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WORKING PAPER NO. 868

FORECASTING TURNING POINTS IN COUNTRIES' OUTPUT GROWTH RATES: A RESPONSE TO MILTON FRIEDMAN

by

Arnold Zellner and Chung-ki Min

DEPARTMENT OF AGRICULTURE AND RESOURCE ECONOMICS AND POLICY

BERKELEY

CALIFORNIA AGRICULTURAL EXPERIMENT STATION

University of California

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS AND POLICY
DIVISION OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF CALIFORNIA AT BERKELEY

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In our past work, Zellner, Hong and Min (1991), we used variants of a simple autoregressive-leading indicator (ARLI) model and a Bayesian decision theoretic method to obtain correct forecasts in about 70 percent of 158 turning point forecasts for 18 industrialized countries' annual output growth rates in the period 1974-1986. IMF data for 1951-1973 were employed to estimate our models that were then employed to forecast downturns and upturns in annual growth rates for the period, 1974-1986. When Milton Friedman learned of our positive results, in a personal communication he challenged us to check our methods with an extended data set. This is indeed an important challenge since it is possible that we were just "lucky" in getting the positive results reported above. Earlier, we recognized such problems in that we began our forecasting experiments with just 9 countries' data and forecasted for the period, 1974-81. Later, in Zellner and Hong (1989) and in Zellner, Hong and Min (1991), we expanded the number of countries from 9 to 18 and extended the forecast period to 1974-1986 to check that the earlier positive results held up with an expanded sample of countries and data. Fortunately, results were positive and now we report such new results for 18 countries' revised data involving 211 turning point episodes during the forecast period 1974-1990.

In Table 1, the results of forecasting 211 possible turning points in 18 countries' growth rates, 1974-1990 are compared to earlier results for 158 turning point episodes in the same 18 countries' growth rates for the period, 1974-1986. An upper turning point

episode is defined as two successive annual growth rates below a third and the fourth either below the third, a downturn, or not below the third, no downturn. In a lower turning point episode, two successive annual growth rates are above the third and the fourth is either above the third, an upturn, or not above the third, a no upturn. In part A of the table, results for six different models using no pooling of data across countries are presented. It is seen that for the case of 211 turning point forecasts, the percentage of correct forecasts ranges from 64 to 72 while for the case of 158 turning point forecasts, the percentage correct ranges from 72 to 82. Thus for the relations fitted individually without pooling, there appears to be a slight deterioration in performance. However, when the countries' relationships are fitted using pooling, the percentages of correct forecasts shown in Part B of Table 1 are very similar for cases of 211 and 158 turning point forecasts, namely 73 to 80 percent and 74 to 81 percent correct, respectively for the earlier period and data and for the latter period and revised data. As found in previous work, use of Bayesian pooling techniques, here complete "shrinkage," produces results that are better than those obtained from individually fitted relations.

The results in Table 1 indicate that our turning point methods work well in both the old data set, 1974-86, and the revised, extended data set, 1974-90. Also, in independent calculations for a current paper, Zellner, Tobias and Ryu (1998), we have collected newly revised data extending to 1995 for the 18 countries in our sample and find that our models and techniques for forecasting turning points continue to perform well.

As regards other aspects of our turning point forecasting procedure, in our past work we compared the performance of our procedures with that of several naive turning point forecasters, namely (1) an "eternal optimist" who always forecasts "no down turn" and "up turn," (2)an "eternal pessimist" who always forecasts "down turn" and "no up turn" and (3) a "deterministic four-year cycle forecaster" who always forecasts "down turn" and "up turn." See Table 2 for the performance of these forecasters compared to the forecast performance of two of our ARLI models.

As is evident, the ARLI models' performance is superior to that of these naive forecasters and also to that of a coin flipper as shown in Table 3. This use of naive models in evaluating turning point forecasting procedures parallels that of naive random walk and other such models that Christ, Friedman, Nelson, Plosser, Cooper and others have employed to check the quality of macroeconometric and other models' point forecasts.

We thank Milton Friedman for his constructive interest in our work and hope that the results reported herein satisfy his curiosity. Also, that the lagged rate of growth of real money is one of our important leading indicator variables is compatible with much of Friedman's well known theoretical and empirical research in monetary economics. Use of this and other of our leading indicator variables was suggested by the fundamental empirical research of Burns and Mitchell in their classic work, Measuring Business Cycles using pre-World War II data for the U.S., UK, French and German economies.

References

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Table 1
Forecasting Turning Points in Rates of Growth of Real Output Growth Rates for 18 Industrialized Countries*

Model	Forecasts of 211 Turning Points, Rev. Data, 1974-90**	Forecasts of 158 Turning Points, 1974-86***
	(Percentage of Correct Turning Point Forecasts)	
A. No Pooling		
1. TVP/ARLI	64	77
2. TVP/ARLI/WI	69	82
3. EW/ARLI	66	72
4. EW/ARLI/WI	67	76
5. FP/ARLI	64	74
6. FP/ARLI/WI	72	72
B. With Pooling		
1. TVP/ARLI	74	74
2. TVP/ARLI/WI	78	80
3. EW/ARLI	73	76
4. EW/ARLI/WI	79	81
5. FP/ARLI	74	75
6. FP/ARLI/WI	80	79

*The countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, UK and U.S. A downturn is defined to occur when two successive growth rates are below the third and the fourth is below the third while an upturn is defined to occur when two successive growth rates are above the third and the fourth is above the third.

** See Zellner, Hong and Min (1991) for information about models and forecasting technique.

***Taken from Zellner, Hong and Min (1991), Table 2, p. 288.

Table 2
Performance of Naive Forecasters and ARLI Models in Forecasting 211 Turning Points in 18 Countries' Output Growth Rates, 1974-90

Forecaster*	116 Down Turn/ No Down Turn Forecasts (Percentage of Correct	95 Up Turn/ No Up Turn Forecasts Forecasts)	211 Turning Point Forecasts
1. Eternal Optimist	36	64	49
2. Eternal Pessimist	64	36	51
3. Deterministic four year cycle	64	64	64
4. TVP/ARLI/WI	66	73	69
5. TVP/ARLI/WI Pooled	77	79	78

* See text for descriptions of the forecast procedures used by the eternal optimist, the eternal pessimist and the deterministic four year cycle forecasters.TVP/ARLI/WI denotes a time varying parameter autoregressive leading indicator variable model that includes a world income variable.

Table 3

Coin Flipper's and Models' Expected Number*and Actual Number of Turning Points, 1974-90

Model	Unpooled Estimation	Pooled Estimation
1. TVP/ARLI	131	134
2. TVP/ARLI/WI	125	129
3. EW/ARLI	106	136
4. EW/ARLI/WI	106	131
5. FP/ARLI	128	131
6. FP/ARLI/WI	121	122
Actual Number of Turning Points	135	135
Total Number of Cases	211	211
7. Coin Flipper	105.5	105.5

* The expected number of turning points for each model is the sum of that model's probabilities of turning points for the 211 cases in which a turning point could occur.