

Supplementary Appendix for
“On the Forecasting Accuracy of Multivariate GARCH
Models”

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Appendix A: Supplementary tables to Section 4

Table A.1: MCS - Dot-com bubble burst (1/04/99 - 31/03/03)

Euclidean distance (38 models)								Stein distance (2 models)							
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
CCC	Egarch (0,1)	27	2.821	0.985	0.37	1.031	0.999	DCCE	Igarch (1,1)	1	3.268	-	1.00	0.999	0.999
	(1,1)	41	2.844	1.170	0.29	1.150	0.996	DCCT	Igarch (1,1)	2	3.274	1.212	0.27	1.003	1.000
DCCA	Egarch (0,1)	6	2.776	0.335	0.83	0.988	0.999	<i>CCC</i>	<i>Igarch (1,1)</i>	<i>3</i>	<i>3.283</i>	-	-	-	-
	(0,2)	18	2.801	0.588	0.65	1.030	0.999	<i>DCCA</i>	<i>Igarch (1,1)</i>	<i>4</i>	<i>3.293</i>	-	-	-	-
	(1,1)	20	2.806	0.510	0.68	1.117	0.997	<i>DCCE</i>	<i>Figarch (1,1)</i>	<i>5</i>	<i>3.439</i>	-	-	-	-
	(1,2)	17	2.799	0.545	0.66	1.012	0.999	<i>DCCT</i>	<i>Figarch (1,1)</i>	<i>6</i>	<i>3.444</i>	-	-	-	-
	Figarch (1,1)	22	2.810	0.372	0.79	0.820	0.989	<i>DCCE</i>	<i>Hgarch (1,1)</i>	<i>7</i>	<i>3.446</i>	-	-	-	-
DCCT	Egarch (0,1)	23	2.811	0.658	0.57	1.026	0.999	<i>DCCT</i>	<i>Hgarch (1,1)</i>	<i>8</i>	<i>3.454</i>	-	-	-	-
	(1,1)	31	2.834	0.779	0.49	1.146	0.996	<i>DCCE</i>	<i>Rm (1,1)</i>	<i>9</i>	<i>3.455</i>	-	-	-	-
	Figarch (1,1)	44	2.849	0.839	0.45	0.855	0.989	<i>DCCE</i>	<i>Egarch (1,2)</i>	<i>10</i>	<i>3.456</i>	-	-	-	-
DCCE	Egarch (0,1)	4	2.769	0.226	0.84	1.011	0.999	<i>L₃ loss function (11 models)</i>							
	(0,2)	13	2.794	0.404	0.77	1.052	0.999	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
	(1,1)	19	2.804	0.430	0.75	1.127	0.997	Aparch (1,1)	1	16.394	-	1.00	0.918	0.999	
	(1,2)	10	2.783	0.331	0.83	1.019	0.999	Egarch (0,1)	2	16.568	0.887	0.47	0.983	0.999	
	(2,2)	33	2.837	1.028	0.35	1.118	0.997	(0,2)	3	16.664	0.688	0.47	1.031	1.000	
	Figarch (1,1)	14	2.796	0.343	0.83	0.832	0.990	(1,1)	9	17.035	1.192	0.27	1.117	0.999	
	Gjr (2,1)	39	2.841	1.242	0.26	0.967	0.994	(1,2)	7	16.918	0.996	0.33	1.082	0.999	
DECO	Egarch (0,1)	1	2.751	-	1.00	0.948	0.999	(2,2)	11	17.086	1.353	0.27	1.121	0.998	
	(0,2)	7	2.776	0.290	0.83	0.991	0.999	Orth.							
	(1,1)	5	2.775	0.281	0.84	1.066	0.998	Garch (2,2)	13	17.235	1.235	0.27	1.007	0.991	
	(1,2)	2	2.760	0.322	0.88	0.961	0.999	Gjr (1,1)	4	16.733	1.255	0.33	0.876	0.998	
	(2,1)	30	2.832	0.721	0.53	1.136	0.996	(1,2)	5	16.737	2.285	0.33	0.891	0.999	
	(2,2)	21	2.807	0.605	0.62	1.055	0.998	(2,1)	8	17.012	1.394	0.27	0.998	0.998	
	Figarch (1,1)	26	2.818	0.470	0.71	0.779	0.985	(2,2)	6	16.797	1.288	0.33	0.985	0.998	
	Gjr (1,1)	43	2.848	1.125	0.30	0.875	0.993								
	(2,1)	37	2.838	0.934	0.40	0.900	0.994								
Orth.	Aparch (1,1)	3	2.764	0.089	0.88	0.976	0.992								
	Egarch (0,1)	12	2.789	0.303	0.83	1.047	0.994								
	(0,2)	16	2.797	0.364	0.79	1.083	0.996								
	(1,1)	29	2.831	0.847	0.45	1.133	0.997								
	(1,2)	25	2.817	0.604	0.62	1.099	0.996								
	(2,2)	34	2.837	0.983	0.37	1.135	0.996								
	Garch (2,1)	35	2.837	0.723	0.53	1.052	0.991								
	(2,2)	24	2.815	0.567	0.65	1.044	0.993								
	Gjr (1,1)	8	2.779	0.242	0.83	0.926	0.991								
	(1,2)	9	2.780	0.256	0.83	0.933	0.992								
	(2,1)	15	2.797	0.392	0.77	0.995	0.995								
(2,2)	11	2.785	0.280	0.83	0.991	0.994									

Note. Rnk: model i 's ranking position based on average sample performances, \bar{L}_i (out of 125 models); \bar{L}_i : model i 's average sample performance; T_D : deviation statistic; p-val: MCS p-value; $VR \equiv Var(\bar{L}_i)/Var(\bar{L})$ ratio between the variance of model i 's loss and the average loss (across models); $Corr \equiv Corr(\bar{L}_i, \bar{L})$ correlation between model i 's loss and the average loss (across models). The values reported for L_E and L_3 are the average loss per element of the forecast error matrix considered, i.e. the total loss is divided by $N(N+1)/2$ and N^2 respectively. For L_S , where the distance is measured in relative terms, the total loss is reported.

Table A.2: MCS - Calm period (1/04/03 - 31/07/07)

Euclidean distance (74 models)							L_3 loss function (74 models)								
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
CCC	Aparch (1,1)	2	0.328	6.224	0.73	0.884	0.969	CCC	Aparch (1,1)	2	0.631	1.090	0.49	0.792	0.910
	Egarch (0,1)	9	0.345	0.695	0.73	0.975	0.997		Egarch (0,1)	22	0.718	3.320	0.49	1.005	0.997
	(0,2)	33	0.348	0.456	0.73	1.042	0.992		(0,2)	52	0.756	1.586	0.49	1.391	0.961
	(1,1)	18	0.346	0.895	0.73	1.098	0.982		(1,1)	63	0.784	0.882	0.49	1.777	0.918
	(1,2)	28	0.347	0.771	0.73	1.061	0.980		(1,2)	61	0.783	1.015	0.49	1.745	0.917
	(2,1)	7	0.344	0.967	0.73	1.082	0.987		(2,1)	57	0.772	1.327	0.49	1.615	0.936
	Figarch (1,1)	25	0.347	0.447	0.73	0.992	0.996		Figarch (1,1)	31	0.731	0.731	0.49	1.025	0.998
	Garch (1,1)	50	0.350	0.467	0.67	1.009	0.997		Garch (1,1)	34	0.732	0.725	0.48	0.998	0.997
	(1,2)	46	0.350	0.446	0.68	1.021	0.997		(1,2)	40	0.739	0.752	0.44	1.050	0.998
	(2,1)	26	0.347	0.439	0.73	1.014	0.997		(2,1)	42	0.740	0.731	0.46	1.081	0.996
(2,2)	11	0.345	0.612	0.73	0.982	0.998	(2,2)	23	0.718	0.873	0.49	0.980	0.999		
Gjr (1,1)	91	0.374	0.923	0.37	1.237	0.957	Gjr (1,2)	95	0.876	0.947	0.34	2.098	0.897		
(1,2)	85	0.372	0.619	0.54	1.260	0.961	Hgarch (1,1)	49	0.747	0.825	0.39	1.043	0.996		
Hgarch (1,1)	55	0.351	0.454	0.68	0.940	0.995	Igarch (1,1)	93	0.874	0.852	0.38	1.352	0.791		
Rm (1,1)	65	0.356	0.507	0.63	0.990	0.967	Rm (1,1)	15	0.674	4.335	0.49	0.823	0.912		
DCCA	Aparch (1,1)	4	0.329	3.590	0.73	0.884	0.970	DCCA	Aparch (1,1)	4	0.638	6.954	0.49	0.790	0.910
	Egarch (0,1)	20	0.346	0.497	0.73	0.977	0.997		Egarch (0,1)	29	0.727	0.840	0.49	1.009	0.997
	(0,2)	40	0.349	0.422	0.71	1.044	0.991		(0,2)	55	0.767	0.723	0.49	1.407	0.958
	(1,1)	32	0.348	0.626	0.73	1.101	0.981		(1,1)	71	0.794	0.748	0.49	1.801	0.915
	(1,2)	38	0.349	0.517	0.73	1.064	0.980		(1,2)	70	0.794	0.730	0.49	1.770	0.913
	(2,1)	16	0.346	0.869	0.73	1.084	0.986		(2,1)	60	0.781	0.787	0.49	1.635	0.934
	Figarch (1,1)	30	0.347	0.445	0.73	0.992	0.996		Figarch (1,1)	37	0.737	0.741	0.45	1.031	0.998
	Garch (1,1)	56	0.351	0.497	0.64	1.010	0.997		Garch (1,1)	38	0.738	0.767	0.43	1.000	0.997
	(1,2)	53	0.351	0.488	0.65	1.021	0.997		(1,2)	47	0.745	0.859	0.38	1.054	0.998
	(2,1)	35	0.348	0.437	0.68	1.015	0.997		(2,1)	50	0.748	0.811	0.40	1.086	0.996
(2,2)	19	0.346	0.504	0.73	0.983	0.998	(2,2)	28	0.727	0.736	0.49	0.983	0.999		
Gjr (1,1)	93	0.374	1.134	0.27	1.238	0.957	Hgarch (1,1)	51	0.749	0.840	0.38	1.051	0.995		
(1,2)	89	0.373	0.830	0.41	1.262	0.960	Igarch (1,2)	97	0.882	1.097	0.26	1.345	0.792		
Hgarch (1,1)	49	0.350	0.439	0.69	0.942	0.995	Rm (1,1)	18	0.677	3.386	0.49	0.818	0.914		
Rm (1,1)	64	0.356	0.482	0.65	0.989	0.967									
DCCCT	Aparch (1,1)	1	0.328	-	1.00	0.884	0.970	DCCCT	Aparch (1,1)	1	0.631	-	1.00	0.791	0.910
	Egarch (0,1)	8	0.345	0.710	0.73	0.975	0.997		Egarch (0,1)	24	0.718	4.498	0.49	1.007	0.997
	(0,2)	31	0.348	0.471	0.73	1.042	0.991		(0,2)	53	0.757	1.150	0.49	1.398	0.960
	(1,1)	17	0.346	1.031	0.73	1.098	0.982		(1,1)	64	0.784	0.934	0.49	1.785	0.916
	(1,2)	29	0.347	0.723	0.73	1.061	0.980		(1,2)	62	0.784	0.880	0.49	1.754	0.915
	(2,1)	6	0.344	0.959	0.73	1.082	0.987		(2,1)	58	0.773	2.041	0.49	1.622	0.935
	Figarch (1,1)	22	0.347	0.490	0.73	0.991	0.997		Figarch (1,1)	30	0.731	0.749	0.49	1.027	0.998
	Garch (1,1)	48	0.350	0.442	0.67	1.009	0.997		Garch (1,1)	32	0.732	0.733	0.49	0.999	0.997
	(1,2)	39	0.349	0.439	0.67	1.021	0.997		(1,2)	39	0.738	0.745	0.44	1.052	0.998
	(2,1)	23	0.347	0.452	0.73	1.013	0.997		(2,1)	41	0.740	0.732	0.47	1.083	0.996
(2,2)	10	0.345	0.678	0.73	0.982	0.998	(2,2)	25	0.719	0.872	0.49	0.981	0.999		
Gjr (1,1)	88	0.373	0.749	0.46	1.237	0.957	Gjr (1,2)	94	0.876	0.894	0.36	2.107	0.897		
(1,2)	82	0.372	0.570	0.57	1.261	0.960	Hgarch (1,1)	45	0.744	0.775	0.42	1.047	0.996		
Hgarch (1,1)	43	0.350	0.440	0.67	0.940	0.995	Igarch (1,1)	92	0.873	0.844	0.38	1.349	0.791		
Rm (1,1)	5	0.340	1.288	0.73	0.957	0.971	Rm (1,1)	5	0.653	7.324	0.49	0.814	0.914		
DCCE	Aparch (1,1)	3	0.329	3.631	0.73	0.884	0.970	DCCE	Aparch (1,1)	3	0.636	6.797	0.49	0.790	0.910
	Egarch (0,1)	15	0.346	0.598	0.73	0.977	0.997		Egarch (0,1)	27	0.724	0.877	0.49	1.010	0.997
	(0,2)	36	0.349	0.427	0.73	1.045	0.991		(0,2)	54	0.765	0.769	0.49	1.408	0.958
	(1,1)	24	0.347	0.813	0.73	1.101	0.981		(1,1)	68	0.792	0.814	0.49	1.801	0.915
	(1,2)	34	0.348	0.546	0.73	1.064	0.980		(1,2)	67	0.791	0.810	0.49	1.771	0.913
	(2,1)	12	0.345	0.943	0.73	1.084	0.986		(2,1)	59	0.779	0.843	0.49	1.635	0.934
	Figarch (1,1)	21	0.347	0.509	0.73	0.992	0.996		Figarch (1,1)	35	0.733	0.728	0.47	1.029	0.998
	Garch (1,1)	51	0.350	0.472	0.67	1.010	0.997		Garch (1,1)	36	0.736	0.736	0.46	1.000	0.997
	(1,2)	47	0.350	0.450	0.68	1.022	0.997		(1,2)	44	0.743	0.799	0.40	1.054	0.998
	(2,1)	27	0.347	0.423	0.73	1.013	0.997		(2,1)	43	0.743	0.759	0.43	1.074	0.996
(2,2)	13	0.345	0.587	0.73	0.984	0.998	(2,2)	26	0.724	0.786	0.49	0.983	0.999		
Gjr (1,1)	92	0.374	1.023	0.32	1.239	0.957	Gjr (1,2)	96	0.881	1.003	0.31	2.119	0.895		
(1,2)	86	0.373	0.678	0.50	1.262	0.960	Hgarch (1,1)	48	0.746	0.786	0.42	1.051	0.996		
Hgarch (1,1)	42	0.349	0.434	0.67	0.942	0.995	Rm (1,1)	12	0.671	4.628	0.49	0.819	0.913		
Rm (1,1)	63	0.355	0.461	0.67	0.989	0.967									
DECO	Aparch (1,1)	14	0.346	0.956	0.73	0.902	0.970	DECO	Aparch (1,1)	21	0.694	1.725	0.49	0.815	0.910
	Rm (1,1)	45	0.350	0.459	0.73	0.974	0.973		Rm (1,1)	20	0.686	2.173	0.49	0.827	0.918
Orth.	Aparch (1,1)	37	0.349	0.839	0.73	1.088	0.960	Orth.	Aparch (1,1)	6	0.661	6.560	0.49	0.874	0.900
	Egarch (0,1)	44	0.350	0.611	0.73	1.095	0.960		Egarch (0,1)	8	0.666	5.965	0.49	0.880	0.899
	(0,2)	54	0.351	0.499	0.73	1.091	0.960		(0,2)	9	0.666	5.685	0.49	0.867	0.900
	(1,1)	57	0.351	0.450	0.73	1.097	0.960		(1,1)	16	0.676	4.113	0.49	0.887	0.899
	(1,2)	41	0.349	0.712	0.73	1.096	0.960		(1,2)	14	0.673	4.443	0.49	0.885	0.899
	(2,1)	60	0.352	0.432	0.71	1.087	0.961		(2,1)	17	0.676	3.965	0.49	0.879	0.899
	(2,2)	59	0.352	0.430	0.69	1.092	0.963		(2,2)	19	0.679	3.378	0.49	0.883	0.903
	Garch (1,1)	58	0.352	0.425	0.72	1.087	0.961		Garch (1,1)	7	0.665	5.720	0.49	0.877	0.900
	(1,2)	61	0.352	0.441	0.67	1.090	0.960		(1,2)	11	0.670	4.466	0.49	0.880	0.898
	(2,1)	52	0.351	0.550	0.73	1.088	0.961		(2,1)	10	0.668	5.554	0.49	0.881	0.899
(2,2)	62	0.353	0.443	0.67	1.086	0.962	(2,2)	13	0.672	4.258	0.49	0.882	0.900		
SBEKK	(1,1)	67	0.363	0.534	0.60	0.955	0.952	SBEKK	(1,1)	46	0.745	0.841	0.49	0.820	0.898
									(1,1)	33	0.732	0.93	0.486	0.837	0.891
								RM	(1,1)	56	0.772	0.73	0.466	0.879	0.913

Note. See Table ??.

Table A.3: MCS - Calm period (1/04/03 - 31/07/07) (Cont.)

Stein distance (12 models)							
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
CCC	Garch (1,1)	5	3.180	0.285	0.72	0.948	0.999
	(1,2)	10	3.193	1.253	0.26	1.168	0.996
	(2,1)	3	3.175	0.476	0.74	1.033	0.998
DCCCT	Garch (1,1)	6	3.183	0.413	0.61	0.935	0.999
	(1,2)	8	3.191	0.683	0.47	1.154	0.996
	(2,1)	2	3.174	0.265	0.74	1.022	0.998
	(2,2)	7	3.189	1.265	0.29	1.027	0.998
	Gjr (1,1)	16	3.203	1.171	0.26	0.806	0.982
DCCE	Garch (1,1)	4	3.179	0.307	0.74	0.967	0.998
	(1,2)	12	3.194	1.101	0.30	1.198	0.996
	(2,1)	1	3.171	-	1.00	1.065	0.998
	Gjr (1,1)	15	3.201	1.084	0.29	0.834	0.982

Note. See Table ??.

Table A.4: MCS - 2007-2008 financial crisis (1/08/07 - 27/12/08)

Euclidean distance (39 models)								Stein distance (26 models)							
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
CCC	Hgarch (1,1)	40	17.172	1.034	0.32	1.171	0.995	CCC	Aparch (1,1)	21	4.773	0.992	0.32	1.098	0.990
DCCA	Figarch (1,1)	28	16.345	0.880	0.39	1.099	0.997		Egarch (0,1)	14	4.712	0.579	0.46	0.991	0.986
	Hgarch (1,1)	21	16.162	0.678	0.50	1.072	0.997		(0,2)	16	4.716	0.569	0.46	1.006	0.985
	Rm (1,1)	35	16.954	0.892	0.38	1.264	0.998	(1,2)	10	4.665	0.587	0.48	0.954	0.990	
DCCT	Figarch (1,1)	43	17.283	1.207	0.25	1.184	0.995	Figarch (1,1)	2	4.531	3.442	0.48	0.781	0.942	
	Hgarch (1,1)	38	17.086	0.992	0.33	1.154	0.995	Hgarch (1,1)	9	4.663	0.623	0.47	0.784	0.931	
DCCE	Figarch (1,1)	25	16.305	0.826	0.42	1.097	0.997	DCCA	Aparch (1,1)	30	4.843	1.099	0.29	1.417	0.991
	Hgarch (1,1)	22	16.208	0.797	0.44	1.076	0.997		Egarch (0,1)	20	4.766	0.626	0.44	1.286	0.987
	Rm (1,1)	44	17.376	1.157	0.27	1.307	0.999		(0,2)	23	4.787	0.678	0.42	1.313	0.984
									(1,2)	17	4.722	0.586	0.46	1.229	0.991
DECO	Aparch (1,1)	27	16.317	0.886	0.39	1.122	0.997	Figarch (1,1)	6	4.585	1.143	0.48	0.959	0.939	
	Figarch (1,1)	5	14.919	0.063	0.90	0.922	0.998	Hgarch (1,1)	8	4.631	0.684	0.48	0.861	0.930	
	Garch (1,1)	32	16.661	0.884	0.39	1.187	0.997	DCCT	Aparch (1,1)	19	4.758	0.814	0.37	1.145	0.992
	(1,2)	29	16.492	0.887	0.39	1.153	0.998		Egarch (0,1)	11	4.669	0.550	0.48	1.031	0.989
	(2,1)	31	16.583	0.938	0.36	1.141	0.999		(0,2)	13	4.678	0.534	0.48	1.048	0.987
	(2,2)	33	16.713	0.962	0.34	1.175	0.999		(1,2)	7	4.623	0.636	0.48	0.995	0.993
	Gjr (1,1)	23	16.237	0.828	0.42	1.104	0.998	Figarch (1,1)	1	4.511	-	1.00	0.816	0.940	
	(1,2)	16	16.043	0.787	0.44	1.058	0.999	Gjr (1,2)	24	4.802	1.192	0.26	1.214	0.990	
	(2,1)	14	15.879	0.780	0.44	1.001	0.999	Hgarch (1,1)	4	4.566	4.693	0.48	0.737	0.931	
	(2,2)	17	16.048	0.892	0.39	1.048	0.999	DCCE	Aparch (1,1)	22	4.787	0.743	0.40	1.337	0.991
Hgarch (1,1)	2	14.816	0.061	0.90	0.899	0.997	Egarch (0,1)		15	4.714	0.578	0.47	1.203	0.987	
Igarch (1,1)	24	16.275	0.808	0.44	1.071	0.992	(0,2)		18	4.727	0.562	0.47	1.228	0.984	
Rm (1,1)	19	16.076	0.444	0.68	1.132	0.998	(1,2)		12	4.671	0.635	0.48	1.151	0.991	
Orth.	Aparch (1,1)	13	15.791	0.596	0.58	0.918	0.996	Figarch (1,1)	3	4.543	2.103	0.48	0.927	0.939	
	Egarch (0,1)	26	16.308	0.914	0.38	1.020	0.998	Garch (2,1)	28	4.834	0.903	0.34	1.306	0.981	
	(0,2)	15	16.026	0.890	0.39	0.942	0.999	Hgarch (1,1)	5	4.578	0.897	0.48	0.824	0.934	
	(1,1)	20	16.088	0.881	0.39	0.928	0.998	L_3 loss function (26 models)							
	(1,2)	12	15.757	0.891	0.44	0.868	0.998	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
	(2,1)	30	16.562	1.068	0.30	1.067	0.999	Aparch (1,1)	26	682.5	1.116	0.28	1.128	1.000	
	(2,2)	6	15.316	0.282	0.79	0.784	0.996	Figarch (1,1)	17	660.0	0.769	0.48	1.062	1.000	
	RM	Arch (2)	71	18.210	1.128	0.28	1.101	0.971	Garch (1,1)	29	687.4	1.189	0.26	1.147	1.000
		Garch (1,1)	18	16.052	0.869	0.39	0.963	0.997	Gjr (1,1)	24	680.2	1.076	0.30	1.121	1.000
		(1,2)	9	15.618	0.827	0.44	0.867	0.998	(1,2)	22	677.6	1.152	0.27	1.105	1.000
(2,1)		10	15.644	0.814	0.44	0.884	0.999	Hgarch (1,1)	15	656.9	0.820	0.48	1.052	1.000	
(2,2)		11	15.666	0.874	0.44	0.861	0.998	Igarch (1,1)	21	675.9	0.896	0.38	1.108	0.999	
Gjr (1,1)		7	15.391	0.405	0.71	0.812	0.996	Rm (1,1)	25	681.9	1.025	0.32	1.136	1.000	
(1,2)		3	14.853	0.120	0.90	0.705	0.997	Orth.	Aparch (1,1)	10	641.6	0.795	0.48	0.991	0.999
(2,1)		1	14.577	-	1.00	0.660	0.996		Egarch (0,1)	16	658.6	0.782	0.47	1.050	1.000
(2,2)		4	14.895	0.070	0.90	0.720	0.997		(0,2)	11	648.8	0.787	0.48	1.001	1.000
									(1,1)	12	650.5	0.808	0.44	0.986	1.000
							(1,2)		8	637.2	1.057	0.48	0.949	0.999	
							(2,1)		18	664.1	0.841	0.42	1.072	1.000	
							(2,2)		4	617.4	0.667	0.49	0.871	0.999	
							Arch (1)		19	665.5	0.962	0.48	0.890	0.989	
							(2)		27	684.5	0.952	0.35	1.013	0.994	
							Garch (1,1)		13	652.6	0.797	0.48	1.021	0.999	
							(1,2)	6	635.9	1.087	0.48	0.955	1.000		
							(2,1)	7	637.1	0.993	0.48	0.968	1.000		
							(2,2)	9	637.4	1.146	0.48	0.952	1.000		
							Gjr (1,1)	5	631.2	0.980	0.48	0.924	0.999		
							(1,2)	2	605.8	1.224	0.49	0.825	0.999		
							(2,1)	1	590.6	-	1.00	0.776	0.999		
							(2,2)	3	609.2	0.858	0.49	0.846	0.999		
							RM	(1,1)	14	654.4	0.886	0.48	1.044	0.998	

Note. See Table ??

Table A.5: MCS (L_E) - Multistep ahead covariance forecasts

5-day ahead forecast horizon Dot-Com bubble burst (5 models)							20-day ahead forecast horizon Dot-Com bubble burst (8 models)								
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
Orth.	Aparch (1,1)	1	2.959	-	1.00	0.982	1.000	Orth.	Aparch (1,1)	8	3.274	0.618	0.552	1.028	1.000
	Egarch (0,1)	3	2.969	0.402	0.65	1.038	1.000		Egarch (0,2)	5	3.262	0.293	0.818	1.021	1.000
	(0,2)	5	2.996	0.991	0.32	1.095	0.999		(1,1)	2	3.251	0.021	0.978	1.020	1.000
	Gjr (1,1)	2	2.967	0.152	0.69	0.909	0.999		(2,1)	4	3.257	0.072	0.953	1.028	1.000
	(1,2)	4	2.984	1.126	0.30	0.986	1.000		(0,1)	1	3.250	-	1.000	1.011	1.000
							Gjr (1,1)		3	3.254	0.015	0.978	0.965	0.999	
							(1,2)		6	3.265	0.256	0.808	0.971	1.000	
							(2,1)		7	3.273	0.318	0.751	0.963	0.999	
Calm period (1 models)							Calm period (3 models)								
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
CCC	Egarch (2,1)	1	0.610	-	1.00	-	-	CCC	Egarch (2,1)	3	0.635	0.598	0.440	1.010	1.000
								Garch (1,2)	1	0.633	-	1.000	0.995	1.000	
								DCCT	Garch (1,2)	2	0.633	1.614	0.440	0.995	1.000
2007-2008 financial crisis (30 models)							2007-2008 financial crisis (18 models)								
MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr	MCS		Rnk	\bar{L}_i	T_D	p-val	VR	Corr
DCCA	Garch (2,1)	39	21.09	1.216	0.25	1.138	0.997	CCC	Rm (1,1)	18	23.86	1.105	0.32	1.046	0.999
	Gjr (1,2)	36	20.98	1.181	0.26	1.133	0.997	DCCA	Garch (2,1)	20	23.99	1.208	0.27	1.049	0.998
	(2,1)	29	20.72	0.959	0.35	1.109	0.998		Igarch (1,1)	15	23.56	1.009	0.37	0.941	0.999
	Igarch (1,1)	27	20.53	1.156	0.27	1.026	0.998		Rm (1,1)	3	22.87	0.394	0.73	1.009	1.000
	Rm (1,1)	7	19.56	0.303	0.76	1.020	0.999	DCCT	Rm (1,1)	12	23.48	1.117	0.37	1.031	0.998
DCCT	Rm (1,1)	26	20.52	0.937	0.37	1.067	0.998	DCCE	Igarch (1,1)	13	23.54	1.098	0.37	0.939	0.999
DCCE	Gjr (2,1)	32	20.82	0.985	0.34	1.115	0.997	Rm (1,1)	5	23.13	0.579	0.58	1.023	1.000	
	Igarch (1,1)	25	20.51	1.074	0.30	1.025	0.998	DECO	Garch (2,1)	9	23.43	1.149	0.37	1.020	0.999
	Rm (1,1)	15	19.92	0.951	0.40	1.045	0.999		Igarch (1,1)	6	23.17	0.390	0.73	0.906	0.997
Garch (1,2)	24	20.51	1.029	0.32	1.073	0.999	Rm (1,1)		1	22.64	-	1.00	0.993	0.999	
	(2,1)	20	20.16	0.918	0.38	1.053	0.999	Orth.	Aparch (1,1)	8	23.32	1.194	0.37	1.041	1.000
DECO	Gjr (1,1)	13	19.88	0.915	0.39	1.022	1.000		Garch (1,1)	7	23.29	1.177	0.37	1.023	1.000
	(1,2)	19	20.13	0.923	0.38	1.052	0.999		(2,1)	14	23.56	1.250	0.26	1.022	1.000
	(2,1)	12	19.83	0.875	0.40	1.030	0.999		Gjr (1,1)	4	22.97	0.465	0.73	1.003	0.999
	(2,2)	18	20.04	0.918	0.38	0.981	0.998		(1,2)	10	23.45	0.991	0.37	1.026	0.999
Igarch (1,1)	10	19.67	0.814	0.44	0.934	0.996	(2,1)		11	23.45	1.057	0.37	1.011	0.999	
Rm (1,1)	1	18.81	-	1.00	0.942	0.999	(2,2)	16	23.67	0.989	0.37	0.995	0.999		
Orth.	Aparch (1,1)	5	19.48	0.725	0.48	0.938	0.997	RM	(1,1)	2	22.73	0.048	0.82	0.964	0.998
	Egarch (0,1)	14	19.89	0.918	0.38	0.980	0.999								
	(1,1)	17	20.02	0.901	0.39	1.002	0.999								
	(2,1)	22	20.34	0.947	0.36	1.037	0.999								
	(2,2)	16	19.94	0.873	0.40	0.961	0.999								
	Garch (1,1)	6	19.54	0.873	0.40	0.938	0.997								
(1,2)	21	20.27	1.117	0.28	1.011	0.999									
(2,1)	8	19.58	0.908	0.40	0.949	0.998									
Gjr (1,1)	3	18.93	0.022	0.98	0.889	0.994									
(1,2)	11	19.71	0.906	0.39	0.969	0.999									
(2,1)	4	18.97	0.032	0.98	0.896	0.996									
(2,2)	9	19.64	0.897	0.40	0.938	0.998									
RM	(1,1)	2	18.83	0.001	0.98	0.887	0.994								

Note. See Table ??.