

BACKTESTING GLOBAL GROWTH-AT-RISK

ONLINE APPENDIX

Christian Andre

October 30, 2019

Estimation			h			
	Window		1	2	3	4
NFCI	1973Q1 2016Q4	Coef.	-0.49 [-0.79 -0.30]	-0.39 [-0.64 -0.16]	-0.33 [-0.47 0.00]	-0.22 [-0.34 0.06]
		Sig.	29.17	41.67	25.00	4.17
		ΔTL	0.00	0.00	0.00	0.00
TS	1973Q1 2016Q4	Coef.	0.31 [0.15 0.47]	0.33 [0.24 0.50]	0.29 [0.13 0.44]	0.28 [0.10 0.45]
		Sig.	25.00	29.17	20.83	25.00
		ΔTL	-5.47	-1.54	0.00	1.49
GF	1973Q1 2016Q4	Coef.	0.06 [0.02 0.11]	0.07 [0.04 0.12]	0.08 [0.00 0.12]	0.04 [-0.01 0.12]
		Sig.	4.17	12.50	12.50	8.33
		ΔTL	-7.85	-4.16	-1.76	-0.68
CS	1986Q2 2016Q4	Coef.	-0.27 [-0.50 -0.07]	-0.15 [-0.49 -0.01]	-0.04 [-0.27 0.07]	0.06 [-0.05 0.17]
		Sig.	16.67	4.17	0.00	0.00
		ΔTL	3.91	0.83	0.17	-0.26
HP	1973Q1 2016Q4	Coef.	0.13 [-0.04 0.34]	0.08 [-0.02 0.25]	0.11 [-0.05 0.32]	-0.02 [-0.26 0.19]
		Sig.	8.33	8.33	0.00	0.00
		ΔTL	-6.90	-4.27	-2.17	-0.94
SV	1973Q1 2016Q4	Coef.	-0.43 [-0.50 -0.24]	-0.28 [-0.66 -0.13]	0.03 [-0.15 0.13]	0.08 [-0.06 0.19]
		Sig.	8.33	8.33	0.00	0.00
		ΔTL	-1.42	-2.42	-2.24	-1.71
EPU	1985Q1 2016Q4	Coef.	-0.18 [-0.32 0.01]	0.03 [-0.07 0.20]	0.04 [-0.02 0.15]	0.04 [-0.22 0.28]
		Sig.	12.50	4.17	0.00	0.00
		ΔTL	1.41	0.14	-0.10	-0.71
CG	1973Q1 2016Q4	Coef.	-0.12 [-0.28 0.22]	-0.17 [-0.43 -0.02]	0.04 [-0.25 0.23]	-0.14 [-0.30 0.06]
		Sig.	4.17	0.00	4.17	4.17
		ΔTL	-8.42	-3.85	-3.42	-1.98
CR	1973Q1 2016Q4	Coef.	-0.11 [-0.29 0.07]	-0.05 [-0.42 0.04]	0.06 [-0.17 0.18]	-0.17 [-0.38 -0.02]
		Sig.	4.17	0.00	0.00	8.33
		ΔTL	-7.54	-4.29	-1.98	-1.43
WUI	1996Q1 2016Q4	Coef.	0.10 [-0.03 0.31]	0.18 [-0.01 0.30]	0.15 [-0.11 0.32]	0.13 [-0.17 0.42]
		Sig.	4.17	0.00	0.00	0.00
		ΔTL	-0.42	0.01	0.54	-0.49
GPR	1985Q1 2016Q4	Coef.	0.04 [-0.03 0.15]	0.05 [-0.01 0.19]	0.07 [-0.01 0.22]	0.17 [0.07 0.25]
		Sig.	0.00	0.00	0.00	0.00
		ΔTL	-2.45	-0.32	-2.80	-3.32

h	1				2				3				4			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Y_{it}	Coef. Sig.	0.11 12.50	0.13 12.50	0.07 4.17	0.01 4.17	0.13 12.50	0.13 8.33	0.12 0.00	0.13 4.17	0.07 0.00	-0.02 4.17	-0.02 4.17	0.01 0.00	-0.04 0.00	-0.06 4.17	-0.01 0.00
NFCI	Coef. Sig.	-0.49 29.17	-0.52 33.33	-0.52 45.83	-0.29 25.00	-0.39 41.67	-0.28 20.83	-0.31 20.83	-0.28 25.00	-0.16 20.83	-0.15 12.50	-0.24 16.67	-0.22 4.17	-0.10 8.33	-0.11 8.33	-0.03 12.50
TS	Coef. Sig.	- 8.33	0.22 8.33	0.24 12.50	0.20 16.67	- 16.67	0.25 12.50	0.27 16.67	0.25 20.83	0.28 20.83	0.22 20.83	0.26 20.83	- 20.83	0.32 20.83	0.28 25.00	0.27 20.83
GF	Coef. Sig.	- 8.33	- 8.33	0.04 4.17	0.01 0.00	- 0.00	- 8.33	0.06 4.17	0.04 8.33	- 8.33	0.06 16.67	0.05 12.50	- 8.33	- 8.33	0.02 8.33	0.03 0.00
SV	Coef. Sig.	- 8.33	- 8.33	- 8.33	-0.34 8.33	- 8.33	- 8.33	-0.03 4.17	-0.03 4.17	- 8.33	- 8.33	0.16 4.17	- 8.33	- 8.33	- 8.33	0.08 0.00
HP	Coef. Sig.	- 8.33	- 8.33	- 8.33	0.05 0.00	- 8.33	- 8.33	0.06 4.17	0.06 4.17	- 8.33	- 8.33	0.08 4.17	- 8.33	- 8.33	- 8.33	0.03 0.00
TL DQ Hits		0.1170 83.33	0.1135 87.50	0.1115 95.83	0.1050 91.67	0.1239 87.50	0.1196 95.83	0.1119 95.83	0.1276 87.50	0.1229 91.67	0.1192 91.67	0.1143 100.00	0.1298 95.83	0.1238 91.67	0.1204 100.00	0.1164 95.83

	GARCH	GJR-GARCH	F-GARCH
ϕ	0.104 [-0.014 0.332]	0.104 [-0.014 0.332]	0.104 [-0.014 0.332]
λ	—	—	0.512 [0.381 0.617]
σ_u^2	1.257 [0.935 1.833]	1.257 [0.935 1.833]	1.257 [0.935 1.833]
Pers.	0.927 [0.826 0.982]	0.936 [0.822 0.980]	0.973 [0.935 0.985]
β	0.696 [0.460 0.759]	0.684 [0.453 0.754]	0.751 [0.658 0.896]
γ	—	0.086 [-0.097 0.146]	—
Skew.	-0.053 [-0.224 0.238]	-0.047 [-0.275 0.305]	-0.031 [-0.205 0.238]
Kurt.	4.552 [3.942 5.853]	4.346 [3.742 6.386]	4.669 [3.656 5.755]
LR Test	100.00	100.00	100.00
ARCH-LM	95.83	95.83	100.00
TL	0.1193	0.1199	0.1167
DQ Hits	91.67	83.33	95.83

h	Method	Model	Cov.	Length	Unc.	Hits	NFCI	Real	TL
1	Benchmark	Historical	94.44	5.422	87.50	41.67	66.67	75.00	0.1398
	QR	NFCI	92.77	5.170	79.17	50.00	79.17	70.83	3.88
		NFCI + TS	91.10	5.111	75.00	45.83	62.50	70.83	0.46
		NFCI + TS + GF	91.16	5.126	79.17	54.17	70.83	66.67	-0.53
		Full	90.91	5.231	66.67	58.33	62.50	66.67	-15.12
		LASSO	90.18	5.169	62.50	50.00	66.67	54.17	-5.21
	GARCH	GARCH	93.34	5.115	91.67	70.83	95.83	95.83	11.97
		GJR-GARCH	93.31	5.116	95.83	70.83	91.67	95.83	11.79
		F-GARCH	93.47	5.130	83.33	66.67	87.50	87.50	14.86
2	Benchmark	Historical	94.47	5.427	91.67	91.67	91.67	87.50	0.1410
	QR	NFCI	92.75	5.257	83.33	75.00	87.50	79.17	0.47
		NFCI + TS	91.51	5.214	87.50	79.17	87.50	79.17	-3.61
		NFCI + TS + GF	91.79	5.236	87.50	83.33	83.33	70.83	-4.66
		Full	90.74	5.228	70.83	87.50	62.50	79.17	-37.07
		LASSO	90.17	5.154	75.00	70.83	70.83	70.83	-8.00
	GARCH	GARCH	93.35	5.185	87.50	87.50	91.67	91.67	6.57
		GJR-GARCH	93.32	5.184	87.50	87.50	95.83	91.67	6.15
		F-GARCH	93.23	5.192	87.50	83.33	83.33	95.83	6.15
3	Benchmark	Historical	94.36	5.433	91.67	87.50	95.83	87.50	0.1420
	QR	NFCI	92.69	5.314	79.17	83.33	79.17	75.00	-3.74
		NFCI + TS	91.19	5.240	79.17	75.00	70.83	83.33	-8.30
		NFCI + TS + GF	91.25	5.278	79.17	70.83	83.33	83.33	-9.15
		Full	90.13	5.282	79.17	79.17	83.33	75.00	-30.04
		LASSO	89.33	5.151	70.83	79.17	66.67	70.83	-15.65
	GARCH	GARCH	92.98	5.225	95.83	87.50	95.83	83.33	2.37
		GJR-GARCH	92.92	5.224	95.83	87.50	100.00	79.17	2.00
		F-GARCH	92.82	5.217	95.83	91.67	87.50	83.33	2.78
4	Benchmark	Historical	94.32	5.440	91.67	95.83	91.67	91.67	0.1427
	QR	NFCI	92.09	5.324	87.50	83.33	79.17	87.50	-11.09
		NFCI + TS	90.70	5.253	83.33	87.50	70.83	91.67	-10.89
		NFCI + TS + GF	90.28	5.217	79.17	91.67	66.67	87.50	-13.41
		Full	87.98	5.166	70.83	66.67	70.83	62.50	-53.26
		LASSO	87.47	5.067	58.33	70.83	66.67	70.83	-24.77
	GARCH	GARCH	92.93	5.247	83.33	91.67	87.50	87.50	-0.16
		GJR-GARCH	92.86	5.247	83.33	95.83	87.50	87.50	-0.16
		F-GARCH	92.93	5.233	91.67	75.00	83.33	95.83	1.09

h	Country	Historical				QR NCFI				GARCH			
		Cov.	Length	Unc.	TL	Cov.	Length	Unc.	TL	Cov.	Length	Unc.	TL
1	AUS	99.24	5.016	0.025	0.0943	99.24	5.015	0.025	0.0958	96.21	4.431	0.523	0.0734***
	CAN	95.45	3.728	0.811	0.0937	94.70	3.365	0.873	0.0684***	90.91	3.263	0.031	0.0714***
	DEU	96.21	4.792	0.523	0.1291	95.45	4.508	0.811	0.1165*	95.45	4.714	0.811	0.1265
	ESP	90.15	5.182	0.011	0.1045	91.67	5.209	0.079	0.1032	92.42	5.052	0.175	0.0700***
	FRA	93.18	3.804	0.338	0.0628	90.15	3.693	0.011	0.0504	93.94	3.872	0.576	0.0570
	GBR	97.73	5.359	0.151	0.1007	96.21	5.230	0.523	0.0813*	96.21	4.844	0.523	0.0803***
	ITA	90.91	3.735	0.031	0.0922	95.45	3.730	0.811	0.0796	91.67	3.535	0.079	0.0599*
	JPN	87.12	4.616	0.000	0.1464	88.64	4.753	0.001	0.1357	90.91	4.994	0.031	0.1245
	KOR	97.73	9.091	0.151	0.2191	96.97	8.501	0.299	0.2116	95.45	7.832	0.811	0.1870**
	MEX	93.18	4.201	0.338	0.2137	96.97	4.236	0.299	0.1604*	90.15	3.878	0.011	0.1869
2	SWE	97.73	5.796	0.151	0.1352	92.42	5.682	0.175	0.1577	96.21	5.514	0.523	0.1251*
	USA	97.73	3.377	0.151	0.0909	93.94	2.929	0.576	0.0705***	95.45	2.841	0.811	0.0685***
	AUS	99.24	5.023	0.026	0.0940	99.24	5.097	0.026	0.1006	96.95	4.501	0.276	0.0726***
	CAN	96.18	3.733	0.649	0.0949	93.13	3.404	0.473	0.0930	92.37	3.288	0.271	0.0867
	DEU	96.18	4.802	0.558	0.1279	94.66	4.680	0.869	0.1313	95.42	4.817	0.830	0.1406
	ESP	90.08	5.185	0.164	0.1076	88.55	5.050	0.052	0.0921**	91.60	5.013	0.243	0.0923**
	FRA	93.13	3.811	0.505	0.0648	93.13	3.970	0.511	0.0615	96.95	4.134	0.505	0.0622
	GBR	97.71	5.365	0.277	0.1019	94.66	5.092	0.916	0.0861*	95.42	4.880	0.883	0.0941
	ITA	90.84	3.739	0.237	0.0939	94.66	3.878	0.901	0.0950	91.60	3.661	0.270	0.0837
	JPN	87.02	4.617	0.000	0.1492	87.79	4.921	0.001	0.1411	87.79	4.996	0.000	0.1497
3	KOR	97.71	9.084	0.141	0.2186	96.95	8.455	0.276	0.2082	95.42	7.947	0.826	0.2058
	MEX	93.13	4.218	0.498	0.2215	93.89	4.619	0.584	0.2274	90.84	3.773	0.038	0.2285
	SWE	97.71	5.801	0.195	0.1349	96.95	5.869	0.400	0.1400	96.95	5.598	0.400	0.1327
	USA	97.71	3.384	0.250	0.0921	91.60	3.020	0.204	0.0782***	96.18	2.876	0.601	0.0751***
	AUS	99.23	5.030	0.026	0.0942	100.00	5.015	0.009	0.0929	98.46	4.585	0.066	0.0778***
	CAN	96.15	3.739	0.659	0.0954	92.31	3.581	0.373	0.0897	91.54	3.323	0.263	0.0948
	DEU	96.92	4.811	0.349	0.1268	96.92	4.659	0.349	0.1274	96.92	4.894	0.349	0.1392
	ESP	90.00	5.187	0.160	0.1098	84.62	5.084	0.038	0.1225	89.23	5.037	0.135	0.1068
	FRA	93.08	3.816	0.495	0.0663	93.85	3.939	0.686	0.0722	96.15	4.162	0.690	0.0710
	GBR	97.69	5.370	0.283	0.1035	96.15	5.242	0.693	0.0985	96.15	4.942	0.690	0.1034
4	ITA	90.77	3.743	0.231	0.0953	84.62	3.632	0.005	0.1139	90.00	3.708	0.128	0.0950
	JPN	86.92	4.617	0.000	0.1501	88.46	4.845	0.001	0.1443	90.77	5.044	0.047	0.1384
	KOR	97.69	9.093	0.144	0.2191	96.92	8.501	0.283	0.2106	94.62	8.069	0.866	0.2042
	MEX	93.85	4.233	0.665	0.2229	96.15	4.733	0.567	0.2092	88.46	3.693	0.017	0.2532
	SWE	97.69	5.806	0.200	0.1362	98.46	5.936	0.105	0.1429	96.92	5.679	0.408	0.1360
	USA	96.92	3.390	0.500	0.0923	96.92	3.262	0.408	0.0844*	95.38	2.945	0.895	0.0835
	AUS	99.22	5.036	0.027	0.0945	99.22	5.081	0.027	0.0965	98.45	4.652	0.068	0.0806***
	CAN	96.12	3.744	0.669	0.0960	96.12	3.845	0.669	0.0953	93.02	3.364	0.527	0.0992
	DEU	96.90	4.819	0.357	0.1264	95.35	4.612	0.859	0.1269	97.67	4.943	0.205	0.1377
	ESP	89.92	5.189	0.155	0.1102	81.40	5.043	0.026	0.1542	89.92	5.068	0.205	0.1142
5	FRA	93.02	3.822	0.485	0.0662	89.92	3.909	0.256	0.0781	96.12	4.202	0.699	0.0744
	GBR	97.67	5.376	0.288	0.1039	95.35	5.159	0.906	0.1006	96.12	4.991	0.699	0.1078
	ITA	90.70	3.746	0.226	0.0951	86.82	3.606	0.009	0.1145	91.47	3.760	0.253	0.1025
	JPN	86.82	4.617	0.000	0.1508	89.92	4.893	0.057	0.1525	92.25	5.068	0.299	0.1381
	KOR	97.67	9.102	0.148	0.2194	96.12	8.537	0.582	0.2376	95.35	8.092	0.883	0.2026
	MEX	93.80	4.248	0.655	0.2239	96.90	4.813	0.357	0.2029	87.60	3.637	0.007	0.2503
	SWE	97.67	5.811	0.205	0.1363	96.12	5.905	0.622	0.1560	97.67	5.747	0.261	0.1418
	USA	97.67	3.396	0.288	0.0926	94.57	3.154	0.874	0.0946	95.35	3.003	0.906	0.0878

h	Method	Model	Cov.	Length	Unc.	Hits	NFCI	Real
1	Benchmark	Historical	90.91	7.976	0.031	0.003	0.025	0.121
	QR + Bonf.	NFCI	51.52	6.111	0.000	0.000	0.000	0.000
		NFCI + TS	39.39	5.893	0.000	0.000	0.000	0.000
		NFCI + TS + GF	34.85	5.694	0.000	0.000	0.000	0.000
		Full	25.76	5.649	0.000	0.000	0.000	0.000
		LASSO	32.58	6.556	0.000	0.000	0.000	0.000
	GARCH + Marg.	GARCH	35.61	5.115	0.000	0.000	0.000	0.000
		GJR-GARCH	36.36	5.116	0.000	0.000	0.000	0.000
		F-GARCH	33.33	5.130	0.000	0.000	0.000	0.000
	GARCH + Bonf.	GARCH	87.12	7.320	0.000	0.000	0.000	0.000
		GJR-GARCH	86.36	7.293	0.000	0.000	0.000	0.000
		F-GARCH	85.61	7.302	0.000	0.000	0.000	0.000
	GARCH + BJPR	GARCH	94.70	7.747	0.873	0.021	0.623	0.455
		GJR-GARCH	94.70	7.708	0.873	0.021	0.623	0.455
		F-GARCH	95.45	7.605	0.811	0.319	0.579	0.872
2	Benchmark	Historical	90.08	7.949	0.042	0.999	0.042	0.133
	QR + Bonf.	NFCI	54.20	6.595	0.000	0.999	0.007	0.000
		NFCI + TS	39.69	6.176	0.000	0.000	0.000	0.000
		NFCI + TS + GF	45.80	6.122	0.000	0.000	0.000	0.000
		Full	33.59	5.922	0.000	0.000	0.000	0.000
		LASSO	37.40	7.290	0.000	0.000	0.000	0.000
	GARCH + Marg.	GARCH	38.17	5.185	0.000	0.999	0.000	0.999
		GJR-GARCH	38.17	5.184	0.000	0.000	0.000	0.999
		F-GARCH	40.46	5.192	0.000	0.999	0.000	0.000
	GARCH + Bonf.	GARCH	92.37	7.919	0.310	0.999	0.753	0.889
		GJR-GARCH	93.13	7.887	0.460	0.999	0.009	0.639
		F-GARCH	91.60	7.835	0.199	0.999	0.572	0.016
	GARCH + BJPR	GARCH	94.66	8.152	0.899	0.999	0.591	0.999
		GJR-GARCH	94.66	8.121	0.899	0.999	0.591	0.999
		F-GARCH	93.89	7.930	0.687	0.483	0.507	0.667
3	Benchmark	Historical	90.00	7.909	0.054	0.999	0.012	0.999
	QR + Bonf.	NFCI	51.54	6.570	0.000	0.999	0.000	0.000
		NFCI + TS	38.46	6.267	0.000	0.000	0.000	0.000
		NFCI + TS + GF	36.92	6.109	0.000	0.000	0.000	0.000
		Full	33.08	5.932	0.000	0.000	0.000	0.000
		LASSO	33.85	7.146	0.000	0.000	0.000	0.000
	GARCH + Marg.	GARCH	39.23	5.225	0.000	0.999	0.000	0.000
		GJR-GARCH	39.23	5.224	0.000	0.999	0.000	0.000
		F-GARCH	39.23	5.217	0.000	0.000	0.000	0.000
	GARCH + Bonf.	GARCH	91.54	8.323	0.237	0.999	0.999	0.999
		GJR-GARCH	91.54	8.287	0.237	0.999	0.999	0.999
		F-GARCH	93.85	8.108	0.631	0.862	0.322	0.871
	GARCH + BJPR	GARCH	95.38	8.503	0.874	0.033	0.509	0.917
		GJR-GARCH	95.38	8.470	0.874	0.033	0.509	0.917
		F-GARCH	96.15	8.157	0.605	0.982	0.532	0.946
4	Benchmark	Historical	87.60	7.905	0.021	0.999	0.090	0.223
	QR + Bonf.	NFCI	48.06	6.587	0.000	0.000	0.000	0.000
		NFCI + TS	36.43	6.248	0.000	0.000	0.000	0.000
		NFCI + TS + GF	37.21	6.136	0.000	0.000	0.000	0.000
		Full	21.71	5.856	0.000	0.000	0.000	0.000
		LASSO	30.23	7.019	0.000	0.000	0.000	0.000
	GARCH + Marg.	GARCH	36.43	5.247	0.000	0.000	0.000	0.000
		GJR-GARCH	36.43	5.247	0.000	0.000	0.000	0.000
		F-GARCH	37.21	5.233	0.000	0.005	0.999	0.000
	GARCH + Bonf.	GARCH	93.80	8.641	0.650	0.619	0.669	0.809
		GJR-GARCH	93.02	8.608	0.512	0.528	0.636	0.886
		F-GARCH	93.02	8.323	0.500	0.845	0.682	0.730
	GARCH + BJPR	GARCH	95.35	8.732	0.886	0.316	0.619	0.900
		GJR-GARCH	95.35	8.693	0.886	0.316	0.619	0.900
		F-GARCH	94.57	8.311	0.864	0.513	0.489	0.802