Have Economic Models' Forecasting Performance for US Output Growth and Inflation Changed Over Time, and When?

Not-For-Publication Appendix *

Barbara Rossi and Tatevik Sekhposyan

Duke University *UNC - Chapel Hill*

First draft: July 2007. This revision: July 2009.

General comments

1. Data sources for the revised data are provided in Table 1. Real time employment and industrial production index are the monthly vintages of Nonfarm Payroll Employment (EMPLOY) and Total Industrial Production Index (IPT) series provided by the Federal Reserve Bank of Philadelphia Real-Time Data Set (http://www.philadelphiafed.org/econ/forecast/real-time-data/data-files/). The monthly vintages of the Civilian Unemployment Rate (UNRATE) are from the ArchivaL Federal Reserve Economic Data (ALFRED) database of the St. Louis Fed.

2. Notes to the figures: The dark solid line in the figure reports the re-scaled rMSFEs, that is $F_{t,m}^{OOS} = \widehat{\sigma}^{-1} m^{-1/2} rMSFE_t$. The light solid lines report 90% bands for testing the null hypothesis that the models' relative forecasting performance is equal (the test rejects when the dark solid line is outside the bands). Negative values of the re-scaled rMSFE denote situations in which the economic model forecasts better than its competitor. For details, refer to the paper.

*This appendix reports the additional results for Rossi, B. & Sekhposyan, T. (2010). Have Economic Models' Forecasting Performance for US Output Growth and Inflation Changed Over Time, and When? *International Journal of Forecasting* 26(4), 2010, 808-835.

Table 1: Description of Data Series

Label	Period	Name	Description	S
		Asset Prices		
rovnght	1959:1 - 2005:12	FYFF	Int Rate: Federal Funds (Effective)	D
rtbill	1959:1 - 2005:12	FYGM3	Int Rate: US Treasury Bills, Sec Mkt, 3-Mo	D
rbnds	1959:1 - 2005:12	FYGT1	Int Rate: US Treasury Const Maturities, 1-Yr	D
rbndm	1959:1 - 2005:12	FYGT5	Int Rate: US Treasury Const Maturities, 5-Yr	D
rbndl	1959:1 - 2005:12	FYGT10	Int Rate: US Treasury Const Maturities, 10-Yr	D
exrate	1959:1 - 2005:12	EXRUS	United States; Effective Exchange Rate	D
stockp	1959:1 - 2005:12	FSPCOM	S&P's Common Stock Price Index: Composite	D
		Activity		
ip	1959:1 - 2005:12	B5001	Industrial Production Total (sa)	F
capu	1959:1 - 2002:06	IPXMCA	Capacity Utilization Rate: MFG, Total	D
emp	1959:1 - 2005:12	LHEM	Civilian Labor Force: Employed, Total	D
unemp	1959:1 - 2005:12	LHUR	Unemp Rate: All Workers, 16 Years and Over	D
hours	1959:1 - 2005:12	A0M001	Average weekly hours, mfg. (hours)	C
deliveries	1959:1 - 2005:12	A0M032	Index of supplier deliveries - vendor perf. (pct.)	C
		Wages and Prices		
cpi	1959:1 - 2005:12	CUUR0000AA0	CPI - All Urban Consumers (nsa)	B
pce	1959:1 - 2005:12	PCE deflator	Price Indexes for Personal Cons. Expenditures	B
ppi	1959:1 - 2005:12	PW	Producer Price Index: All Commodities	D
earn	1959:1 - 2003:04	LE6GP	Avg Hourly Earnings - Goods - Producing	D
oil	1959:1 - 2003:06	WPU0561	Crude Petroleum (Domestic Production)	B
		Money		
m0	1959:1 - 2003:06	FMBASE	Monetary Base, Adj For Reserve Req Chgs	D
m1	1959:1 - 2005:12	FM1	Money Stock: M1	D
m2	1959:1 - 2005:12	FM2	Money Stock: M2	D
m3	1959:1 - 2005:12	FM3	Money Stock: M3	D
		Miscellaneous		
lead	1959:1 - 2005:12	G0M910	Composite index of 10 leading indicators	C

Note: Sources (S) are abbreviated as follows: B - Bureau of Labor Statistics, C - Conference Board, D - DRI Basic Economics Database, F - Federal Reserve Board of Governors. S pread is defined as the difference between rbndl and rovnght. The same names preceded by an "r" denote the real version of the variable. For example, Real Interest Rates (such as rrovnght, rrtbill, rrbnds, rrbndm, rrbndl) are defined as Nominal Interest Rates minus CPI inflation. Real stock variables such as Real Money Balances (rm0, rm1, rm2, rm3) are defined as the ratio of the Nominal Money Balances and CPI.

Section 1: Detailed results for all available series

Detailed results on Output Growth

Figure 1: One Year Ahead Output Growth Forecast - Asset Prices

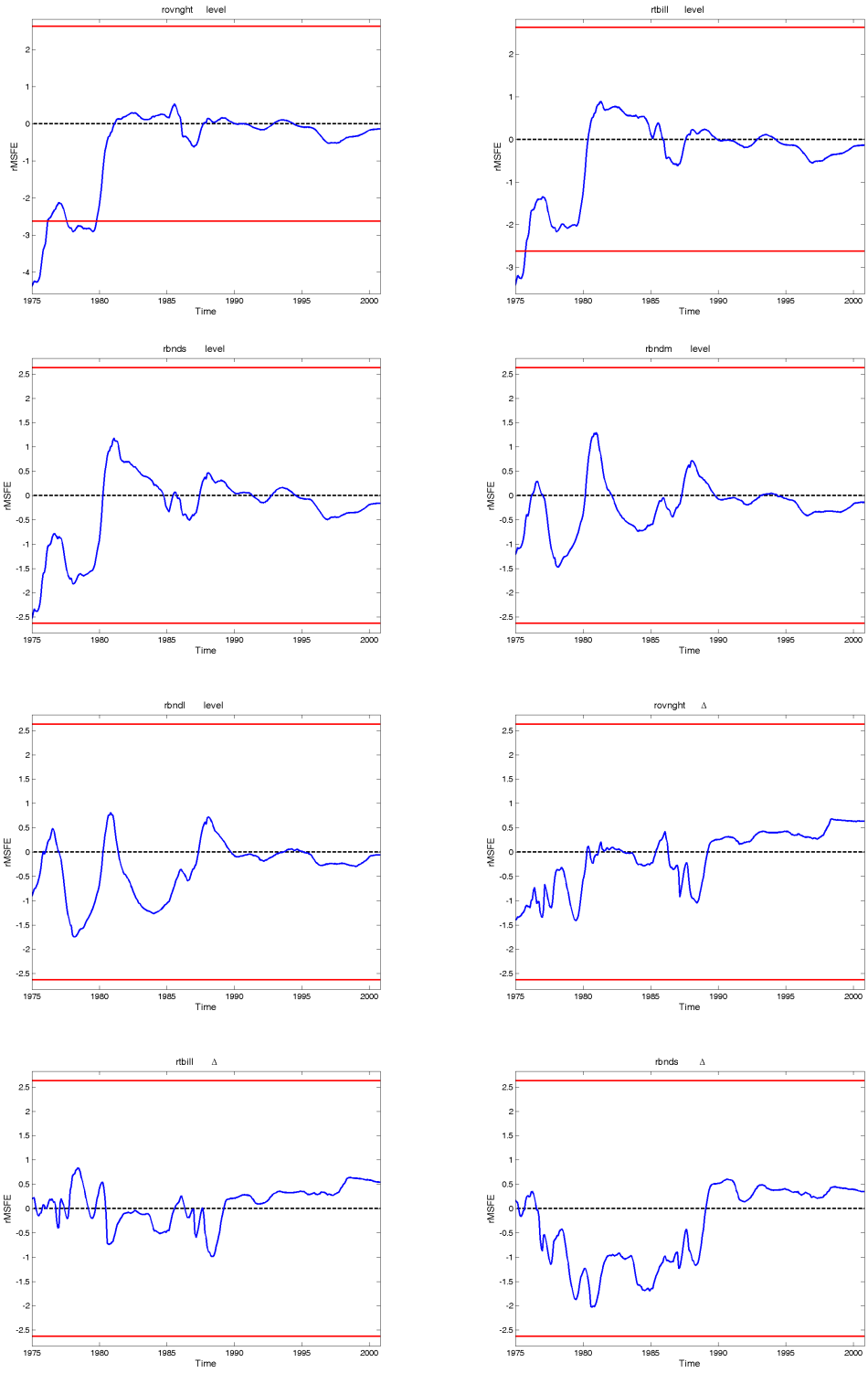


Figure 2: One Year Ahead Output Growth Forecast - Asset Prices (cont.)

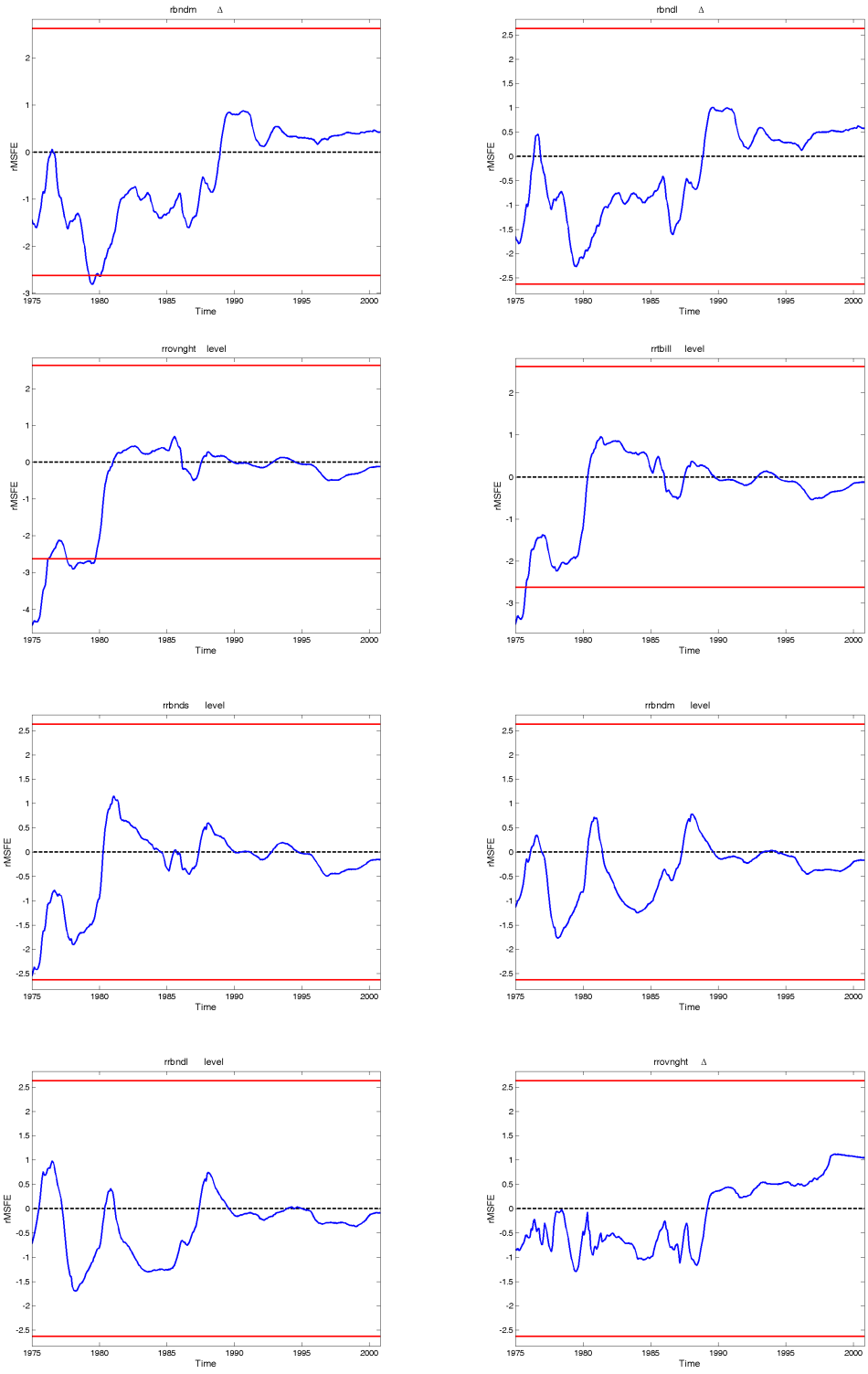


Figure 3: One Year Ahead Output Growth Forecast - Asset Prices (cont.)

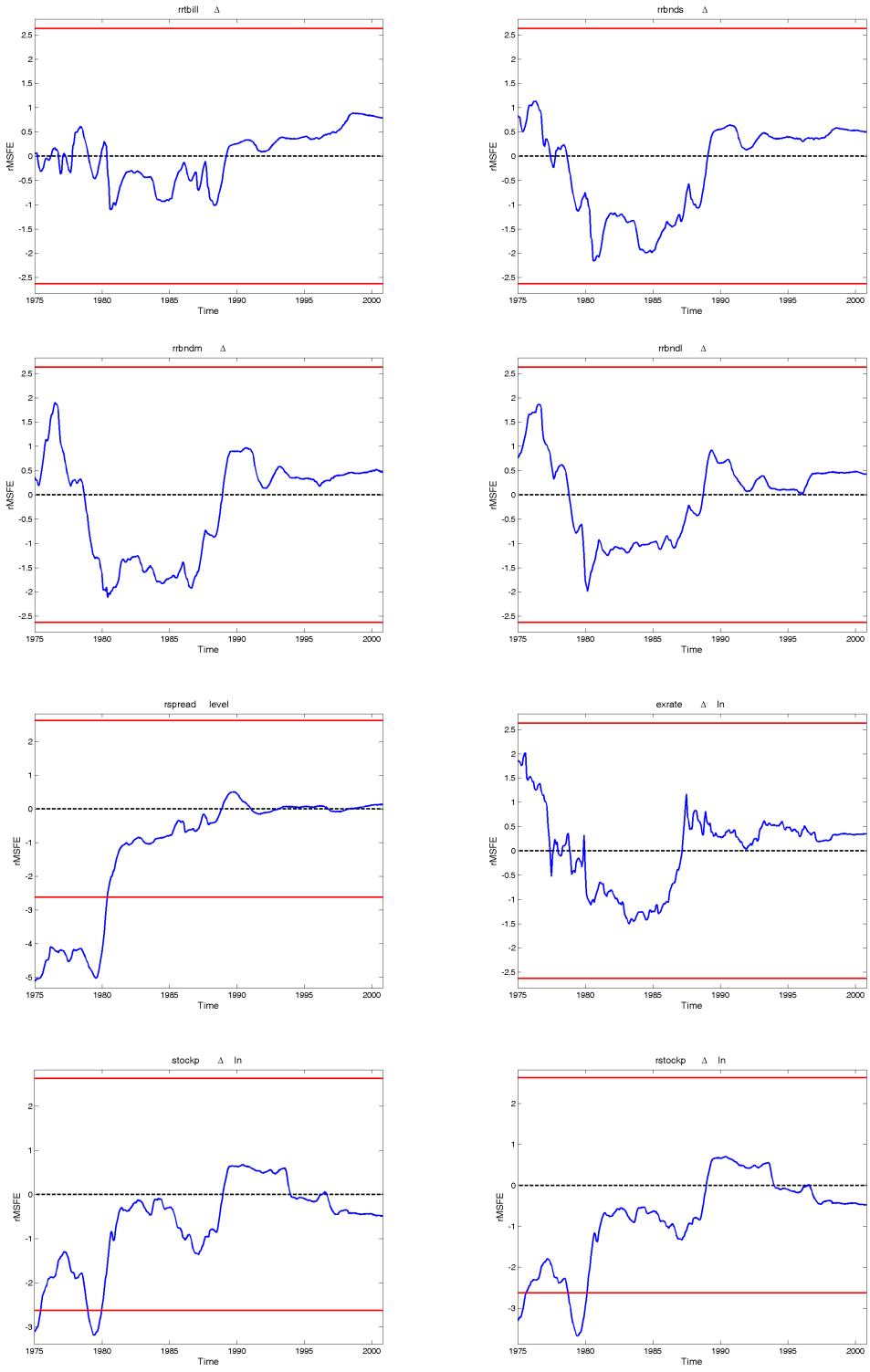


Figure 4: One Year Ahead Output Growth Forecast - Activity Measures

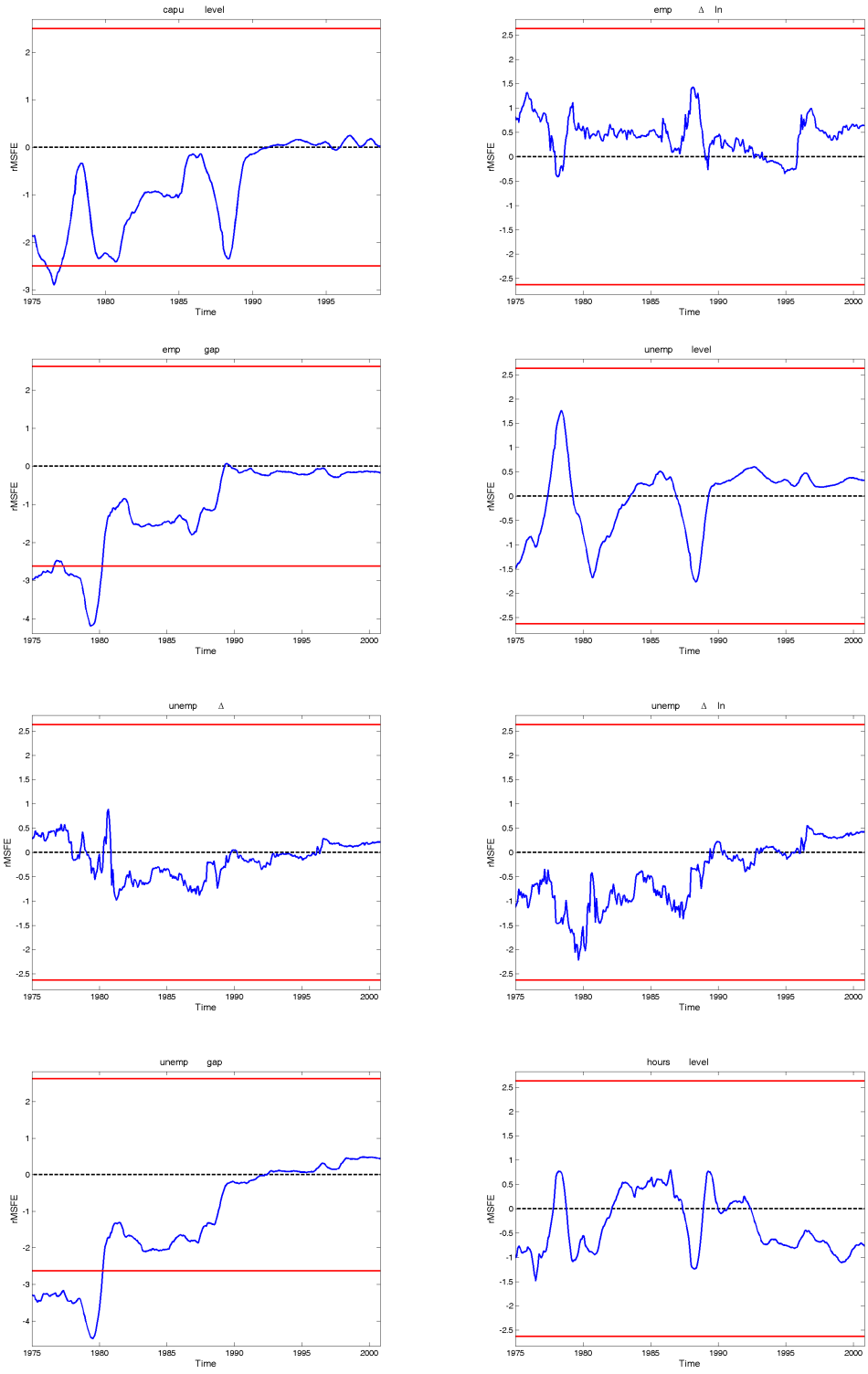


Figure 5: One Year Ahead Output Growth Forecast - Activity Measures (cont.)

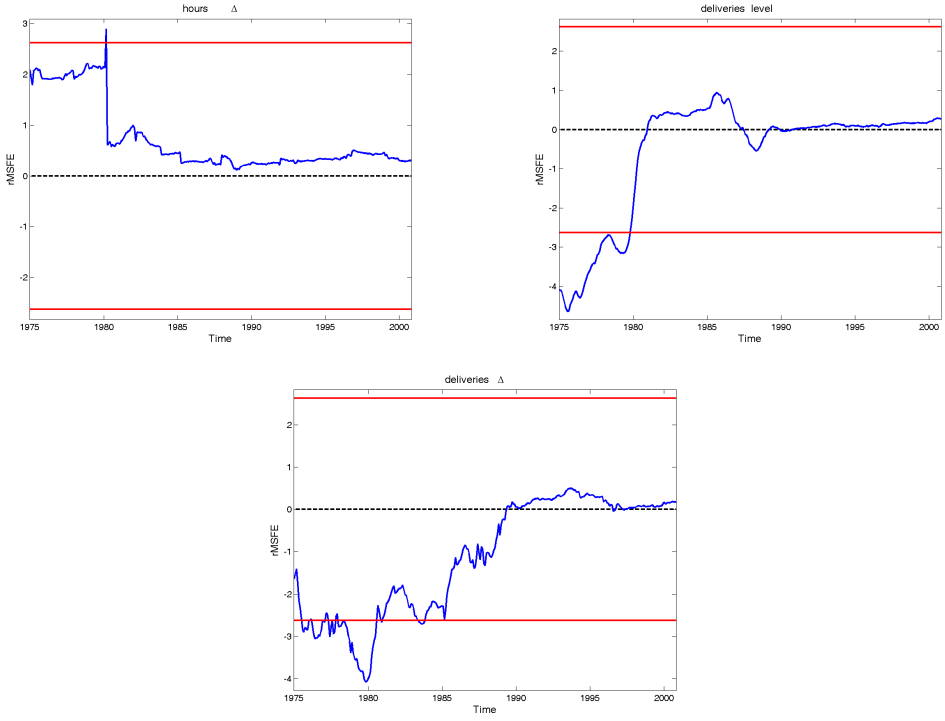


Figure 6: One Year Ahead Output Growth Forecast - Wages & Prices

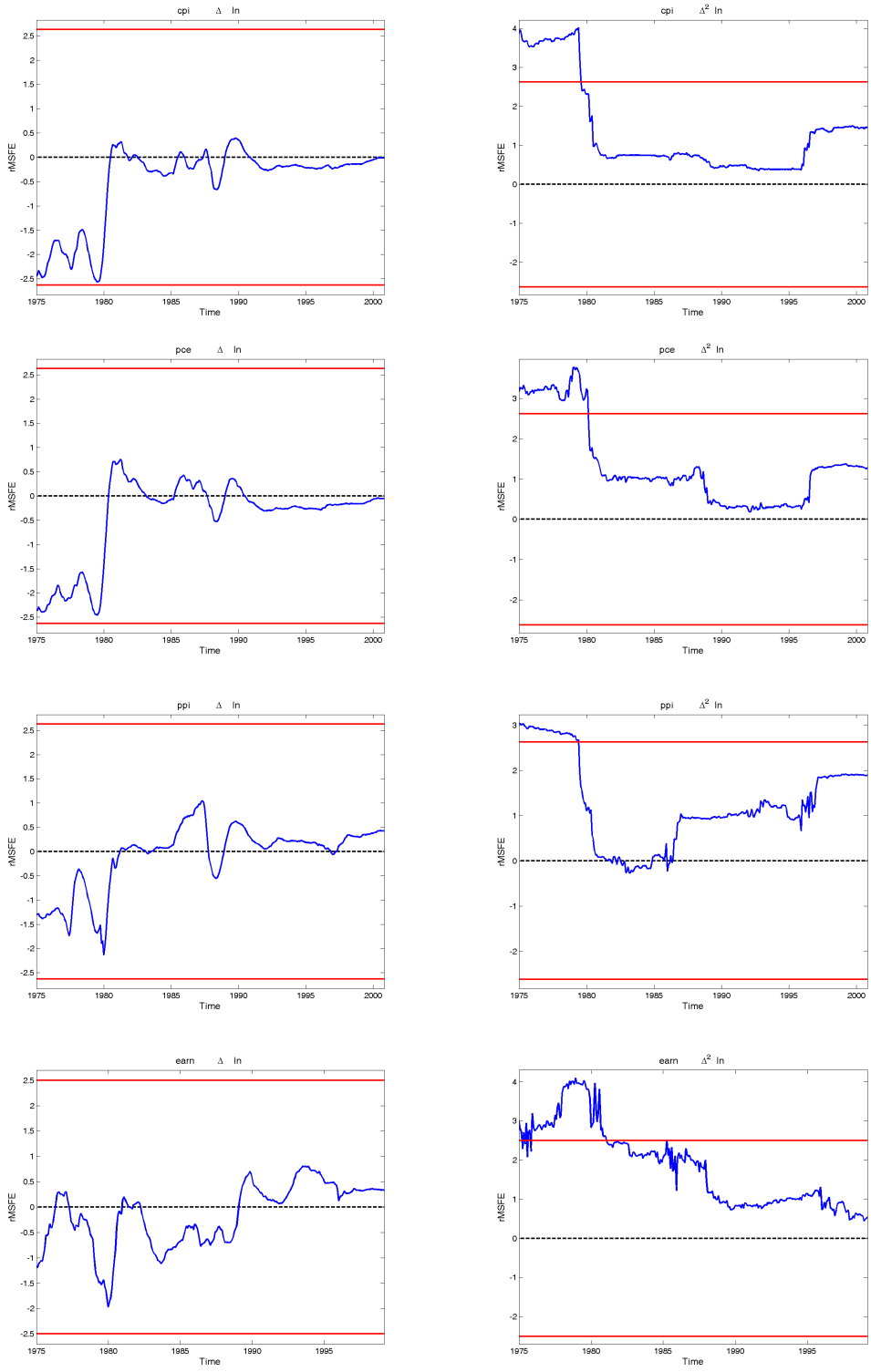


Figure 7: One Year Ahead Output Growth Forecast - Wages & Prices (cont.)

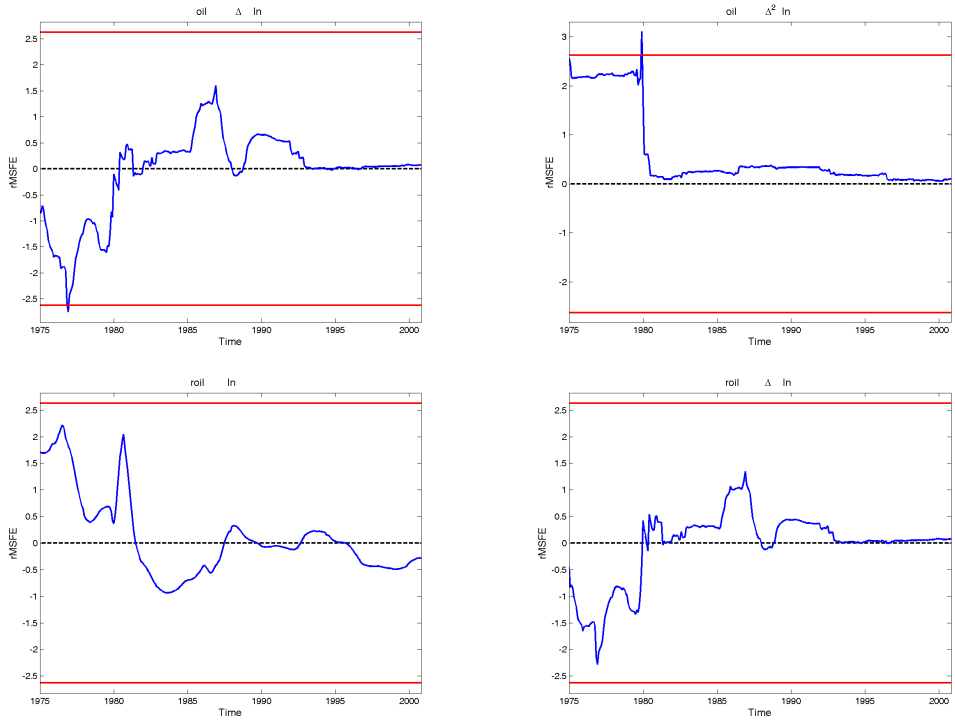


Figure 8: One Year Ahead Output Growth Forecast - Money

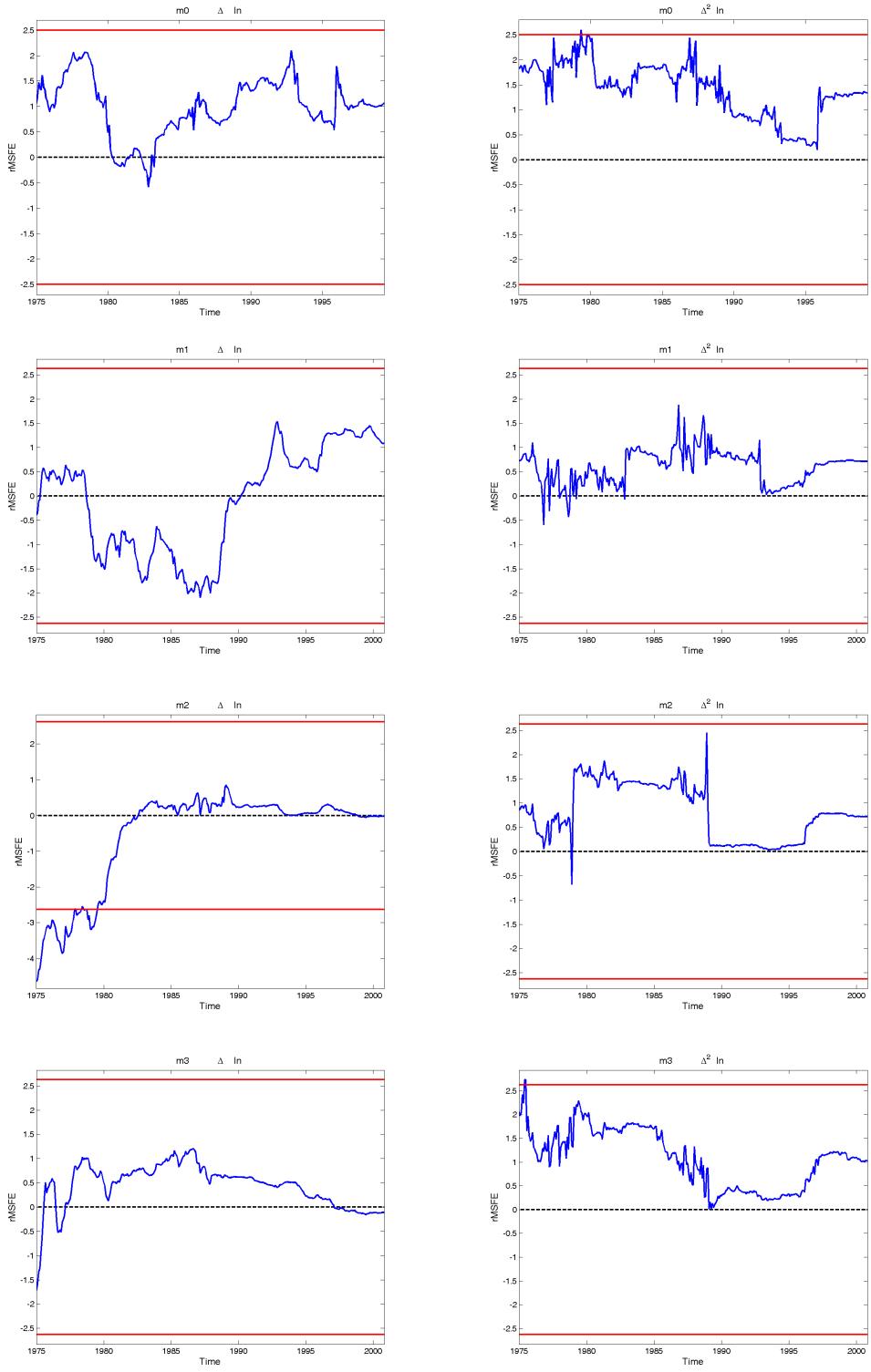


Figure 9: One Year Ahead Output Growth Forecast - Money (cont.)

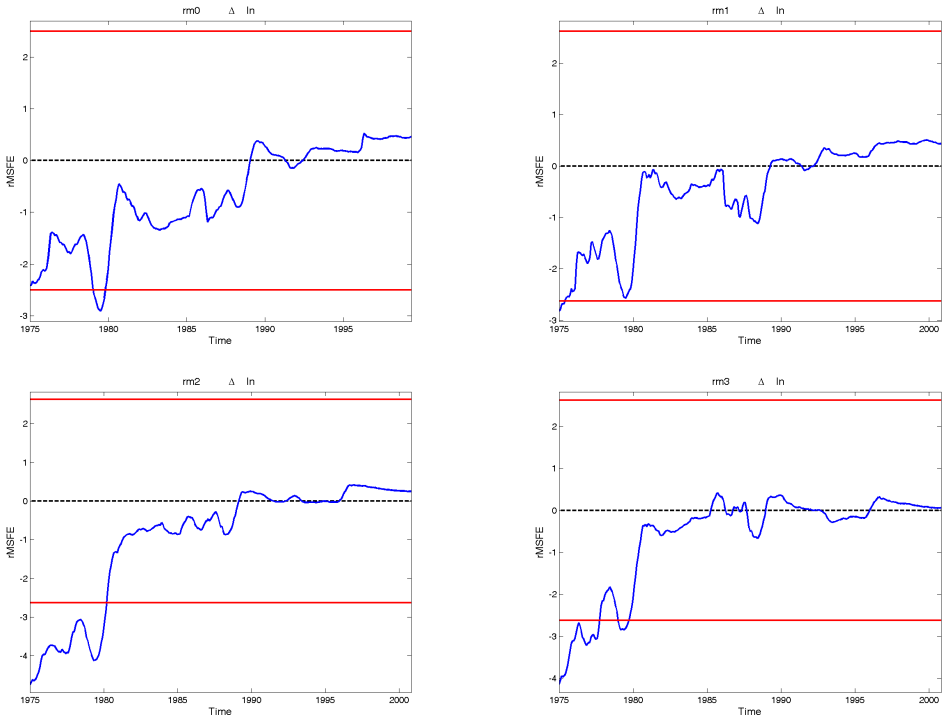


Figure 10: Miscellaneous

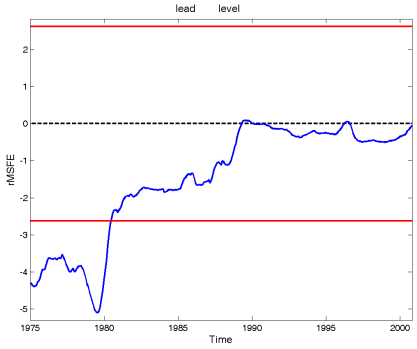


Table 2: Forecasting Output Growth: Tests of Average Equal Predictive Ability

Variable		rMSFE	p-value	Variable		rMSFE	p-value
rovnght	level	-2.28	0.02	unemp	Δln	-0.75	0.45
rtbill	level	-1.81	0.07	unemp	gap	-2.65	0.01
rbnds	level	-1.53	0.13	hours	level	-0.69	0.49
rbndm	level	-0.97	0.33	hours	Δ	1.62	0.10
rbndl	level	-0.96	0.33	deliveries	level	-1.72	0.09
rovnght	Δ	-0.38	0.70	deliveries	Δ	-1.85	0.06
rtbill	Δ	0.28	0.78	cpi	Δln	-1.53	0.13
rbnds	Δ	-0.45	0.65	cpi	$\Delta^2 ln$	3.40	0.00
rbndm	Δ	-1.13	0.26	pce	Δln	-1.39	0.17
rbndl	Δ	-0.92	0.36	pce	$\Delta^2 ln$	3.00	0.00
rrovnght	level	-2.22	0.03	ppi	Δln	-0.29	0.77
rrtbill	level	-1.81	0.07	ppi	$\Delta^2 ln$	3.14	0.00
rrbnds	level	-1.55	0.12	earn	Δln	-0.64	0.52
rrbndm	level	-1.15	0.25	earn	$\Delta^2 ln$	3.48	0.00
rrbndl	level	-0.97	0.33	oil	Δln	-0.24	0.81
rrovnght	Δ	-0.21	0.83	oil	$\Delta^2 ln$	1.63	0.10
rrtbill	Δ	0.13	0.89	roil	ln	0.39	0.70
rrbnds	Δ	-0.16	0.87	roil	Δln	-0.05	0.96
rrbndm	Δ	-0.34	0.74	m0	Δln	1.91	0.06
rrbndl	Δ	0.13	0.89	m0	$\Delta^2 ln$	2.88	0.00
rspread	level	-3.12	0.00	m1	Δln	-0.16	0.87
exrate	Δln	0.76	0.45	m1	$\Delta^2 ln$	1.23	0.22
stockp	Δln	-2.03	0.04	m2	Δln	-2.28	0.02
rstockp	Δln	-2.32	0.02	m2	$\Delta^2 ln$	1.61	0.11
ip	Δln	-	-	m3	Δln	-0.15	0.88
ip	gap	-	-	m3	$\Delta^2 ln$	2.62	0.01
capu	level	-1.64	0.10	rm0	Δln	-1.64	0.10
emp	Δln	0.94	0.35	rm1	Δln	-1.49	0.14
emp	gap	-2.54	0.01	rm2	Δln	-2.80	0.01
unemp	level	-0.57	0.57	rm3	Δln	-2.20	0.03
unemp	Δ	-0.03	0.97	lead	level	-3.34	0.00

Note: rMSFE denotes the re-scaled average MSFE difference over the full out-of-sample period. A negative value indicate that the model with an explanatory variable outperforms the autoregressive model); p-value is the full out-of-sample test p-value.

Table 3: Forecasting Output Growth: Tests of Equal Predictive Ability Over Time

Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	0.00	0.00	1976	5	unemp	Δln	1.00	0.87		
rtbill	level	0.00	0.00	1976	3	unemp	gap	0.00	0.00	1976	3
rbnds	level	0.00	0.00	1976	3	hours	level	1.00	1.00		
rbndm	level	0.02	0.01	1975	12	hours	Δ	0.65	0.54		
rbndl	level	0.11	0.07	1975	12	deliveries	level	0.00	0.00	1976	5
rovnght	Δ	0.53	0.37			deliveries	Δ	0.19	0.37		
rtbill	Δ	1.00	1.00			cpi	Δln	0.00	0.00	1975	10
rbnds	Δ	1.00	1.00			cpi	$\Delta^2 ln$	0.01	0.02	1976	3
rbndm	Δ	0.15	0.19			pce	Δln	0.00	0.00	1975	10
rbndl	Δ	0.14	0.17			pce	$\Delta^2 ln$	0.15	0.15		
rrovnght	level	0.00	0.00	1976	5	ppi	Δln	0.73	0.66		
rrtbill	level	0.00	0.00	1976	3	ppi	$\Delta^2 ln$	0.18	0.16		
rrbnds	level	0.00	0.00	1976	3	earn	Δln	0.62	0.49		
rrbndm	level	0.09	0.06	1975	12	earn	$\Delta^2 ln$	0.05	0.28		
rrbndl	level	0.45	0.33			oil	Δln	0.62	0.54		
rrovnght	Δ	0.79	0.65			oil	$\Delta^2 ln$	0.19	0.13		
rrtbill	Δ	1.00	1.00			roil	ln	0.81	0.70		
rrbnds	Δ	1.00	1.00			roil	Δln	1.00	0.87		
rrbndm	Δ	0.75	0.70			m0	Δln	1.00	1.00		
rrbndl	Δ	1.00	1.00			m0	$\Delta^2 ln$	0.71	1.00		
rspread	level	0.00	0.00	1976	6	m1	Δln	0.67	0.60		
exrate	Δln	0.58	0.43			m1	$\Delta^2 ln$	1.00	1.00		
stockp	Δln	0.00	0.00	1976	7	m2	Δln	0.00	0.00	1977	10
rstockp	Δln	0.00	0.00	1976	7	m2	$\Delta^2 ln$	1.00	1.00		
ip	Δln	-	-	-	-	m3	Δln	0.68	0.57		
ip	gap	-	-	-	-	m3	$\Delta^2 ln$	0.38	0.67		
capu	level	0.53	0.60			rm0	Δln	0.00	0.00	1975	10
emp	Δln	1.00	1.00			rm1	Δln	0.00	0.00	1975	10
emp	gap	0.02	0.02	1976	2	rm2	Δln	0.00	0.00	1975	10
unemp	level	0.90	0.86			rm3	Δln	0.00	0.00	1975	10
unemp	Δ	1.00	1.00			lead	level	0.00	0.00	1975	10

Note: The table reports p-values of Giacomini and Rossi's (2008) One-Time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.

Detailed results on Output Growth – Real Time Data

Figure 11: One Year Ahead Output Growth Forecast in Real-Time - Asset Prices

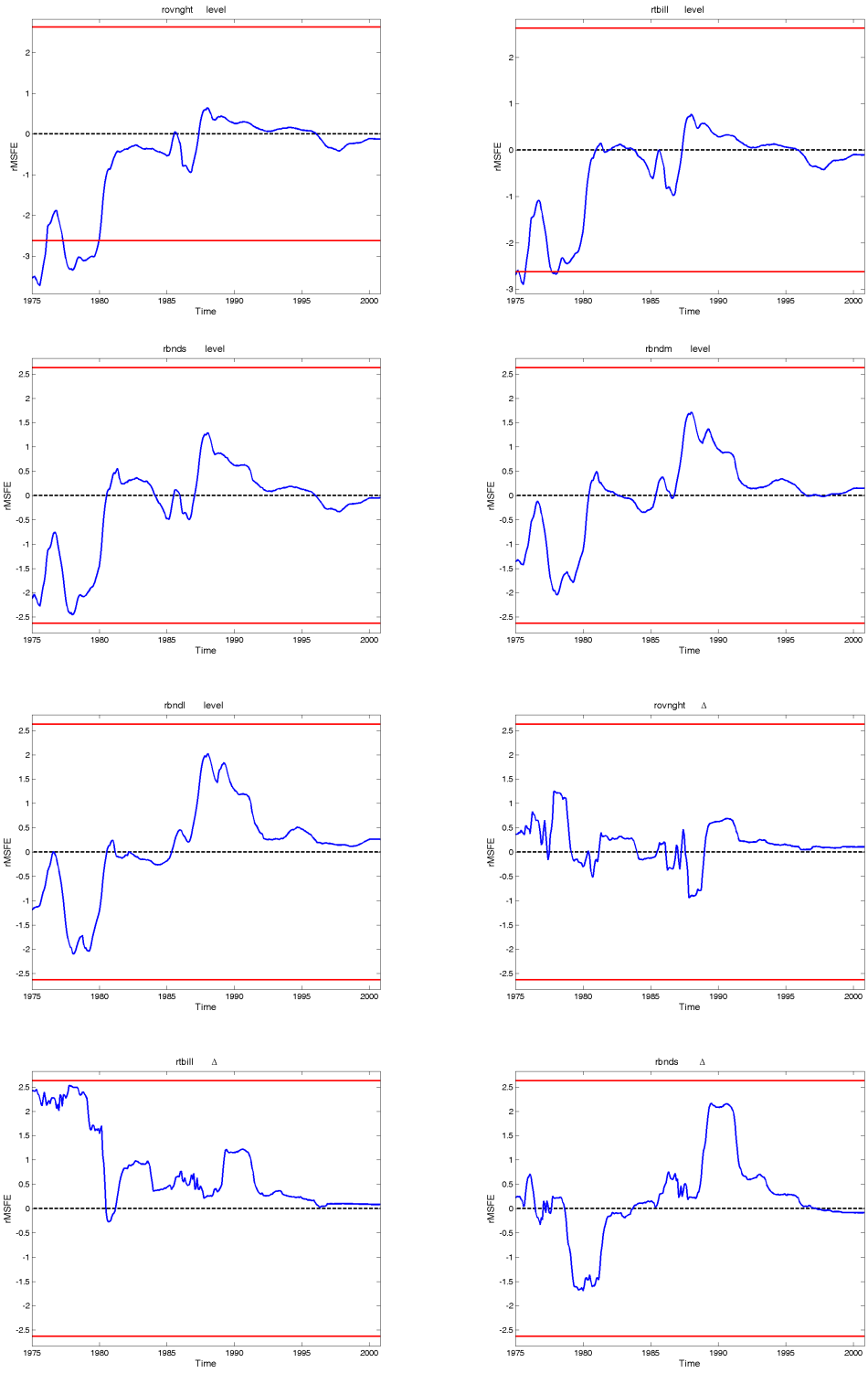


Figure 12: One Year Ahead Output Growth Forecast in Real-Time - Asset Prices (cont.)

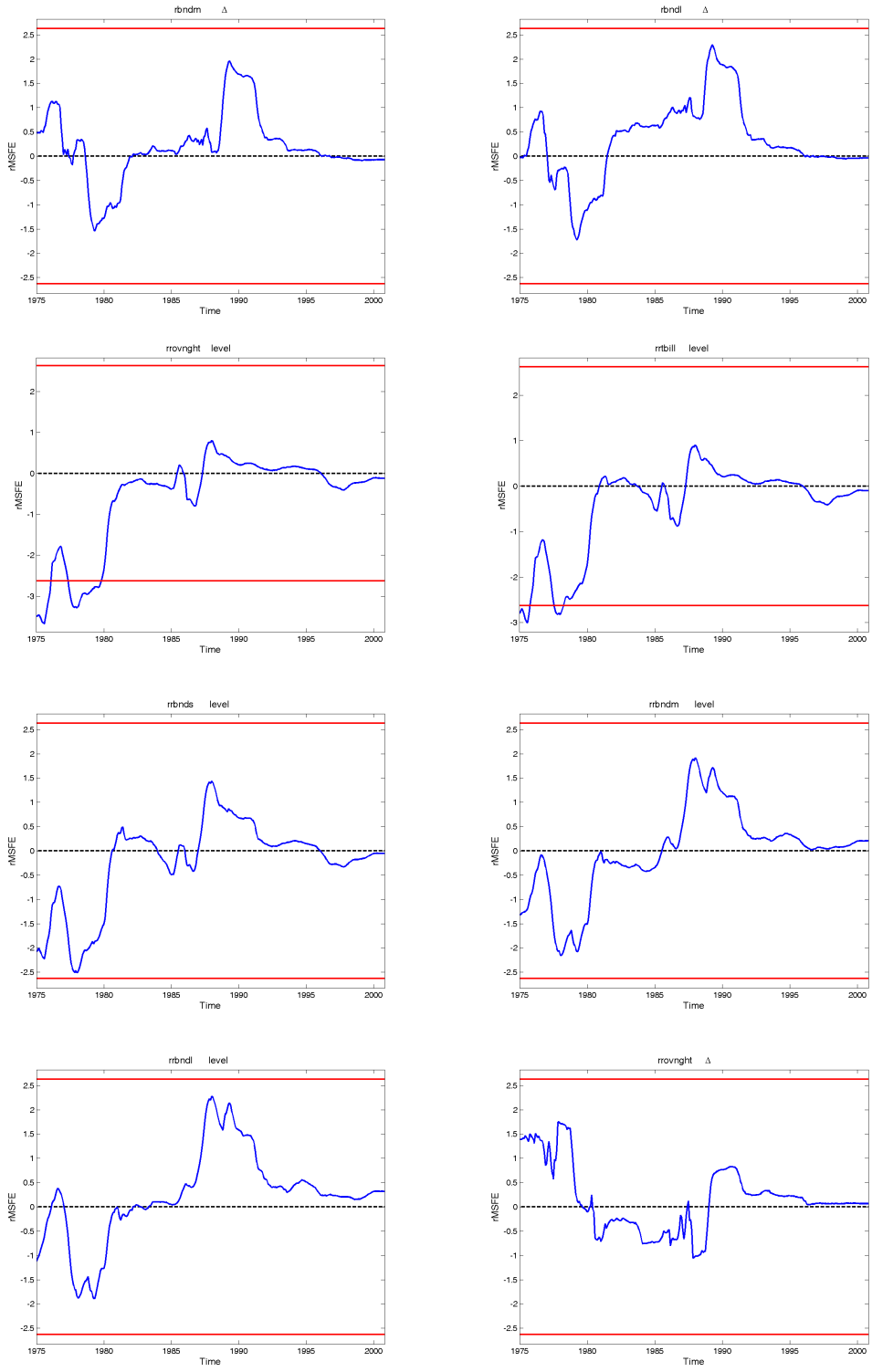


Figure 13: One Year Ahead Output Growth Forecast in Real-Time - Asset Prices (cont.)

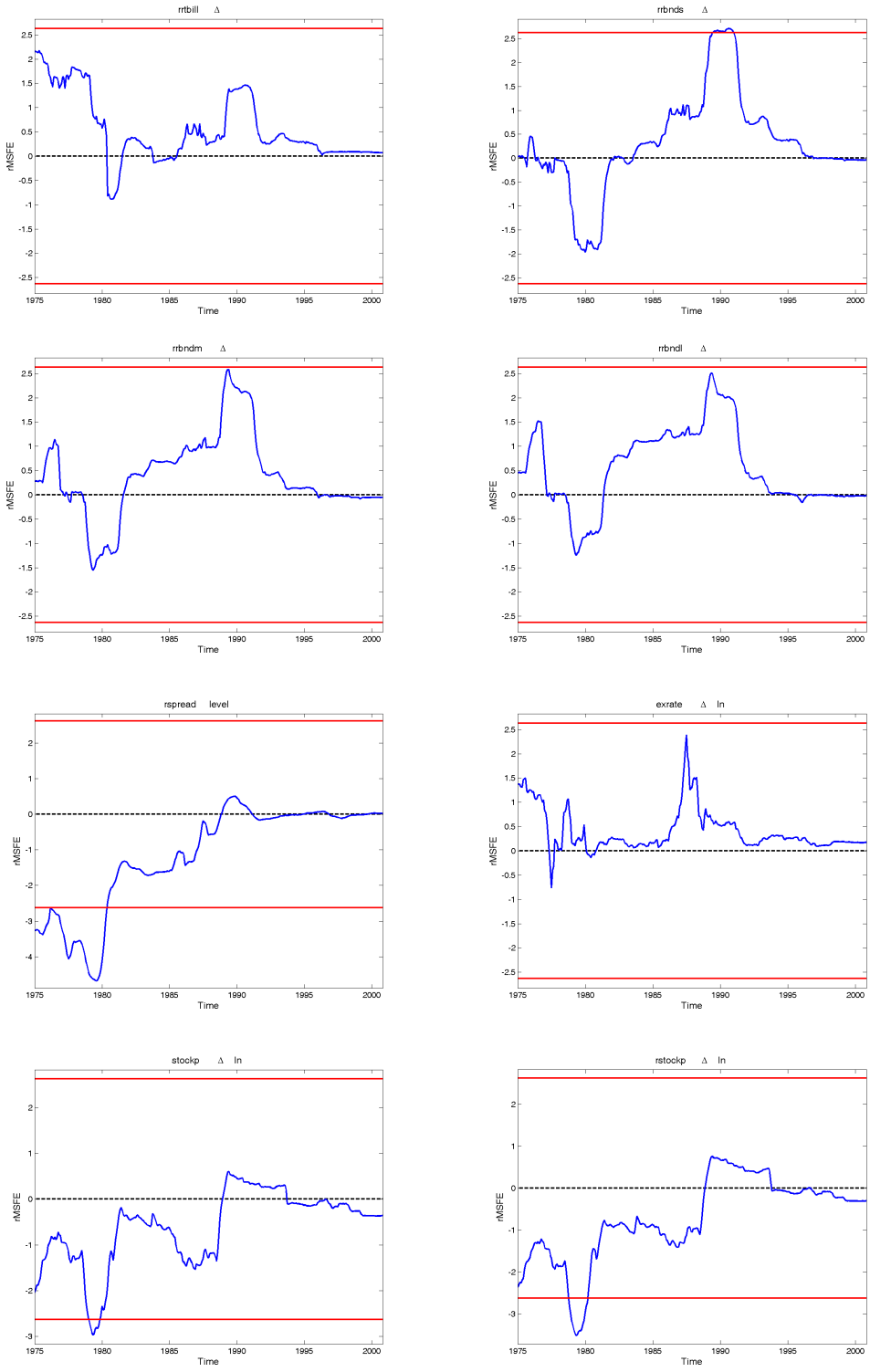


Figure 14: One Year Ahead Real Time Output Growth Forecast - Activity Measures

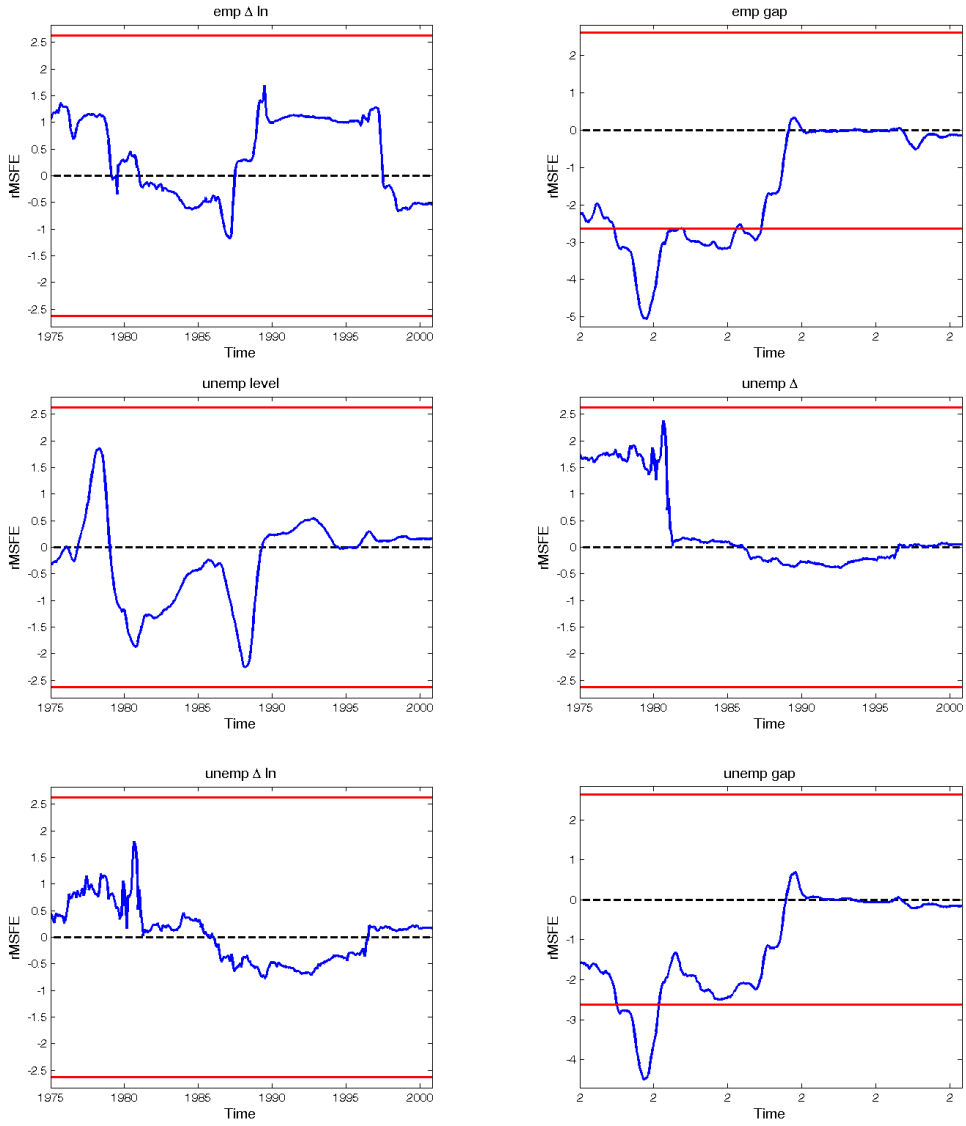


Figure 15: One Year Ahead Real Time Output Growth Forecast - Prices

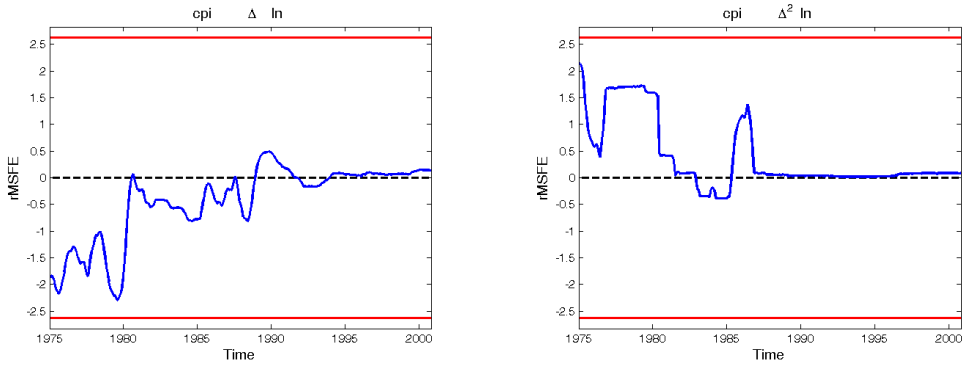


Table 4: Forecasting Output Growth in Real-Time: Tests of Average Equal Predictive Ability

Variable		rMSFE	p-value	Variable		rMSFE	p-value
rovnght	level	-2.14	0.03	rrtbill	Δ	1.30	0.19
rtbill	level	-1.72	0.08	rrbnds	Δ	0.36	0.72
rbnds	level	-1.30	0.19	rrbndm	Δ	0.55	0.58
rbndm	level	-0.66	0.51	rrbndl	Δ	0.83	0.41
rbndl	level	-0.44	0.66	rspread	level	-2.60	0.01
rovnght	Δ	0.26	0.79	exrate	Δln	1.04	0.30
rtbill	Δ	1.67	0.10	stockp	Δln	-1.66	0.10
rbnds	Δ	0.30	0.76	rstockp	Δln	-1.91	0.06
rbndm	Δ	0.35	0.73	emp	Δln	0.50	0.62
rbndl	Δ	0.39	0.70	emp	gap	-2.92	0.00
rrovnght	level	-2.03	0.04	unemp	level	-0.50	0.62
rrtbill	level	-1.73	0.08	unemp	Δ	0.85	0.39
rrbnds	level	-1.28	0.20	unemp	Δln	0.23	0.82
rrbndm	level	-0.64	0.52	unemp	gap	-2.23	0.03
rrbndl	level	-0.22	0.83	cpi	Δln	-1.38	0.17
rrovnght	Δ	0.51	0.61	cpi	$\Delta^2 ln$	0.98	0.33

Note: rMSFE denotes the re-scaled average MSFE difference over the full out-of-sample period. A negative value indicate that the model with an explanatory variable outperforms the autoregressive model); p-value is the full out-of-sample test p-value.

Table 5: Forecasting Output Growth in Real-Time: Tests of Equal Predictive Ability Over Time

Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	0.00	0.00	1976	5	rrtbill	Δ	0.73	0.62		
rtbill	level	0.00	0.00	1976	3	rrbnds	Δ	0.51	0.38		
rbnds	level	0.00	0.00	1976	3	rrbndm	Δ	0.78	0.64		
rbndm	level	0.04	0.02	1976	2	rrbndl	Δ	1.00	0.86		
rbndl	level	0.08	0.05	1976	1	rspread	level	0.00	0.02	1984	9
rovnght	Δ	1.00	1.00			exrate	Δln	1.00	1.00		
rtbill	Δ	0.53	0.43			stockp	Δln	0.08	0.06	1976	7
rbnds	Δ	0.85	0.75			rstockp	Δln	0.07	0.06	1976	7
rbndm	Δ	1.00	0.89			emp	Δln	1.00	1.00		
rbndl	Δ	0.82	0.70			emp	gap	0.00	0.02	1984	8
rrovnght	level	0.00	0.00	1976	5	unemp	level	1.00	0.85		
rrtbill	level	0.00	0.00	1976	3	unemp	Δ	0.66	0.54		
rrbnds	level	0.00	0.00	1976	3	unemp	Δln	1.00	1.00		
rrbndm	level	0.10	0.07	1976	1	unemp	gap	0.02	0.06	1984	8
rrbndl	level	0.13	0.11			cpi	Δln	0.01	0.00	1975	9
rrovnght	Δ	0.86	0.82			cpi	$\Delta^2 ln$	0.66	0.59		

Note: The table reports p-values of Giacomini and Rossi's (2008) One-Time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.

Detailed results on Inflation

Figure 16: One Year Ahead Inflation Forecast - Asset Prices

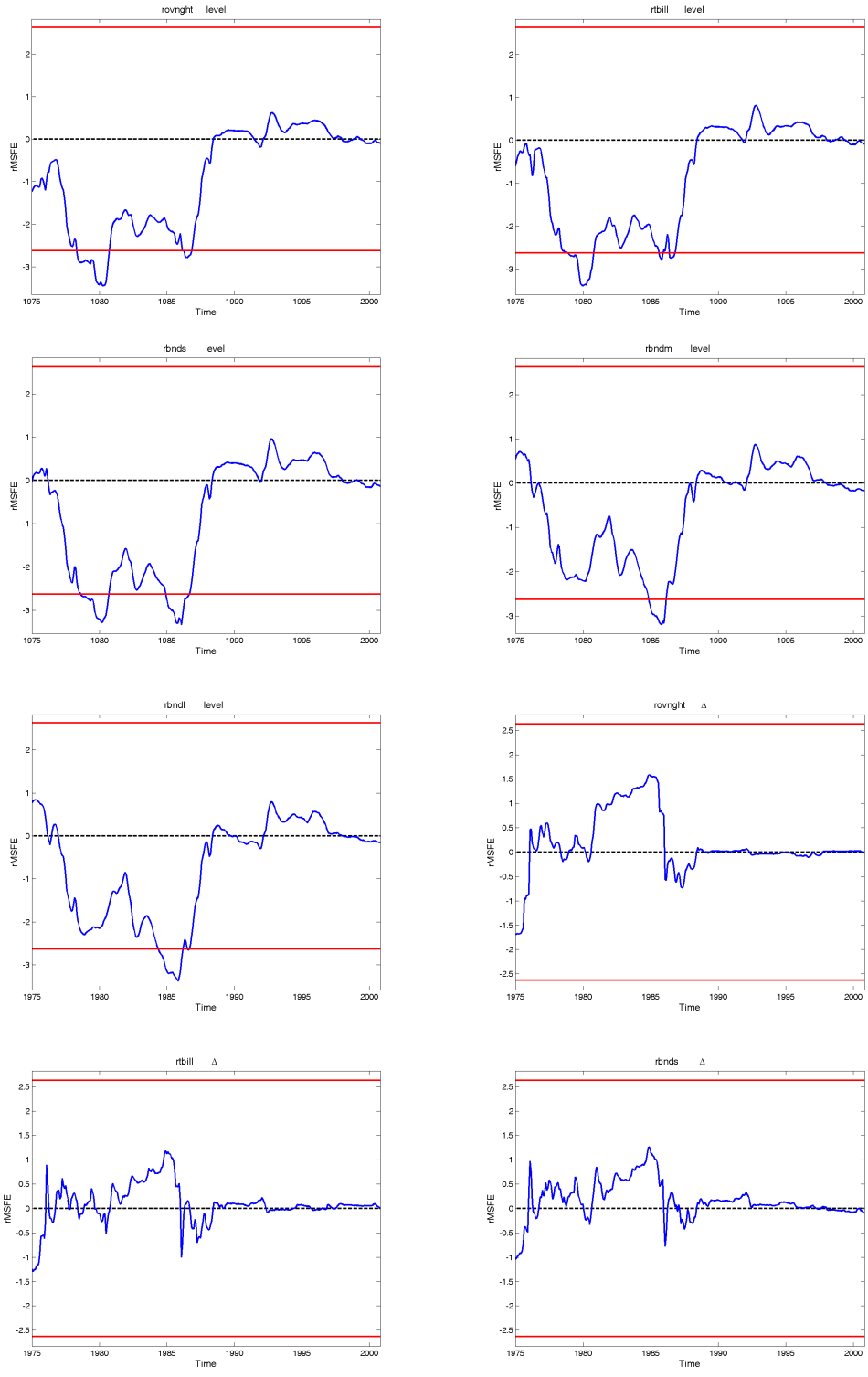


Figure 17: One Year Ahead Inflation Forecast - Asset Prices (cont.)

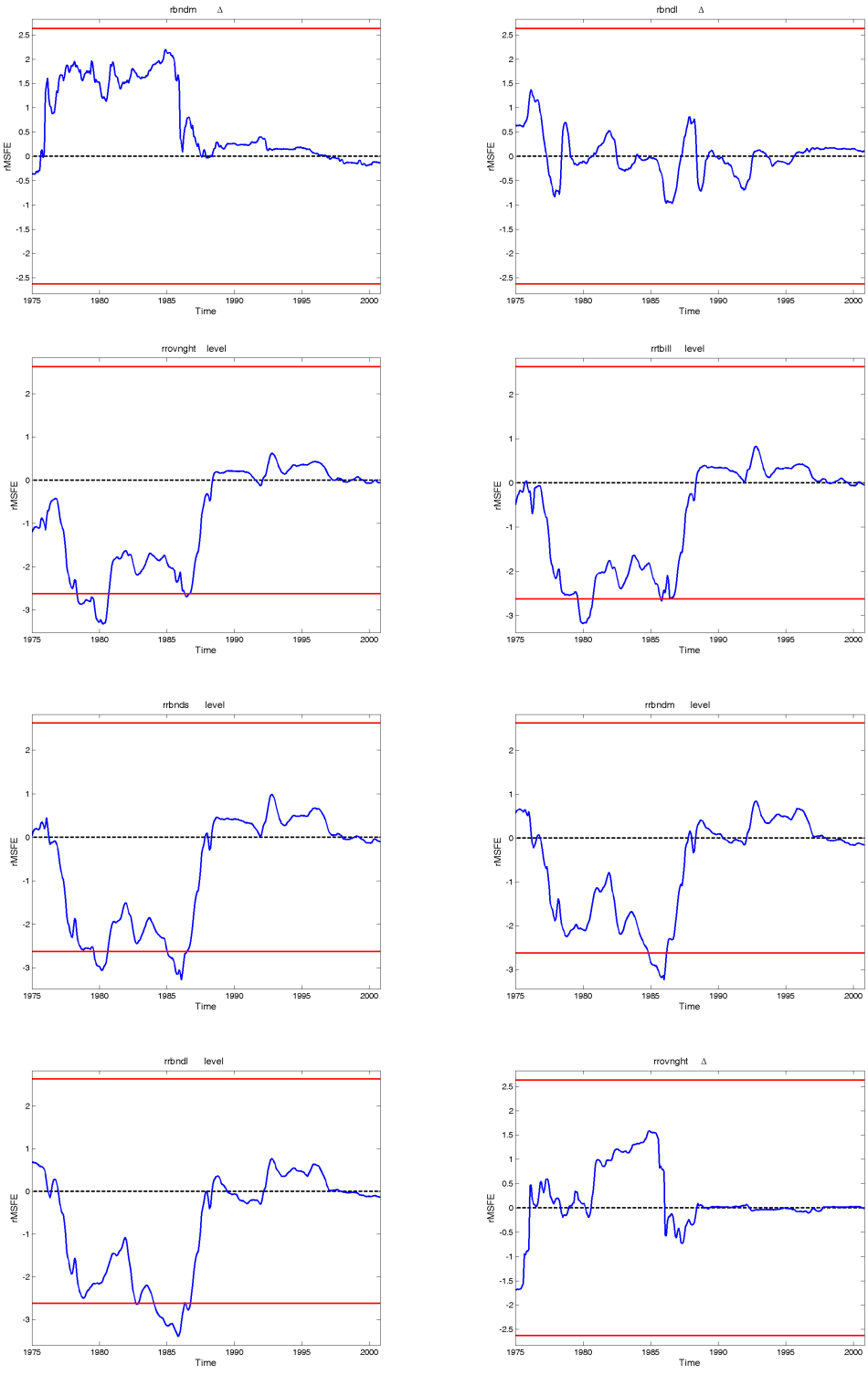


Figure 18: One Year Ahead Inflation Forecast - Asset Prices (cont.)

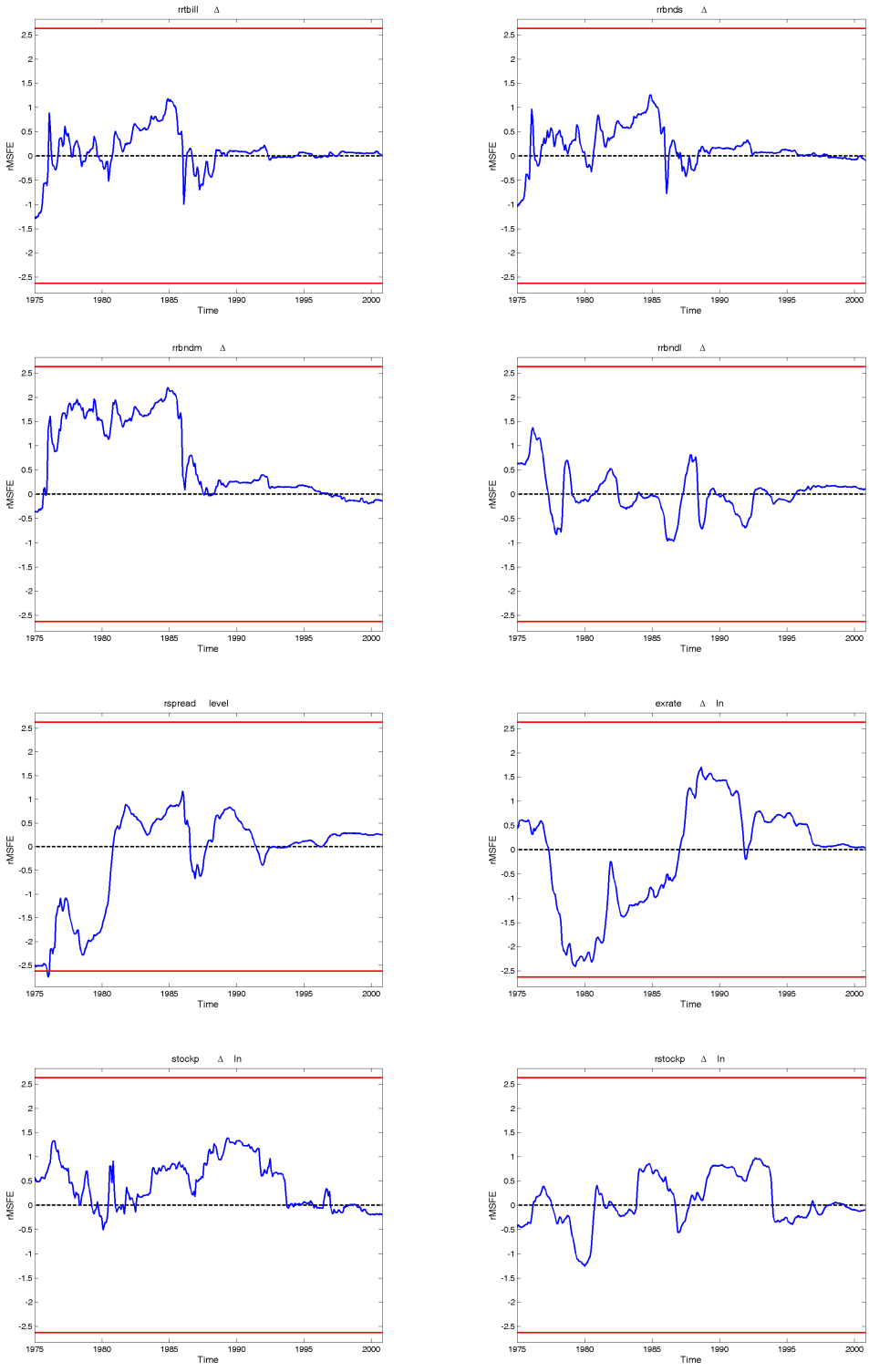


Figure 19: One Year Ahead Inflation Forecast - Activity Measures

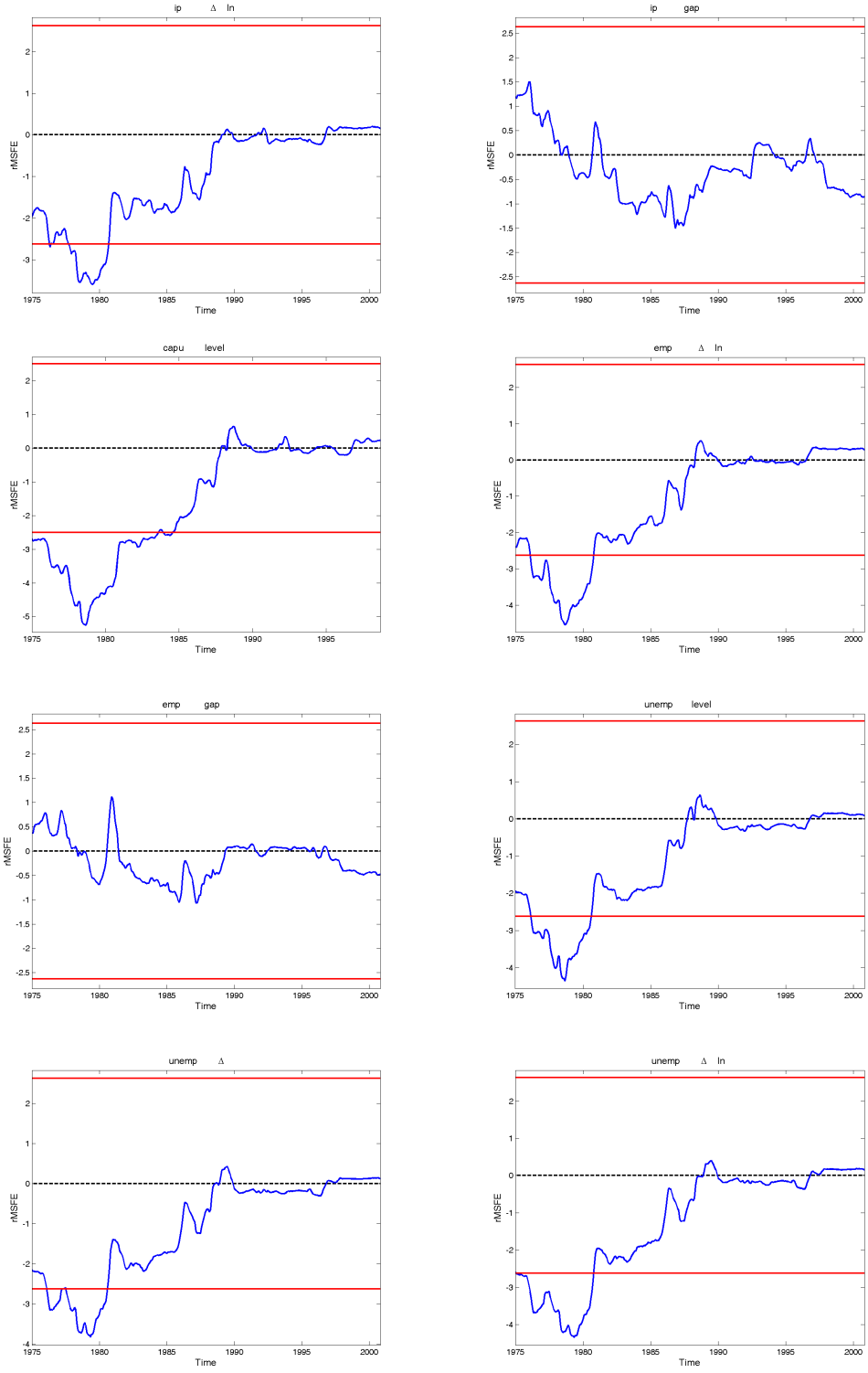


Figure 20: One Year Ahead Inflation Forecast - Activity Measures (cont.)

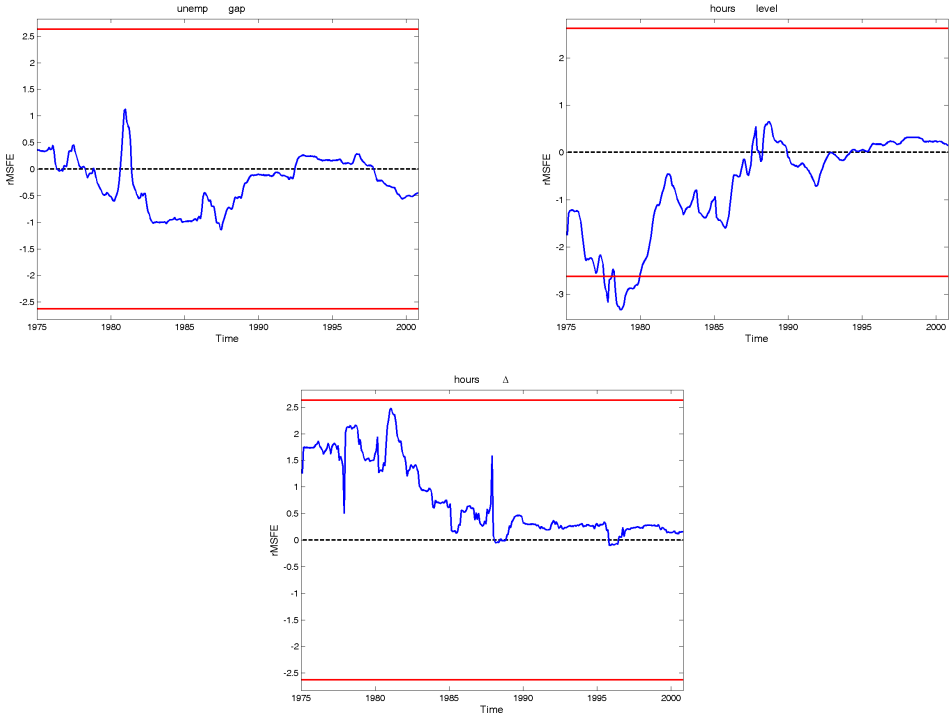


Figure 21: One Year Ahead Inflation Forecast - Wages & Prices

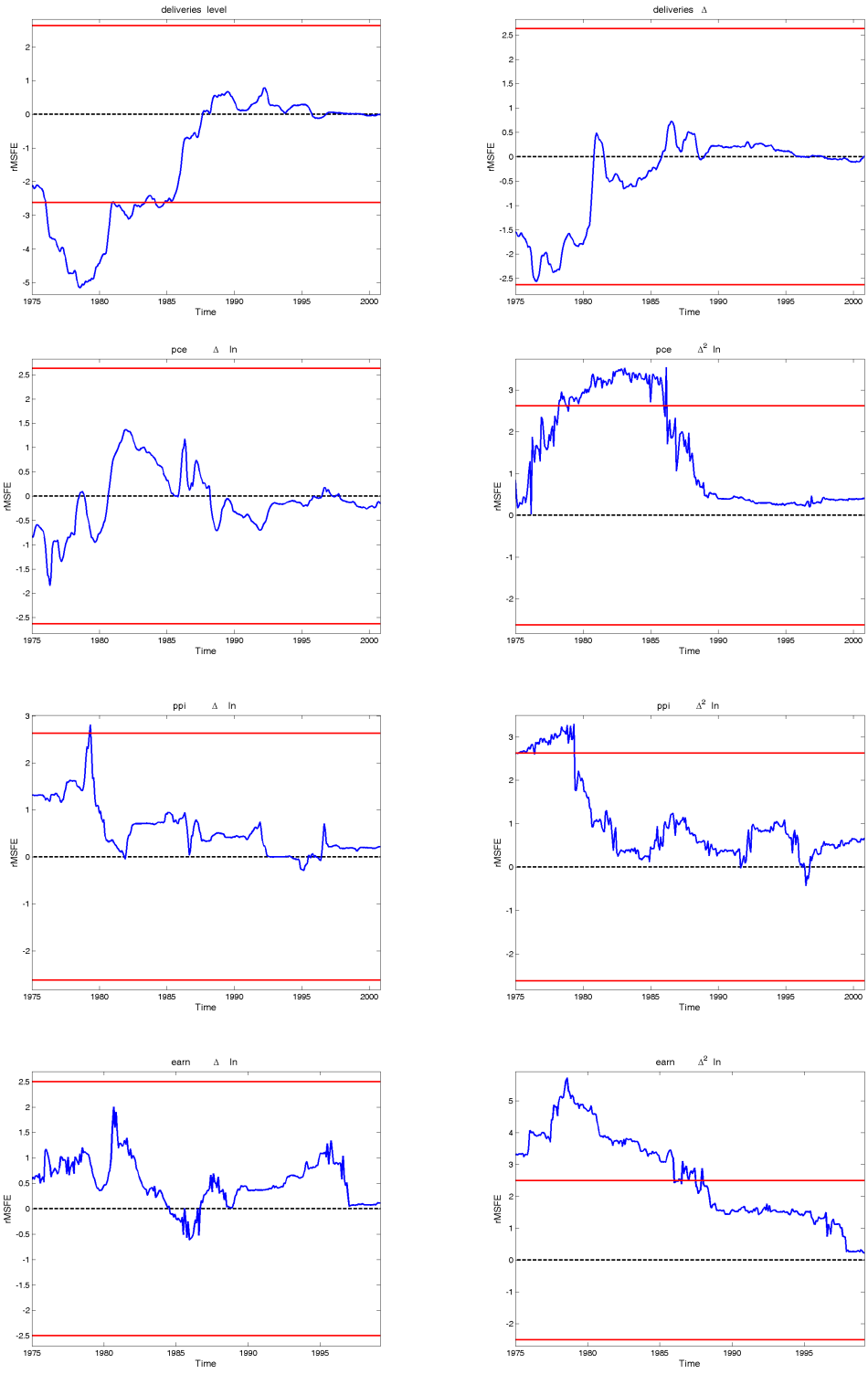


Figure 22: One Year Ahead Inflation Forecast - Wages & Prices (cont.)

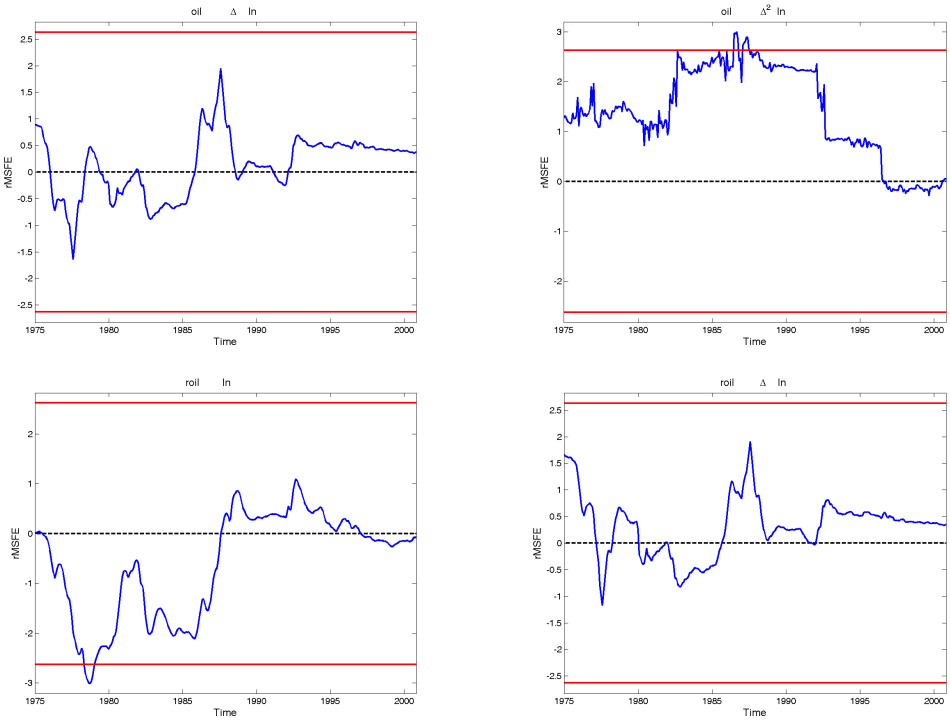


Figure 23: One Year Ahead Inflation Forecast - Money

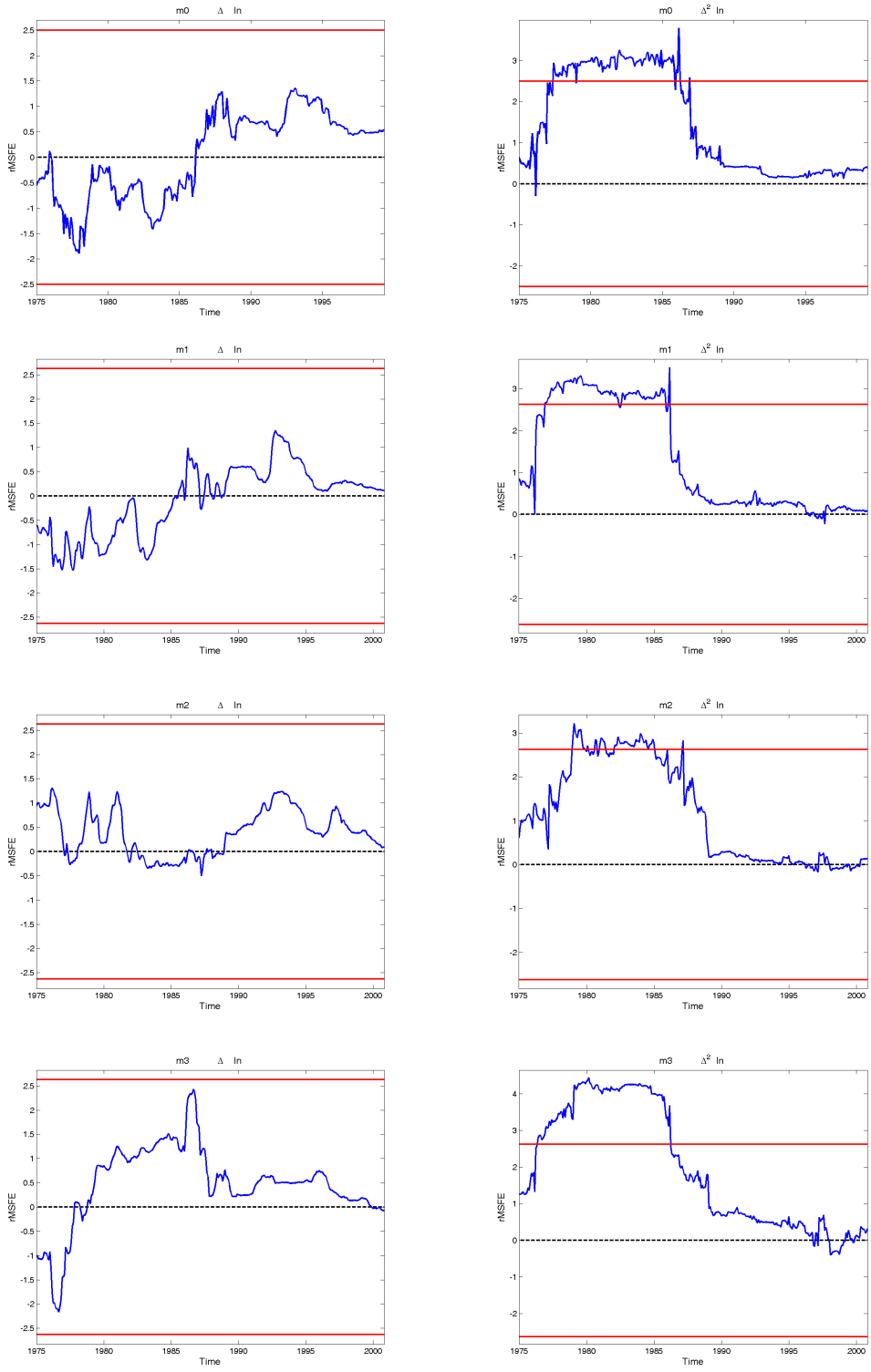


Figure 24: One Year Ahead Inflation Forecast - Money (cont.)

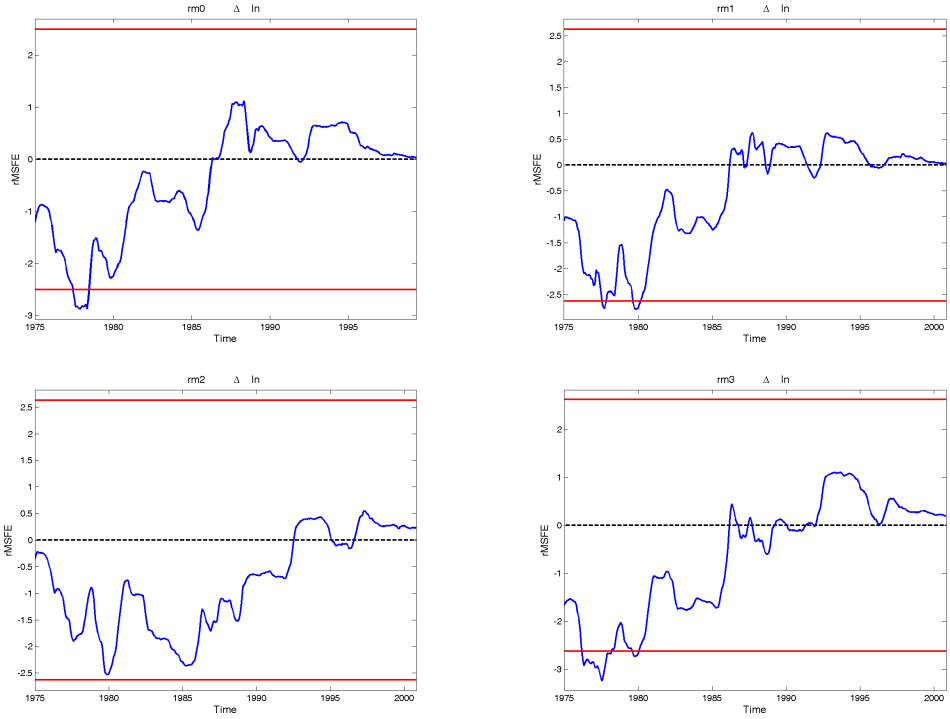


Figure 25: Miscellaneous

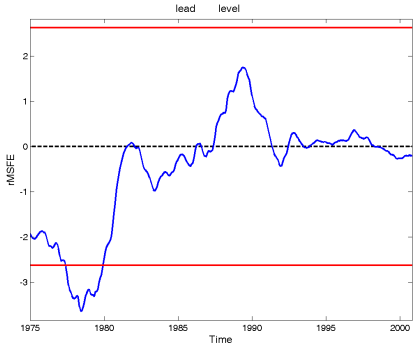


Table 6: Forecasting Inflation: Tests of Average Equal Predictive Ability

Variable		rMSFE	p-value	Variable		rMSFE	p-value
rovnght	level	-1.59	0.11	unemp	Δln	-2.38	0.02
rtbill	level	-1.30	0.19	unemp	gap	-0.55	0.58
rbnds	level	-1.30	0.19	hours	level	-1.36	0.17
rbndm	level	-1.04	0.30	hours	Δ	1.17	0.24
rbndl	level	-1.06	0.29	deliveries	level	-2.35	0.02
rovnght	Δ	-0.09	0.92	deliveries	Δ	-0.92	0.36
rtbill	Δ	-0.08	0.94	cpi	Δln	-	-
rbnds	Δ	0.03	0.98	cpi	$\Delta^2 ln$	-	-
rbndm	Δ	0.91	0.36	pce	Δln	-0.45	0.66
rbndl	Δ	0.29	0.77	pce	$\Delta^2 ln$	2.19	0.03
rrovnght	level	-1.49	0.13	ppi	Δln	1.19	0.24
rrtbill	level	-1.15	0.25	ppi	$\Delta^2 ln$	2.39	0.02
rrbnds	level	-1.16	0.25	earn	Δln	0.84	0.40
rrbndm	level	-0.99	0.32	earn	$\Delta^2 ln$	4.30	0.00
rrbndl	level	-1.08	0.28	oil	Δln	0.67	0.50
rrovnght	Δ	-0.09	0.92	oil	$\Delta^2 ln$	2.39	0.02
rrtbill	Δ	-0.08	0.94	roil	ln	-0.96	0.34
rrbnds	Δ	0.03	0.98	roil	Δln	1.18	0.24
rrbndm	Δ	0.91	0.36	m0	Δln	0.06	0.95
rrbndl	Δ	0.29	0.77	m0	$\Delta^2 ln$	2.15	0.03
rspread	level	-0.66	0.51	m1	Δln	-0.21	0.83
exrate	Δln	0.18	0.86	m1	$\Delta^2 ln$	2.07	0.04
stockp	Δln	0.61	0.54	m2	Δln	0.64	0.52
rstockp	Δln	-0.10	0.92	m2	$\Delta^2 ln$	1.91	0.06
ip	Δln	-2.02	0.04	m3	Δln	0.37	0.71
ip	gap	-0.52	0.60	m3	$\Delta^2 ln$	3.15	0.00
capu	level	-2.56	0.01	rm0	Δln	-0.90	0.37
emp	Δln	-2.05	0.04	rm1	Δln	-1.07	0.28
emp	gap	-0.43	0.66	rm2	Δln	-1.30	0.19
unemp	level	-2.09	0.04	rm3	Δln	-1.36	0.18
unemp	Δ	-2.12	0.03	lead	level	-1.30	0.20

Note: rMSFE denotes the re-scaled average MSFE difference over the full out-of-sample period. A negative value indicate that the model with an explanatory variable outperforms the autoregressive model); p-value is the full out-of-sample test p-value.

Table 7: Forecasting Inflation: Tests of Equal Predictive Ability Over Time

Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	0.39	0.57			unemp	Δln	0.00	0.03	1984	8
rtbill	level	0.50	0.63			unemp	gap	0.79	0.67		
rbnds	level	0.42	0.55			hours	level	0.14	0.19		
rbndm	level	0.73	0.80			hours	Δ	1.00	1.00		
rbndl	level	0.76	0.83			deliveries	level	0.00	0.02	1983	8
rovnght	Δ	0.80	0.70			deliveries	Δ	0.16	0.11		
rtbill	Δ	1.00	1.00			cpi	Δln	-	-	-	-
rbnds	Δ	1.00	1.00			cpi	$\Delta^2 ln$	-	-	-	-
rbndm	Δ	1.00	1.00			pce	Δln	0.83	0.78		
rbndl	Δ	1.00	1.00			pce	$\Delta^2 ln$	0.58	0.78		
rrovnght	level	0.45	0.62			ppi	Δln	1.00	1.00		
rrtbill	level	0.60	0.70			ppi	$\Delta^2 ln$	0.31	0.26		
rrbnds	level	0.51	0.61			earn	Δln	1.00	0.83		
rrbndm	level	0.79	0.84			earn	$\Delta^2 ln$	0.00	0.07	1983	9
rrbndl	level	0.76	0.83			oil	Δln	1.00	0.83		
rrovnght	Δ	0.80	0.70			oil	$\Delta^2 ln$	0.18	0.60		
rrtbill	Δ	1.00	1.00			roil	ln	0.47	0.48		
rrbnds	Δ	1.00	1.00			roil	Δln	0.51	0.38		
rrbndm	Δ	1.00	1.00			m0	Δln	0.80	0.70		
rrbndl	Δ	1.00	1.00			m0	$\Delta^2 ln$	0.65	0.80		
rspread	level	0.28	0.19			m1	Δln	1.00	0.88		
exrate	Δln	1.00	0.83			m1	$\Delta^2 ln$	0.37	0.57		
stockp	Δln	1.00	1.00			m2	Δln	1.00	1.00		
rstockp	Δln	0.89	0.79			m2	$\Delta^2 ln$	0.48	0.64		
ip	Δln	0.10	0.20			m3	Δln	0.40	0.28		
ip	gap	0.82	0.69			m3	$\Delta^2 ln$	0.06	0.26		
capu	level	0.00	0.00	1983	10	rm0	Δln	0.32	0.34		
emp	Δln	0.00	0.03	1983	10	rm1	Δln	0.46	0.47		
emp	gap	0.82	0.70			rm2	Δln	0.70	0.86		
unemp	level	0.00	0.04	1983	10	rm3	Δln	0.29	0.31		
unemp	Δ	0.03	0.08	1984	7	lead	level	0.04	0.06	1984	6

Note: The table reports p-values of Giacomini and Rossi's (2008) One-Time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.

Section 2: Robustness to recursive BIC lag length selection

Forecasting Output Growth using the recursive BIC

Figure 26: One Year Ahead Output Growth Forecast - Asset Prices

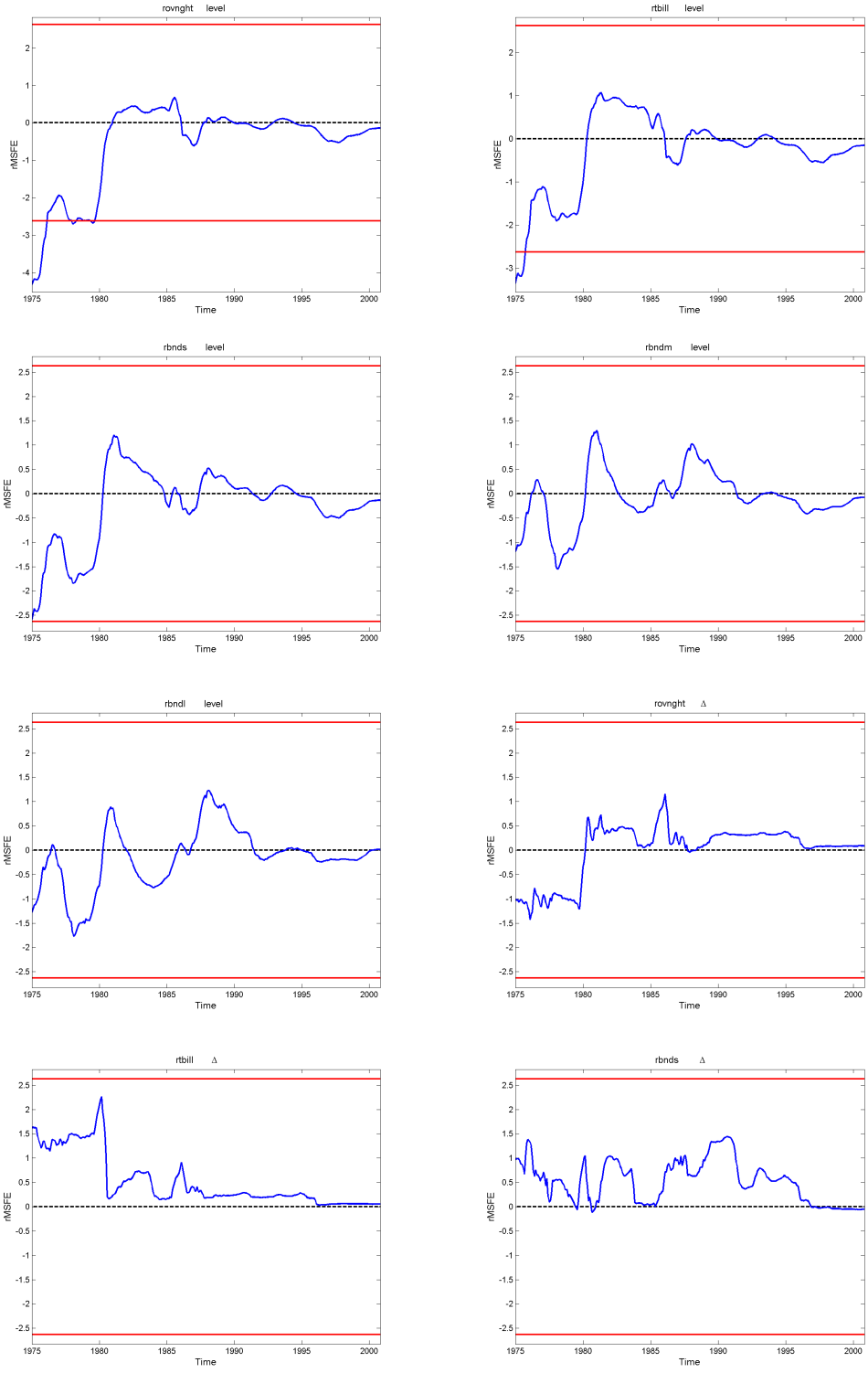


Figure 27: One Year Ahead Output Growth Forecast - Asset Prices (cont.)

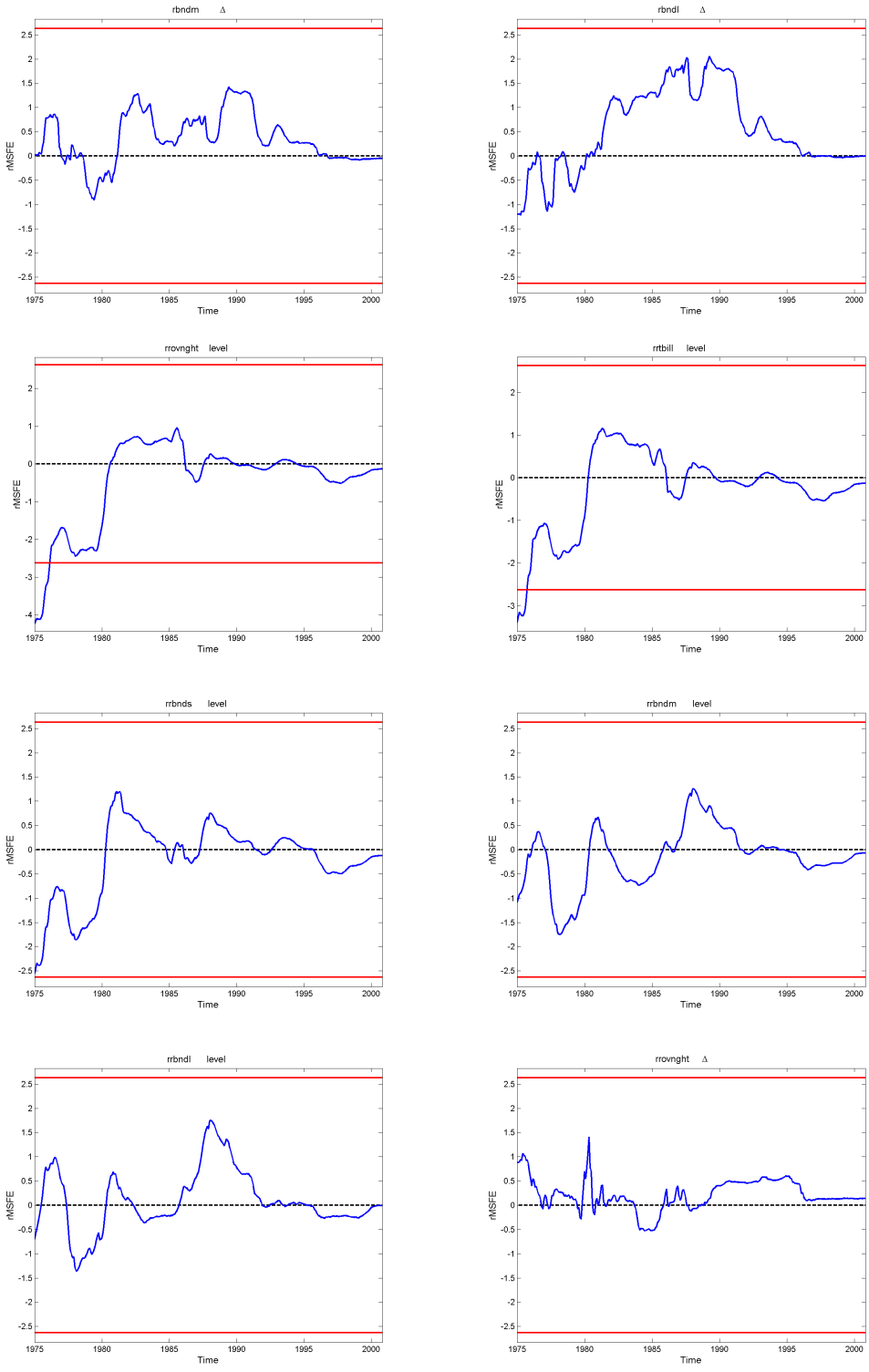


Figure 28: One Year Ahead Output Growth Forecast - Asset Prices (cont.)

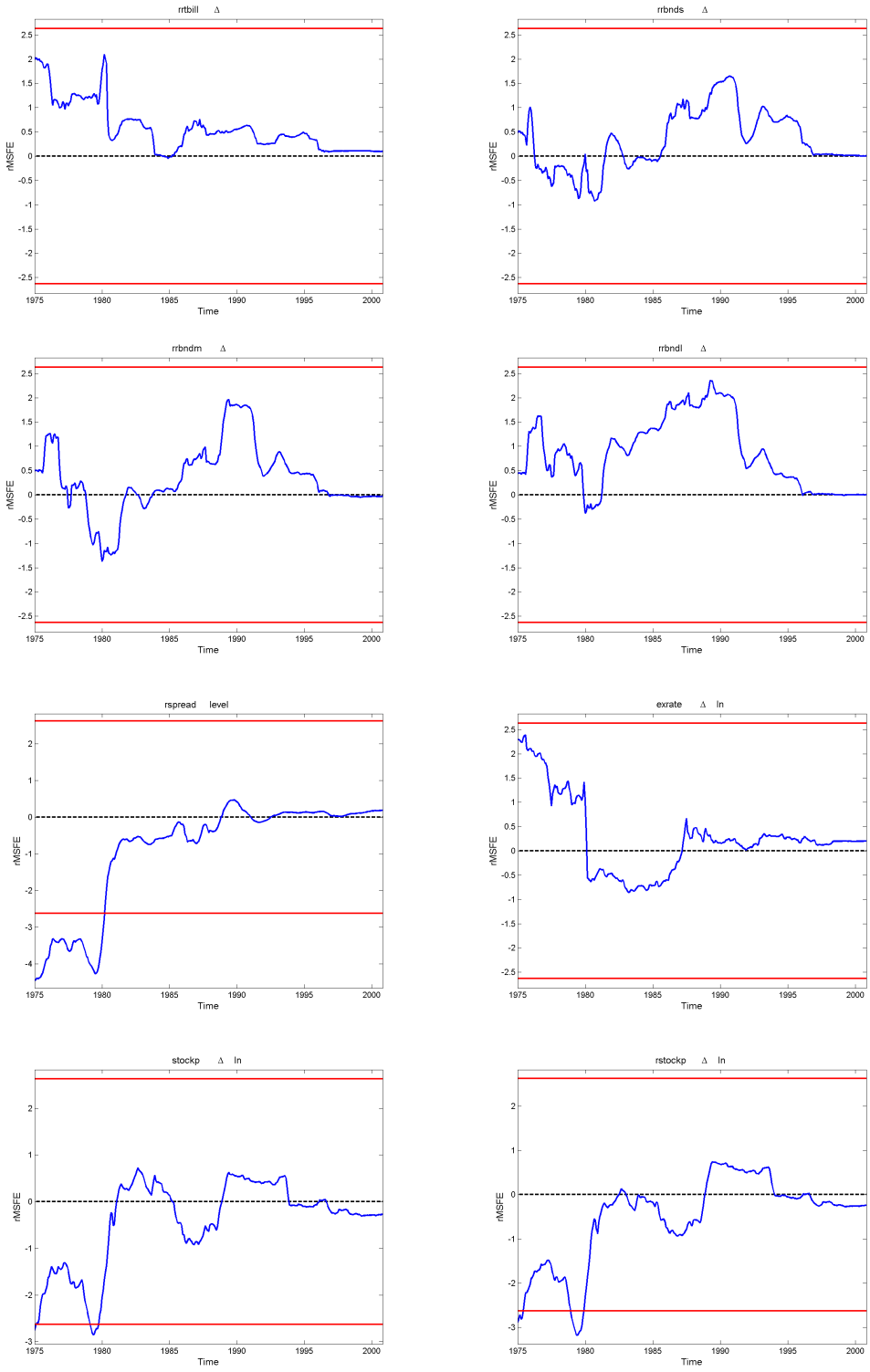


Figure 29: One Year Ahead Output Growth Forecast - Activity Measures

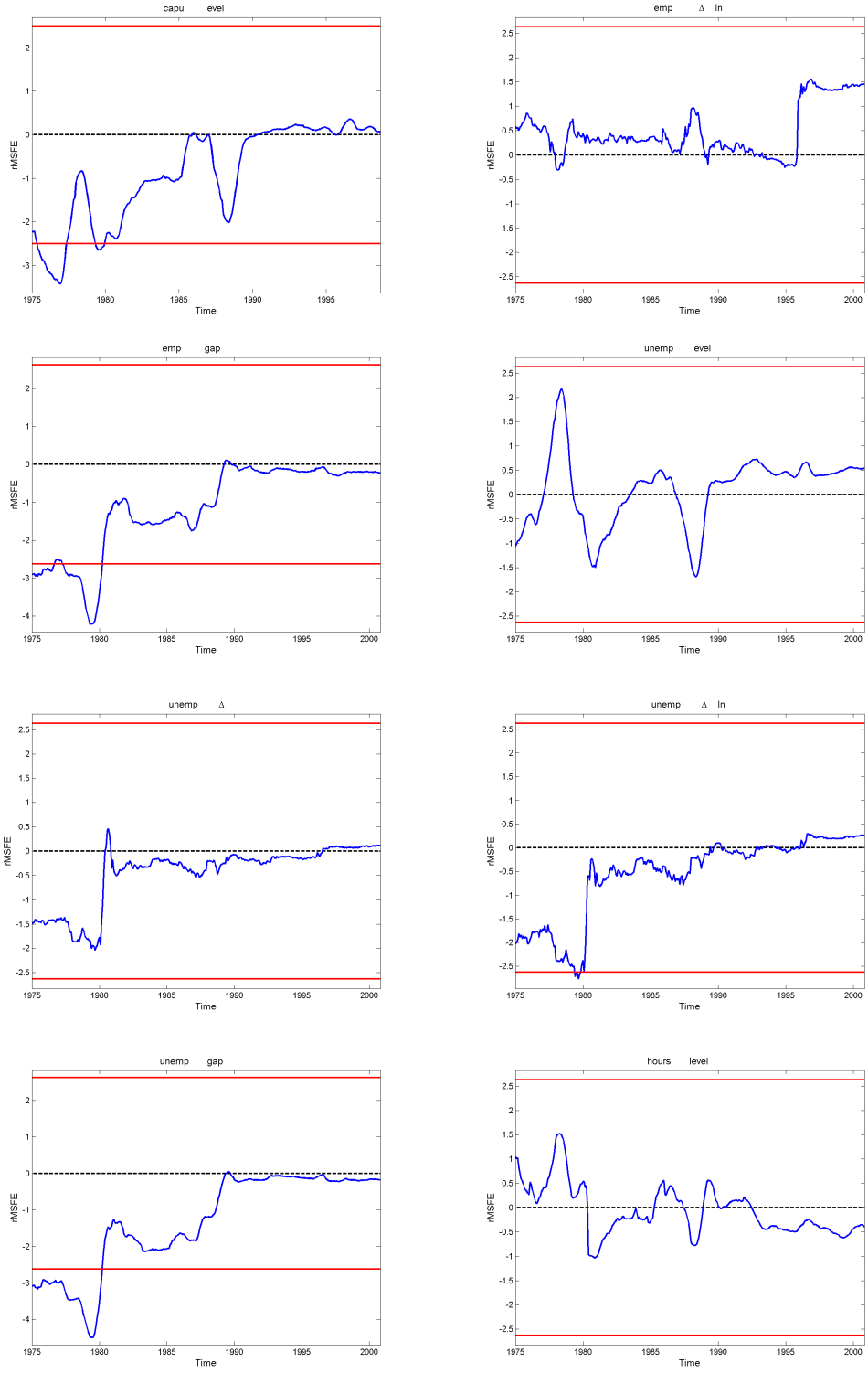


Figure 30: One Year Ahead Output Growth Forecast - Activity Measures (cont.)

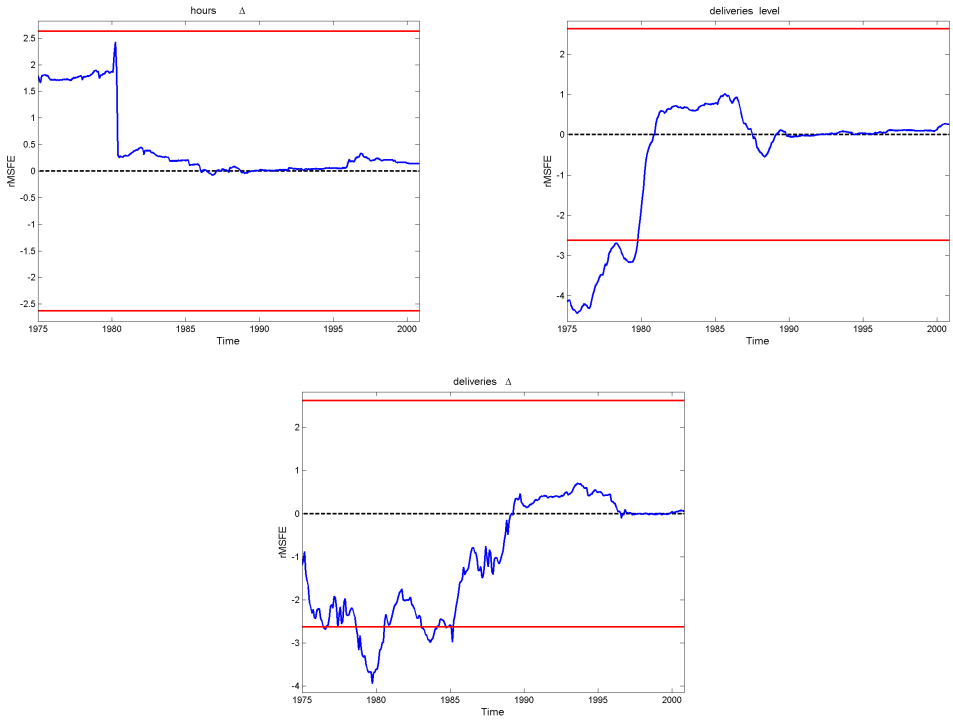


Figure 31: One Year Ahead Output Growth Forecast - Wages & Prices

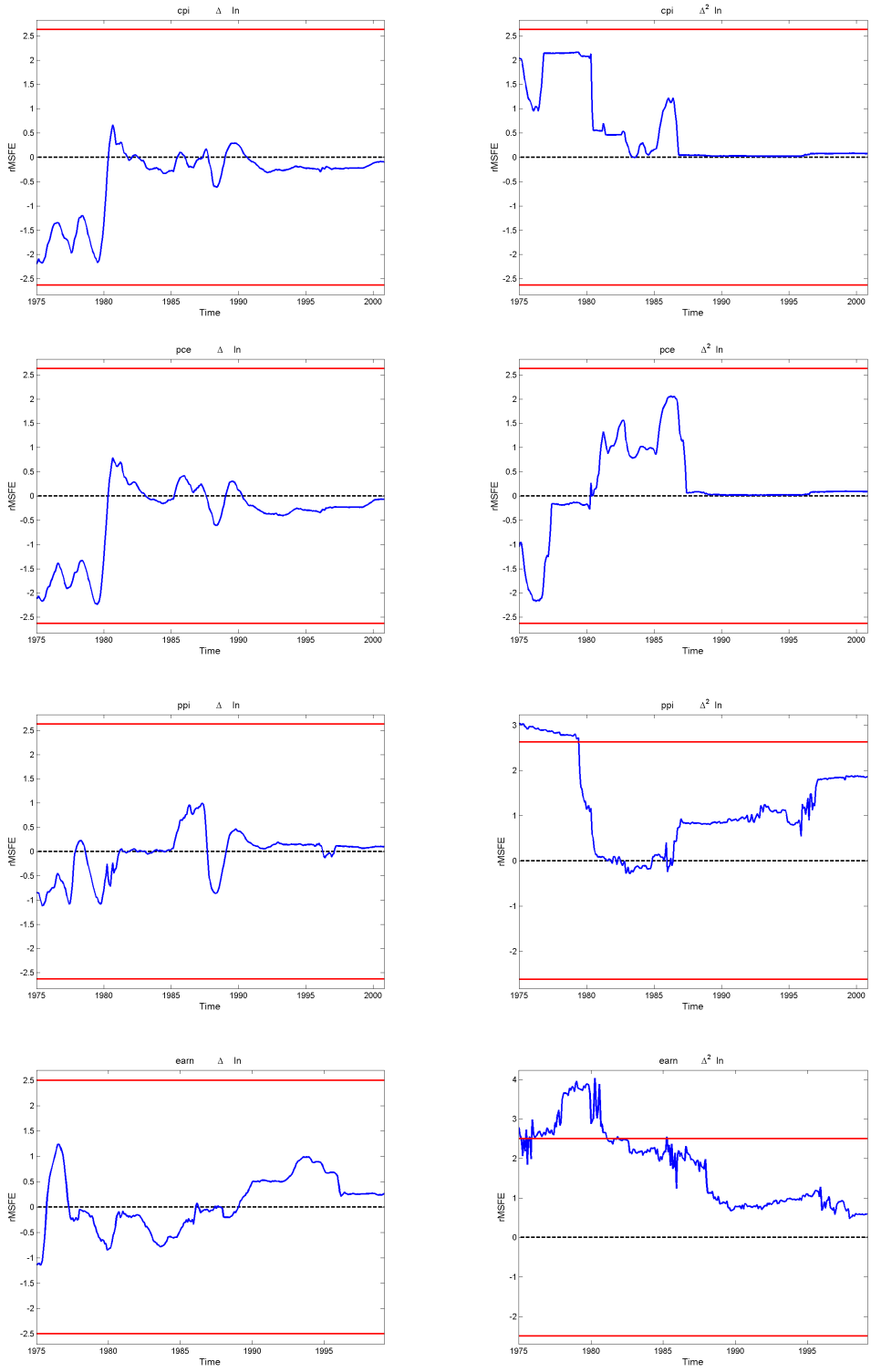


Figure 32: One Year Ahead Output Growth Forecast - Wages & Prices (cont.)

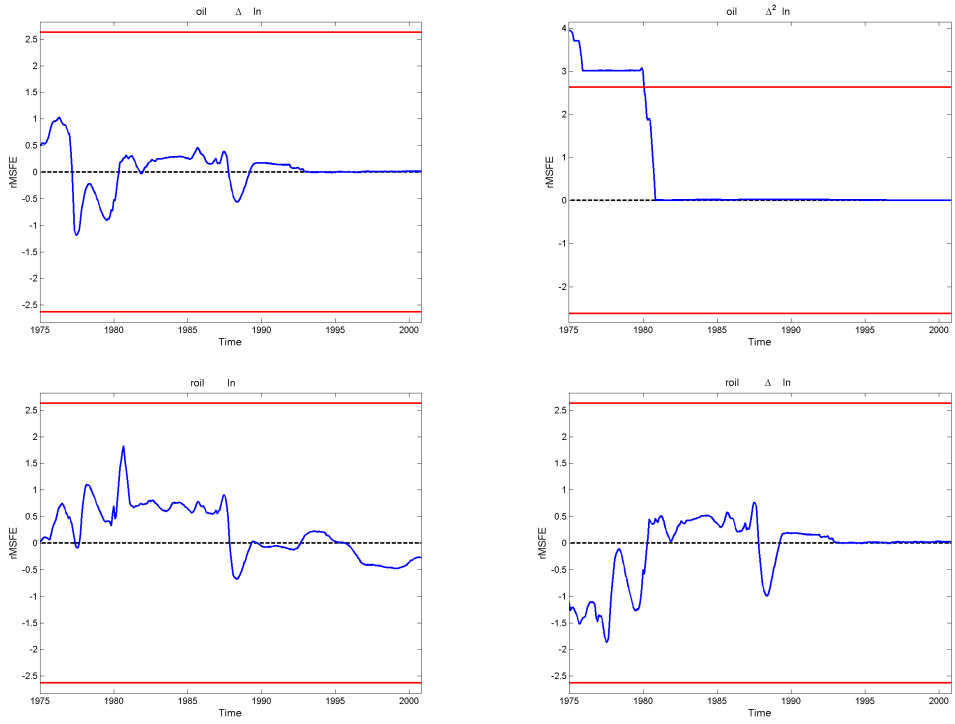


Figure 33: One Year Ahead Output Growth Forecast - Money

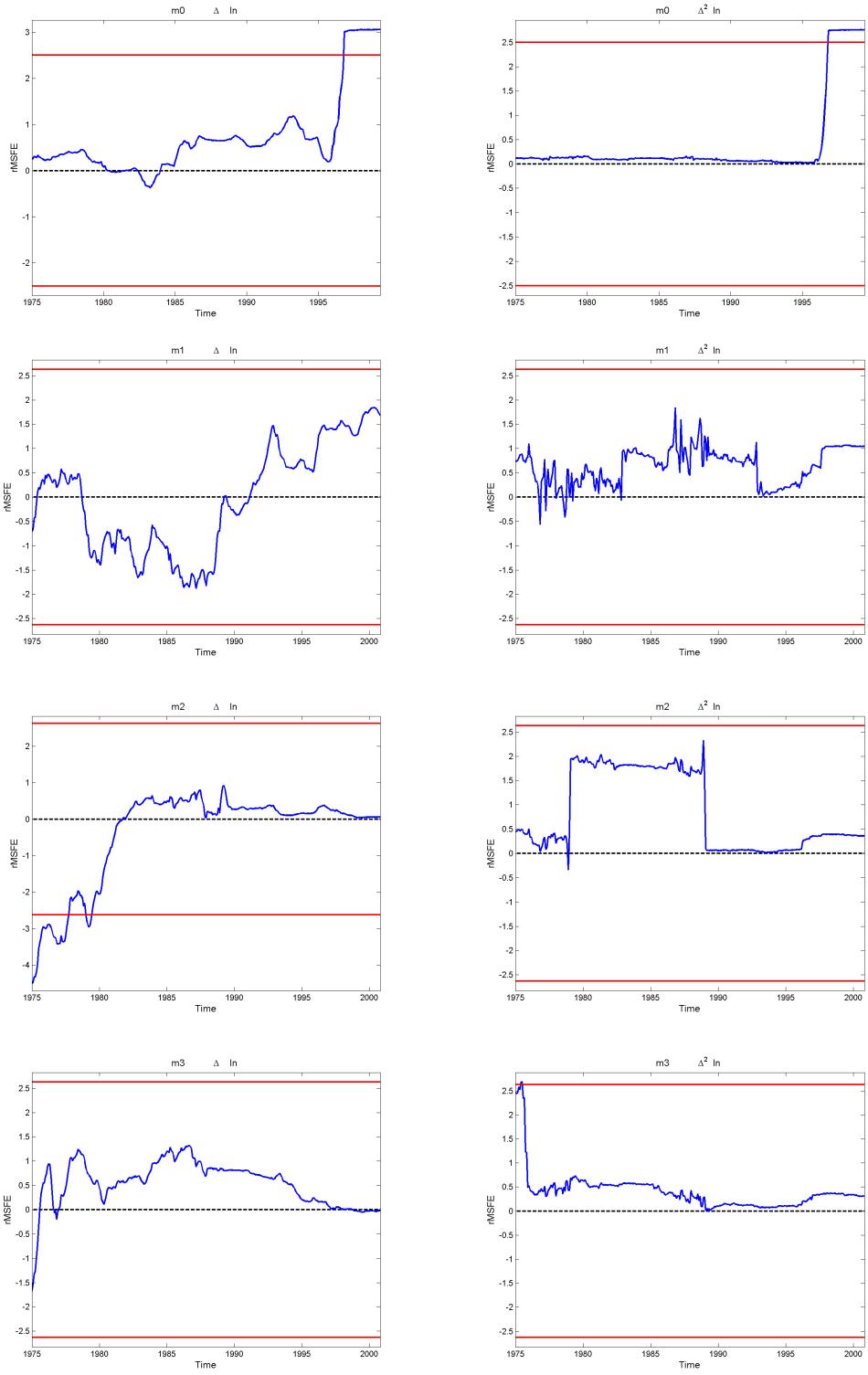


Figure 34: One Year Ahead Output Growth Forecast - Money (cont.)

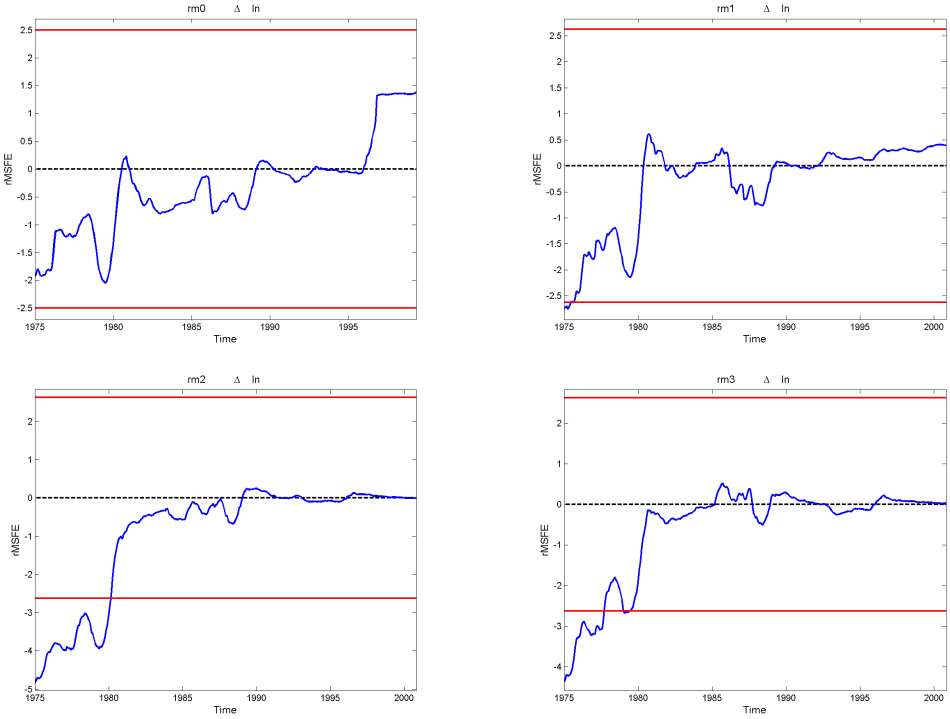


Figure 35: Miscellaneous

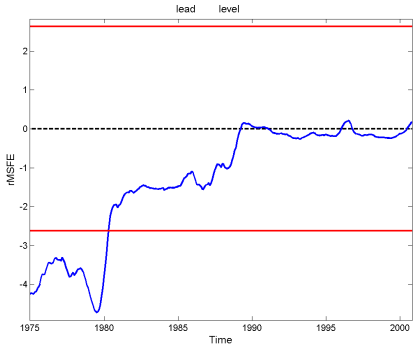


Table 8: Forecasting Output Growth: Tests of Average Equal Predictive Ability

Variable		rMSFE	p-value	Variable		rMSFE	p-value
rovnght	level	-2.17	0.03	unemp	Δln	-1.16	0.25
rtbill	level	-1.68	0.09	unemp	gap	-2.87	0.00
rbnds	level	-1.50	0.13	hours	level	0.16	0.87
rbndm	level	-0.75	0.46	hours	Δ	1.14	0.26
rbndl	level	-0.86	0.39	deliveries	level	-1.65	0.10
rovnght	Δ	-0.23	0.82	deliveries	Δ	-1.72	0.08
rtbill	Δ	1.11	0.27	cpi	Δln	-1.44	0.15
rbnds	Δ	0.82	0.41	cpi	$\Delta^2 ln$	1.21	0.23
rbndm	Δ	0.28	0.78	pce	Δln	-1.30	0.19
rbndl	Δ	0.20	0.84	pce	$\Delta^2 ln$	0.00	1.00
rrovnght	level	-1.98	0.05	ppi	Δln	-0.29	0.77
rrtbill	level	-1.66	0.10	ppi	$\Delta^2 ln$	3.06	0.00
rrbnds	level	-1.46	0.15	earn	Δln	-0.45	0.65
rrbndm	level	-0.78	0.43	earn	$\Delta^2 ln$	3.39	0.00
rrbndl	level	-0.35	0.72	oil	Δln	0.40	0.69
rrovnght	Δ	0.59	0.56	oil	$\Delta^2 ln$	2.10	0.04
rrtbill	Δ	1.35	0.18	roil	ln	0.22	0.83
rrbnds	Δ	0.64	0.52	roil	Δln	-0.39	0.70
rrbndm	Δ	0.53	0.60	m0	Δln	2.19	0.03
rrbndl	Δ	1.14	0.25	m0	$\Delta^2 ln$	1.63	0.10
rspread	level	-2.59	0.01	m1	Δln	-0.17	0.86
exrate	Δln	1.09	0.28	m1	$\Delta^2 ln$	1.40	0.16
stockp	Δln	-1.56	0.12	m2	Δln	-2.03	0.04
rstockp	Δln	-1.74	0.08	m2	$\Delta^2 ln$	1.39	0.16
ip	Δln	-	-	m3	Δln	-0.04	0.97
ip	gap	-	-	m3	$\Delta^2 ln$	1.79	0.07
capu	level	-1.76	0.08	rm0	Δln	-0.65	0.52
emp	Δln	1.19	0.24	rm1	Δln	-1.27	0.20
emp	gap	-2.53	0.01	rm2	Δln	-2.86	0.00
unemp	level	-0.25	0.80	rm3	Δln	-2.30	0.02
unemp	Δ	-0.93	0.35	lead	level	-2.98	0.00

Note: rMSFE denotes the re-scaled average MSFE difference over the full out-of-sample period. A negative value indicate that the model with an explanatory variable outperforms the autoregressive model); p-value is the full out-of-sample test p-value.

Table 9: Forecasting Output Growth: Tests of Equal Predictive Ability Over Time

Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	0.00	0.00	1976	5	unemp	Δln	0.38	0.27		
rtbill	level	0.00	0.00	1976	3	unemp	gap	0.00	0.00	1976	3
rbnds	level	0.00	0.00	1976	3	hours	level	0.59	0.42		
rbndm	level	0.02	0.01	1975	12	hours	Δ	0.74	0.63		
rbndl	level	0.02	0.01	1975	12	deliveries	level	0.00	0.00	1976	6
rovnght	Δ	0.70	0.54			deliveries	Δ	0.20	0.31		
rtbill	Δ	0.86	0.78			cpi	Δln	0.00	0.00	1975	10
rbnds	Δ	1.00	1.00			cpi	$\Delta^2 ln$	0.68	0.63		
rbndm	Δ	1.00	0.90			pce	Δln	0.02	0.01	1975	10
rbndl	Δ	0.57	0.40			pce	$\Delta^2 ln$	0.46	0.36		
rrovnght	level	0.00	0.00	1976	5	ppi	Δln	1.00	0.89		
rrtbill	level	0.00	0.00	1976	3	ppi	$\Delta^2 ln$	0.17	0.15		
rrbnds	level	0.00	0.00	1976	3	earn	Δln	1.00	0.85		
rrbndm	level	0.09	0.06	1975	12	earn	$\Delta^2 ln$	0.07	0.35		
rrbndl	level	0.35	0.23			oil	Δln	1.00	1.00		
rrovnght	Δ	1.00	1.00			oil	$\Delta^2 ln$	0.00	0.00	1975	12
rrtbill	Δ	0.87	0.85			roil	ln	1.00	0.87		
rrbnds	Δ	1.00	1.00			roil	Δln	0.85	0.74		
rrbndm	Δ	1.00	1.00			m0	Δln	0.07	0.02	1999	4
rrbndl	Δ	1.00	1.00			m0	$\Delta^2 ln$	0.11	0.03	1999	4
rspread	level	0.00	0.00	1976	6	m1	Δln	0.54	0.48		
exrate	Δln	0.23	0.15			m1	$\Delta^2 ln$	1.00	1.00		
stockp	Δln	0.00	0.00	1976	7	m2	Δln	0.00	0.00	1977	10
rstockp	Δln	0.00	0.00	1976	7	m2	$\Delta^2 ln$	1.00	1.00		
ip	Δln	-	-	-	-	m3	Δln	0.69	0.57		
ip	gap	-	-	-	-	m3	$\Delta^2 ln$	0.25	0.18		
capu	level	0.23	0.31			rm0	Δln	0.01	0.00	1975	12
emp	Δln	1.00	0.83			rm1	Δln	0.00	0.00	1975	10
emp	gap	0.01	0.01	1976	5	rm2	Δln	0.00	0.00	1975	10
unemp	level	1.00	1.00			rm3	Δln	0.00	0.00	1975	10
unemp	Δ	0.31	0.21			lead	level	0.00	0.00	1975	10

Note: The table reports p-values of Giacomini and Rossi's (2008) One-Time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.

Figure 36: One Year Ahead Inflation Forecast - Asset Prices

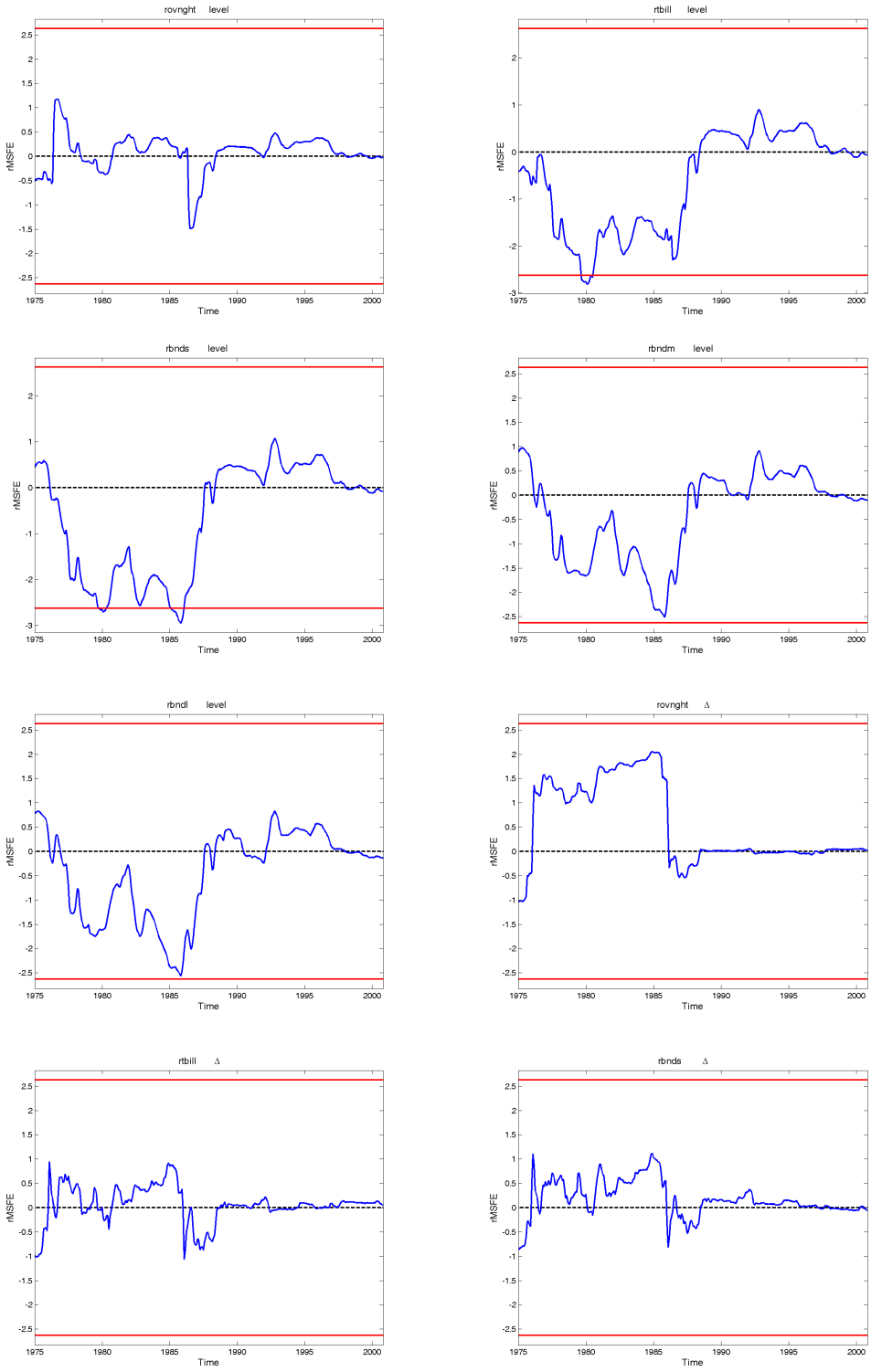


Figure 37: One Year Ahead Inflation Forecast - Asset Prices (cont.)

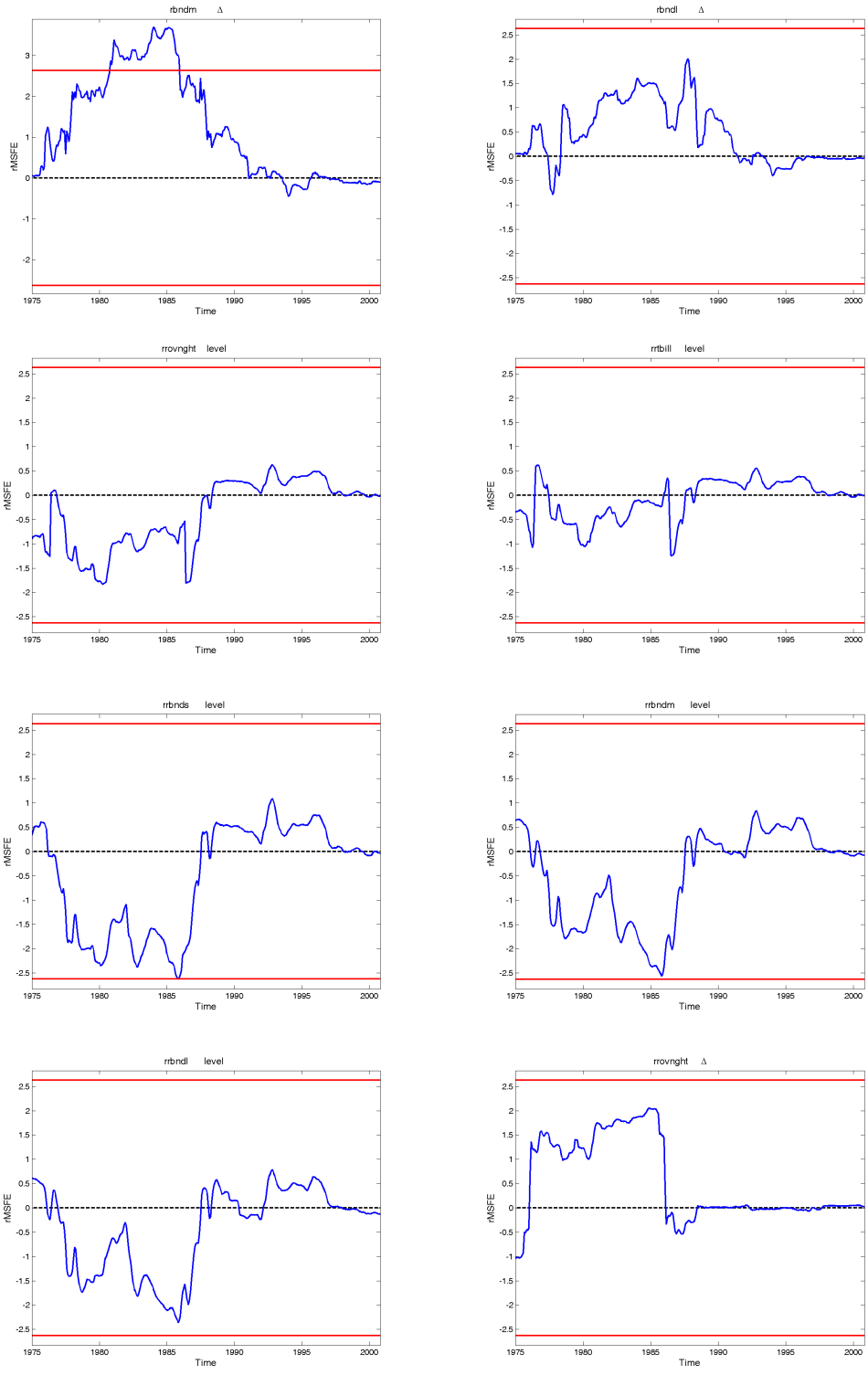


Figure 38: One Year Ahead Inflation Forecast - Asset Prices (cont.)

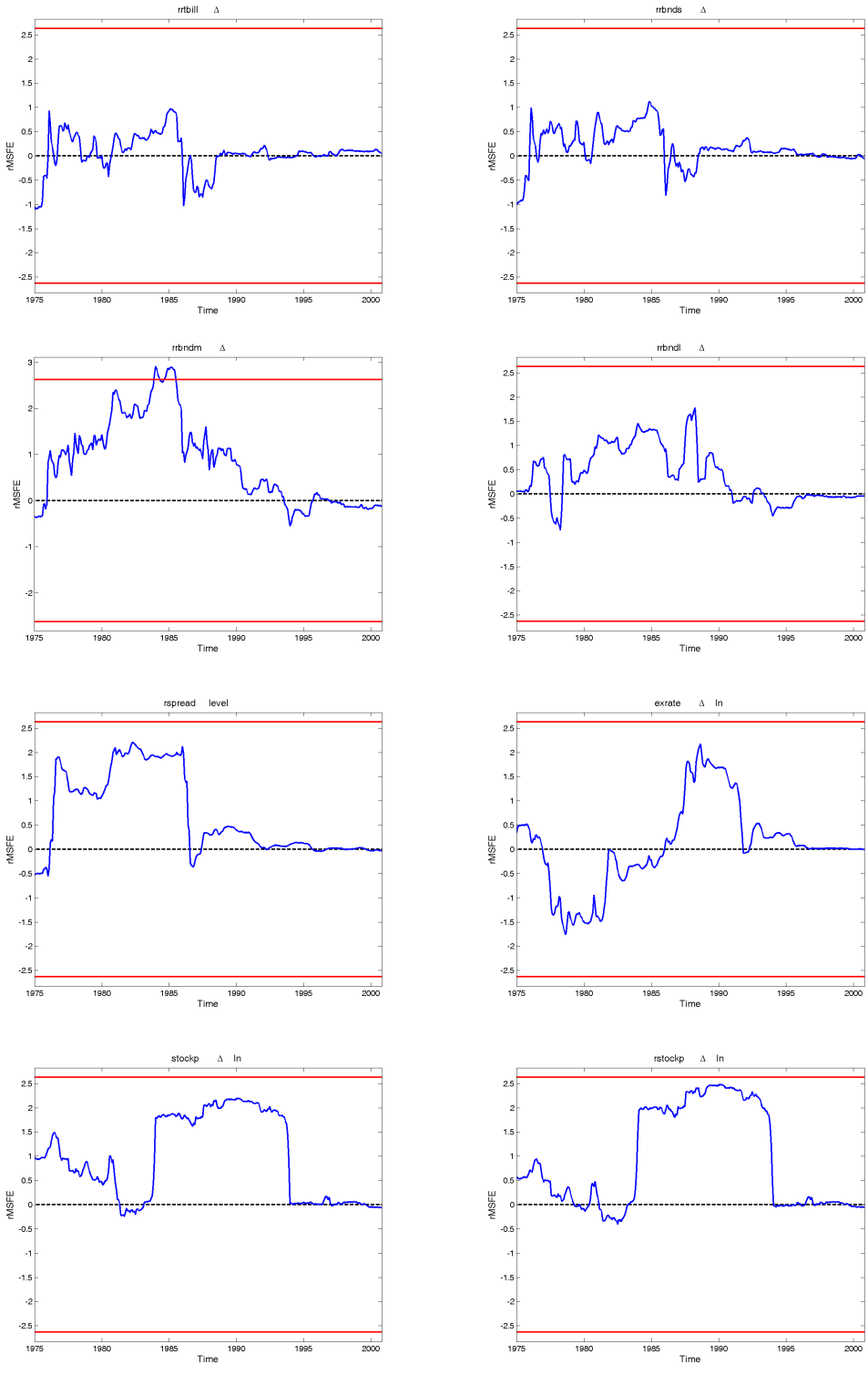


Figure 39: One Year Ahead Inflation Forecast - Activity Measures

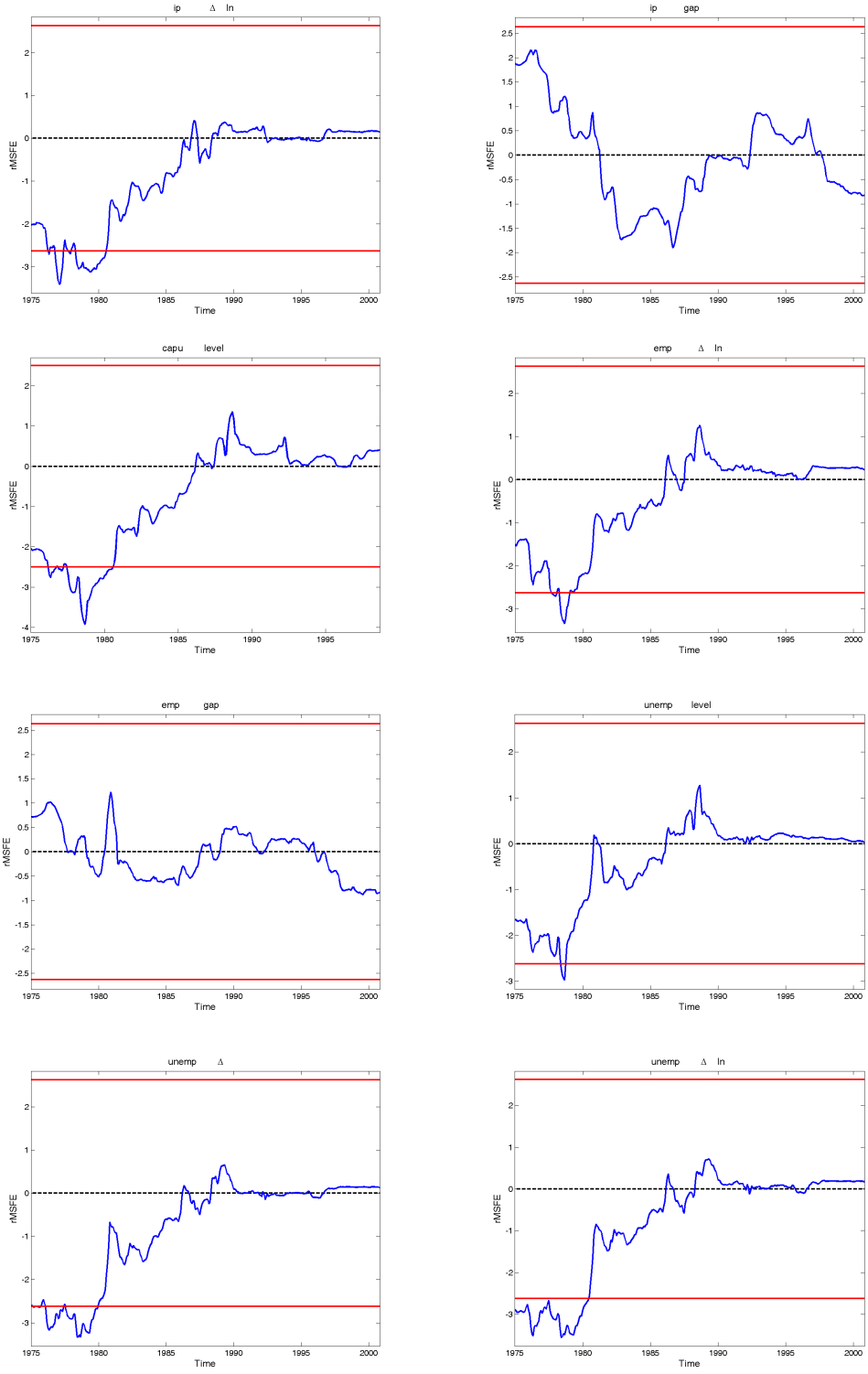


Figure 40: One Year Ahead Inflation Forecast - Activity Measures (cont.)

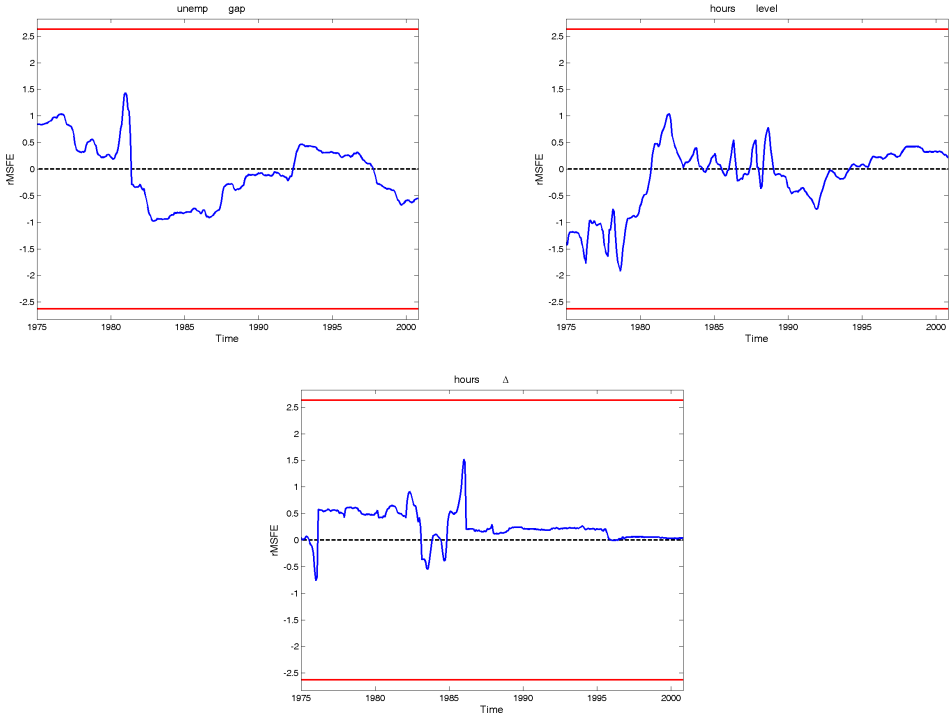


Figure 41: One Year Ahead Inflation Forecast - Wages & Prices

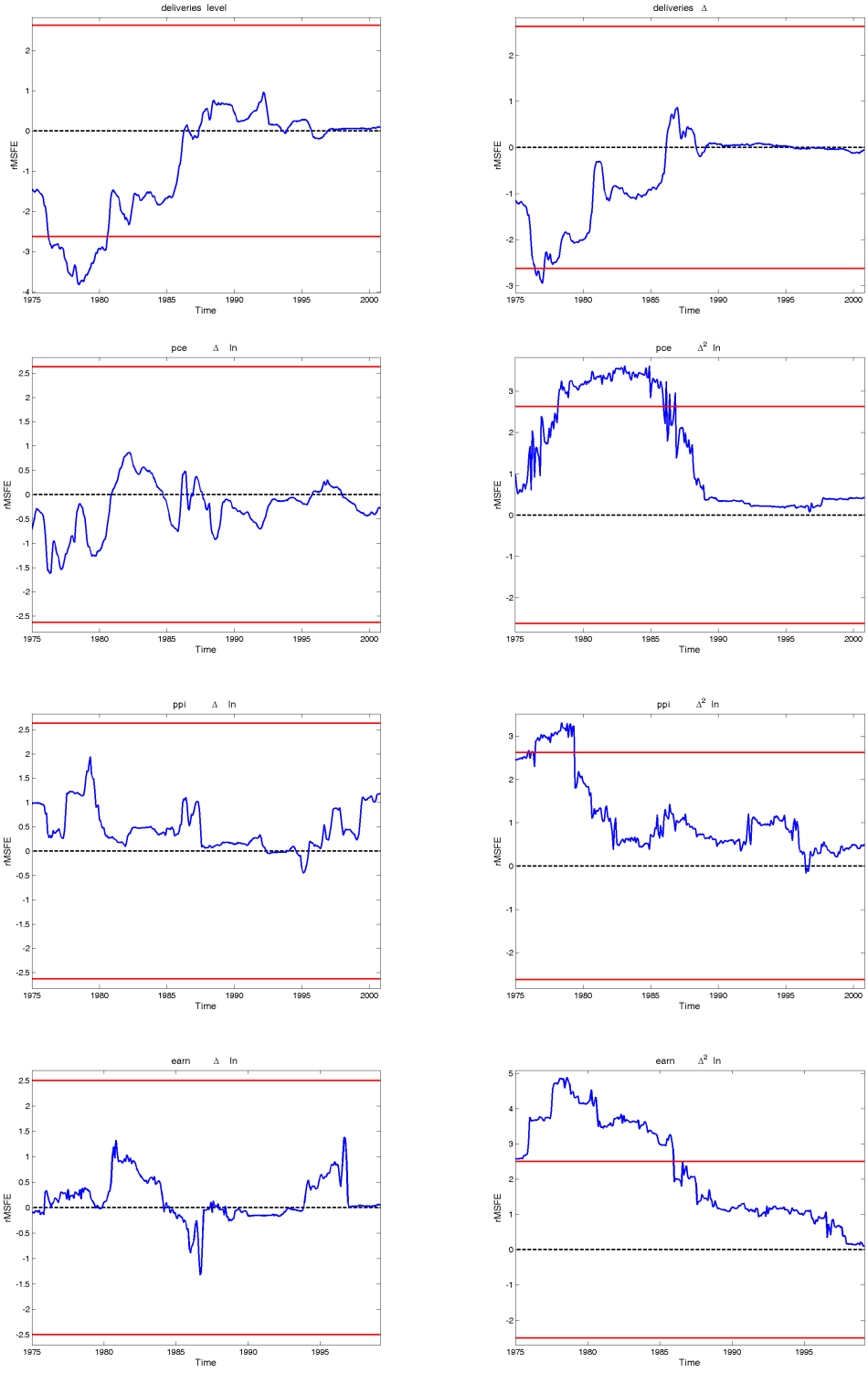


Figure 42: One Year Ahead Inflation Forecast - Wages & Prices (cont.)

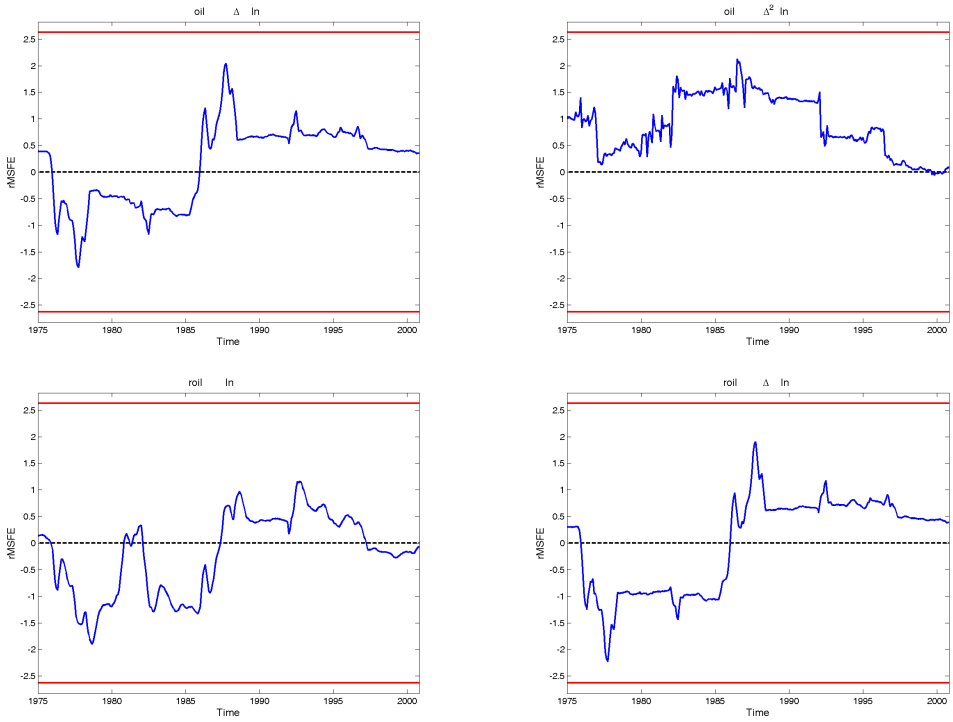


Figure 43: One Year Ahead Inflation Forecast - Money

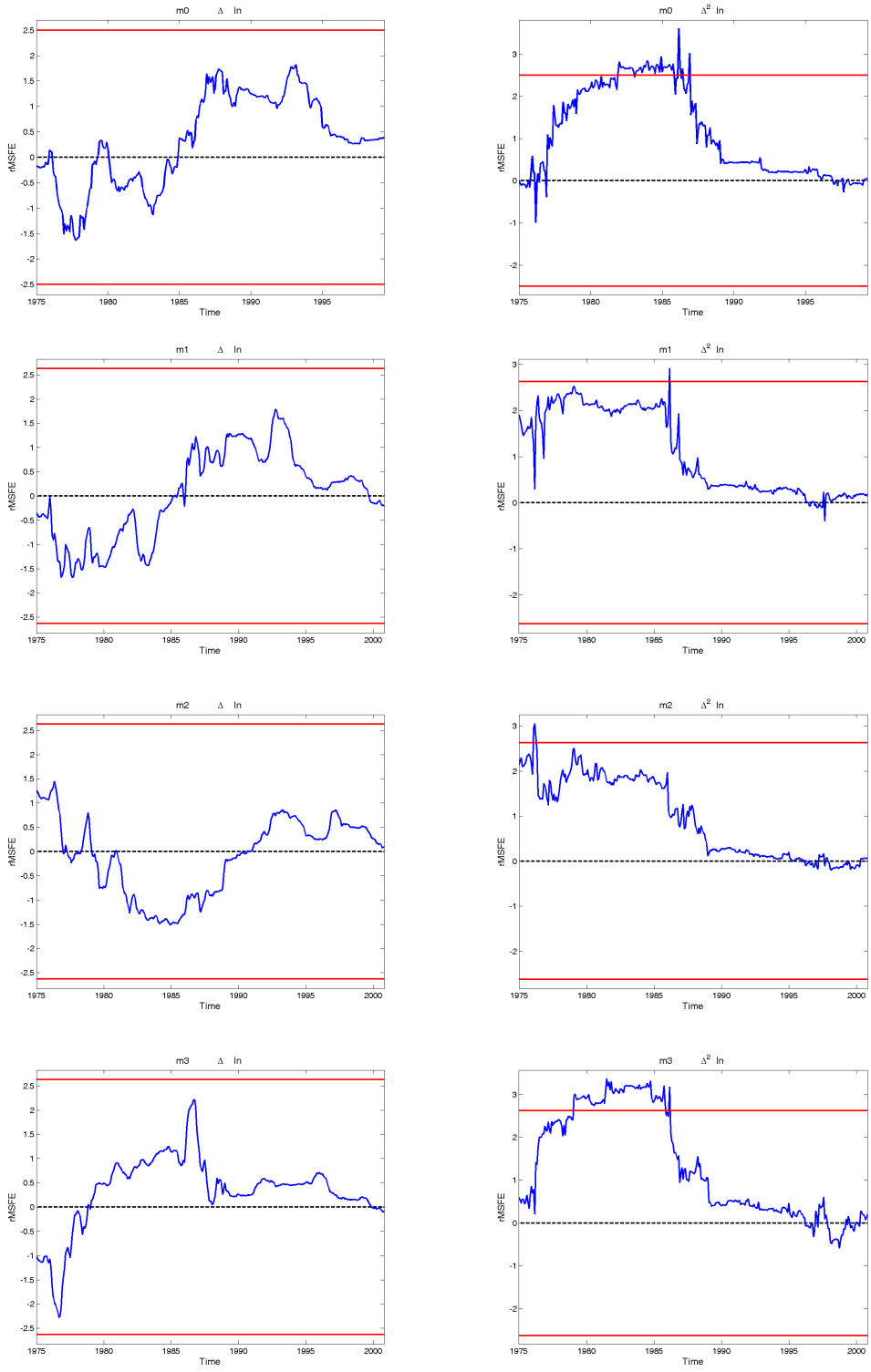


Figure 44: One Year Ahead Inflation Forecast - Money (cont.)

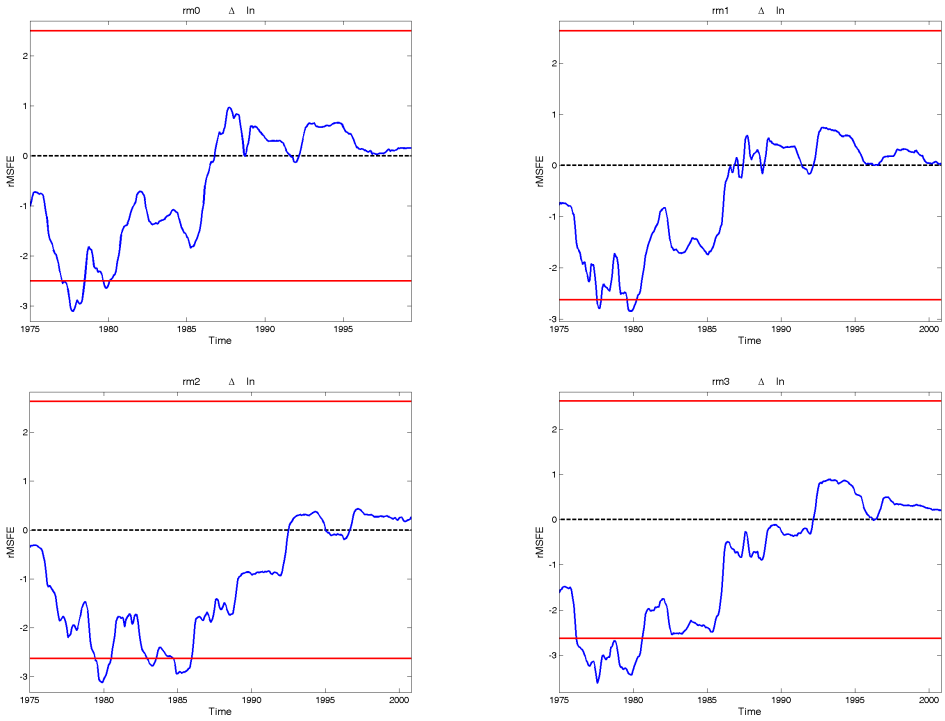


Figure 45: Miscellaneous

Table 10: Forecasting Inflation: Tests of Average Equal Predictive Ability

Variable		rMSFE	p-value	Variable		rMSFE	p-value
rovnght	level	0.00	1.00	unemp	Δln	-1.76	0.08
rtbill	level	-0.91	0.36	unemp	gap	-0.15	0.88
rbnds	level	-0.89	0.37	hours	level	-0.51	0.61
rbndm	level	-0.53	0.60	hours	Δ	0.40	0.69
rbndl	level	-0.63	0.53	deliveries	level	-1.47	0.14
rovnght	Δ	0.53	0.60	deliveries	Δ	-1.12	0.26
rtbill	Δ	-0.06	0.95	cpi	Δln	-	-
rbnds	Δ	0.08	0.94	cpi	$\Delta^2 ln$	-	-
rbndm	Δ	1.74	0.08	pce	Δln	-0.68	0.50
rbndl	Δ	0.65	0.51	pce	$\Delta^2 ln$	2.33	0.02
rrovnght	level	-0.67	0.50	ppi	Δln	1.34	0.18
rrtbill	level	-0.12	0.90	ppi	$\Delta^2 ln$	2.41	0.02
rrbnds	level	-0.65	0.51	earn	Δln	0.20	0.84
rrbndm	level	-0.63	0.53	earn	$\Delta^2 ln$	3.58	0.00
rrbndl	level	-0.56	0.57	oil	Δln	0.39	0.70
rrovnght	Δ	0.53	0.60	oil	$\Delta^2 ln$	1.73	0.08
rrtbill	Δ	-0.06	0.95	roil	ln	-0.36	0.72
rrbnds	Δ	0.01	0.99	roil	Δln	0.22	0.82
rrbndm	Δ	1.06	0.29	m0	Δln	0.52	0.60
rrbndl	Δ	0.55	0.58	m0	$\Delta^2 ln$	1.49	0.14
rspread	level	0.81	0.42	m1	Δln	-0.20	0.84
exrate	Δln	0.22	0.82	m1	$\Delta^2 ln$	2.28	0.02
stockp	Δln	1.45	0.15	m2	Δln	0.05	0.96
rstockp	Δln	1.29	0.20	m2	$\Delta^2 ln$	2.18	0.03
ip	Δln	-1.53	0.13	m3	Δln	0.21	0.84
ip	gap	-0.02	0.98	m3	$\Delta^2 ln$	2.04	0.04
capu	level	-1.27	0.21	rm0	Δln	-1.03	0.30
emp	Δln	-0.98	0.33	rm1	Δln	-1.12	0.26
emp	gap	-0.27	0.79	rm2	Δln	-1.64	0.10
unemp	level	-0.98	0.33	rm3	Δln	-1.82	0.07
unemp	Δ	-1.68	0.09	lead	level	-1.03	0.30

Note: rMSFE denotes the re-scaled average MSFE difference over the full out-of-sample period. A negative value indicate that the model with an explanatory variable outperforms the autoregressive model); p-value is the full out-of-sample test p-value.

Table 11: Forecasting Inflation: Tests of Equal Predictive Ability Over Time

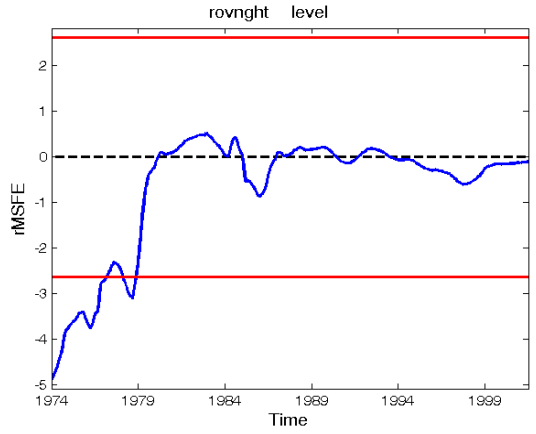
Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	1.00	1.00			unemp	Δln	0.04	0.08	1984	3
rtbill	level	0.75	0.80			unemp	gap	1.00	1.00		
rbnds	level	0.66	0.72			hours	level	0.74	0.70		
rbndm	level	1.00	1.00			hours	Δ	1.00	1.00		
rbndl	level	1.00	1.00			deliveries	level	0.11	0.16		
ovnght	Δ	1.00	1.00			deliveries	Δ	0.33	0.34		
rtbill	Δ	1.00	1.00			cpi	Δln	-	-	-	-
rbnds	Δ	1.00	1.00			cpi	$\Delta^2 ln$	-	-	-	-
rbndm	Δ	0.27	0.50			pce	Δln	1.00	1.00		
rbndl	Δ	1.00	1.00			pce	$\Delta^2 ln$	0.40	0.63		
rrovnght	level	1.00	1.00			ppi	Δln	1.00	0.87		
rrtbill	level	1.00	1.00			ppi	$\Delta^2 ln$	0.46	0.40		
rrbnds	level	0.81	0.82			earn	Δln	1.00	1.00		
rrbndm	level	1.00	1.00			earn	$\Delta^2 ln$	0.00	0.14		
rrbndl	level	1.00	1.00			oil	Δln	0.65	0.51		
rrovnght	Δ	1.00	1.00			oil	$\Delta^2 ln$	0.77	0.89		
rrtbill	Δ	1.00	1.00			roil	ln	1.00	1.00		
rrbnds	Δ	1.00	1.00			roil	Δln	0.56	0.44		
rrbndm	Δ	0.74	0.82			m0	Δln	1.00	0.80		
rrbndl	Δ	1.00	1.00			m0	$\Delta^2 ln$	0.76	0.56		
rspread	level	1.00	0.89			m1	Δln	0.86	0.82		
exrate	Δln	0.73	0.62			m1	$\Delta^2 ln$	0.29	0.49		
stockp	Δln	0.83	1.00			m2	Δln	1.00	1.00		
rstockp	Δln	1.00	1.00			m2	$\Delta^2 ln$	0.17	0.32		
ip	Δln	0.13	0.17			m3	Δln	0.45	0.34		
ip	gap	0.49	0.34			m3	$\Delta^2 ln$	0.65	0.82		
capu	level	0.02	0.03	1983	10	rm0	Δln	0.24	0.26		
emp	Δln	0.12	0.14			rm1	Δln	0.44	0.45		
emp	gap	1.00	0.88			rm2	Δln	0.47	0.69		
unemp	level	0.21	0.23			rm3	Δln	0.11	0.25		
unemp	Δ	0.08	0.10	1975	12	lead	level	0.11	0.13		

Note: The table reports p-values of Giacomini and Rossi's (2008) One-Time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.

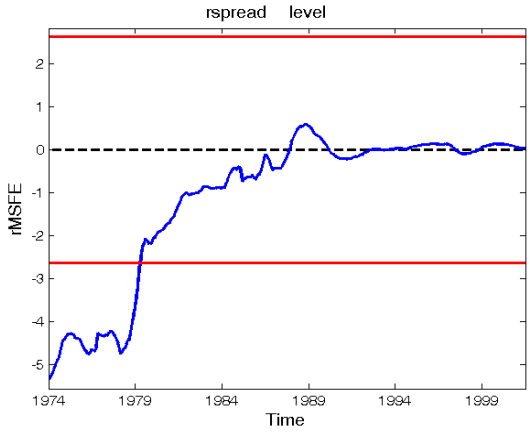
Section 3: Robustness to the choice of window size

Figure 46: Robustness to changes in window size in forecasting output (m=100)

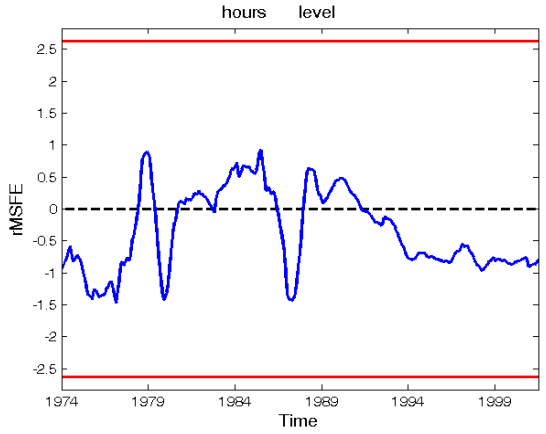
Federal Funds Rate



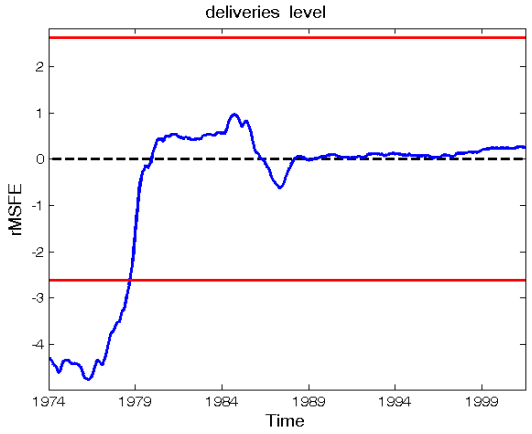
Interest Rate Spread



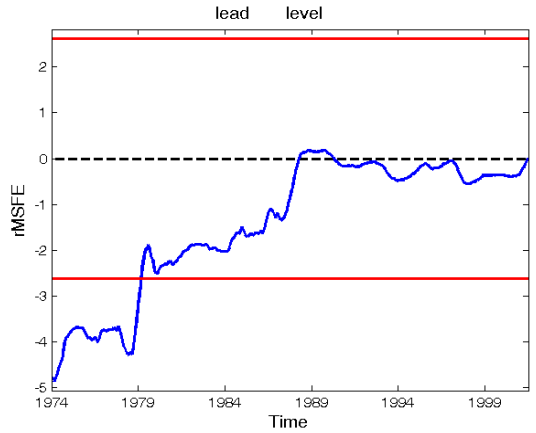
Average Weekly Hours



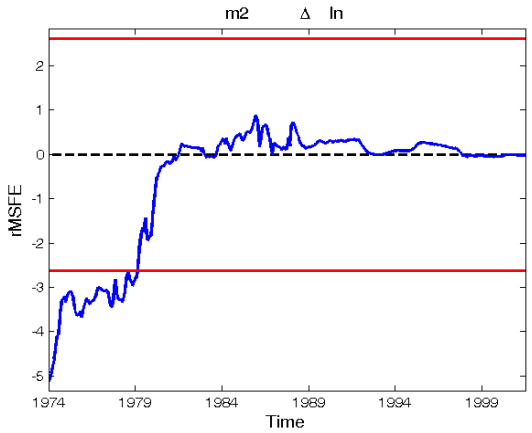
Index of Supplier Deliveries



Index of 10 Leading Indicators



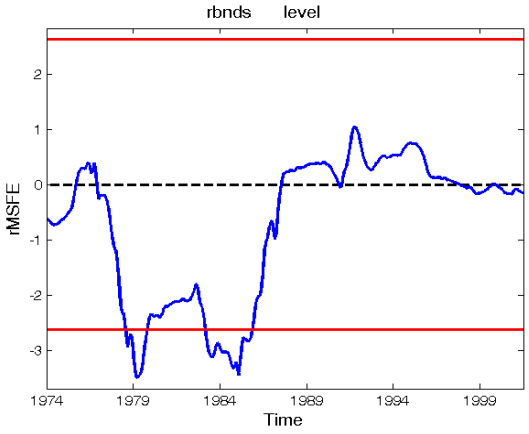
Money (M2)



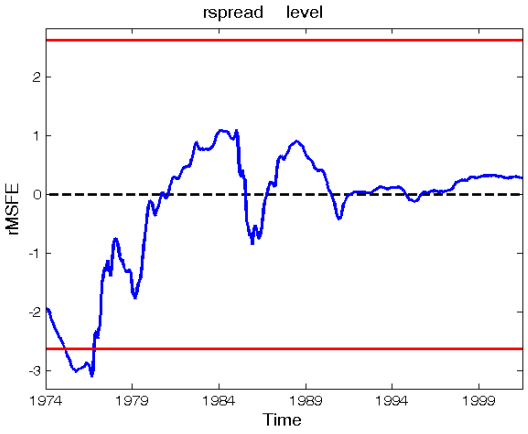
Note: The dark solid line in the figure reports the re-scaled rMSFEs, $\widehat{\sigma}^{-1}m^{-1/2}rMSFE_t$, that is $F_{t,m}^{OOS}$. The light solid lines report 90% bands for testing the null hypothesis that the models' relative forecasting performance is equal (the test rejects when the dark solid line is outside the bands). Negative values of the re-scaled rMSFE denote situations in which the economic model forecasts better than its competitor.

Figure 47: Robustness to changes in window size in forecasting inflation (m=100)

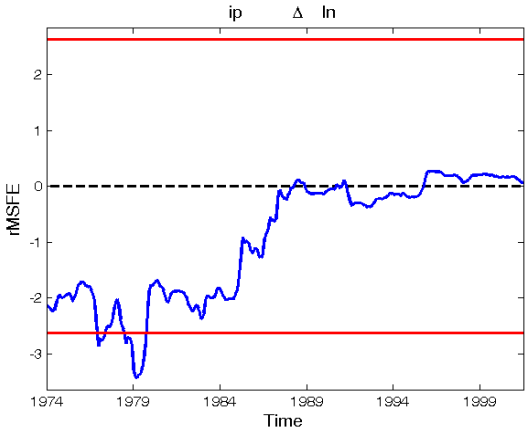
One-year Treasury Bond Rate



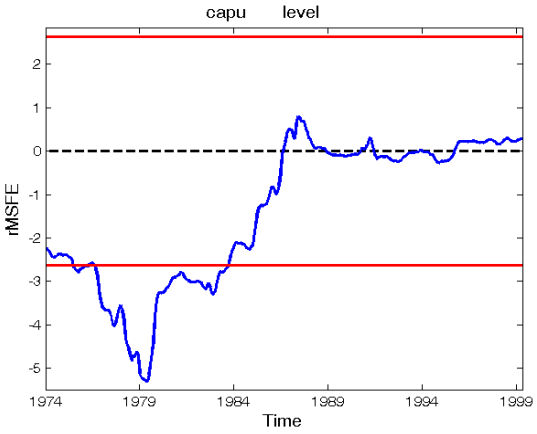
Interest Rate Spread



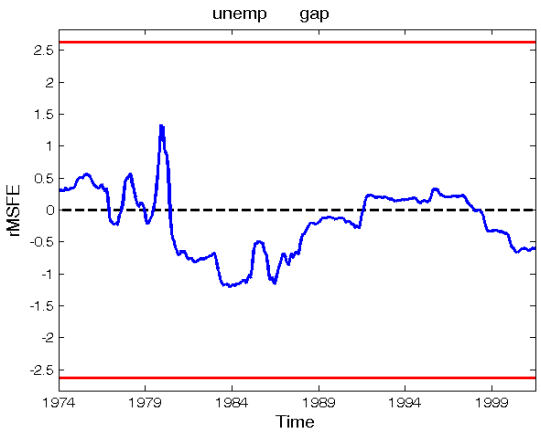
Industrial Production



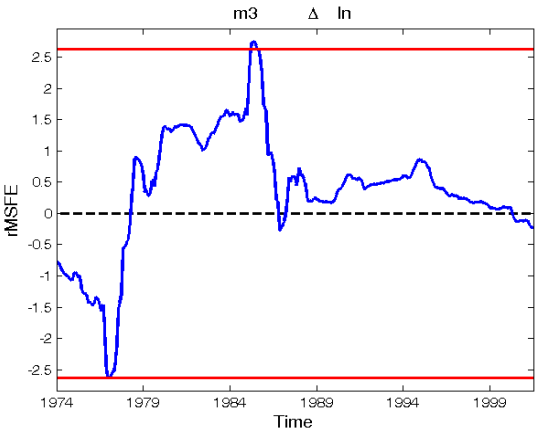
Capacity Utilization



Unemployment



Money (M3)

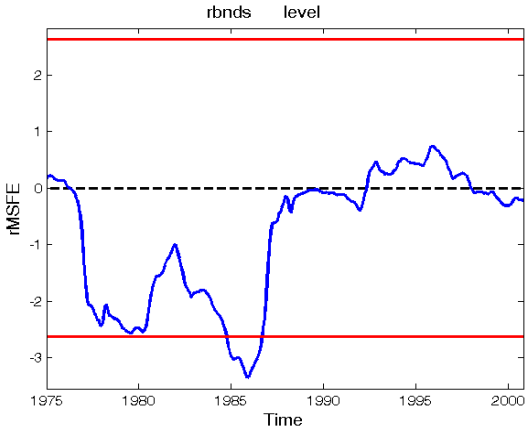


Note: The dark solid line in the figure reports the re-scaled rMSFEs, $\widehat{\sigma}^{-1}m^{-1/2}rMSFE_t$, that is $F_{t,m}^{OOS}$. The light solid lines report 90% bands for testing the null hypothesis that the models' relative forecasting performance is equal (the test rejects when the dark solid line is outside the bands). Negative values of the re-scaled rMSFE denote situations in which the economic model forecasts better than its competitor.

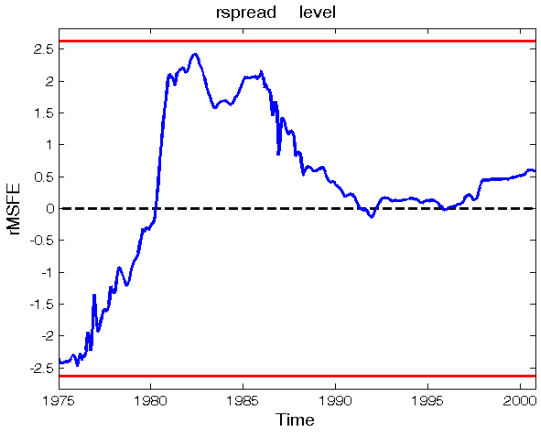
Section 4: Robustness to Consumption Deflator-based measures of Inflation

Figure 48: Forecasting Consumption Deflator Based Inflation ($m = 120$, full sample lag selection)

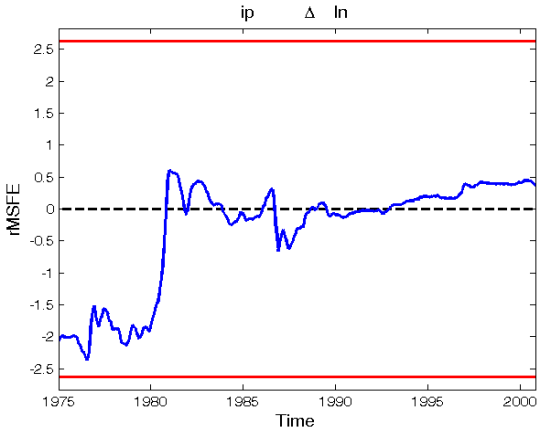
One-year Treasury Bond Rate



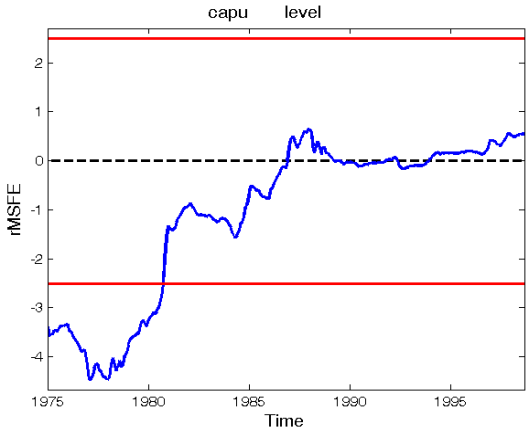
Interest Rate Spread



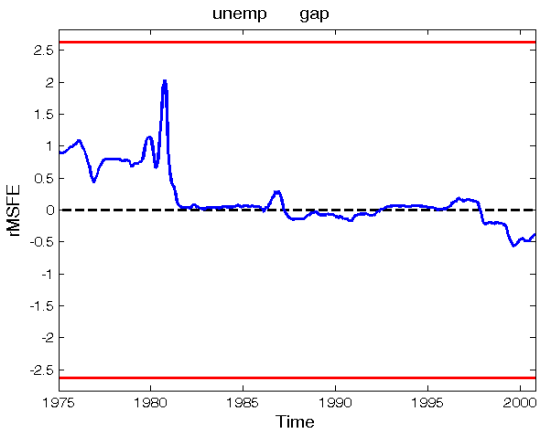
Industrial Production



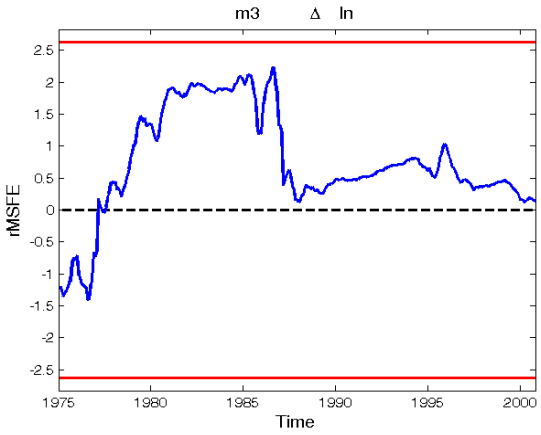
Capacity Utilization



Unemployment



Money (M3)



Note: The dark solid line in the figure reports the re-scaled rMSFEs, $\widehat{\sigma}^{-1}m^{-1/2}rMSFE_t$, that is $F_{t,m}^{OOS}$. The light solid lines report 90% bands for testing the null hypothesis that the models' relative forecasting performance is equal (the test rejects when the dark solid line is outside the bands). Negative values of the re-scaled rMSFE denote situations in which the economic model forecasts better than its competitor.

Section 5: Robustness to changes in variance

Table 12: Forecasting Output Growth: Tests of Equal Predictive Ability Over Time (Wald test)

Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	0.02	0.00	1976	5	unemp	Δln	1.00	0.87		
rtbill	level	0.00	0.00	1976	3	unemp	gap	0.07	0.00	1976	3
rbnds	level	0.01	0.00	1976	3	hours	level	1.00	1.00		
rbndm	level	0.22	0.01	1975	12	hours	Δ	1.00	0.54		
rbndl	level	0.52	0.07	1975	12	deliveries	level	0.07	0.00	1976	5
rovnght	Δ	0.84	0.37			deliveries	Δ	0.54	0.37		
rtbill	Δ	1.00	1.00			cpi	Δln	0.23	0.00	1975	10
rbnds	Δ	1.00	1.00			cpi	$\Delta^2 ln$	0.81	0.02	1976	3
rbndm	Δ	0.45	0.19			pce	Δln	0.29	0.00	1975	10
rbndl	Δ	0.40	0.17			pce	$\Delta^2 ln$	1.00	0.15		
rrovnght	level	0.02	0.00	1976	5	ppi	Δln	1.00	0.66		
rrtbill	level	0.00	0.00	1976	3	ppi	$\Delta^2 ln$	0.81	0.16		
rrbnds	level	0.02	0.00	1976	3	earn	Δln	0.88	0.49		
rrbndm	level	0.53	0.06	1975	12	earn	$\Delta^2 ln$	0.58	0.28		
rrbndl	level	0.89	0.33			oil	Δln	1.00	0.54		
rrovnght	Δ	0.34	0.65			oil	$\Delta^2 ln$	1.00	0.13		
rrtbill	Δ	0.81	1.00			roil	ln	1.00	0.70		
rrbnds	Δ	1.00	1.00			roil	Δln	1.00	0.87		
rrbndm	Δ	0.90	0.70			m0	Δln	1.00	1.00		
rrbndl	Δ	1.00	1.00			m0	$\Delta^2 ln$	1.00	1.00		
rspread	level	0.00	0.00	1976	6	m1	Δln	0.61	0.60		
exrate	Δln	1.00	0.43			m1	$\Delta^2 ln$	1.00	1.00		
stockp	Δln	0.05	0.00	1976	7	m2	Δln	0.05	0.00	1977	10
rstockp	Δln	0.07	0.00	1976	7	m2	$\Delta^2 ln$	1.00	1.00		
ip	Δln	-	-	-	-	m3	Δln	1.00	0.57		
ip	gap	-	-	-	-	m3	$\Delta^2 ln$	1.00	0.67		
capu	level	0.61	0.60			rm0	Δln	0.05	0.00	1975	10
emp	Δln	1.00	1.00			rm1	Δln	0.10	0.00	1975	10
emp	gap	0.25	0.02	1976	2	rm2	Δln	0.00	0.00	1975	10
unemp	level	1.00	0.86			rm3	Δln	0.02	0.00	1975	10
unemp	Δ	1.00	1.00			lead	level	0.02	0.00	1975	10

Note: The table reports p-values of Giacomini and Rossi's (2008) Wald version of the One-time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.

Table 13: Forecasting Inflation: Tests of Equal Predictive Ability Over Time (Wald test)

Variable		One-time	Break	Break Date		Variable		One-time	Break	Break Date	
rovnght	level	0.68	0.57			unemp	Δln	0.13	0.03	1984	8
rtbill	level	0.76	0.63			unemp	gap	1.00	0.67		
rbnds	level	0.67	0.55			hours	level	0.59	0.19		
rbndm	level	0.89	0.80			hours	Δ	1.00	1.00		
rbndl	level	0.84	0.83			deliveries	level	0.08	0.02	1983	8
rovnght	Δ	0.82	0.70			deliveries	Δ	0.70	0.11		
rtbill	Δ	1.00	1.00			cpi	Δln	-	-	-	-
rbnds	Δ	1.00	1.00			cpi	$\Delta^2 ln$	-	-	-	-
rbndm	Δ	1.00	1.00			pce	Δln	1.00	0.78		
rbndl	Δ	1.00	1.00			pce	$\Delta^2 ln$	1.00	0.78		
rrovnght	level	0.73	0.62			ppi	Δln	1.00	1.00		
rrtbill	level	0.82	0.70			ppi	$\Delta^2 ln$	1.00	0.26		
rrbnds	level	0.74	0.61			earn	Δln	1.00	0.83		
rrbndm	level	1.00	0.84			earn	$\Delta^2 ln$	0.03	0.07	1983	9
rrbndl	level	0.84	0.83			oil	Δln	0.67	0.83		
rrovnght	Δ	0.82	0.70			oil	$\Delta^2 ln$	0.55	0.60		
rrtbill	Δ	1.00	1.00			roil	ln	0.77	0.48		
rrbnds	Δ	1.00	1.00			roil	Δln	0.70	0.38		
rrbndm	Δ	1.00	1.00			m0	Δln	0.90	0.70		
rrbndl	Δ	1.00	1.00			m0	$\Delta^2 ln$	1.00	0.80		
rspread	level	0.46	0.19			m1	Δln	1.00	0.88		
exrate	Δln	0.84	0.83			m1	$\Delta^2 ln$	1.00	0.57		
stockp	Δln	1.00	1.00			m2	Δln	1.00	1.00		
rstockp	Δln	1.00	0.79			m2	$\Delta^2 ln$	1.00	0.64		
ip	Δln	0.55	0.20			m3	Δln	0.47	0.28		
ip	gap	0.56	0.69			m3	$\Delta^2 ln$	0.65	0.26		
capu	level	0.02	0.00	1983	10	rm0	Δln	0.58	0.34		
emp	Δln	0.20	0.03	1983	10	rm1	Δln	0.82	0.47		
emp	gap	1.00	0.70			rm2	Δln	0.81	0.86		
unemp	level	0.23	0.04	1983	10	rm3	Δln	0.48	0.31		
unemp	Δ	0.29	0.08	1984	7	lead	level	0.15	0.06	1984	6

Note: The table reports p-values of Giacomini and Rossi's (2008) Wald version of the One-time Reversal ("One-time") and $\sup_t LM_2(t)$ ("Break") tests. The estimated break dates are reported if significant at least at 10% level.