.31

Using the above out-of-sample data and the results from Part (a), fill in the following table. (Hint: You can use the SAS program combo.sas to do the calculations for you.)

Out-of-Sample Performance
of Various Methods

	Econometric	ARIMA	Nelson Method	G-R Method	Simple AVE
MAE	**5.78**	**4.49125**	**4.34595**	**4.31942**	**4.76937**
MSE	**40.2572**	**30.6437**	**29.8051**	**29.1645**	**31.0209**

Did the combination methods do better than the individual methods? **Answer:** Yes, the combination methods (both Nelson and G-R) performed better in terms of MAE and MSE than the individual methods.

Which method performed the best overall? **Answer:** The G-R method performed better overall. Evidently, one or more of the individual forecasting methods is biased and thus allowing for an intercept and not requiring the combination weights to add to one is helpful.

Are your conclusions sensitive to which measure (MAE or MSE) is chosen to gauge out-of-sample forecasting accuracy? **Answer:** NO.

Extra Information: Even though the simple average combination forecast performs pretty well when the forecasting methods are equally accurate it is best to use econometric determined combination methods in order to better use the difference in the forecasting accuracies and correlation in the errors of the competing forecasting methods to optimize the benefits of combing forecasts.