ONLINE APPENDIX

FORECASTING MACROECONOMIC DATA FOR AN EMERGING MARKET WITH A NONLINEAR DSGE MODEL

Mehmet Balcilar*, Rangan Gupta† & Kevin Kotzé‡

August 2014

*Department of Economics, Eastern Mediterranean University, Famagusta, Turkish Republic of Northern Cyprus, via Mersin 10, Turkey; and Department of Economics, University of Pretoria, Pretoria, 0002, South Africa.

†Corresponding author. Department of Economics, University of Pretoria, Pretoria, 0002, South Africa. Email: rangan.gupta@up.ac.za

‡School of Economics, University of Cape Town, Private Bag, Rondebosch, 7701, South Africa.

1 Eight-Step Ahead Forecasts - DSGE Models

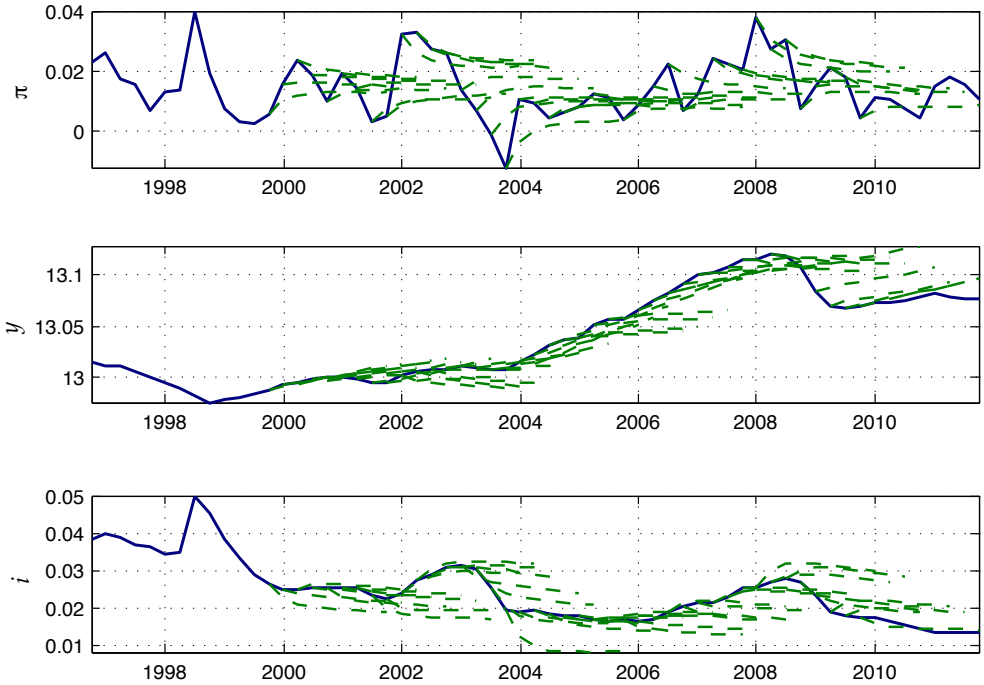

Figure 1: Nonlinear DSGE with Particle filter (2000q1 - 2011q4)

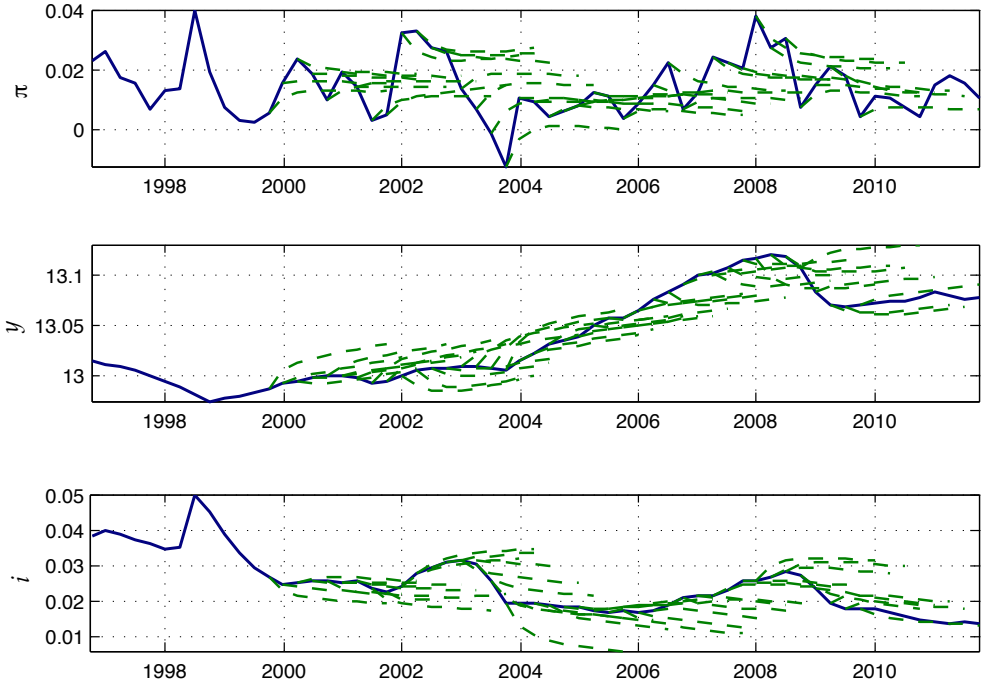

Figure 2: Linear DSGE with Kalman filter (2000q1 - 2011q4)

2 Eight-Step Ahead Forecasts - BVAR Models with Stochastic Variable Selection

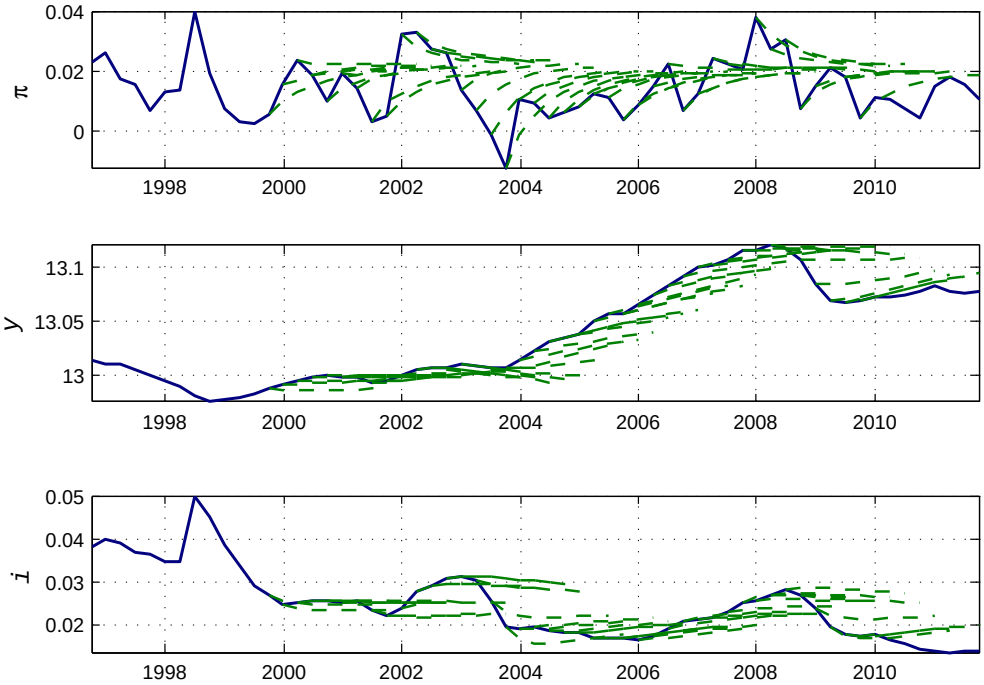

Figure 3: BVAR with Stochastic Variable Selection (2000q1 - 2011q4)

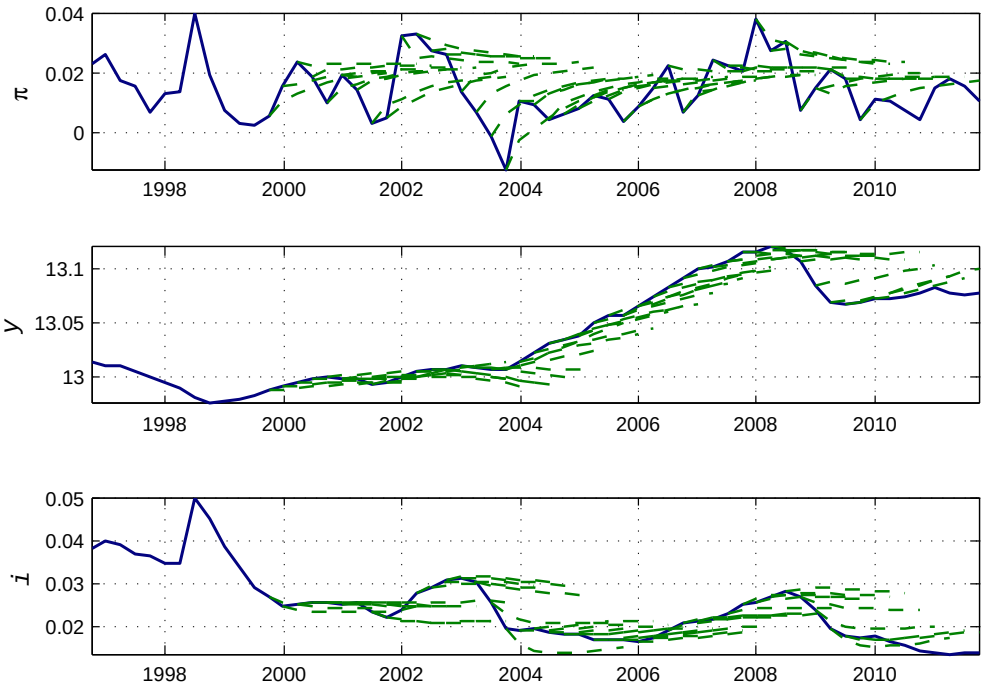

Figure 4: BVAR with No Stochastic Variable Selection (2000q1 - 2011q4)

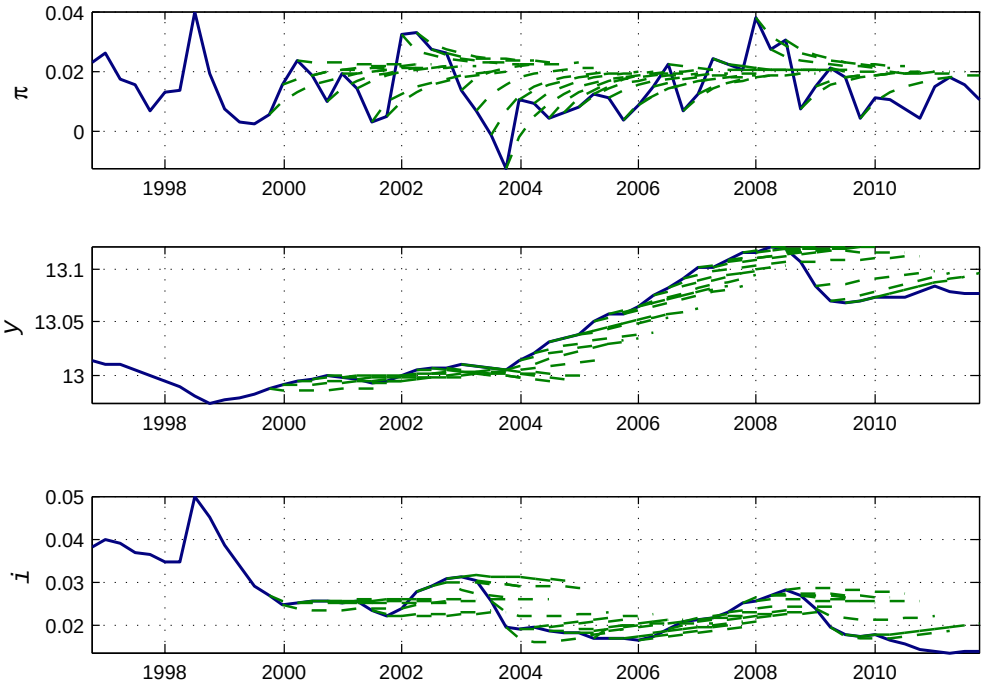

Figure 5: BVAR with Stochastic Variable Selection and Time Varying Parameters (2000q1 - 2011q4)

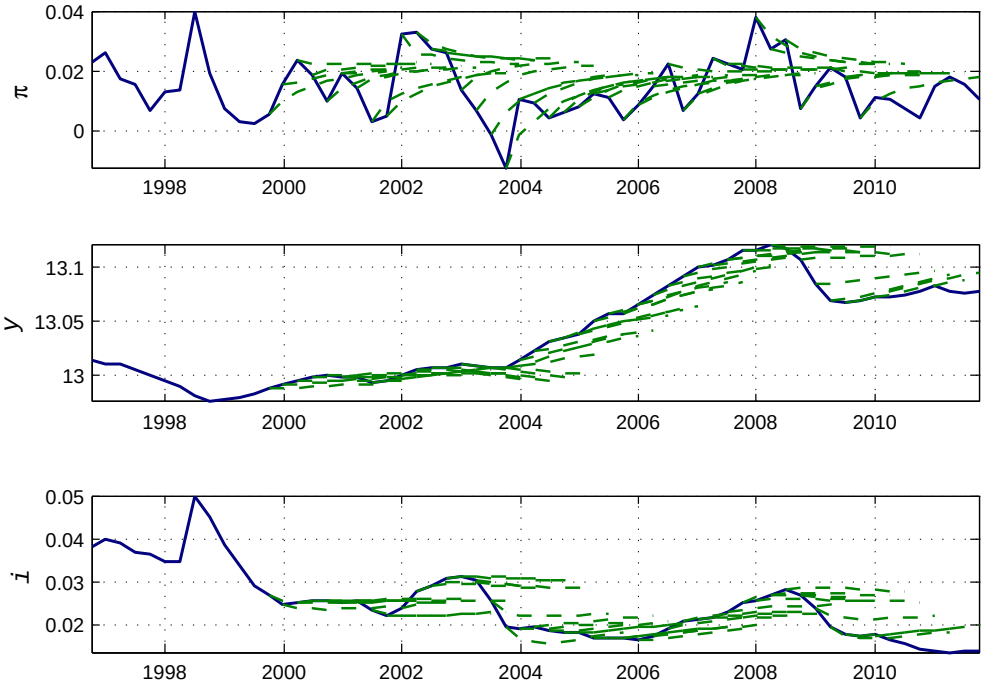

Figure 6: BVAR with Stochastic Variable Selection and endogenous Structural Breaks (2000q1 - 2011q4)

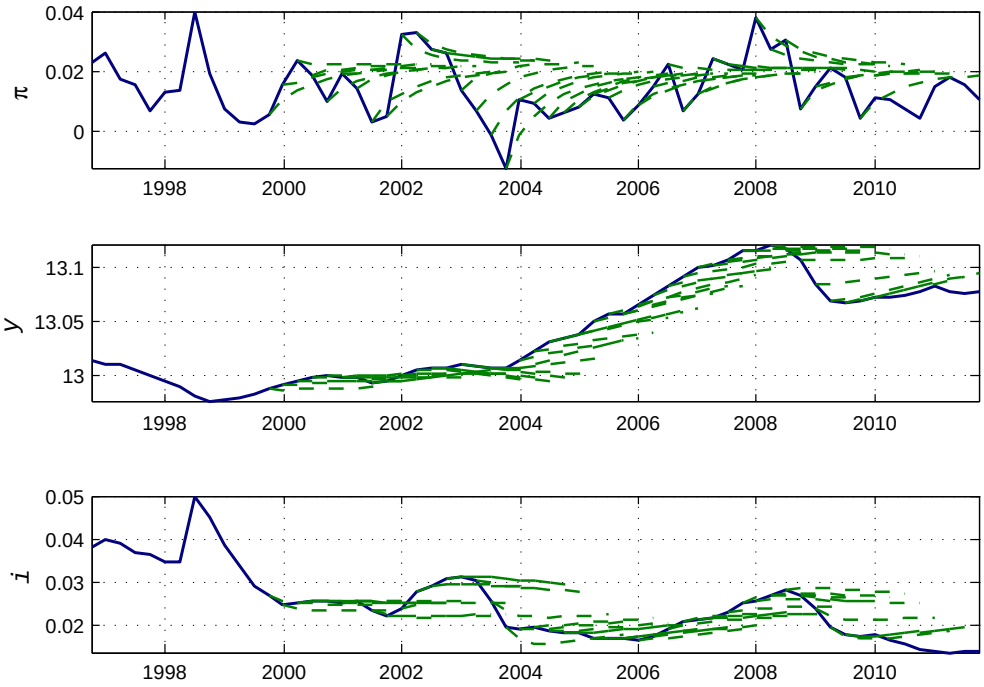

Figure 7: BVAR with Stochastic Variable Selection and Lasso Prior (2000q1 - 2011q4)

3 Eight-Step Ahead Forecasts - BVAR Models with Minnesota Prior

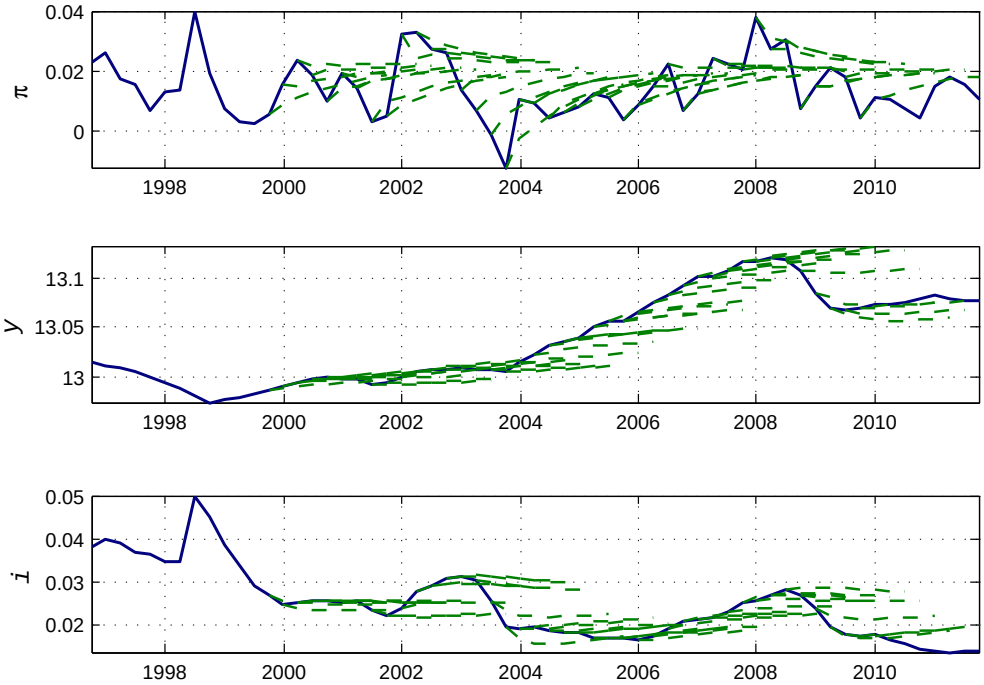

Figure 8: BVAR with Minnesota Prior [1. $\zeta = 2$, $\kappa = 2$, $\omega = 0.001$] (2000q1 - 2011q4)

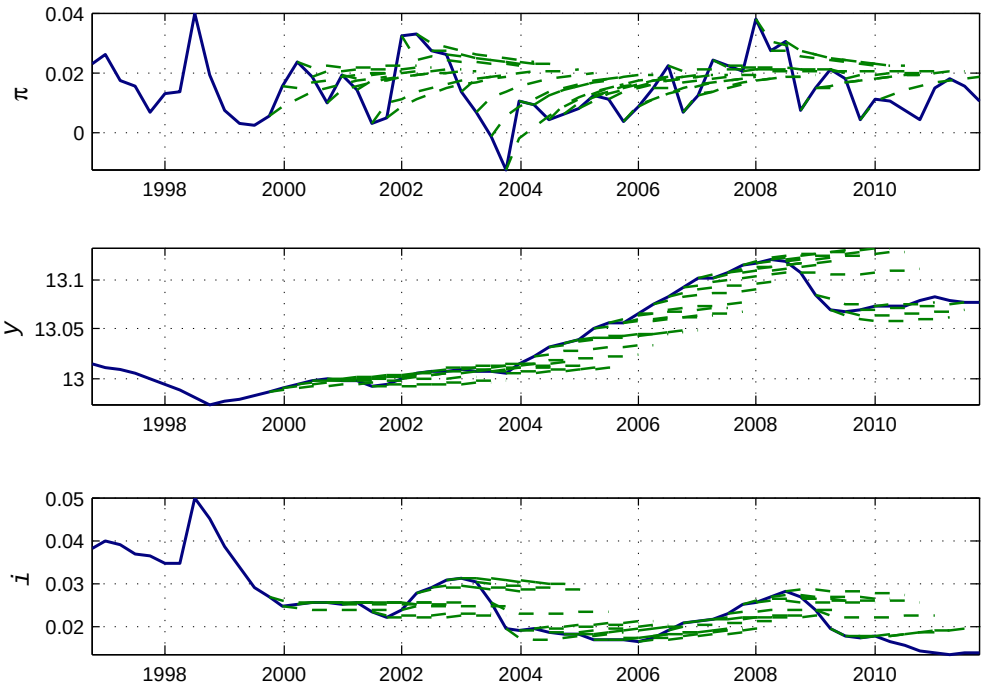

Figure 9: BVAR with Minnesota Prior [2. $\zeta = 0.3$, $\kappa = 0.5$, $\omega = 0.001$] (2000q1 - 2011q4)

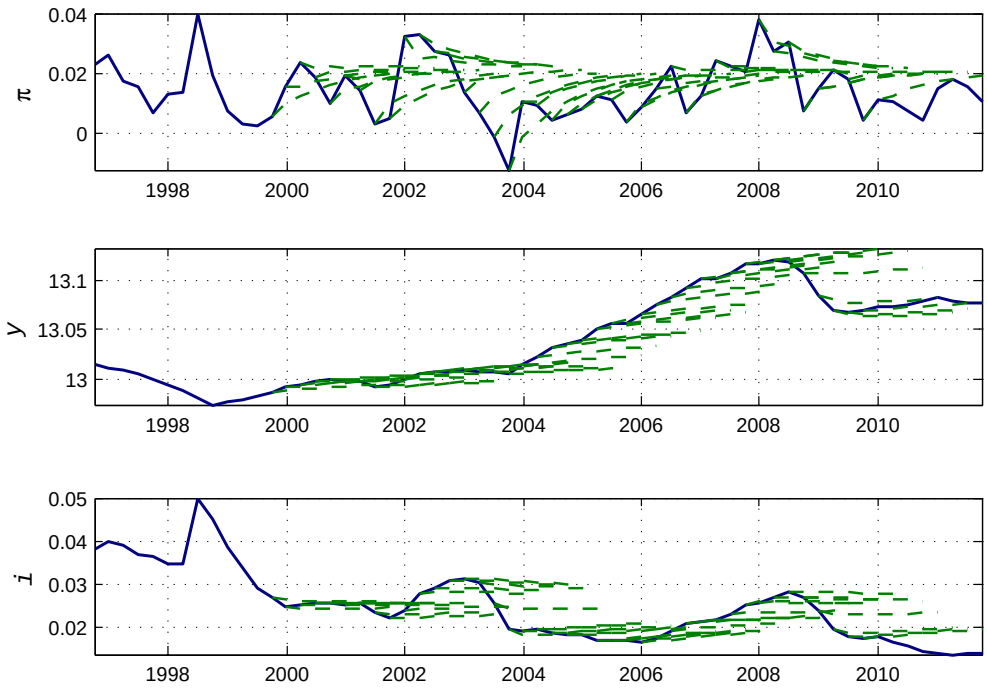

Figure 10: BVAR with Minnesota Prior [3. $\zeta = 0.2$, $\kappa = 1$, $\omega = 0.001$] (2000q1 - 2011q4)

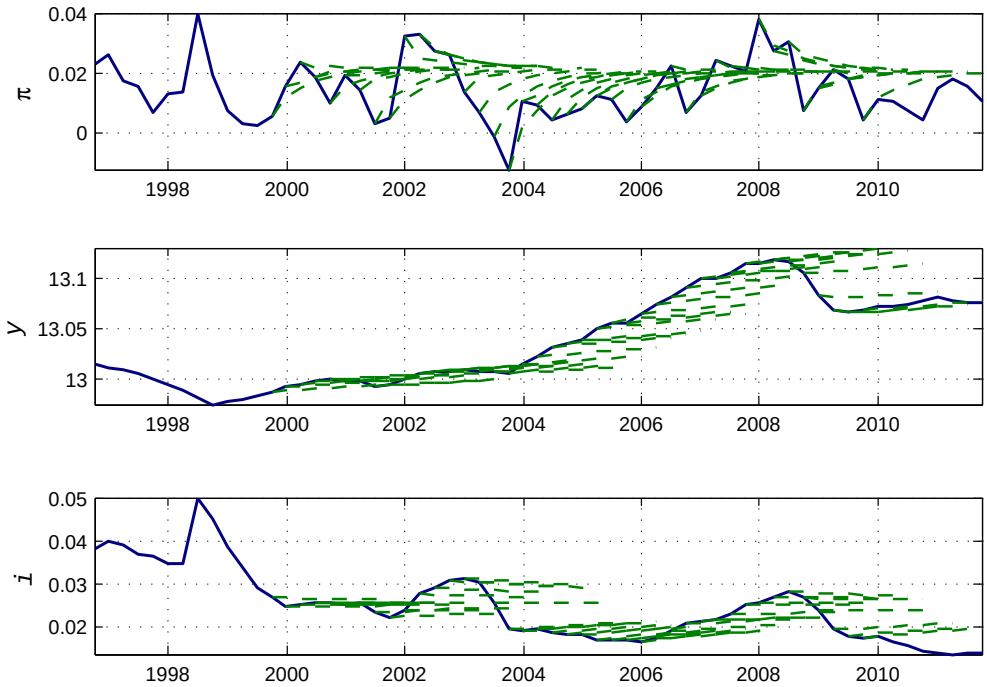

Figure 11: BVAR with Minnesota Prior [4. $\zeta = 0.1$, $\kappa = 1$, $\omega = 0.001$] (2000q1 - 2011q4)

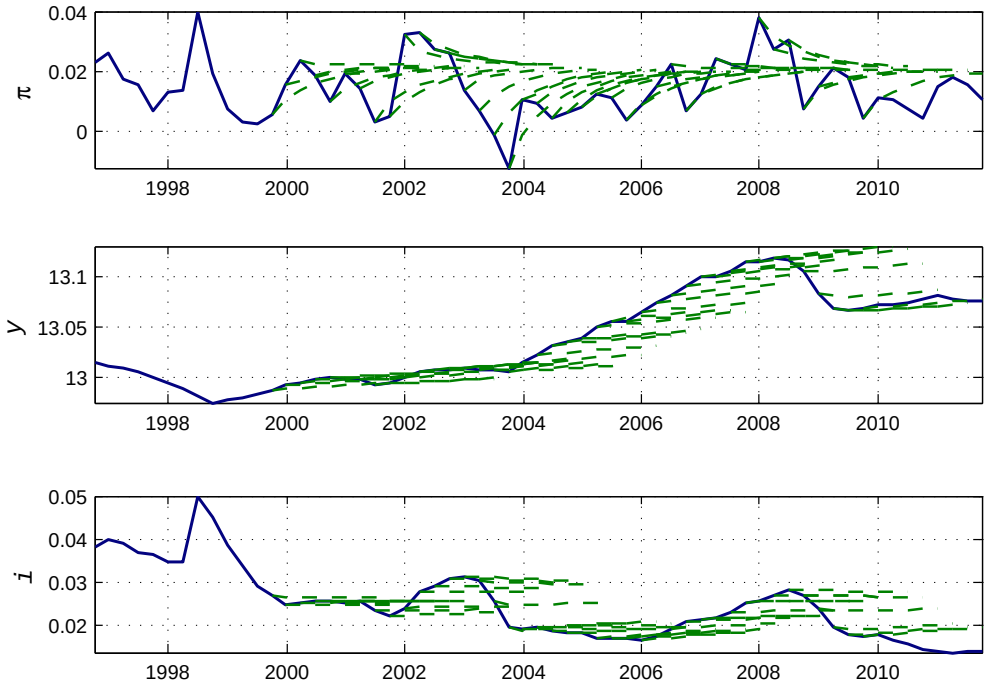

Figure 12: BVAR with Minnesota Prior [5. $\zeta = 0.2$, $\kappa = 2$, $\omega = 0.001$] (2000q1 - 2011q4)

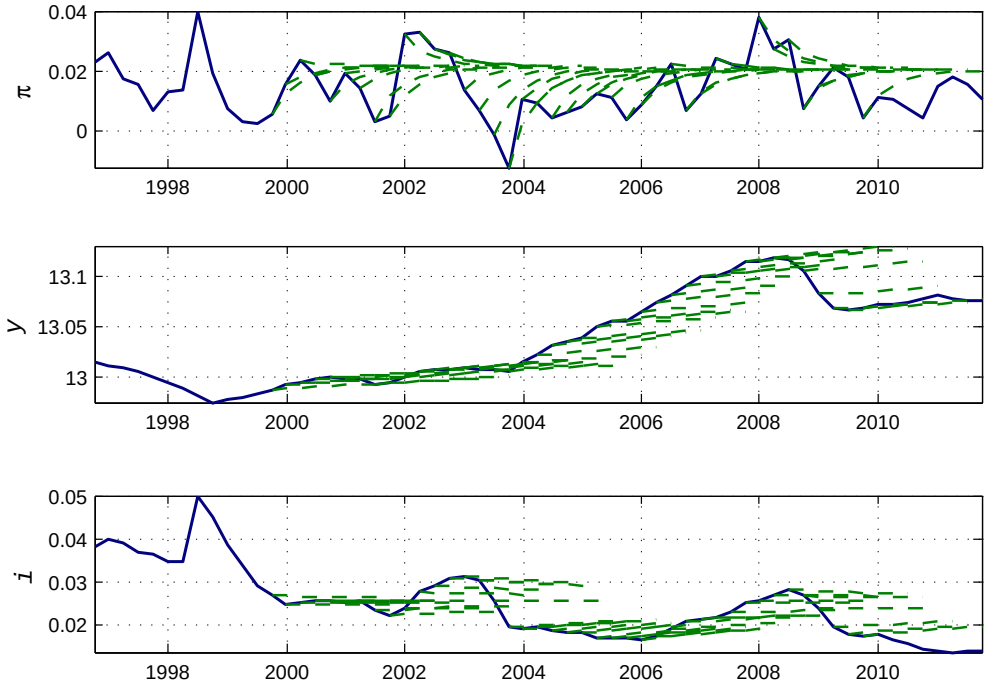

Figure 13: BVAR with Minnesota Prior [6. $\zeta = 0.1$, $\kappa = 2$, $\omega = 0.001$] (2000q1 - 2011q4)

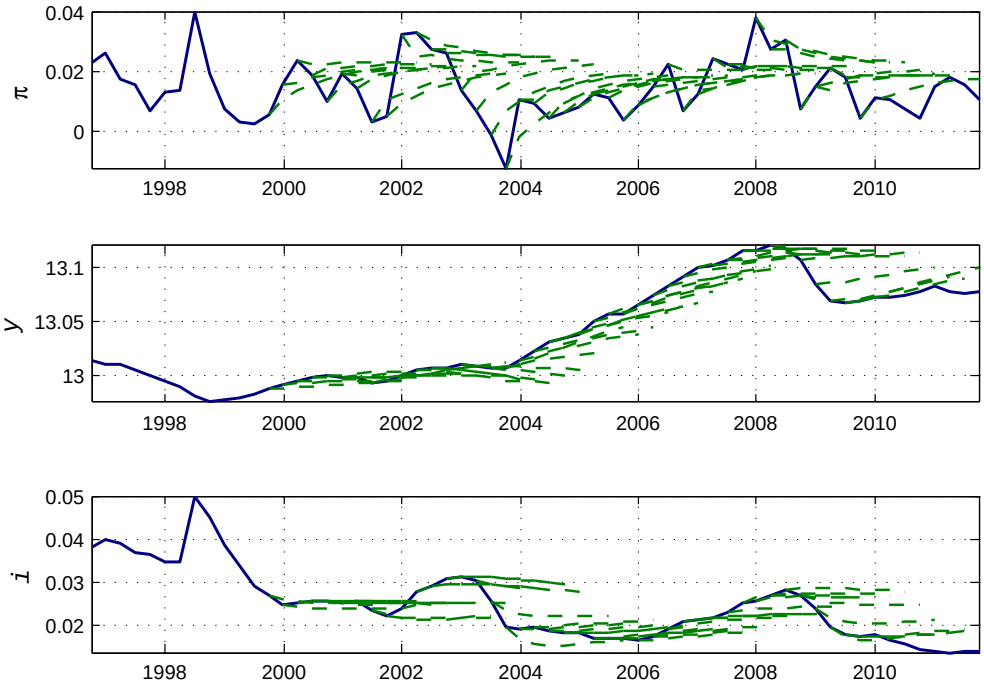

Figure 14: BVAR with Minnesota Prior [7. $\zeta = 0.3$, $\kappa = 0.5$, $\omega = 0.5$] (2000q1 - 2011q4)

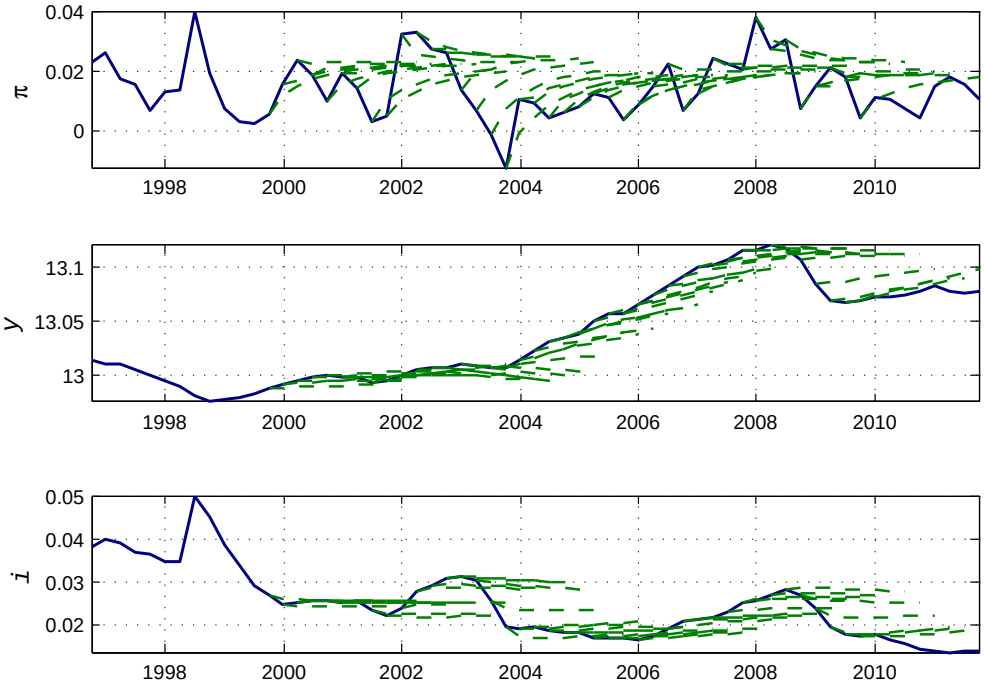

Figure 15: BVAR with Minnesota Prior [8. $\zeta = 0.2$, $\kappa = 1$, $\omega = 0.5$] (2000q1 - 2011q4)

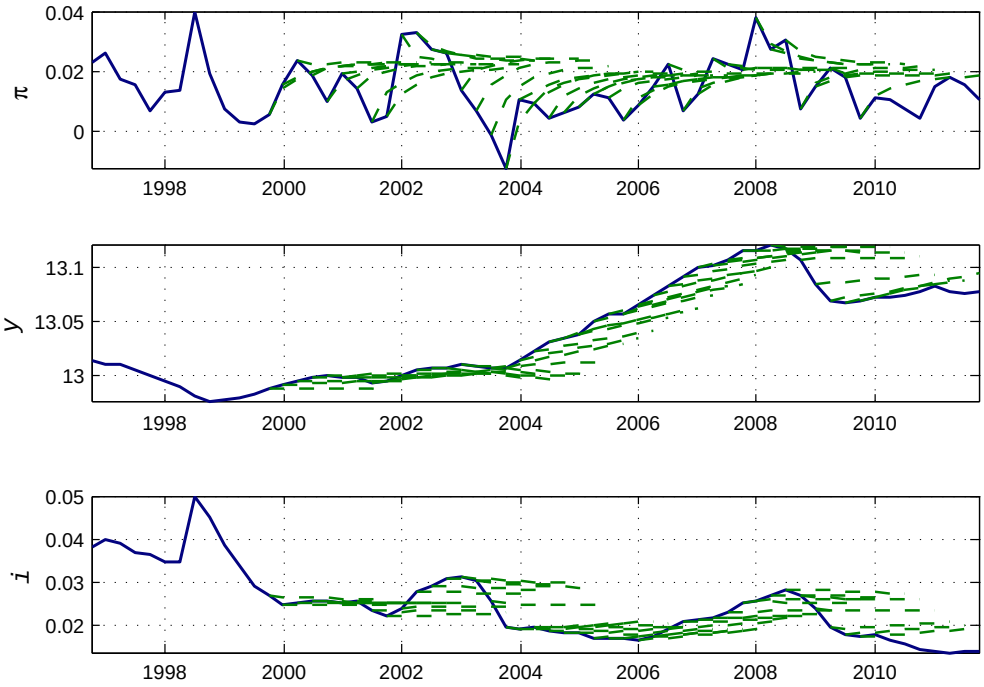

Figure 16: BVAR with Minnesota Prior [9. $\zeta = 0.1$, $\kappa = 1$, $\omega = 0.5$] (2000q1 - 2011q4)

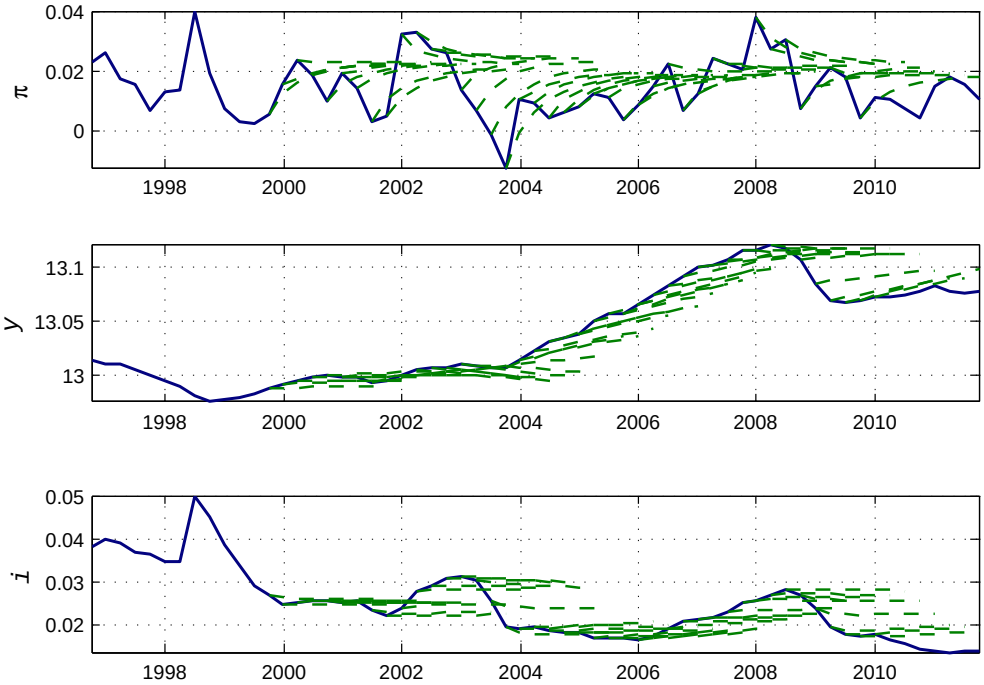

Figure 17: BVAR with Minnesota Prior [10. $\zeta = 0.2$, $\kappa = 2$, $\omega = 0.5$] (2000q1 - 2011q4)

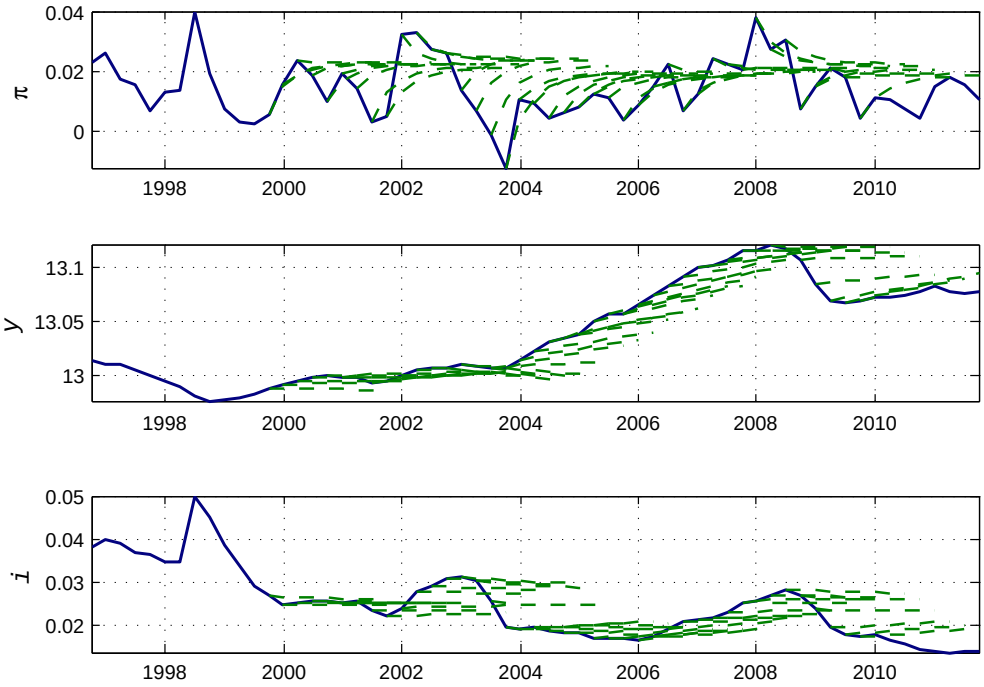

Figure 18: BVAR with Minnesota Prior [11. $\zeta = 0.1$, $\kappa = 2$, $\omega = 0.5$] (2000q1 - 2011q4)

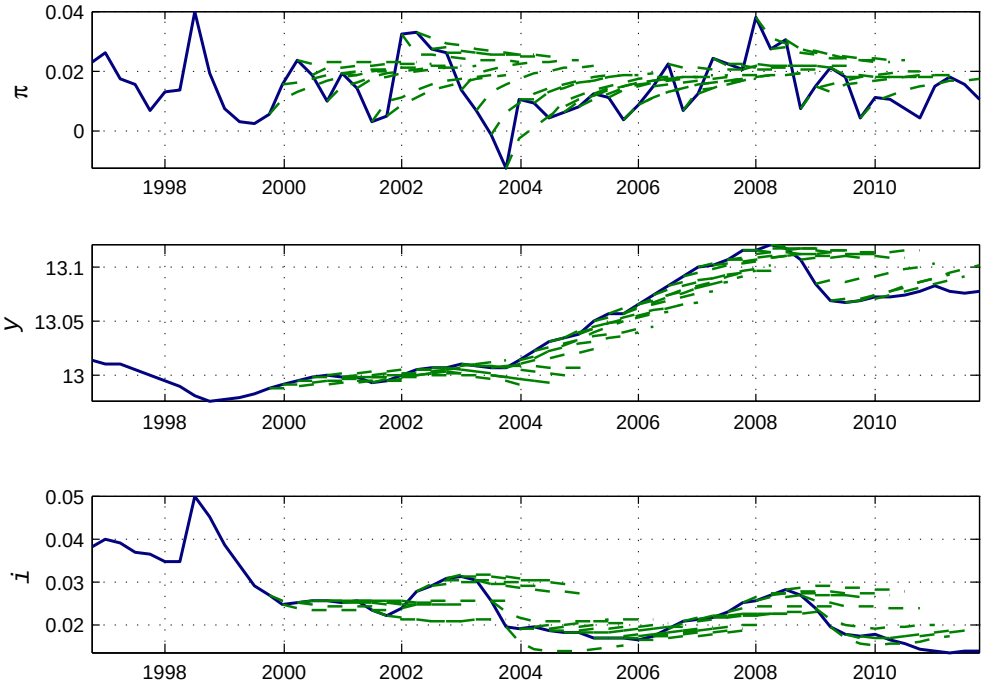

Figure 19: BVAR with Minnesota Prior [12. $\zeta = 2$, $\kappa = 0$, $\omega = 1$] (2000q1 - 2011q4)

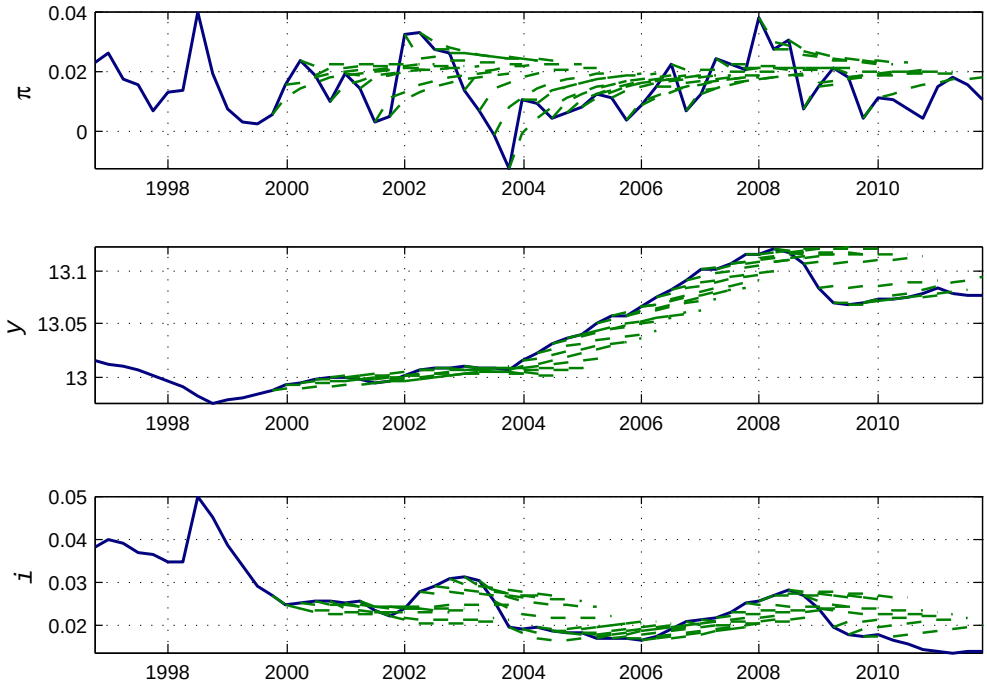

Figure 20: BVAR with Minnesota Prior [13. $\zeta = 0.3$, $\kappa = 0.5$, $\omega = 0.5$] (2000q1 - 2011q4)

4 Eight-Step Ahead Forecasts - Classical VAR Model

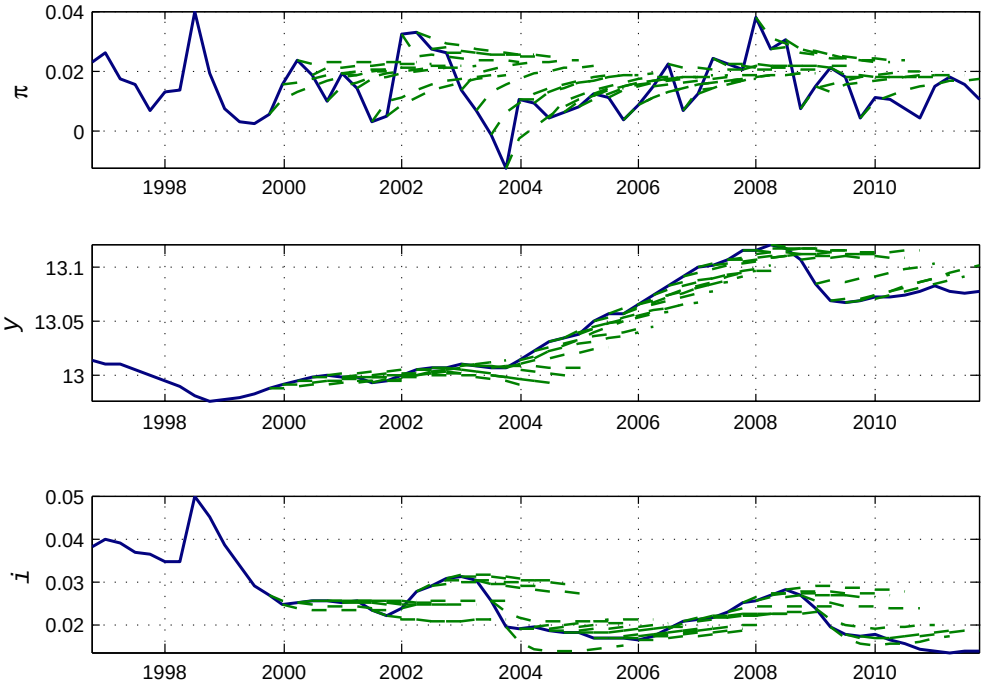

Figure 21: Classical VAR model (2000q1 - 2011q4)

5 Eight-Step Ahead Forecasts - Random-Walk Model

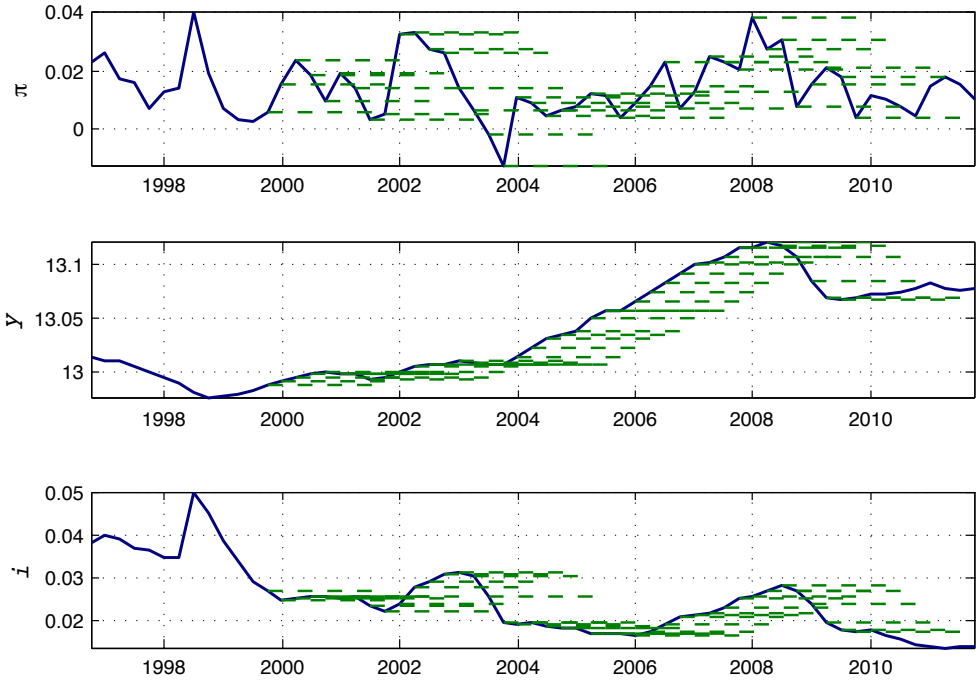

Figure 22: Random-Walk model (2000q1 - 2011q4)

6 Root Mean Square Error - DSGE Models

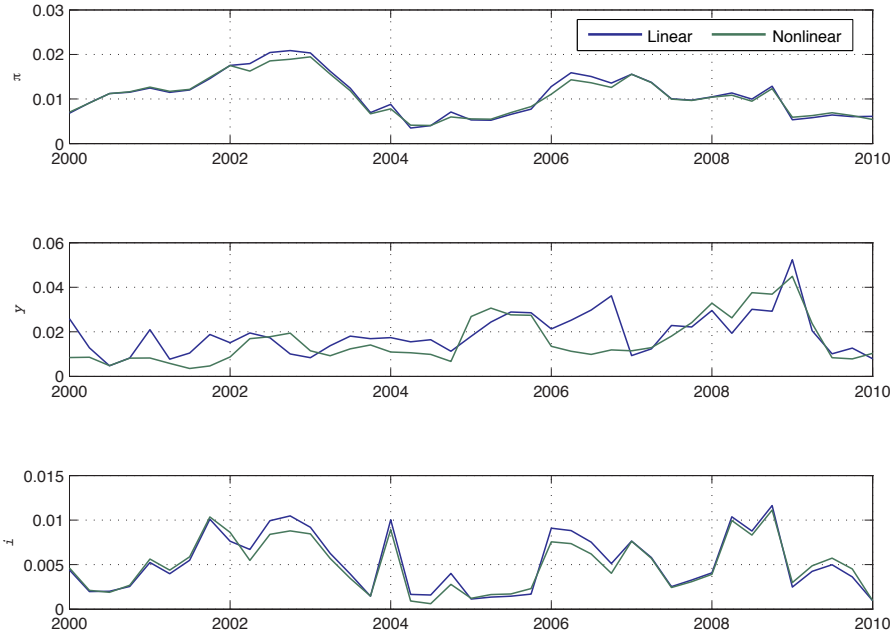

Figure 23: DSGE - Average 8-step ahead forecasts (2000q1 - 2011q4)

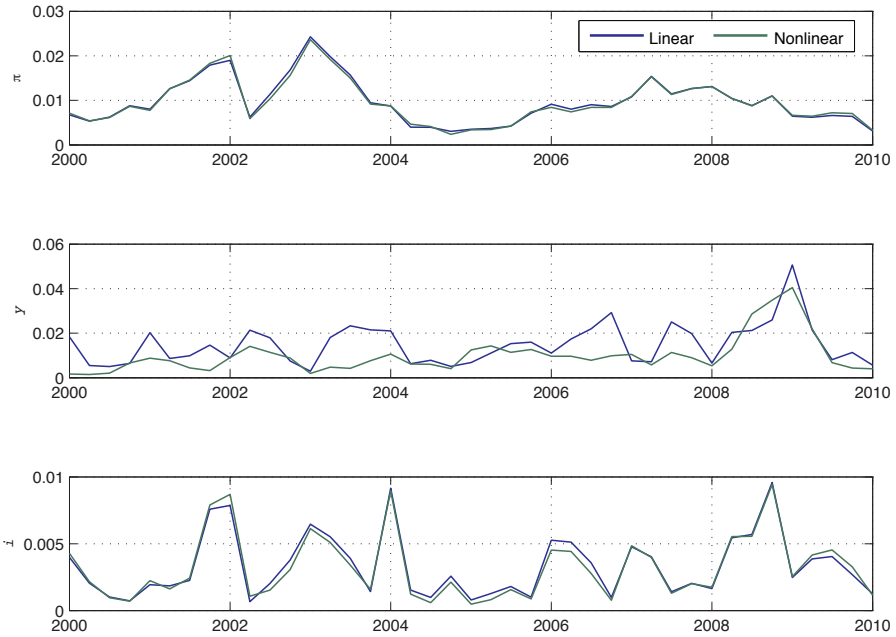

Figure 24: DSGE - Average 4-step ahead forecasts (2000q1 - 2011q4)

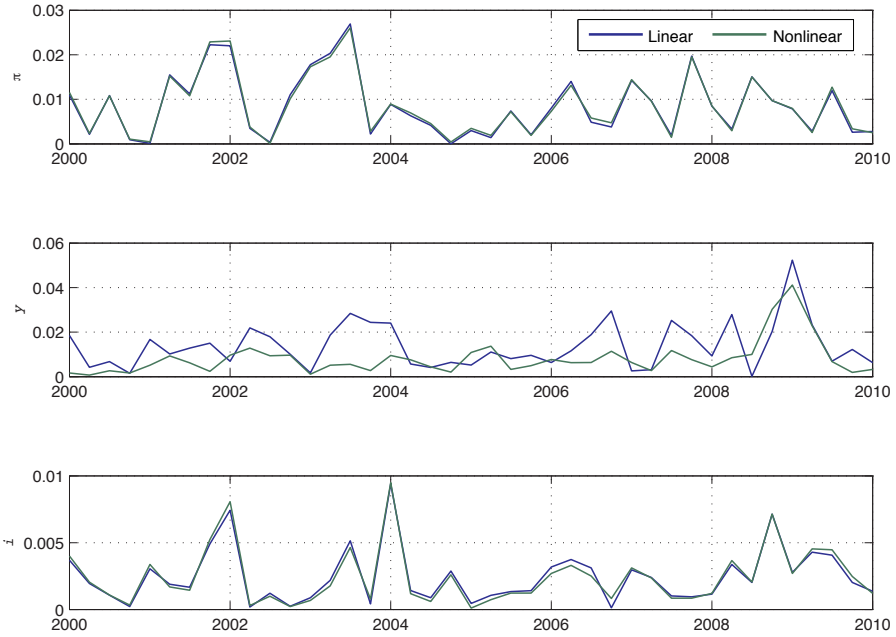

Figure 25: DSGE - 2-step ahead forecast (2000q1 - 2011q4)

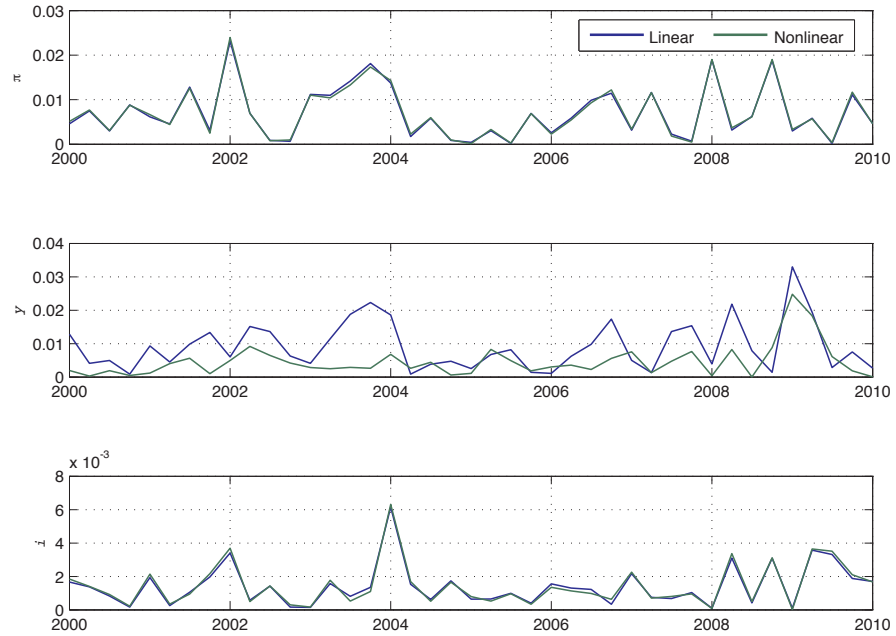

Figure 26: DSGE - 1-step ahead forecast (2000q1 - 2011q4)

7 Root Mean Square Error - BVAR Models with Stochastic Variable Selection

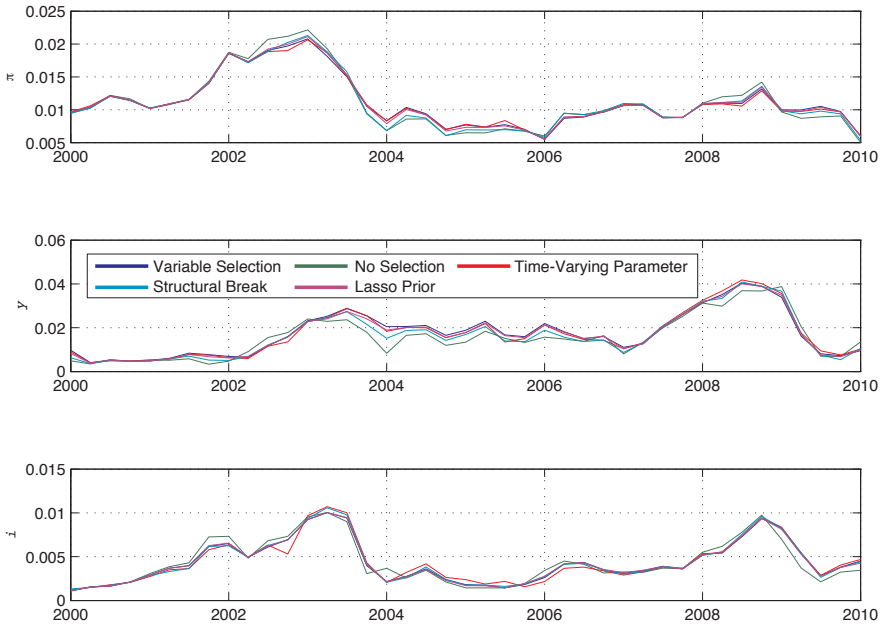

Figure 27: BVAR with SVS - Average 8-step ahead forecasts (2000q1 - 2011q4)

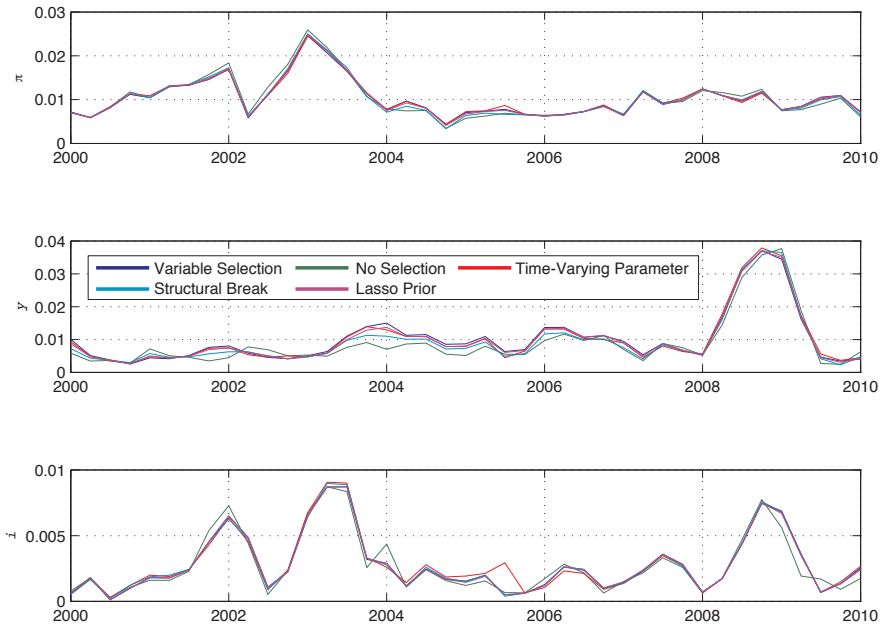

Figure 28: BVAR with SVS - Average 4-step ahead forecasts (2000q1 - 2011q4)

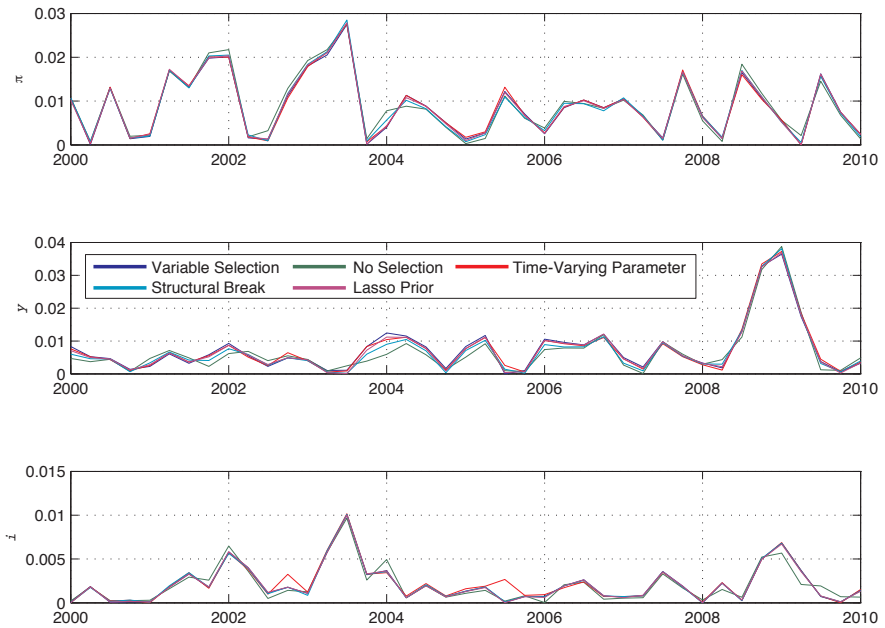

Figure 29: BVAR with SVS - 2-step ahead forecast (2000q1 - 2011q4)

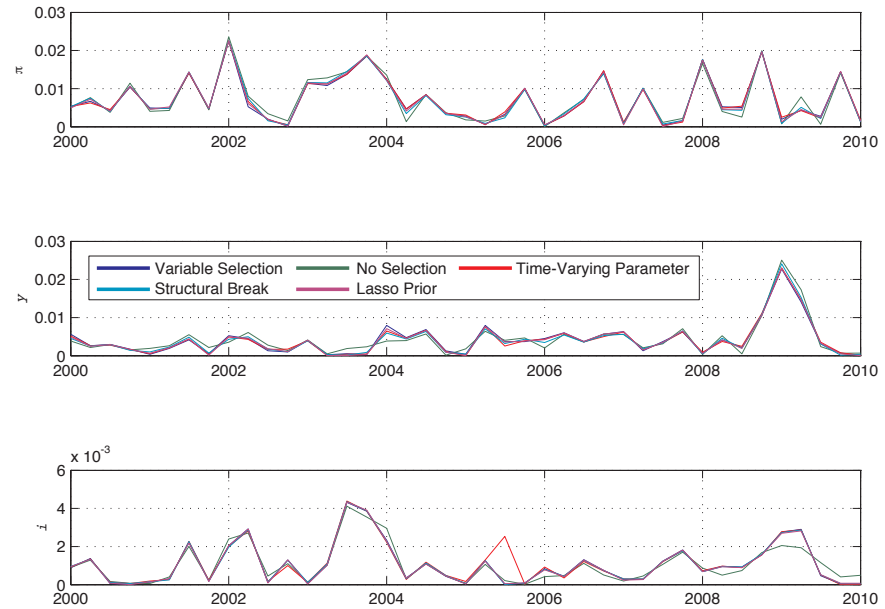

Figure 30: BVAR with SVS - 1-step ahead forecast (2000q1 - 2011q4)

8 Root Mean Square Error - BVAR Models with Minnesota Prior

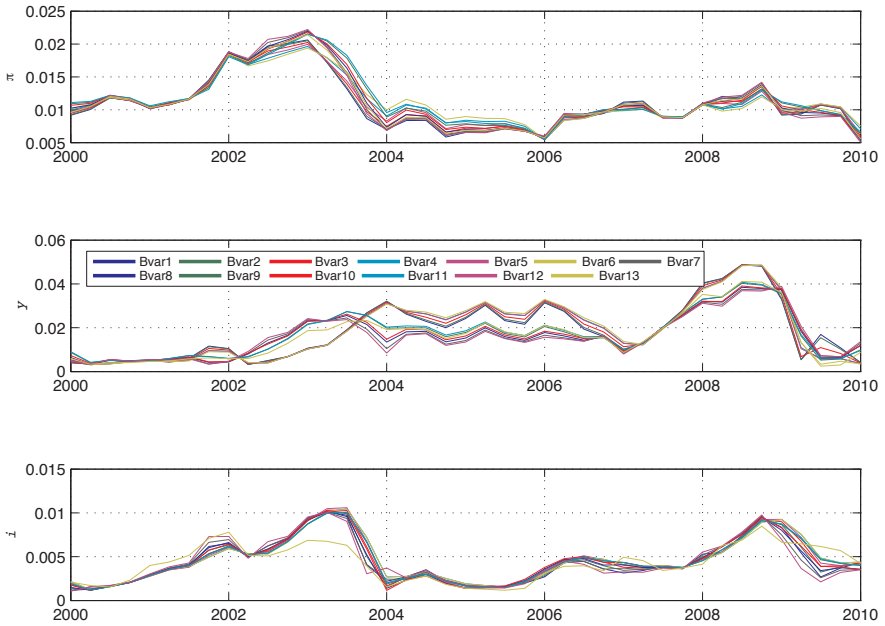

Figure 31: BVAR with Minnesota Prior - Average 8-step ahead forecasts (2000q1 - 2011q4)

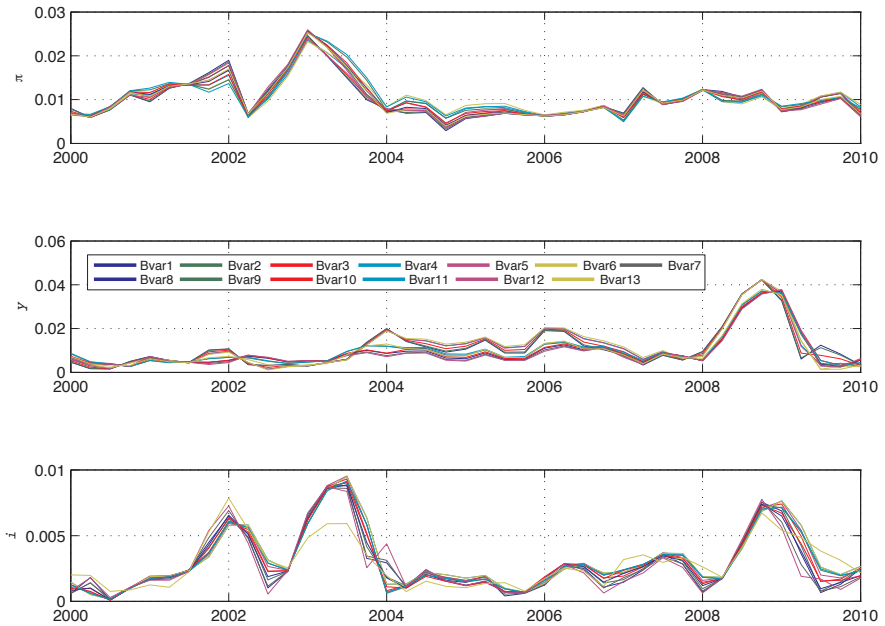

Figure 32: BVAR with Minnesota Prior - Average 4-step ahead forecasts (2000q1 - 2011q4)

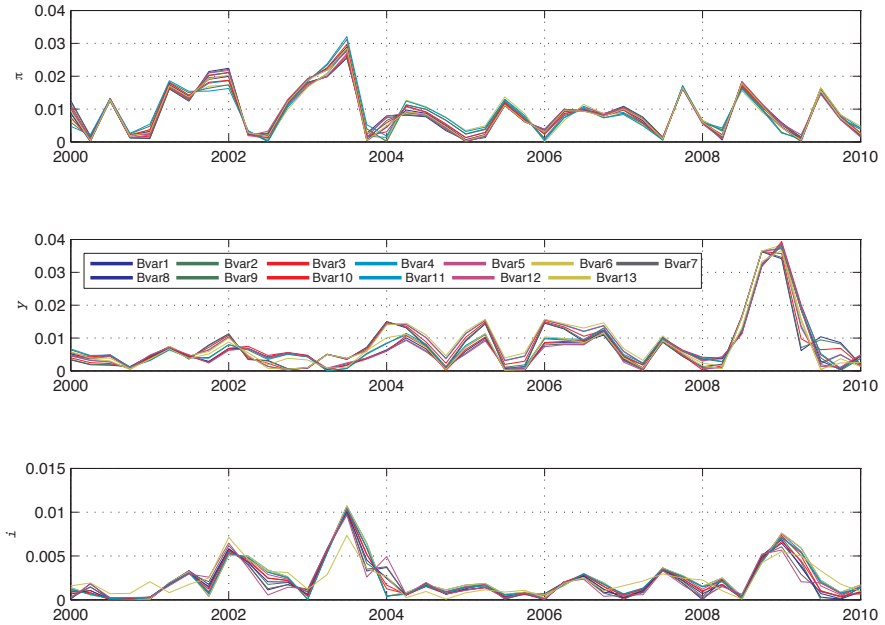

Figure 33: BVAR with Minnesota Prior - 2-step ahead forecast (2000q1 - 2011q4)

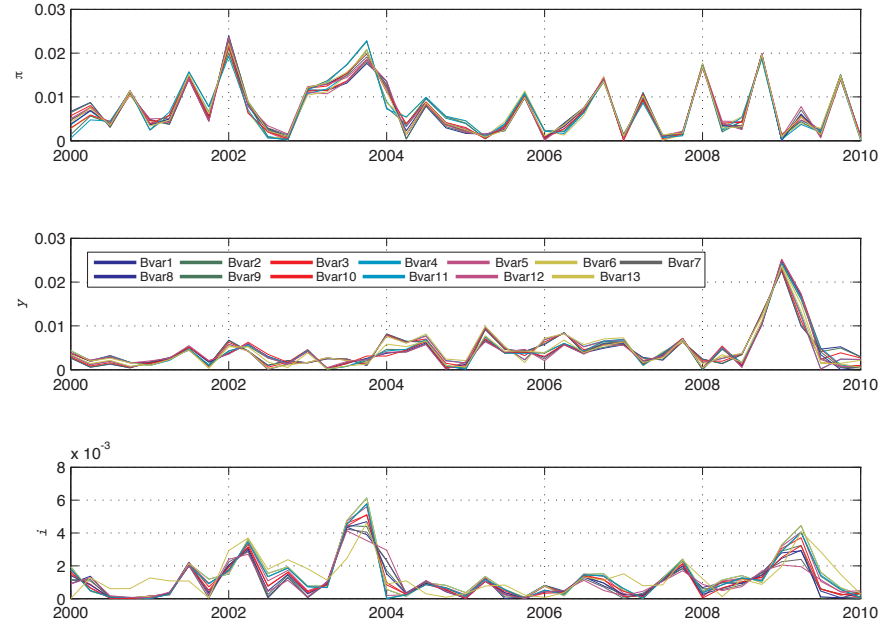

Figure 34: BVAR with Minnesota Prior - 1-step ahead forecast (2000q1 - 2011q4)

9 Root Mean Square Error - Classical VAR Model

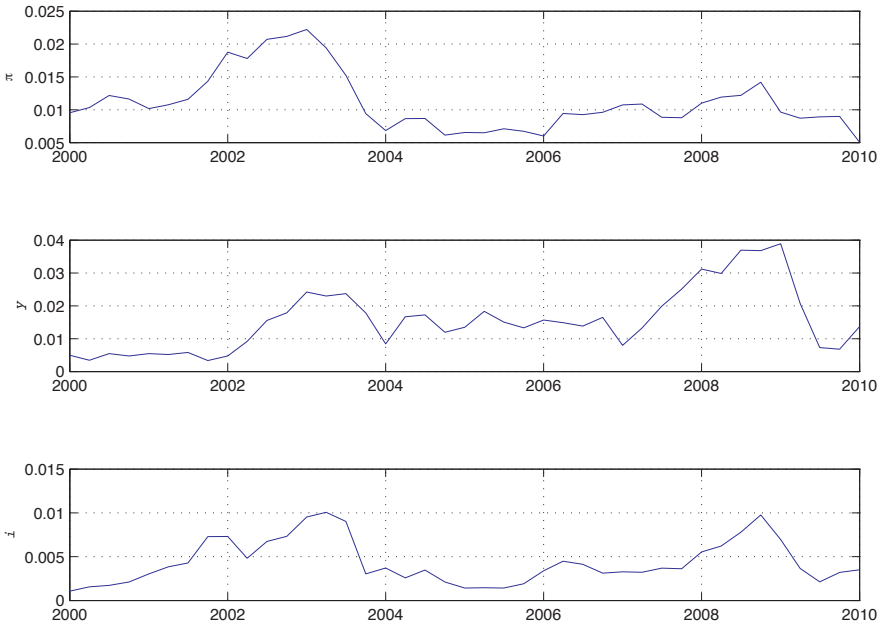

Figure 35: Classical VAR Model - Average 8-step ahead forecasts (2000q1 - 2011q4)

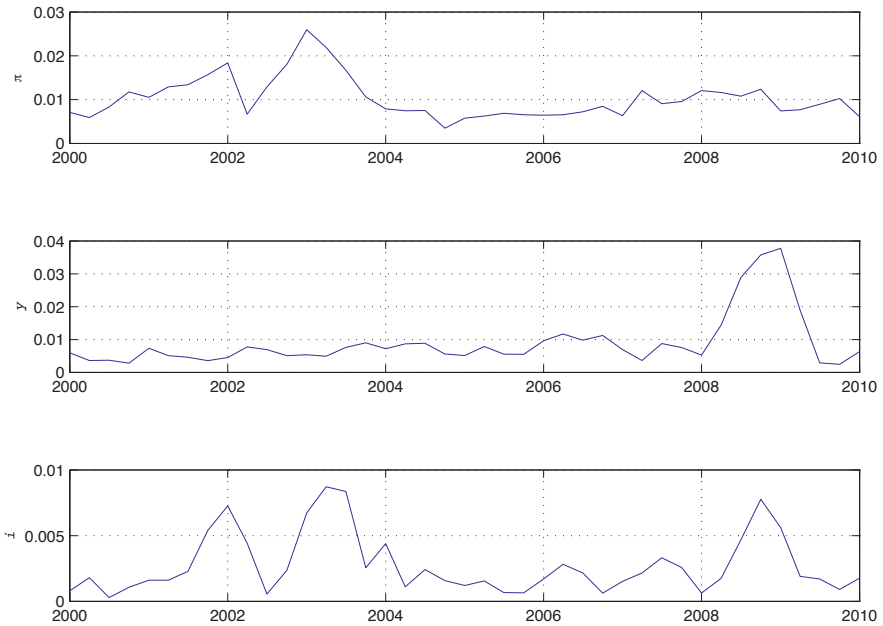

Figure 36: Classical VAR Model - Average 4-step ahead forecasts (2000q1 - 2011q4)

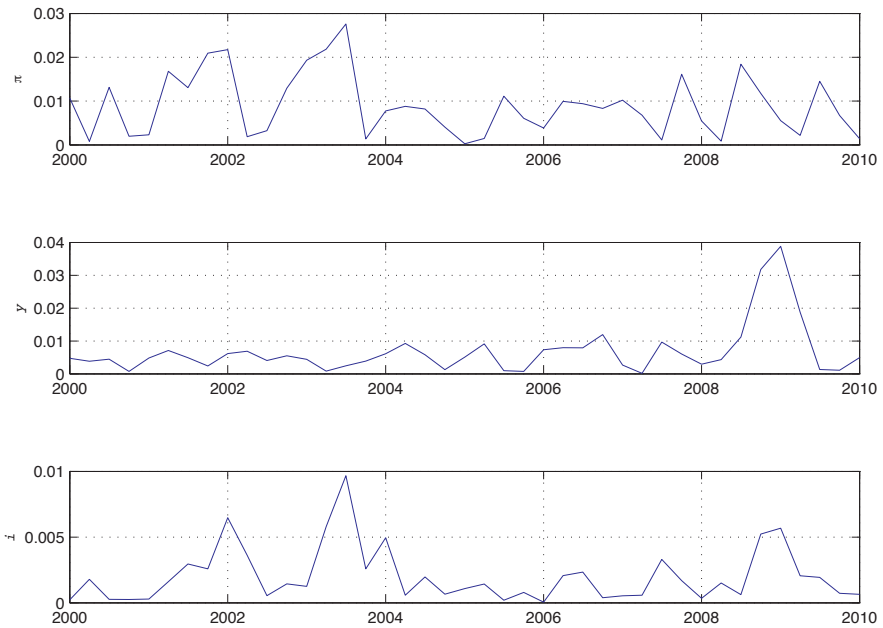

Figure 37: Classical VAR Model - 2-step ahead forecast (2000q1 - 2011q4)

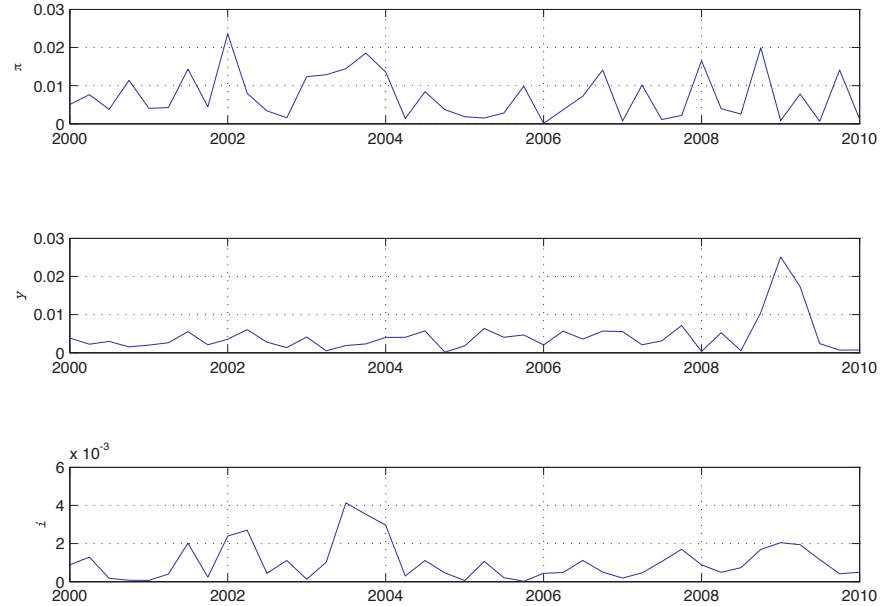

Figure 38: Classical VAR Model - 1-step ahead forecast (2000q1 - 2011q4)

10 Root Mean Square Error - Random-Walk Model

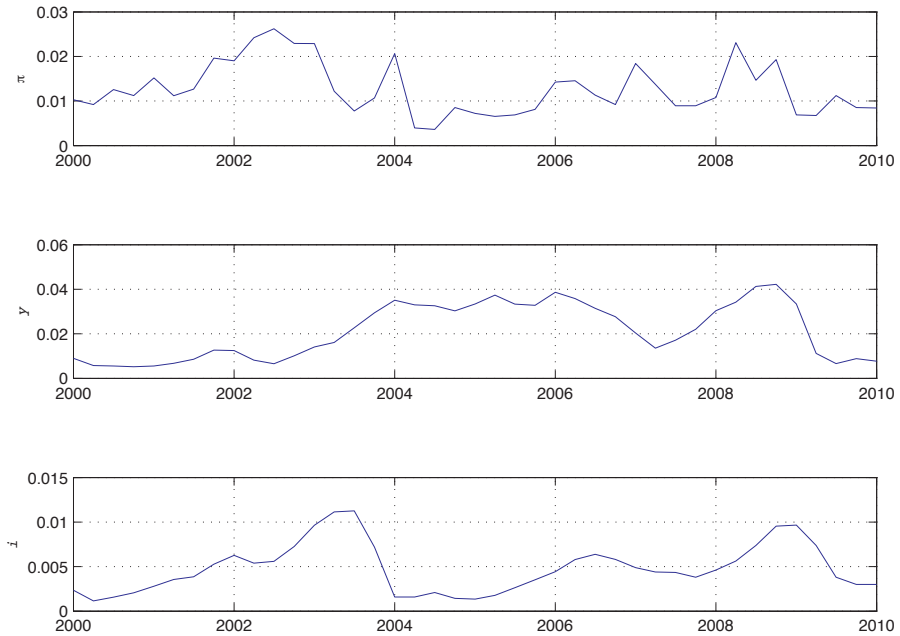

Figure 39: Random-Walk Model - Average 8-step ahead forecasts (2000q1 - 2011q4)

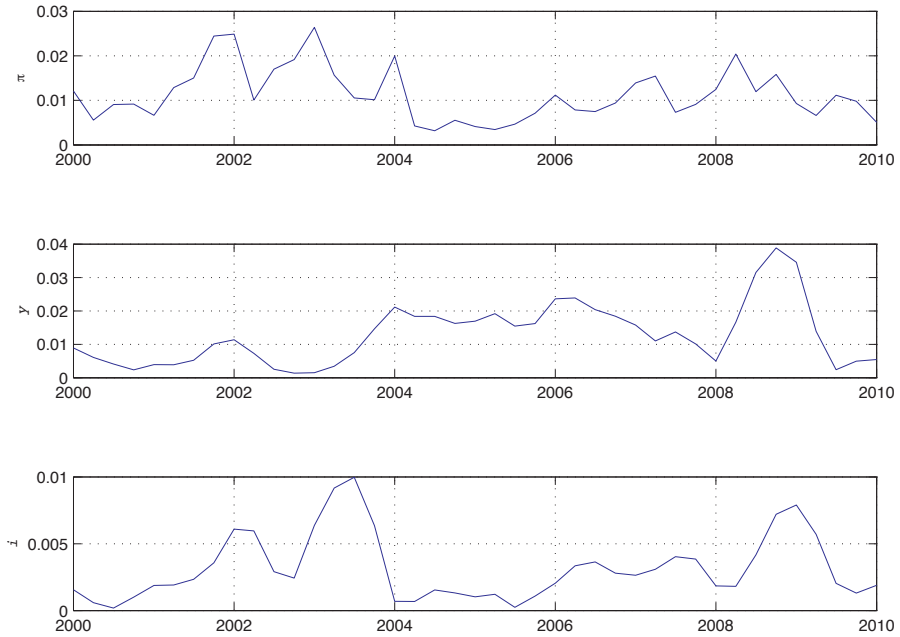

Figure 40: Random-Walk Model - Average 4-step ahead forecasts (2000q1 - 2011q4)

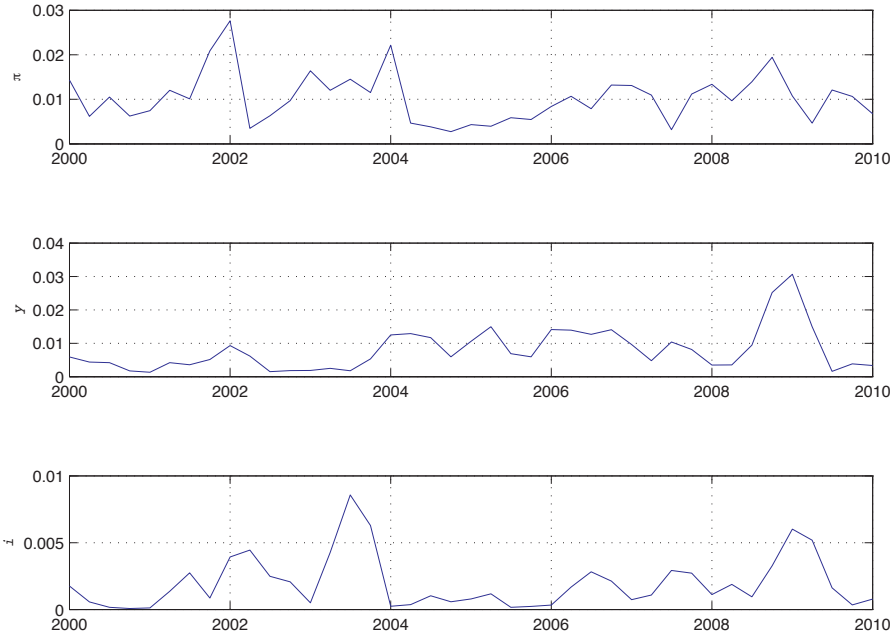

Figure 41: Random-Walk Model - 2-step ahead forecast (2000q1 - 2011q4)

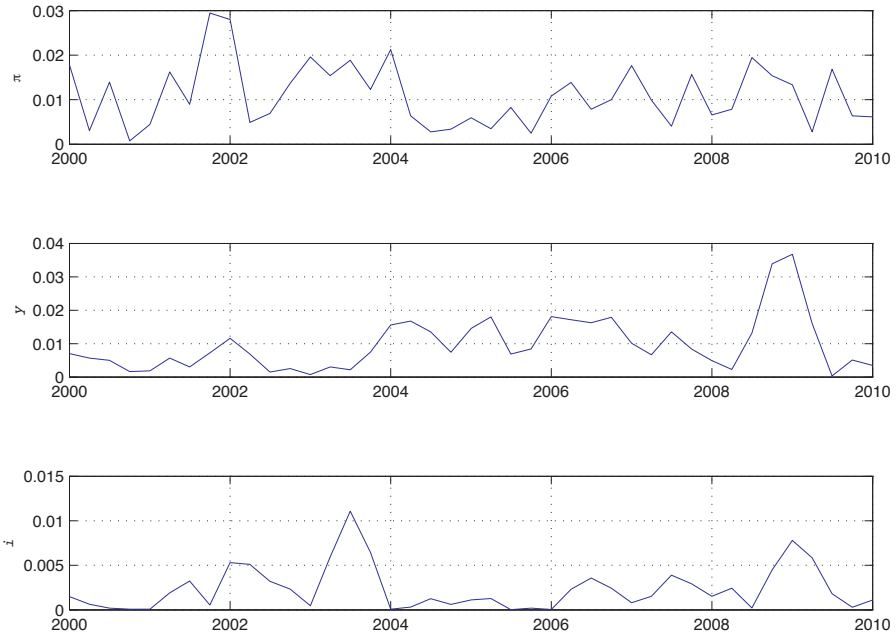

Figure 42: Random-Walk Model - 1-step ahead forecast (2000q1 - 2011q4)

TABLES[i]

Root Mean Square Error (Sum Over Time)
& Count of significant Diebold-Mariano Statistics (Over Time)

[i]Statistics for the relative root-mean-squared-error at each point in time, 2000Q1 - 2011Q4, are also available on request.

	8-step Ave	4-step Ave	2-step Ave	8-step	7-step	6-step	5-step	4-step	3-step	2-step	1-step
BVAR Min 1	0.44	0.41	0.36	0.41	0.41	0.41	0.41	0.40	0.37	0.36	0.29
BVAR Min 2	0.44	0.41	0.36	0.41	0.41	0.42	0.41	0.40	0.37	0.36	0.29
BVAR Min 3	0.45	0.41	0.36	0.41	0.42	0.42	0.41	0.40	0.38	0.36	0.29
BVAR Min 4	0.45	0.42	0.36	0.42	0.43	0.43	0.42	0.42	0.39	0.36	0.29
BVAR Min 5	0.45	0.41	0.36	0.42	0.42	0.42	0.42	0.41	0.38	0.36	0.29
BVAR Min 6	0.46	0.42	0.36	0.42	0.43	0.43	0.43	0.42	0.40	0.36	0.29
BVAR Min 7	0.45	0.42	0.36	0.43	0.43	0.43	0.42	0.41	0.38	0.36	0.29
BVAR Min 8	0.46	0.42	0.36	0.43	0.43	0.43	0.42	0.42	0.38	0.36	0.29
BVAR Min 9	0.47	0.43	0.36	0.44	0.44	0.44	0.44	0.43	0.40	0.36	0.29
BVAR Min 10	0.46	0.42	0.36	0.44	0.44	0.44	0.43	0.42	0.39	0.36	0.29
BVAR Min 11	0.47	0.43	0.36	0.44	0.44	0.44	0.44	0.44	0.41	0.37	0.29
BVAR Min 12	0.45	0.42	0.37	0.42	0.42	0.42	0.42	0.41	0.38	0.36	0.29
BVAR Min 13	0.45	0.42	0.36	0.42	0.43	0.43	0.42	0.41	0.38	0.36	0.29
BVAR SVS	0.45	0.42	0.36	0.42	0.43	0.43	0.42	0.41	0.39	0.36	0.29
BVAR No SVS	0.45	0.42	0.37	0.42	0.42	0.42	0.42	0.41	0.38	0.36	0.29
BVAR SVS TVP	0.45	0.42	0.36	0.42	0.42	0.43	0.42	0.41	0.39	0.36	0.29
BVAR SVS STB	0.45	0.41	0.36	0.42	0.42	0.42	0.42	0.41	0.38	0.36	0.29
BVAR SVS Lasso	0.45	0.42	0.36	0.42	0.43	0.43	0.42	0.42	0.39	0.36	0.29
Classic VAR	0.45	0.42	0.37	0.42	0.42	0.42	0.42	0.41	0.38	0.36	0.29
R Walk	0.52	0.47	0.42	0.43	0.47	0.53	0.52	0.44	0.45	0.45	0.33
Linear DSGE (Kalman)	0.45	0.39	0.35	0.41	0.43	0.43	0.41	0.37	0.35	0.35	0.28
Nonlinear DSGE (Part)	0.43	0.39	0.35	0.38	0.40	0.41	0.39	0.36	0.35	0.35	0.28

Table 1: CPI - Sum of Root Mean Square Errors (2000q1 - 2011q4)

	8-step Ave	4-step Ave	2-step Ave	8-step	7-step	6-step	5-step	4-step	3-step	2-step	1-step
BVAR Min 1	0.75	0.44	0.26	1.06	0.96	0.85	0.74	0.60	0.46	0.30	0.18
BVAR Min 2	0.75	0.44	0.26	1.06	0.97	0.85	0.74	0.61	0.47	0.31	0.18
BVAR Min 3	0.75	0.45	0.26	1.06	0.96	0.86	0.75	0.62	0.48	0.32	0.18
BVAR Min 4	0.76	0.46	0.27	1.07	0.97	0.87	0.76	0.63	0.49	0.33	0.18
BVAR Min 5	0.76	0.46	0.27	1.07	0.97	0.87	0.76	0.63	0.49	0.33	0.18
BVAR Min 6	0.77	0.46	0.28	1.07	0.97	0.88	0.77	0.64	0.50	0.34	0.18
BVAR Min 7	0.64	0.36	0.23	0.96	0.82	0.68	0.58	0.49	0.37	0.27	0.17
BVAR Min 8	0.65	0.37	0.24	0.97	0.84	0.71	0.60	0.50	0.39	0.28	0.17
BVAR Min 9	0.68	0.40	0.24	1.01	0.88	0.75	0.64	0.53	0.41	0.29	0.17
BVAR Min 10	0.67	0.39	0.25	0.99	0.86	0.73	0.62	0.52	0.41	0.29	0.18
BVAR Min 11	0.70	0.41	0.25	1.03	0.90	0.76	0.65	0.55	0.43	0.30	0.17
BVAR Min 12	0.63	0.36	0.23	0.96	0.82	0.68	0.57	0.48	0.37	0.27	0.17
BVAR Min 13	0.65	0.38	0.24	0.95	0.84	0.71	0.61	0.51	0.40	0.27	0.16
BVAR SVS	0.70	0.41	0.25	1.04	0.91	0.78	0.66	0.56	0.43	0.30	0.16
BVAR No SVS	0.63	0.36	0.23	0.95	0.82	0.67	0.57	0.48	0.37	0.27	0.17
BVAR SVS TVP	0.69	0.40	0.25	1.03	0.90	0.77	0.65	0.54	0.42	0.29	0.16
BVAR SVS STB	0.66	0.38	0.23	0.98	0.85	0.72	0.61	0.51	0.39	0.28	0.16
BVAR SVS Lasso	0.69	0.40	0.24	1.01	0.89	0.76	0.64	0.54	0.42	0.29	0.16
Classic VAR	0.63	0.36	0.23	0.96	0.82	0.68	0.57	0.48	0.37	0.27	0.17
R Walk	0.87	0.53	0.33	1.24	1.12	1.00	0.86	0.72	0.57	0.40	0.21
Linear DSGE (Kalman)	0.77	0.60	0.48	0.94	0.87	0.82	0.76	0.69	0.65	0.56	0.37
Nonlinear DSGE (Part)	0.65	0.40	0.27	0.93	0.82	0.71	0.61	0.53	0.42	0.33	0.18

Table 2: GDP - Sum of Root Mean Square Errors (2000q1 - 2011q4)

	8-step Ave	4-step Ave	2-step Ave	8-step	7-step	6-step	5-step	4-step	3-step	2-step	1-step
BVAR Min 1	0.17	0.11	0.07	0.22	0.22	0.20	0.19	0.15	0.12	0.08	0.04
BVAR Min 2	0.18	0.11	0.07	0.23	0.22	0.20	0.19	0.15	0.12	0.08	0.04
BVAR Min 3	0.18	0.12	0.07	0.23	0.23	0.21	0.19	0.16	0.13	0.09	0.04
BVAR Min 4	0.18	0.12	0.08	0.24	0.23	0.21	0.19	0.17	0.13	0.09	0.05
BVAR Min 5	0.18	0.12	0.07	0.24	0.23	0.21	0.19	0.16	0.13	0.09	0.04
BVAR Min 6	0.18	0.12	0.08	0.24	0.23	0.21	0.19	0.17	0.13	0.09	0.05
BVAR Min 7	0.17	0.11	0.06	0.23	0.22	0.20	0.19	0.15	0.12	0.08	0.04
BVAR Min 8	0.18	0.11	0.06	0.23	0.22	0.20	0.19	0.15	0.12	0.08	0.04
BVAR Min 9	0.18	0.12	0.07	0.24	0.23	0.21	0.19	0.16	0.13	0.09	0.04
BVAR Min 10	0.18	0.11	0.07	0.24	0.23	0.21	0.19	0.16	0.12	0.08	0.04
BVAR Min 11	0.18	0.12	0.07	0.24	0.23	0.21	0.19	0.16	0.13	0.09	0.04
BVAR Min 12	0.17	0.11	0.06	0.22	0.22	0.20	0.18	0.15	0.11	0.08	0.04
BVAR Min 13	0.17	0.11	0.07	0.21	0.21	0.19	0.18	0.15	0.12	0.09	0.05
BVAR SVS	0.17	0.11	0.07	0.22	0.22	0.20	0.19	0.15	0.12	0.08	0.04
BVAR No SVS	0.17	0.11	0.06	0.22	0.22	0.20	0.18	0.15	0.11	0.08	0.04
BVAR SVS TVP	0.17	0.11	0.07	0.22	0.21	0.20	0.18	0.15	0.12	0.09	0.04
BVAR SVS STB	0.17	0.11	0.07	0.23	0.22	0.20	0.19	0.15	0.12	0.08	0.04
BVAR SVS Lasso	0.17	0.11	0.07	0.22	0.22	0.20	0.19	0.15	0.12	0.08	0.04
Classic VAR	0.17	0.11	0.06	0.22	0.22	0.20	0.18	0.15	0.11	0.08	0.04
R Walk	0.20	0.13	0.08	0.30	0.25	0.23	0.21	0.17	0.14	0.10	0.05
Linear DSGE (Kalman)	0.21	0.13	0.08	0.28	0.26	0.25	0.22	0.18	0.14	0.10	0.05
Nonlinear DSGE (Part)	0.20	0.13	0.08	0.26	0.25	0.23	0.20	0.17	0.14	0.09	0.05

Table 3: Interest Rates - Sum of Root Mean Square Errors (2000q1 - 2011q4)

	8-step		7-step		6-step		5-step		4-step		3-step		2-step	
	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other
BVAR Min1	14	3	14	4	14	4	13	6	13	5	13	7	16	11
BVAR Min2	15	3	14	4	13	4	14	6	13	5	11	7	14	12
BVAR Min3	13	3	14	4	14	4	15	5	15	5	13	7	15	12
BVAR Min4	10	5	11	3	11	4	10	6	12	6	15	9	14	12
BVAR Min5	11	3	12	2	13	3	13	5	13	5	15	9	17	12
BVAR Min6	10	5	10	6	10	7	11	7	11	7	14	11	16	14
BVAR Min7	15	4	15	5	14	4	15	6	15	6	14	8	17	14
BVAR Min8	16	3	14	4	14	3	15	5	14	5	14	9	16	13
BVAR Min9	14	4	15	4	16	4	14	6	14	6	15	7	17	12
BVAR Min10	14	3	14	3	15	3	15	5	14	5	15	9	17	13
BVAR Min11	13	5	13	4	13	4	13	5	13	5	15	8	16	12
BVAR Min12	15	3	14	5	15	4	15	6	15	6	14	8	16	13
BVAR Min13	15	3	15	4	14	3	14	5	14	5	13	8	17	14
BVAR SVS	14	3	13	3	14	3	15	5	14	5	16	9	17	12
BVAR no SVS	15	3	14	5	15	4	15	6	15	6	14	8	16	13
BVAR SVS TVP	13	3	12	3	14	3	15	5	15	5	15	8	17	13
BVAR SVS STB	14	3	13	5	14	4	15	5	13	5	13	8	17	12
BVAR SVS Lasso	14	3	13	3	14	3	14	5	15	5	14	9	17	14
Classic VAR	15	3	14	5	15	4	15	6	15	6	14	8	16	13
R Walk	17	3	18	2	18	2	19	4	18	4	23	6	28	6
Linear DSGE	12	4	9	4	9	6	8	5	8	7	11	10	15	16

Table 4: CPI - Number of significant Diebold & Mariano Statistics (2000q1 - 2011q4)

	8-step		7-step		6-step		5-step		4-step		3-step		2-step	
	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other
BVAR Min1	17	10	15	10	14	13	13	12	13	10	12	12	14	19
BVAR Min2	17	10	16	10	14	13	14	12	13	11	12	12	13	18
BVAR Min3	17	10	15	10	15	12	15	11	14	12	13	12	15	17
BVAR Min4	19	8	17	9	15	10	15	9	15	9	13	10	17	15
BVAR Min5	18	8	16	9	15	10	15	9	15	9	12	10	17	14
BVAR Min6	18	7	16	9	16	9	16	9	15	9	15	10	17	13
BVAR Min7	10	14	9	14	11	17	8	16	13	16	12	18	13	20
BVAR Min8	12	14	11	14	13	16	10	14	13	16	12	18	13	20
BVAR Min9	14	14	13	14	12	16	12	14	14	15	12	17	13	23
BVAR Min10	14	14	12	14	12	16	10	14	12	16	12	17	14	21
BVAR Min11	14	14	13	14	12	16	12	14	13	15	12	18	14	23
BVAR Min12	9	14	8	15	9	17	7	16	12	15	12	18	13	21
BVAR Min13	14	14	14	15	12	16	11	16	12	16	10	16	11	18
BVAR SVS	14	13	14	12	13	15	12	14	14	15	12	14	13	21
BVAR no SVS	9	15	8	15	9	17	7	16	12	15	11	18	12	21
BVAR SVS TVP	14	13	14	13	13	15	13	13	13	16	10	17	12	21
BVAR SVS STB	14	13	13	15	12	16	11	14	13	15	11	17	12	22
BVAR SVS Lasso	14	13	14	14	13	16	14	14	15	16	12	17	13	20
Classic VAR	9	14	8	15	9	17	7	16	12	15	12	18	12	21
R Walk	21	5	20	5	21	8	22	7	22	9	20	9	23	13
Linear DSGE	13	6	17	5	21	5	22	5	24	4	25	5	28	6

Table 5: GDP - Number of significant Diebold & Mariano Statistics (2000q1 - 2011q4)

	8-step		7-step		6-step		5-step		4-step		3-step		2-step	
	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other	Nonlinear	Other
BVAR Min1	10	18	10	15	11	15	10	16	11	17	10	17	12	21
BVAR Min2	11	16	10	15	12	15	10	16	11	16	11	16	12	21
BVAR Min3	11	15	11	14	13	15	12	16	13	16	13	16	13	20
BVAR Min4	10	15	11	13	13	15	13	16	15	15	15	16	15	19
BVAR Min5	12	15	11	14	13	15	12	16	14	15	14	18	14	20
BVAR Min6	10	15	11	13	13	15	13	16	15	15	15	16	15	19
BVAR Min7	9	18	10	15	11	16	10	17	10	17	10	18	12	22
BVAR Min8	9	17	10	14	11	15	10	16	12	16	11	18	12	22
BVAR Min9	11	15	11	14	12	15	13	16	14	15	15	18	14	20
BVAR Min10	10	16	10	13	11	15	11	17	12	16	12	18	12	23
BVAR Min11	10	15	11	13	12	15	13	16	14	15	15	18	14	20
BVAR Min12	9	19	10	16	10	16	9	17	8	18	8	21	10	24
BVAR Min13	9	17	9	15	11	15	11	14	12	16	12	18	16	19
BVAR SVS	10	18	10	15	11	16	10	17	11	17	10	17	11	21
BVAR no SVS	9	19	10	16	10	16	9	17	8	18	8	21	10	24
BVAR SVS TVP	10	17	10	13	13	14	11	16	12	16	11	16	11	21
BVAR SVS STB	10	17	10	14	11	15	10	16	11	17	10	17	11	21
BVAR SVS Lasso	10	18	10	16	11	15	10	16	11	17	10	17	11	21
Classic VAR	9	19	10	16	10	16	9	17	8	18	8	21	10	24
R Walk	12	17	11	15	13	16	14	16	14	16	15	19	14	20
Linear DSGE	16	9	14	9	12	8	12	9	11	10	11	12	14	15

Table 6: Interest Rates - Number of significant Diebold & Mariano Statistics (2000q1 - 2011q4)