

Appendix Tables for

**A Comparison of Direct and Iterated Multistep AR Methods  
for Forecasting Macroeconomic Time Series**

Massimiliano Marcellino

Istituto di Economia Politica, Universita Bocconi and IGIER

James H. Stock

Department of Economics, Harvard University  
and the NBER

and

Mark W. Watson

Department of Economics and Woodrow Wilson School, Princeton University  
and the NBER

February 2004  
(Revised April 2005)

This Appendix contains version of Tables 1-3 and 5-6 using second differences of the logarithm of prices, nominal wages, and nominal money supply series.

**Table A1**  
**Distributions of relative MSFEs of direct vs. iterated univariate forecasts based on**  
**the same lag selection method: All Series**

Lag Selection	Mean/Percentile	Forecast Horizon			
		3	6	12	24
AR(4)	mean	0.99 (<.005)	0.99 (<.005)	1.00 (0.01)	1.05 (0.84)
	0.10	0.97 (<.005)	0.90 (<.005)	0.89 (<.005)	0.86 (<.005)
	0.25	0.99 (<.005)	0.96 (<.005)	0.96 (<.005)	0.94 (<.005)
	0.50	1.00 (<.005)	1.00 (0.01)	1.01 (0.07)	1.04 (>.995)
	0.75	1.01 (0.70)	1.02 (0.91)	1.03 (0.66)	1.11 (>.995)
	0.90	1.02 (0.89)	1.04 (0.90)	1.08 (0.93)	1.23 (>.995)
AR(12)	mean	1.01 (>.995)	1.01 (>.995)	1.03 (>.995)	1.09 (>.995)
	0.10	0.99 (>.995)	0.97 (>.995)	0.95 (>.995)	0.93 (0.98)
	0.25	1.00 (>.995)	0.99 (>.995)	1.00 (>.995)	0.99 (>.995)
	0.50	1.00 (>.995)	1.01 (>.995)	1.03 (>.995)	1.08 (>.995)
	0.75	1.01 (>.995)	1.02 (>.995)	1.06 (>.995)	1.16 (>.995)
	0.90	1.02 (0.99)	1.04 (0.98)	1.12 (>.995)	1.29 (>.995)
AR(BIC)	mean	0.99 (<.005)	0.99 (<.005)	1.00 (0.38)	1.04 (0.96)
	0.10	0.93 (<.005)	0.90 (0.01)	0.91 (0.01)	0.85 (<.005)
	0.25	0.97 (<.005)	0.97 (<.005)	0.97 (0.01)	0.97 (0.41)
	0.50	1.00 (<.005)	1.00 (0.15)	1.01 (0.59)	1.03 (0.99)
	0.75	1.01 (0.98)	1.02 (0.93)	1.03 (0.77)	1.12 (>.995)
	0.90	1.03 (>.995)	1.05 (>.995)	1.10 (>.995)	1.19 (0.99)
AR(AIC)	mean	1.00 (>.995)	1.01 (>.995)	1.03 (>.995)	1.09 (>.995)
	0.10	0.98 (0.99)	0.95 (>.995)	0.95 (>.995)	0.91 (0.80)
	0.25	0.99 (0.17)	0.98 (0.92)	0.98 (0.97)	1.00 (>.995)
	0.50	1.00 (0.51)	1.01 (>.995)	1.02 (>.995)	1.07 (>.995)
	0.75	1.02 (>.995)	1.03 (>.995)	1.06 (>.995)	1.17 (>.995)
	0.90	1.04 (>.995)	1.06 (>.995)	1.12 (>.995)	1.29 (>.995)

Notes: See Notes to Table 1 in the text

**Table A2**  
**Distributions of relative MSFEs of direct vs. iterated univariate forecasts based on**  
**the same lag selection method, by category of series**

Model	Mean/Percentile	Forecast Horizon			
		3	6	12	24
<b>A. Excluding prices, wages, and money</b>					
AR(4)	mean	1.00 (0.01)	1.01 (0.58)	1.03 (0.98)	1.09 (>.995)
	0.10	0.98 (<.005)	0.97 (<.005)	0.96 (0.07)	0.94 (0.25)
	0.25	1.00 (0.01)	0.99 (0.09)	0.99 (0.09)	1.01 (>.995)
	0.50	1.00 (0.46)	1.01 (0.83)	1.02 (0.86)	1.06 (>.995)
	0.75	1.01 (0.93)	1.02 (0.91)	1.05 (0.85)	1.14 (>.995)
	0.90	1.02 (0.94)	1.05 (0.94)	1.10 (0.97)	1.33 (>.995)
AR(12)	mean	1.01 (>.995)	1.01 (>.995)	1.03 (>.995)	1.11 (>.995)
	0.10	0.99 (>.995)	0.97 (0.96)	0.96 (0.99)	0.93 (0.75)
	0.25	1.00 (>.995)	0.99 (>.995)	1.00 (>.995)	1.03 (>.995)
	0.50	1.00 (>.995)	1.01 (>.995)	1.03 (>.995)	1.11 (>.995)
	0.75	1.01 (0.96)	1.02 (0.95)	1.06 (>.995)	1.18 (>.995)
	0.90	1.02 (0.97)	1.04 (0.94)	1.12 (>.995)	1.31 (>.995)
BIC	mean	1.00 (<.005)	1.00 (0.03)	1.03 (0.95)	1.07 (0.98)
	0.10	0.96 (<.005)	0.95 (<.005)	0.97 (0.26)	0.94 (0.30)
	0.25	0.98 (<.005)	0.99 (<.005)	0.99 (0.16)	1.00 (0.97)
	0.50	1.00 (0.05)	1.01 (0.25)	1.02 (0.85)	1.05 (>.995)
	0.75	1.01 (0.97)	1.02 (0.91)	1.05 (0.94)	1.13 (>.995)
	0.90	1.03 (>.995)	1.05 (0.97)	1.11 (>.995)	1.26 (>.995)
AIC	mean	1.01 (>.995)	1.01 (>.995)	1.04 (>.995)	1.11 (>.995)
	0.10	0.97 (0.06)	0.95 (0.12)	0.96 (0.86)	0.95 (0.78)
	0.25	0.99 (<.005)	0.99 (0.71)	0.99 (0.74)	1.02 (>.995)
	0.50	1.00 (0.16)	1.01 (0.97)	1.02 (>.995)	1.10 (>.995)
	0.75	1.02 (>.995)	1.03 (>.995)	1.07 (>.995)	1.18 (>.995)
	0.90	1.04 (>.995)	1.06 (>.995)	1.12 (>.995)	1.32 (>.995)
<b>B. Prices, wages, and money only</b>					
AR(4)	mean	0.97 (<.005)	0.91 (<.005)	0.89 (<.005)	0.88 (<.005)
	0.10	0.93 (<.005)	0.84 (<.005)	0.81 (<.005)	0.79 (<.005)
	0.25	0.96 (<.005)	0.89 (<.005)	0.85 (<.005)	0.84 (<.005)
	0.50	0.98 (<.005)	0.90 (<.005)	0.90 (<.005)	0.89 (<.005)
	0.75	0.99 (<.005)	0.94 (<.005)	0.93 (<.005)	0.92 (<.005)
	0.90	1.00 (<.005)	0.97 (<.005)	0.96 (<.005)	0.95 (<.005)
AR(12)	mean	1.00 (>.995)	1.01 (>.995)	1.01 (>.995)	1.01 (>.995)
	0.10	0.99 (>.995)	0.98 (>.995)	0.93 (>.995)	0.88 (0.93)
	0.25	1.00 (>.995)	0.99 (>.995)	0.97 (>.995)	0.95 (>.995)
	0.50	1.00 (>.995)	1.01 (>.995)	1.00 (>.995)	1.02 (>.995)
	0.75	1.01 (>.995)	1.03 (>.995)	1.04 (>.995)	1.06 (>.995)
	0.90	1.02 (>.995)	1.04 (>.995)	1.09 (>.995)	1.12 (>.995)
BIC	mean	0.95 (<.005)	0.92 (0.01)	0.91 (<.005)	0.92 (<.005)
	0.10	0.87 (<.005)	0.78 (<.005)	0.73 (<.005)	0.69 (<.005)
	0.25	0.93 (0.01)	0.86 (0.02)	0.81 (<.005)	0.82 (<.005)
	0.50	0.95 (<.005)	0.93 (<.005)	0.95 (0.01)	0.95 (0.04)
	0.75	1.00 (0.06)	1.00 (0.01)	0.99 (0.01)	1.01 (0.42)
	0.90	1.04 (>.995)	1.04 (>.995)	1.05 (>.995)	1.08 (0.99)
AIC	mean	1.00 (>.995)	1.00 (>.995)	0.99 (>.995)	0.99 (>.995)
	0.10	0.98 (>.995)	0.94 (>.995)	0.89 (0.98)	0.85 (0.39)
	0.25	0.98 (>.995)	0.98 (>.995)	0.95 (>.995)	0.94 (0.97)
	0.50	1.00 (0.98)	1.00 (>.995)	0.99 (>.995)	1.00 (>.995)
	0.75	1.01 (>.995)	1.02 (>.995)	1.03 (>.995)	1.04 (>.995)
	0.90	1.02 (>.995)	1.04 (>.995)	1.08 (>.995)	1.12 (>.995)

Notes: See the notes to Table 2 in the text.

**Table A3**  
**Relative MSFEs of each univariate forecast method, relative to iterated AR(4),**  
**and the fraction of times each forecast method is best**

Forecast Horizon	Summary statistic	Iterated					Direct				
		AR(4)	AR(12)	BIC	AIC	sum	AR(4)	AR(12)	BIC	AIC	sum
<b>A. All series</b>											
	mean	1.00	0.98	0.99	0.98		0.99	0.98	0.97	0.97	
3	median	1.00	1.00	1.00	1.00		1.00	1.01	1.01	1.00	
	fraction best	0.15	0.19	0.24	0.12	0.70	0.05	0.12	0.04	0.09	0.34
	mean	1.00	0.96	0.99	0.96		0.99	0.98	0.97	0.97	
6	median	1.00	1.00	1.00	1.00		1.00	1.01	1.01	1.00	
	fraction best	0.15	0.22	0.17	0.21	0.75	0.05	0.12	0.04	0.09	0.30
	mean	1.00	0.97	0.99	0.96		1.00	1.00	0.99	0.99	
12	median	1.00	1.01	1.00	1.00		1.01	1.03	1.01	1.01	
	fraction best	0.24	0.20	0.15	0.17	0.76	0.06	0.10	0.05	0.08	0.29
	mean	1.00	0.99	0.99	0.97		1.05	1.08	1.03	1.06	
24	median	1.00	1.01	1.00	1.00		1.04	1.08	1.03	1.07	
	fraction best	0.21	0.21	0.14	0.21	0.76	0.08	0.08	0.05	0.08	0.29
<b>B. Excluding Prices, Wages, and Money</b>											
	mean	1.00	1.02	1.01	1.02		1.00	1.03	1.01	1.02	
3	median	1.00	1.02	1.00	1.01		1.00	1.01	1.00	1.01	
	fraction best	0.19	0.19	0.25	0.11	0.75	0.06	0.10	0.07	0.05	0.28
	mean	1.00	1.01	1.02	1.01		1.01	1.03	1.02	1.02	
6	median	1.00	1.02	1.00	1.00		1.01	1.02	1.02	1.01	
	fraction best	0.19	0.21	0.18	0.21	0.79	0.06	0.10	0.05	0.05	0.27
	mean	1.00	1.03	1.01	1.01		1.03	1.06	1.04	1.05	
12	median	1.00	1.02	1.01	1.00		1.02	1.05	1.03	1.03	
	fraction best	0.30	0.19	0.17	0.16	0.82	0.08	0.05	0.06	0.03	0.22
	mean	1.00	1.05	1.01	1.02		1.09	1.15	1.09	1.13	
24	median	1.00	1.01	1.00	1.00		1.06	1.12	1.06	1.10	
	fraction best	0.26	0.19	0.16	0.21	0.81	0.10	0.03	0.05	0.04	0.22
<b>C. Prices, Wages, and Money</b>											
	mean	1.00	0.85	0.91	0.85		0.97	0.85	0.87	0.85	
3	median	1.00	0.85	0.92	0.86		0.98	0.86	0.86	0.85	
	fraction best	0.00	0.20	0.17	0.14	0.51	0.00	0.20	0.14	0.23	0.57
	mean	1.00	0.78	0.88	0.79		0.91	0.79	0.80	0.78	
6	median	1.00	0.79	0.86	0.79		0.90	0.78	0.81	0.78	
	fraction best	0.00	0.29	0.14	0.20	0.63	0.00	0.20	0.00	0.23	0.43
	mean	1.00	0.77	0.88	0.78		0.89	0.77	0.79	0.77	
12	median	1.00	0.78	0.84	0.78		0.90	0.79	0.81	0.78	
	fraction best	0.00	0.26	0.09	0.20	0.54	0.00	0.29	0.00	0.26	0.54
	mean	1.00	0.79	0.89	0.80		0.88	0.79	0.81	0.79	
24	median	1.00	0.83	0.89	0.83		0.89	0.82	0.84	0.83	
	fraction best	0.00	0.29	0.09	0.20	0.57	0.00	0.29	0.06	0.23	0.57

Notes: See the notes to Table 3 in the text.

**Table A5**  
**Distributions of relative MSFEs of direct vs. iterated bivariate forecasts based on**  
**the same lag selection method: All Series**

Model	Mean/Percentile	Forecast Horizon			
		3	6	12	24
AR(4)	mean	1.00	0.99	1.01	1.06
	0.10	0.96	0.89	0.87	0.82
	0.25	0.98	0.96	0.94	0.93
	0.50	1.00	1.01	1.01	1.04
	0.75	1.02	1.03	1.06	1.15
	0.90	1.03	1.07	1.13	1.34
AR(12)	mean	1.02	1.04	1.07	1.13
	0.10	0.99	0.98	0.95	0.90
	0.25	1.00	1.00	1.01	1.01
	0.50	1.01	1.03	1.06	1.11
	0.75	1.02	1.06	1.12	1.23
	0.90	1.05	1.10	1.19	1.39
BIC	mean	0.97	0.95	0.96	1.01
	0.10	0.83	0.71	0.70	0.70
	0.25	0.94	0.90	0.89	0.88
	0.50	1.00	0.99	1.00	1.03
	0.75	1.02	1.03	1.05	1.13
	0.90	1.05	1.08	1.13	1.29
AIC	mean	1.02	1.03	1.06	1.12
	0.10	0.95	0.93	0.91	0.87
	0.25	0.99	0.98	0.99	0.99
	0.50	1.01	1.02	1.05	1.08
	0.75	1.04	1.07	1.13	1.22
	0.90	1.08	1.14	1.23	1.41

Notes: See the notes to Table 5 in the text.

**Table A6**  
**Relative MSFEs of each bivariate forecast method, relative to iterated VAR(4),**  
**and the fraction of times each forecast method is best**

Forecast Horizon	Percentile	Iterated forecasts					Direct forecasts				
		AR(4)	AR(12)	BIC	AIC	sum	AR(4)	AR(12)	BIC	AIC	sum
<b>A. All Variables</b>											
	mean	1.00	1.02	1.05	1.00		1.00	1.04	1.01	1.01	
3	median	1.00	1.04	1.01	1.00		1.00	1.05	1.01	1.02	
	fraction best	0.16	0.12	0.26	0.14	0.68	0.08	0.06	0.09	0.10	0.33
	mean	1.00	0.99	1.07	0.98		0.99	1.03	0.99	1.01	
6	median	1.00	1.03	1.02	1.00		1.00	1.05	1.01	1.02	
	fraction best	0.19	0.19	0.22	0.16	0.76	0.07	0.06	0.07	0.06	0.26
	mean	1.00	0.99	1.07	0.97		1.01	1.06	1.01	1.03	
12	median	1.00	1.01	1.03	1.00		1.01	1.08	1.02	1.04	
	fraction best	0.20	0.20	0.17	0.18	0.75	0.06	0.09	0.07	0.06	0.28
	mean	1.00	1.01	1.06	0.98		1.06	1.13	1.05	1.10	
24	median	1.00	1.01	1.02	1.00		1.04	1.11	1.04	1.08	
	fraction best	0.19	0.21	0.17	0.18	0.75	0.06	0.09	0.08	0.06	0.29
<b>B. Pairs not including wages, prices, or money</b>											
	mean	1.00	1.06	1.03	1.02		1.01	1.08	1.02	.04	
3	median	1.00	1.05	1.00	1.01		1.01	1.06	1.01	.02	
	fraction best	0.18	0.10	0.29	0.13	0.71	0.09	0.04	0.11	.07	0.31
	mean	1.00	1.04	1.04	1.01		1.02	1.08	1.03	.05	
6	median	1.00	1.05	1.01	1.01		1.01	1.07	1.02	.03	
	fraction best	0.22	0.16	0.25	0.14	0.77	0.08	0.05	0.08	.04	0.25
	mean	1.00	1.05	1.04	1.01		1.05	1.12	1.05	.08	
12	median	1.00	1.04	1.02	1.00		1.03	1.11	1.03	.06	
	fraction best	0.24	0.17	0.20	0.17	0.78	0.06	0.06	0.08	.04	0.24
	mean	1.00	1.07	1.02	1.01		1.12	1.23	1.10	.18	
24	median	1.00	1.04	1.01	1.00		1.08	1.18	1.07	.12	
	fraction best	0.23	0.17	0.22	0.19	0.81	0.05	0.06	0.07	.03	0.22
<b>C. Non price, wage, money variables in pairs that include a price, wage, money variable</b>											
	mean	1.00	1.07	1.01	1.04		1.01	1.09	1.02	1.07	
3	median	1.00	1.07	1.00	1.03		1.01	1.08	1.01	1.06	
	fraction best	0.24	0.07	0.41	0.07	0.78	0.08	0.02	0.09	0.04	0.23
	mean	1.00	1.05	1.01	1.02		1.02	1.10	1.02	1.09	
6	median	1.00	1.05	1.00	1.02		1.02	1.09	1.02	1.07	
	fraction best	0.28	0.10	0.34	0.13	0.84	0.05	0.03	0.06	0.02	0.17
	mean	1.00	1.04	1.02	1.01		1.04	1.12	1.05	1.11	
12	median	1.00	1.03	1.01	1.01		1.02	1.11	1.03	1.10	
	fraction best	0.26	0.14	0.25	0.19	0.83	0.09	0.03	0.05	0.02	0.18
	mean	1.00	1.04	1.01	1.02		1.10	1.18	1.12	1.17	
24	median	1.00	1.02	1.00	1.01		1.07	1.15	1.08	1.13	
	fraction best	0.26	0.17	0.22	0.17	0.82	0.06	0.05	0.06	0.04	0.21
<b>D. Price, wage, money variables</b>											
	mean	1.00	0.87	1.13	0.89		0.97	0.88	0.96	0.87	
3	median	1.00	0.87	1.13	0.89		0.97	0.87	0.97	0.87	
	fraction best	0.03	0.23	0.01	0.23	0.50	0.04	0.19	0.04	0.24	0.51
	mean	1.00	0.80	1.20	0.83		0.90	0.82	0.86	0.81	
6	median	1.00	0.80	1.19	0.84		0.90	0.81	0.87	0.80	
	fraction best	0.01	0.37	0.00	0.27	0.66	0.06	0.14	0.03	0.14	0.37
	mean	1.00	0.77	1.23	0.82		0.88	0.80	0.84	0.79	
12	median	1.00	0.77	1.21	0.82		0.88	0.80	0.85	0.80	
	fraction best	0.01	0.37	0.00	0.20	0.58	0.05	0.23	0.06	0.15	0.48
	mean	1.00	0.78	1.22	0.83		0.86	0.81	0.84	0.81	
24	median	1.00	0.79	1.19	0.84		0.87	0.82	0.85	0.81	
	fraction best	0.01	0.35	0.00	0.16	0.52	0.05	0.24	0.12	0.19	0.60

Notes: See the notes to Table 6 in the text.