

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

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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 (0.82)
	0.10	0.97 (<.005)	0.90 (<.005)	0.90 (<.005)	0.86 (<.005)
	0.25	0.99 (<.005)	0.96 (<.005)	0.96 (<.005)	0.94 (<.005)
	0.50	1.00 (0.01)	1.00 (0.01)	1.01 (0.09)	1.04 (0.98)
	0.75	1.01 (0.75)	1.02 (0.94)	1.03 (0.61)	1.11 (>.995)
	0.90	1.02 (0.89)	1.04 (0.94)	1.08 (0.91)	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 (>.995)	1.04 (>.995)	1.12 (>.995)	1.29 (>.995)
AR(BIC)	mean	0.99 (<.005)	0.99 (<.005)	1.00 (0.38)	1.04 (0.94)
	0.10	0.93 (<.005)	0.92 (0.01)	0.91 (0.01)	0.85 (<.005)
	0.25	0.97 (<.005)	0.97 (<.005)	0.97 (0.01)	0.97 (0.47)
	0.50	1.00 (0.01)	1.00 (0.09)	1.01 (0.57)	1.03 (0.98)
	0.75	1.01 (>.995)	1.02 (0.94)	1.03 (0.71)	1.12 (>.995)
	0.90	1.03 (>.995)	1.05 (>.995)	1.10 (0.99)	1.19 (0.99)
AR(AIC)	mean	1.00 (>.995)	1.01 (>.995)	1.03 (>.995)	1.09 (>.995)
	0.10	0.98 (0.98)	0.95 (>.995)	0.95 (>.995)	0.91 (0.76)
	0.25	0.99 (0.17)	0.98 (0.96)	0.98 (0.97)	1.00 (>.995)
	0.50	1.00 (0.48)	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
A. Excluding prices, wages, and money					
AR(4)	mean	1.00 (0.01)	1.01 (0.55)	1.03 (0.95)	1.09 (>.995)
	0.10	0.98 (<.005)	0.97 (<.005)	0.96 (0.07)	0.94 (0.29)
	0.25	1.00 (0.01)	0.99 (0.08)	0.99 (0.11)	1.01 (0.99)
	0.50	1.00 (0.38)	1.01 (0.79)	1.02 (0.79)	1.06 (>.995)
	0.75	1.01 (0.94)	1.02 (0.93)	1.04 (0.84)	1.13 (>.995)
	0.90	1.02 (0.95)	1.05 (0.98)	1.10 (0.96)	1.33 (>.995)
AR(12)	mean	1.01 (>.995)	1.01 (>.995)	1.03 (>.995)	1.11 (>.995)
	0.10	0.99 (0.99)	0.97 (0.99)	0.96 (0.99)	0.93 (0.80)
	0.25	1.00 (>.995)	0.99 (>.995)	1.00 (>.995)	1.03 (>.995)
	0.50	1.00 (0.98)	1.01 (0.97)	1.03 (>.995)	1.11 (>.995)
	0.75	1.01 (0.95)	1.02 (0.98)	1.06 (>.995)	1.18 (>.995)
	0.90	1.02 (0.97)	1.04 (0.94)	1.12 (0.99)	1.31 (>.995)
BIC	mean	1.00 (<.005)	1.00 (0.04)	1.03 (0.88)	1.07 (0.99)
	0.10	0.96 (<.005)	0.95 (<.005)	0.97 (0.29)	0.94 (0.33)
	0.25	0.98 (<.005)	0.99 (<.005)	0.99 (0.13)	1.00 (0.97)
	0.50	1.00 (0.01)	1.00 (0.27)	1.02 (0.75)	1.05 (0.99)
	0.75	1.01 (0.98)	1.02 (0.93)	1.05 (0.91)	1.13 (>.995)
	0.90	1.03 (>.995)	1.05 (>.995)	1.11 (0.98)	1.26 (>.995)
AIC	mean	1.01 (>.995)	1.01 (>.995)	1.04 (>.995)	1.11 (>.995)
	0.10	0.97 (0.10)	0.95 (0.14)	0.96 (0.94)	0.95 (0.83)
	0.25	0.99 (<.005)	0.99 (0.77)	0.99 (0.84)	1.02 (>.995)
	0.50	1.00 (0.20)	1.01 (0.94)	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 (0.98)	1.32 (>.995)
B. Prices, wages, and money only					
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 (0.90)
	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 (<.005)	0.91 (<.005)	0.92 (<.005)
	0.10	0.87 (<.005)	0.78 (<.005)	0.73 (<.005)	0.69 (<.005)
	0.25	0.93 (<.005)	0.86 (0.01)	0.81 (<.005)	0.82 (<.005)
	0.50	0.95 (<.005)	0.93 (<.005)	0.95 (0.02)	0.95 (0.05)
	0.75	1.00 (0.06)	1.00 (0.01)	0.99 (0.01)	1.01 (0.47)
	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 (0.97)	0.85 (0.38)
	0.25	0.98 (>.995)	0.98 (>.995)	0.95 (>.995)	0.94 (0.98)
	0.50	1.00 (0.97)	1.00 (>.995)	0.99 (>.995)	1.00 (0.97)
	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
A. All series											
	mean	1.00	0.98	0.99	0.98		1.00	0.99	0.98	0.99	
3	median	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
	fraction best	0.15	0.19	0.23	0.12	0.70	0.05	0.12	0.09	0.09	0.34
	mean	1.00	0.97	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	0.30
	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	1.09	1.03	1.07	
	fraction best	0.20	0.21	0.14	0.21	0.77	0.08	0.08	0.05	0.08	0.29
B. Excluding Prices, Wages, and Money											
	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	0.12		0.06	0.10	0.07	0.05	
	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		0.06	0.10	0.05	0.05	
	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	0.18	0.17	0.16		0.08	0.05	0.07	0.04	
	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	0.15	0.21		0.10	0.03	0.05	0.04	
C. Prices, Wages, and Money											
	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
A. All Variables											
	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. Pairs not including wages, prices, or money											
	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
C. Non price, wage, money variables in pairs that include a price, wage, money variable											
	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
D. Price, wage, money variables											
	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.