

Technical Appendix

A Forecast Comparison of Volatility Models: Does Anything
Beat a GARCH(1,1)?

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1. R^2 from Forecast Regressions

Table A.1

Deutschmark - U.S. dollar exchange rate

Panel A: Models with Gaussian error distribution

Base model	R^2_{intra}	R^{*2}_{intra}	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	4.64	5.38	0.01	0.03	-1440.46	2	2.3024	2.3003	59.6
LGARCH(1,1)	43.33	29.29	2.81	0.92	-1410.62	3	2.2564	2.2533	16.9
LGARCH(2,1)	43.40	28.40	2.84	0.94	-1409.20	4	2.2557	2.2515	17.9
LGARCH(1,2)	42.47	26.81	4.03	1.51	-1407.03	4	2.2522	2.2481	19.0
LGARCH(2,2)	42.52	27.03	3.87	1.35	-1406.94	5	2.2537	2.2483	18.9
IGARCH(1,1)	42.53	27.90	3.17	1.09	-1415.35	2	2.2623	2.2602	12.5
IGARCH(2,1)	43.01	27.51	3.21	1.11	-1413.91	3	2.2616	2.2586	13.3
IGARCH(1,2)	43.68	27.78	3.82	1.43	-1413.75	3	2.2614	2.2583	14.3
IGARCH(2,2)	39.30	24.17	2.60	0.74	-1411.79	4	2.2598	2.2557	15.0
TS-GARCH(1,1)	44.63	32.72	3.00	0.82	-1411.39	3	2.2576	2.2546	19.7
TS-GARCH(2,1)	45.10	32.14	3.07	0.92	-1409.90	4	2.2568	2.2527	20.6
TS-GARCH(1,2)	45.32	31.66	4.57	1.72	-1406.92	4	2.2521	2.2479	21.6
TS-GARCH(2,2)	45.45	31.92	4.27	1.37	-1406.73	5	2.2534	2.2479	21.4
A-GARCH(1,1)	42.43	28.70	2.63	0.78	-1410.22	4	2.2573	2.2532	18.5
A-GARCH(2,1)	42.17	26.67	2.88	0.97	-1408.35	6	2.2575	2.2508	19.2
A-GARCH(1,2)	42.52	26.89	4.00	1.49	-1407.03	5	2.2538	2.2484	19.1
A-GARCH(2,2)	32.34	16.70	3.08	0.69	-1399.80	7	2.2455	2.2374	16.5
NA-GARCH(1,1)	41.60	28.55	2.51	0.76	-1410.16	4	2.2572	2.2531	19.0
NA-GARCH(2,1)	41.69	26.76	2.82	0.94	-1408.30	6	2.2575	2.2508	19.7
NA-GARCH(1,2)	42.63	27.14	3.88	1.45	-1407.01	5	2.2538	2.2484	19.4
NA-GARCH(2,2)	27.58	13.73	2.78	0.54	-1399.59	7	2.2452	2.2371	15.8
V-GARCH(1,1)	38.77	26.21	1.77	0.34	-1410.24	4	2.2574	2.2532	17.1
V-GARCH(2,1)	37.38	22.42	2.23	0.50	-1407.26	6	2.2558	2.2491	19.1
V-GARCH(1,2)	35.37	21.67	3.42	1.01	-1404.43	5	2.2497	2.2443	16.7
V-GARCH(2,2)	27.01	15.00	2.89	0.73	-1399.26	7	2.2446	2.2366	14.3
THR-GARCH(1,1)	41.83	31.27	2.61	0.64	-1410.15	4	2.2572	2.2531	21.8
THR-GARCH(2,1)	42.34	30.06	2.88	0.85	-1408.40	6	2.2576	2.2509	22.5
THR-GARCH(1,2)	45.53	32.20	4.17	1.55	-1406.78	5	2.2534	2.2480	22.4
THR-GARCH(2,2)	30.19	19.25	2.95	0.67	-1398.31	7	2.2431	2.2350	17.4
GJR-GARCH(1,1)	42.59	29.22	2.71	0.86	-1410.43	4	2.2577	2.2535	17.9
GJR-GARCH(2,1)	42.51	27.84	2.86	0.98	-1408.80	6	2.2583	2.2516	19.0
GJR-GARCH(1,2)	42.11	26.26	4.15	1.56	-1407.00	5	2.2538	2.2484	18.6
GJR-GARCH(2,2)	28.43	16.08	2.46	0.51	-1398.48	7	2.2434	2.2353	17.6
LOG-GARCH(1,1)	44.71	32.53	2.71	0.61	-1410.61	3	2.2564	2.2533	19.0
LOG-GARCH(2,1)	45.10	31.28	2.81	0.70	-1408.65	4	2.2548	2.2507	20.2
LOG-GARCH(1,2)	45.11	30.70	4.22	1.32	-1404.59	4	2.2483	2.2442	20.9
LOG-GARCH(2,2)	45.15	30.72	3.86	0.98	-1404.43	5	2.2497	2.2443	21.0
EGARCH(1,1)	41.88	31.06	2.39	0.48	-1409.40	4	2.2560	2.2519	20.9
EGARCH(2,1)	42.76	29.93	2.62	0.63	-1407.47	6	2.2561	2.2494	22.3
EGARCH(1,2)	45.39	31.20	4.05	1.27	-1404.56	5	2.2499	2.2445	21.3
EGARCH(2,2)	27.25	18.79	2.94	0.67	-1396.65	7	2.2405	2.2324	16.5
NGARCH(1,1)	44.25	31.25	2.91	0.87	-1410.09	4	2.2571	2.2530	17.7
NGARCH(2,1)	44.53	30.54	2.96	0.93	-1408.55	5	2.2563	2.2508	18.7
NGARCH(1,2)	44.34	30.03	4.41	1.64	-1405.84	5	2.2519	2.2465	20.0
NGARCH(2,2)	44.42	30.28	4.18	1.40	-1405.72	6	2.2533	2.2466	20.0
A-PARCH(1,1)	42.57	31.05	2.68	0.73	-1409.46	5	2.2577	2.2523	19.9
A-PARCH(2,1)	42.87	29.77	2.88	0.88	-1407.67	7	2.2580	2.2500	21.0
A-PARCH(1,2)	44.43	30.18	4.38	1.63	-1405.84	6	2.2535	2.2468	20.1
A-PARCH(2,2)	41.56	27.81	4.59	1.73	-1403.05	8	2.2523	2.2428	20.0
GQ-ARCH(1,1)	42.43	28.70	2.63	0.78	-1410.22	4	2.2573	2.2532	18.5
GQ-ARCH(2,1)	46.14	29.45	2.88	1.00	-1402.85	7	2.2504	2.2423	23.6
GQ-ARCH(1,2)	42.52	26.89	4.00	1.49	-1407.03	5	2.2538	2.2484	19.1
GQ-ARCH(2,2)	35.39	19.47	3.77	0.94	-1397.56	8	2.2435	2.2341	18.0
H-GARCH(1,1)	42.05	30.07	2.51	0.64	-1409.11	7	2.2604	2.2523	20.6
AUG-GARCH(1,1)	41.44	29.57	2.23	0.48	-1408.43	9	2.2625	2.2516	21.7

Table A.1.

Table A.1 - continued

Deutschmark - U.S. dollar exchange rate

Panel B: Models with Gaussian error distribution and constant in mean

Base model	R^2_{intra}	R^{*2}_{intra}	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	4.68	5.36	0.02	0.02	-1440.04	3	2.3033	2.3003	59.0
LGARCH(1,1)	43.14	29.20	2.75	0.87	-1410.03	4	2.2570	2.2529	16.3
LGARCH(2,1)	43.22	28.35	2.77	0.88	-1408.61	5	2.2564	2.2509	17.2
LGARCH(1,2)	42.58	27.01	3.92	1.44	-1406.46	5	2.2529	2.2475	18.4
LGARCH(2,2)	42.63	27.24	3.77	1.29	-1406.37	6	2.2544	2.2477	18.3
IGARCH(1,1)	42.43	27.87	3.13	1.05	-1414.86	3	2.2631	2.2601	12.1
IGARCH(2,1)	42.89	27.47	3.16	1.06	-1413.42	4	2.2624	2.2583	12.9
IGARCH(1,2)	43.60	27.77	3.74	1.36	-1413.25	4	2.2622	2.2580	13.8
IGARCH(2,2)	39.09	24.07	2.55	0.71	-1411.30	5	2.2606	2.2552	14.6
TS-GARCH(1,1)	44.34	32.44	2.92	0.76	-1410.40	4	2.2576	2.2534	19.0
TS-GARCH(2,1)	44.85	31.97	2.99	0.85	-1408.93	5	2.2569	2.2515	19.6
TS-GARCH(1,2)	45.30	31.62	4.44	1.62	-1405.90	5	2.2520	2.2466	20.7
TS-GARCH(2,2)	45.43	31.83	4.14	1.27	-1405.69	6	2.2533	2.2466	20.6
A-GARCH(1,1)	42.32	28.63	2.60	0.76	-1409.74	5	2.2582	2.2528	17.7
A-GARCH(2,1)	42.12	26.65	2.84	0.94	-1407.89	7	2.2584	2.2503	18.4
A-GARCH(1,2)	42.52	26.92	3.96	1.46	-1406.46	6	2.2545	2.2478	18.2
A-GARCH(2,2)	32.36	16.68	3.07	0.68	-1399.38	8	2.2464	2.2370	15.9
NA-GARCH(1,1)	41.58	28.48	2.49	0.73	-1409.69	5	2.2581	2.2527	18.1
NA-GARCH(2,1)	41.72	26.76	2.80	0.91	-1407.87	7	2.2584	2.2503	18.8
NA-GARCH(1,2)	42.63	27.11	3.87	1.42	-1406.46	6	2.2545	2.2478	18.5
NA-GARCH(2,2)	27.68	13.73	2.80	0.54	-1399.21	8	2.2461	2.2367	15.3
V-GARCH(1,1)	38.67	26.10	1.75	0.32	-1409.76	5	2.2582	2.2528	16.3
V-GARCH(2,1)	37.31	22.33	2.21	0.48	-1406.78	7	2.2566	2.2486	18.3
V-GARCH(1,2)	35.26	21.62	3.42	0.99	-1403.86	6	2.2504	2.2437	16.1
V-GARCH(2,2)	26.82	14.90	2.87	0.71	-1398.76	8	2.2454	2.2360	13.8
THR-GARCH(1,1)	41.88	31.10	2.60	0.62	-1409.51	5	2.2578	2.2524	20.8
THR-GARCH(2,1)	42.42	29.97	2.86	0.82	-1407.84	7	2.2583	2.2503	21.3
THR-GARCH(1,2)	45.40	31.86	4.27	1.55	-1405.88	6	2.2536	2.2469	21.0
THR-GARCH(2,2)	30.19	19.03	2.96	0.66	-1397.77	8	2.2438	2.2344	16.9
GJR-GARCH(1,1)	42.54	29.12	2.67	0.83	-1409.91	5	2.2584	2.2530	17.1
GJR-GARCH(2,1)	42.50	27.81	2.81	0.93	-1408.33	7	2.2591	2.2510	18.2
GJR-GARCH(1,2)	41.98	26.09	4.15	1.53	-1406.38	6	2.2544	2.2477	17.7
GJR-GARCH(2,2)	28.48	16.03	2.46	0.50	-1398.13	8	2.2444	2.2350	17.1
LOG-GARCH(1,1)	44.41	32.23	2.65	0.57	-1409.64	4	2.2564	2.2522	18.3
LOG-GARCH(2,1)	44.85	31.12	2.73	0.65	-1407.67	5	2.2549	2.2494	19.3
LOG-GARCH(1,2)	45.10	30.73	4.04	1.22	-1403.44	5	2.2481	2.2427	20.2
LOG-GARCH(2,2)	45.18	30.70	3.69	0.89	-1403.28	6	2.2495	2.2427	20.3
EGARCH(1,1)	41.96	30.90	2.38	0.46	-1408.79	5	2.2567	2.2512	19.9
EGARCH(2,1)	42.88	29.93	2.59	0.59	-1406.88	7	2.2568	2.2487	21.1
EGARCH(1,2)	44.81	30.27	4.16	1.25	-1403.42	6	2.2497	2.2430	19.9
EGARCH(2,2)	27.11	18.57	2.88	0.64	-1395.92	8	2.2409	2.2314	15.9
NGARCH(1,1)	44.11	31.29	2.86	0.82	-1409.37	5	2.2576	2.2522	17.2
NGARCH(2,1)	44.42	30.61	2.89	0.86	-1407.84	6	2.2567	2.2500	18.1
NGARCH(1,2)	44.58	30.39	4.32	1.57	-1405.13	6	2.2524	2.2457	19.4
NGARCH(2,2)	44.66	30.64	4.08	1.31	-1404.98	7	2.2538	2.2457	19.4
A-PARCH(1,1)	42.57	30.94	2.65	0.70	-1408.91	6	2.2584	2.2517	19.1
A-PARCH(2,1)	42.94	29.79	2.85	0.84	-1407.18	8	2.2589	2.2494	20.0
A-PARCH(1,2)	44.38	30.08	4.41	1.60	-1405.12	7	2.2540	2.2459	19.2
A-PARCH(2,2)	41.52	27.81	4.58	1.70	-1402.40	9	2.2528	2.2420	19.1
GQ-ARCH(1,1)	42.32	28.63	2.60	0.76	-1409.74	5	2.2582	2.2528	17.7
GQ-ARCH(2,1)	45.96	29.19	2.83	0.97	-1401.91	8	2.2505	2.2410	22.3
GQ-ARCH(1,2)	42.52	26.92	3.96	1.46	-1406.46	6	2.2545	2.2478	18.2
GQ-ARCH(2,2)	35.61	19.66	3.78	0.95	-1396.94	9	2.2441	2.2333	17.2
H-GARCH(1,1)	42.17	30.03	2.47	0.60	-1408.50	8	2.2610	2.2515	19.5
AUG-GARCH(1,1)	41.41	29.39	2.22	0.46	-1407.56	10	2.2627	2.2504	20.4

Table A.1.

Table A.1 - continued
Deutschmark - U.S. dollar exchange rate

Panel C: Models with Gaussian error distribution and constant and GARCH in mean

Base model	R^2_{intra}	R^{*2}_{intra}	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	4.99	5.59	0.03	0.01	-1439.55	4	2.3041	2.3000	60.0
LGARCH(1,1)	42.96	29.21	2.74	0.88	-1410.00	5	2.2586	2.2532	16.3
LGARCH(2,1)	43.18	28.36	2.77	0.89	-1408.61	6	2.2580	2.2512	17.2
LGARCH(1,2)	42.58	26.98	3.93	1.44	-1406.46	6	2.2545	2.2478	18.4
LGARCH(2,2)	42.63	27.23	3.77	1.29	-1406.37	7	2.2560	2.2479	18.3
IGARCH(1,1)	42.27	27.83	3.12	1.06	-1414.84	4	2.2647	2.2605	12.0
IGARCH(2,1)	42.89	27.47	3.16	1.06	-1413.42	5	2.2640	2.2586	12.9
IGARCH(1,2)	43.64	27.76	3.75	1.36	-1413.25	5	2.2638	2.2584	13.8
IGARCH(2,2)	38.22	23.69	2.49	0.71	-1411.07	6	2.2619	2.2552	14.5
TS-GARCH(1,1)	44.39	32.45	2.93	0.76	-1410.39	5	2.2592	2.2538	19.0
TS-GARCH(2,1)	44.93	31.97	2.99	0.85	-1408.93	6	2.2585	2.2517	19.6
TS-GARCH(1,2)	45.31	31.63	4.44	1.62	-1405.90	6	2.2536	2.2469	20.7
TS-GARCH(2,2)	45.43	31.83	4.13	1.27	-1405.69	7	2.2549	2.2468	20.6
A-GARCH(1,1)	42.25	28.65	2.60	0.77	-1409.73	6	2.2597	2.2530	17.7
A-GARCH(2,1)	42.17	26.62	2.85	0.93	-1407.89	8	2.2600	2.2506	18.4
A-GARCH(1,2)	42.52	26.91	3.97	1.46	-1406.46	7	2.2561	2.2480	18.2
A-GARCH(2,2)	32.36	16.77	3.06	0.69	-1399.36	9	2.2480	2.2371	15.8
NA-GARCH(1,1)	41.57	28.50	2.49	0.74	-1409.69	6	2.2597	2.2530	18.0
NA-GARCH(2,1)	41.79	26.65	2.80	0.90	-1407.86	8	2.2599	2.2505	18.9
NA-GARCH(1,2)	42.63	27.09	3.87	1.41	-1406.46	7	2.2561	2.2480	18.6
NA-GARCH(2,2)	27.58	13.72	2.77	0.54	-1399.18	9	2.2477	2.2368	15.2
V-GARCH(1,1)	38.67	26.13	1.75	0.33	-1409.76	6	2.2598	2.2531	16.3
V-GARCH(2,1)	37.31	22.28	2.20	0.47	-1406.77	8	2.2582	2.2488	18.3
V-GARCH(1,2)	35.24	21.61	3.42	0.99	-1403.86	7	2.2520	2.2439	16.1
V-GARCH(2,2)	26.76	14.86	2.87	0.71	-1398.76	9	2.2470	2.2362	13.9
THR-GARCH(1,1)	42.09	31.09	2.60	0.61	-1409.48	6	2.2593	2.2526	20.9
THR-GARCH(2,1)	42.79	30.04	2.88	0.80	-1407.79	8	2.2598	2.2504	21.4
THR-GARCH(1,2)	45.45	31.95	4.19	1.51	-1405.88	7	2.2552	2.2471	21.0
THR-GARCH(2,2)	30.02	18.98	2.92	0.66	-1397.75	9	2.2454	2.2345	16.9
GJR-GARCH(1,1)	42.46	29.14	2.67	0.84	-1409.90	6	2.2600	2.2533	17.0
GJR-GARCH(2,1)	42.52	27.79	2.82	0.93	-1408.33	8	2.2607	2.2513	18.2
GJR-GARCH(1,2)	42.03	26.15	4.13	1.52	-1406.38	7	2.2560	2.2479	17.7
GJR-GARCH(2,2)	28.35	15.98	2.41	0.49	-1398.09	9	2.2460	2.2351	17.0
LOG-GARCH(1,1)	44.43	32.22	2.65	0.56	-1409.64	5	2.2580	2.2526	18.3
LOG-GARCH(2,1)	44.91	31.12	2.74	0.65	-1407.66	6	2.2564	2.2497	19.3
LOG-GARCH(1,2)	45.09	30.73	4.03	1.22	-1403.44	6	2.2497	2.2430	20.1
LOG-GARCH(2,2)	45.17	30.71	3.68	0.89	-1403.28	7	2.2510	2.2430	20.3
EGARCH(1,1)	42.07	30.89	2.38	0.46	-1408.78	6	2.2582	2.2515	20.0
EGARCH(2,1)	43.13	29.91	2.61	0.59	-1406.86	8	2.2584	2.2489	21.1
EGARCH(1,2)	44.75	30.24	4.15	1.25	-1403.42	7	2.2513	2.2432	19.9
EGARCH(2,2)	26.93	18.51	2.83	0.64	-1395.90	9	2.2425	2.2316	15.8
NGARCH(1,1)	44.01	31.25	2.85	0.82	-1409.37	6	2.2592	2.2524	17.1
NGARCH(2,1)	44.45	30.60	2.90	0.86	-1407.84	7	2.2583	2.2503	18.1
NGARCH(1,2)	44.58	30.39	4.32	1.57	-1405.13	7	2.2540	2.2459	19.4
NGARCH(2,2)	44.66	30.66	4.07	1.31	-1404.98	8	2.2554	2.2459	19.4
A-PARCH(1,1)	42.63	30.93	2.65	0.69	-1408.90	7	2.2600	2.2520	19.1
A-PARCH(2,1)	43.14	29.76	2.87	0.83	-1407.15	9	2.2604	2.2496	20.1
A-PARCH(1,2)	44.36	30.06	4.40	1.60	-1405.12	8	2.2556	2.2461	19.1
A-PARCH(2,2)	41.52	27.87	4.56	1.70	-1402.40	10	2.2544	2.2421	19.1
GQ-ARCH(1,1)	42.25	28.65	2.60	0.77	-1409.73	6	2.2597	2.2530	17.6
GQ-ARCH(2,1)	46.38	29.08	2.88	0.96	-1401.87	9	2.2520	2.2411	22.3
GQ-ARCH(1,2)	42.52	26.91	3.97	1.46	-1406.46	7	2.2561	2.2480	18.2
GQ-ARCH(2,2)	35.52	19.72	3.72	0.95	-1396.92	10	2.2457	2.2334	17.1
H-GARCH(1,1)	42.29	30.11	2.39	0.46	-1408.25	9	2.2622	2.2513	20.6
AUG-GARCH(1,1)	41.73	29.40	2.26	0.45	-1407.38	11	2.2640	2.2502	20.8

Table A.1.

Table A.1 - continued
Deutschmark - U.S. dollar exchange rate

Panel D: Models with t distributed errors									
Base model	R^2_{intra}	R^{*2}_{intra}	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	4.64	5.42	0.01	0.04	-1400.50	3	2.2402	2.2372	57.7
LGARCH(1,1)	43.32	29.33	2.78	0.91	-1381.72	4	2.2118	2.2077	17.2
LGARCH(2,1)	43.51	28.93	2.80	0.92	-1381.03	5	2.2123	2.2069	17.8
LGARCH(1,2)	43.28	27.68	3.90	1.57	-1380.68	5	2.2118	2.2064	18.1
LGARCH(2,2)	43.18	28.03	3.49	1.17	-1380.22	6	2.2126	2.2059	18.2
IGARCH(1,1)	42.82	28.29	3.12	1.06	-1384.70	3	2.2150	2.2120	13.3
IGARCH(2,1)	43.15	28.12	3.15	1.07	-1384.04	4	2.2155	2.2114	13.7
IGARCH(1,2)	43.40	28.23	3.30	1.16	-1384.04	4	2.2155	2.2114	13.7
IGARCH(2,2)	41.47	26.57	2.88	0.88	-1383.01	5	2.2155	2.2101	14.4
TS-GARCH(1,1)	44.64	32.74	2.99	0.81	-1381.08	4	2.2108	2.2067	19.7
TS-GARCH(2,1)	45.11	32.47	3.05	0.88	-1380.30	5	2.2112	2.2058	20.2
TS-GARCH(1,2)	45.44	31.99	4.70	1.94	-1379.43	5	2.2098	2.2044	21.4
TS-GARCH(2,2)	45.47	32.63	3.77	1.12	-1378.62	6	2.2101	2.2034	21.1
A-GARCH(1,1)	43.12	29.23	2.73	0.87	-1381.70	5	2.2134	2.2080	17.6
A-GARCH(2,1)	42.50	27.12	3.00	1.08	-1380.55	7	2.2148	2.2067	17.9
A-GARCH(1,2)	42.26	26.16	4.36	1.80	-1380.52	6	2.2131	2.2064	17.1
A-GARCH(2,2)	33.72	17.86	3.40	0.85	-1376.39	8	2.2097	2.2003	16.1
NA-GARCH(1,1)	42.85	29.18	2.69	0.86	-1381.69	5	2.2134	2.2080	17.8
NA-GARCH(2,1)	42.55	27.35	3.05	1.08	-1380.56	7	2.2148	2.2067	18.0
NA-GARCH(1,2)	42.24	25.99	4.44	1.78	-1380.55	6	2.2132	2.2065	17.1
NA-GARCH(2,2)	30.40	16.14	3.28	0.75	-1376.60	8	2.2100	2.2006	15.6
V-GARCH(1,1)	39.86	26.90	1.92	0.45	-1382.48	5	2.2146	2.2092	16.5
V-GARCH(2,1)	38.58	23.77	2.33	0.62	-1381.27	7	2.2159	2.2079	17.6
V-GARCH(1,2)	32.62	18.46	3.67	1.11	-1379.16	6	2.2110	2.2042	15.4
V-GARCH(2,2)	25.13	13.68	2.85	0.67	-1375.83	8	2.2088	2.1994	13.7
THR-GARCH(1,1)	43.06	32.03	2.78	0.72	-1380.78	5	2.2119	2.2065	20.8
THR-GARCH(2,1)	43.19	30.51	3.13	0.97	-1379.63	7	2.2133	2.2052	20.9
THR-GARCH(1,2)	44.84	30.97	4.93	2.00	-1379.36	6	2.2113	2.2046	21.3
THR-GARCH(2,2)	33.80	22.45	3.40	0.88	-1375.42	8	2.2082	2.1987	17.4
GJR-GARCH(1,1)	42.77	29.30	2.71	0.87	-1381.64	5	2.2133	2.2079	17.9
GJR-GARCH(2,1)	42.64	28.16	2.93	1.03	-1380.72	7	2.2150	2.2070	18.5
GJR-GARCH(1,2)	41.68	25.33	4.39	1.74	-1380.56	6	2.2132	2.2065	17.2
GJR-GARCH(2,2)	30.44	17.43	2.85	0.69	-1375.91	8	2.2089	2.1995	17.3
LOG-GARCH(1,1)	44.70	32.52	2.72	0.62	-1380.81	4	2.2104	2.2062	18.9
LOG-GARCH(2,1)	45.22	32.04	2.80	0.69	-1379.96	5	2.2106	2.2052	19.5
LOG-GARCH(1,2)	46.12	31.10	4.56	1.51	-1378.52	5	2.2083	2.2029	21.2
LOG-GARCH(2,2)	46.25	31.83	3.76	0.86	-1377.99	6	2.2091	2.2024	20.8
EGARCH(1,1)	43.17	31.86	2.55	0.55	-1380.52	5	2.2115	2.2061	20.0
EGARCH(2,1)	43.73	30.70	2.87	0.74	-1379.52	7	2.2131	2.2051	20.4
EGARCH(1,2)	42.59	26.96	4.76	1.36	-1378.16	6	2.2094	2.2026	21.2
EGARCH(2,2)	30.85	20.59	3.33	0.74	-1374.72	8	2.2070	2.1976	16.5
NGARCH(1,1)	44.58	32.15	2.94	0.83	-1380.80	5	2.2120	2.2066	18.5
NGARCH(2,1)	44.97	31.81	2.99	0.89	-1380.02	6	2.2123	2.2056	19.1
NGARCH(1,2)	45.18	31.42	4.60	1.89	-1379.30	6	2.2112	2.2045	20.1
NGARCH(2,2)	45.39	32.35	3.77	1.13	-1378.59	7	2.2116	2.2036	20.6
A-PARCH(1,1)	43.35	31.77	2.78	0.76	-1380.58	6	2.2132	2.2065	19.7
A-PARCH(2,1)	43.43	30.42	3.09	0.97	-1379.47	8	2.2146	2.2052	20.1
A-PARCH(1,2)	43.89	29.40	4.92	1.95	-1379.17	7	2.2126	2.2045	19.8
A-PARCH(2,2)	42.15	28.38	4.93	2.03	-1378.02	9	2.2139	2.2031	18.9
GQ-ARCH(1,1)	43.12	29.23	2.73	0.87	-1381.70	5	2.2134	2.2080	17.6
GQ-ARCH(2,1)	46.41	29.71	3.01	1.09	-1377.43	8	2.2114	2.2019	22.0
GQ-ARCH(1,2)	42.30	26.21	4.35	1.80	-1380.52	6	2.2131	2.2064	17.1
GQ-ARCH(2,2)	36.75	20.51	3.89	1.03	-1374.60	9	2.2085	2.1976	17.1
H-GARCH(1,1)	43.62	31.94	2.70	0.70	-1380.44	8	2.2162	2.2067	18.1
AUG-GARCH(1,1)	43.40	32.00	2.76	0.75	-1380.60	10	2.2196	2.2073	19.2

Table A.1.

Table A.1 - continued
Deutschmark - U.S. dollar exchange rate

Panel E: Models with t distributed errors and constant in mean

Base model	R^2_{intra}	R^{*2}_{intra}	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	4.69	5.39	0.02	0.02	-1399.42	4	2.2401	2.2359	56.9
LGARCH(1,1)	43.11	29.23	2.73	0.87	-1380.88	5	2.2121	2.2067	16.6
LGARCH(2,1)	43.32	28.85	2.74	0.88	-1380.20	6	2.2126	2.2059	17.1
LGARCH(1,2)	43.44	28.01	3.61	1.41	-1379.92	6	2.2122	2.2055	17.4
LGARCH(2,2)	43.27	28.29	3.38	1.11	-1379.48	7	2.2131	2.2050	17.5
IGARCH(1,1)	42.62	28.15	3.09	1.04	-1384.06	4	2.2156	2.2114	12.7
IGARCH(2,1)	42.97	28.00	3.12	1.05	-1383.41	5	2.2161	2.2107	13.1
IGARCH(1,2)	43.21	28.12	3.25	1.13	-1383.41	5	2.2161	2.2107	13.1
IGARCH(2,2)	41.08	26.25	2.83	0.84	-1382.32	6	2.2160	2.2093	13.8
TS-GARCH(1,1)	44.39	32.50	2.93	0.77	-1380.19	5	2.2110	2.2056	19.2
TS-GARCH(2,1)	44.88	32.30	2.99	0.84	-1379.44	6	2.2114	2.2047	19.6
TS-GARCH(1,2)	45.46	32.04	4.57	1.87	-1378.67	6	2.2102	2.2034	20.8
TS-GARCH(2,2)	45.42	32.54	3.70	1.08	-1377.83	7	2.2104	2.2024	20.6
A-GARCH(1,1)	43.08	29.21	2.73	0.87	-1380.88	6	2.2137	2.2070	16.6
A-GARCH(2,1)	42.56	27.24	2.98	1.07	-1379.80	8	2.2152	2.2057	16.9
A-GARCH(1,2)	42.42	26.40	4.32	1.79	-1379.71	7	2.2134	2.2054	16.3
A-GARCH(2,2)	33.88	18.02	3.40	0.86	-1375.76	9	2.2103	2.1995	15.5
NA-GARCH(1,1)	42.96	29.17	2.70	0.86	-1380.88	6	2.2137	2.2070	16.7
NA-GARCH(2,1)	42.69	27.40	3.04	1.07	-1379.83	8	2.2152	2.2058	16.9
NA-GARCH(1,2)	42.27	26.00	4.46	1.78	-1379.74	7	2.2135	2.2054	16.2
NA-GARCH(2,2)	30.69	16.32	3.29	0.76	-1375.99	9	2.2107	2.1998	14.9
V-GARCH(1,1)	39.91	26.89	1.92	0.45	-1381.59	6	2.2148	2.2081	15.6
V-GARCH(2,1)	38.91	24.19	2.30	0.59	-1380.35	8	2.2160	2.2066	16.2
V-GARCH(1,2)	32.50	18.37	3.68	1.11	-1378.31	7	2.2112	2.2031	14.9
V-GARCH(2,2)	25.09	13.67	2.86	0.66	-1375.14	9	2.2093	2.1985	13.2
THR-GARCH(1,1)	43.14	31.90	2.77	0.71	-1380.02	6	2.2123	2.2056	20.0
THR-GARCH(2,1)	43.36	30.58	3.09	0.94	-1378.97	8	2.2138	2.2044	20.0
THR-GARCH(1,2)	44.48	30.42	4.94	1.95	-1378.50	7	2.2115	2.2034	20.7
THR-GARCH(2,2)	33.93	22.49	3.43	0.89	-1374.86	9	2.2089	2.1980	16.9
GJR-GARCH(1,1)	42.75	29.19	2.69	0.86	-1380.85	6	2.2136	2.2069	17.0
GJR-GARCH(2,1)	42.70	28.16	2.89	1.00	-1379.99	8	2.2155	2.2060	17.5
GJR-GARCH(1,2)	41.69	25.33	4.36	1.72	-1379.77	7	2.2135	2.2055	16.5
GJR-GARCH(2,2)	30.58	17.48	2.84	0.67	-1375.33	9	2.2096	2.1988	16.7
LOG-GARCH(1,1)	44.44	32.29	2.67	0.59	-1379.94	5	2.2106	2.2052	18.5
LOG-GARCH(2,1)	44.99	31.87	2.74	0.65	-1379.10	6	2.2108	2.2041	18.9
LOG-GARCH(1,2)	46.23	31.28	4.43	1.46	-1377.76	6	2.2087	2.2020	20.7
LOG-GARCH(2,2)	46.28	31.85	3.66	0.81	-1377.21	7	2.2094	2.2014	20.3
EGARCH(1,1)	43.27	31.73	2.54	0.54	-1379.78	6	2.2119	2.2052	19.2
EGARCH(2,1)	43.89	30.76	2.83	0.71	-1378.83	8	2.2136	2.2042	19.5
EGARCH(1,2)	41.48	25.83	4.64	1.25	-1377.19	7	2.2094	2.2013	20.7
EGARCH(2,2)	30.81	20.38	3.30	0.72	-1374.11	9	2.2077	2.1968	16.2
NGARCH(1,1)	44.34	31.94	2.88	0.80	-1379.95	6	2.2122	2.2055	18.0
NGARCH(2,1)	44.76	31.68	2.92	0.84	-1379.18	7	2.2126	2.2045	18.5
NGARCH(1,2)	45.28	31.63	4.47	1.82	-1378.57	7	2.2116	2.2035	19.7
NGARCH(2,2)	45.38	32.39	3.69	1.08	-1377.81	8	2.2120	2.2025	20.2
A-PARCH(1,1)	43.41	31.64	2.77	0.75	-1379.83	7	2.2136	2.2055	18.8
A-PARCH(2,1)	43.54	30.42	3.07	0.96	-1378.80	9	2.2152	2.2043	19.1
A-PARCH(1,2)	44.14	29.77	4.86	1.92	-1378.38	8	2.2129	2.2034	19.2
A-PARCH(2,2)	41.53	27.68	4.99	2.01	-1377.27	10	2.2143	2.2020	18.6
GQ-ARCH(1,1)	43.08	29.21	2.72	0.87	-1380.88	6	2.2137	2.2070	16.6
GQ-ARCH(2,1)	46.39	29.60	2.97	1.07	-1376.38	9	2.2113	2.2004	20.7
GQ-ARCH(1,2)	42.55	26.57	4.28	1.77	-1379.72	7	2.2134	2.2054	16.3
GQ-ARCH(2,2)	37.02	20.78	3.91	1.04	-1373.85	10	2.2089	2.1966	16.3
H-GARCH(1,1)	43.53	31.87	2.55	0.58	-1379.63	9	2.2165	2.2056	17.4
AUG-GARCH(1,1)	43.27	31.74	2.60	0.64	-1379.74	11	2.2199	2.2061	18.7

Table A.1.

Table A.1 - continued
Deutschmark - U.S. dollar exchange rate

Panel F: Models with t distributed errors and constant and GARCH in mean

Base model	R^2_{intra}	R^{*2}_{intra}	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	5.25	5.80	0.05	0.01	-1397.83	5	2.2392	2.2337	58.7
LGARCH(1,1)	42.42	29.25	2.69	0.92	-1380.41	6	2.2129	2.2062	16.5
LGARCH(2,1)	42.65	29.07	2.70	0.92	-1379.84	7	2.2136	2.2056	16.8
LGARCH(1,2)	43.15	28.15	3.63	1.54	-1379.62	7	2.2133	2.2052	17.2
LGARCH(2,2)	43.07	30.25	2.79	1.06	-1378.54	8	2.2132	2.2037	16.8
IGARCH(1,1)	41.77	27.96	3.03	1.07	-1383.59	5	2.2164	2.2110	12.5
IGARCH(2,1)	42.09	27.94	3.05	1.08	-1383.04	6	2.2171	2.2104	12.8
IGARCH(1,2)	42.12	27.99	3.08	1.10	-1383.05	6	2.2172	2.2104	12.8
IGARCH(2,2)	39.80	25.73	2.73	0.86	-1381.64	7	2.2165	2.2084	13.7
TS-GARCH(1,1)	43.51	32.31	2.87	0.80	-1379.82	6	2.2120	2.2053	19.1
TS-GARCH(2,1)	43.97	32.20	2.91	0.86	-1379.12	7	2.2125	2.2044	19.5
TS-GARCH(1,2)	44.99	32.01	4.35	1.90	-1378.08	7	2.2108	2.2028	20.7
TS-GARCH(2,2)	44.76	32.83	3.46	1.06	-1377.10	8	2.2109	2.2014	20.8
A-GARCH(1,1)	42.58	29.33	2.72	0.95	-1380.40	7	2.2145	2.2065	16.2
A-GARCH(2,1)	42.05	27.61	2.98	1.15	-1379.44	9	2.2162	2.2053	16.3
A-GARCH(1,2)	42.13	26.27	4.28	1.90	-1379.24	8	2.2143	2.2048	16.0
A-GARCH(2,2)	33.53	18.19	3.30	0.92	-1375.04	10	2.2108	2.1985	14.8
NA-GARCH(1,1)	42.68	29.33	2.73	0.95	-1380.40	7	2.2145	2.2065	16.1
NA-GARCH(2,1)	42.33	27.63	3.06	1.16	-1379.50	9	2.2163	2.2054	16.4
NA-GARCH(1,2)	41.73	25.45	4.47	1.89	-1379.23	8	2.2143	2.2048	15.8
NA-GARCH(2,2)	29.81	15.84	3.20	0.79	-1375.23	10	2.2111	2.1988	14.2
V-GARCH(1,1)	39.87	27.06	1.98	0.52	-1381.14	7	2.2157	2.2076	15.3
V-GARCH(2,1)	39.11	24.74	2.30	0.64	-1380.13	9	2.2173	2.2064	15.7
V-GARCH(1,2)	32.90	18.70	3.63	1.14	-1377.84	8	2.2120	2.2026	14.7
V-GARCH(2,2)	25.47	13.93	2.84	0.71	-1374.49	10	2.2099	2.1976	12.7
THR-GARCH(1,1)	42.60	31.90	2.75	0.75	-1379.72	7	2.2134	2.2054	19.8
THR-GARCH(2,1)	42.74	30.67	3.06	0.98	-1378.72	9	2.2150	2.2042	19.7
THR-GARCH(1,2)	43.73	29.58	4.76	1.93	-1377.70	8	2.2118	2.2024	20.8
THR-GARCH(2,2)	32.41	21.38	3.18	0.88	-1373.88	10	2.2089	2.1966	16.6
GJR-GARCH(1,1)	42.26	29.24	2.67	0.91	-1380.40	7	2.2145	2.2065	16.7
GJR-GARCH(2,1)	42.15	28.40	2.90	1.07	-1379.63	9	2.2165	2.2056	17.0
GJR-GARCH(1,2)	41.07	24.71	4.28	1.76	-1379.30	8	2.2144	2.2049	16.2
GJR-GARCH(2,2)	29.96	17.11	2.72	0.68	-1374.69	10	2.2102	2.1979	16.2
LOG-GARCH(1,1)	43.67	32.15	2.64	0.62	-1379.53	6	2.2115	2.2048	18.4
LOG-GARCH(2,1)	44.20	31.86	2.69	0.67	-1378.78	7	2.2119	2.2039	18.8
LOG-GARCH(1,2)	46.01	31.23	4.17	1.43	-1377.12	7	2.2093	2.2012	20.5
LOG-GARCH(2,2)	46.05	32.12	3.49	0.80	-1376.56	8	2.2100	2.2005	20.2
EGARCH(1,1)	42.78	31.76	2.54	0.58	-1379.44	7	2.2130	2.2049	18.9
EGARCH(2,1)	43.24	30.80	2.82	0.75	-1378.56	9	2.2148	2.2039	19.2
EGARCH(1,2)	39.82	24.47	4.26	1.13	-1376.28	8	2.2095	2.2001	20.6
EGARCH(2,2)	28.80	19.16	2.95	0.70	-1372.95	10	2.2074	2.1951	15.9
NGARCH(1,1)	43.50	31.75	2.82	0.84	-1379.53	7	2.2131	2.2051	17.8
NGARCH(2,1)	43.94	31.67	2.86	0.87	-1378.86	8	2.2137	2.2042	18.3
NGARCH(1,2)	44.91	31.65	4.30	1.87	-1378.05	8	2.2124	2.2029	19.6
NGARCH(2,2)	44.76	32.83	3.46	1.06	-1377.10	9	2.2124	2.2016	20.8
A-PARCH(1,1)	42.87	31.56	2.75	0.80	-1379.47	8	2.2146	2.2052	18.4
A-PARCH(2,1)	42.96	30.58	3.03	0.99	-1378.53	10	2.2163	2.2040	18.6
A-PARCH(1,2)	43.16	28.52	4.74	1.90	-1377.58	9	2.2132	2.2024	19.6
A-PARCH(2,2)	40.87	27.10	4.76	2.01	-1376.49	11	2.2147	2.2009	18.3
GQ-ARCH(1,1)	42.58	29.33	2.72	0.95	-1380.40	7	2.2145	2.2065	16.2
GQ-ARCH(2,1)	45.65	29.90	2.91	1.10	-1376.25	10	2.2127	2.2004	20.5
GQ-ARCH(1,2)	42.07	26.19	4.29	1.91	-1379.24	8	2.2143	2.2048	16.0
GQ-ARCH(2,2)	36.21	20.88	3.58	1.09	-1373.30	11	2.2096	2.1959	15.6
H-GARCH(1,1)	43.22	32.02	2.82	0.85	-1379.12	10	2.2173	2.2050	16.8
AUG-GARCH(1,1)	43.15	32.38	2.93	0.93	-1379.35	12	2.2208	2.2056	17.5

Table A.1.

Table A.2

IBM

Panel A: Models with Gaussian error distribution

Base model	R^2_{intra}	R^{*2}_{intra}	$R^2_{i.+o.}$	$R^{*2}_{i.+o.}$	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	1.93	5.51	3.10	3.62	0.70	0.57	-4820.17	2	4.0574	4.0563	29.9
LGARCH(1,1)	5.84	10.65	1.85	5.47	0.05	0.09	-4774.86	3	4.0201	4.0185	8.7
LGARCH(2,1)	2.98	6.46	2.86	4.82	0.10	0.17	-4768.85	4	4.0159	4.0137	7.3
LGARCH(1,2)	4.71	8.99	1.94	4.96	0.05	0.16	-4772.46	4	4.0189	4.0167	8.4
LGARCH(2,2)	5.08	9.25	3.01	5.92	0.10	0.13	-4765.28	5	4.0137	4.0108	6.7
IGARCH(1,1)	2.14	4.26	1.13	2.61	0.01	0.83	-4778.88	2	4.0226	4.0215	10.4
IGARCH(2,1)	2.56	5.62	2.81	4.52	0.07	0.20	-4770.97	3	4.0168	4.0152	6.9
IGARCH(1,2)	2.12	4.34	1.38	2.89	0.00	0.68	-4775.92	3	4.0210	4.0194	9.3
IGARCH(2,2)	4.65	8.51	2.97	5.68	0.08	0.17	-4767.64	4	4.0148	4.0126	6.4
TS-GARCH(1,1)	12.24	17.01	1.05	5.22	0.19	0.01	-4750.16	3	3.9993	3.9977	11.4
TS-GARCH(2,1)	10.73	17.47	1.94	6.09	0.45	0.06	-4743.75	4	3.9947	3.9925	8.3
TS-GARCH(1,2)	12.29	17.71	1.24	5.57	0.26	0.04	-4746.69	4	3.9972	3.9950	10.2
TS-GARCH(2,2)	11.21	17.77	1.83	6.12	0.42	0.06	-4743.52	5	3.9954	3.9925	8.4
A-GARCH(1,1)	7.23	14.36	1.86	7.14	0.42	0.07	-4761.61	4	4.0098	4.0076	9.8
A-GARCH(2,1)	6.28	13.22	2.11	7.54	0.80	0.22	-4753.67	6	4.0048	4.0012	9.8
A-GARCH(1,2)	7.41	14.39	1.67	7.03	0.42	0.09	-4759.90	5	4.0092	4.0063	10.3
A-GARCH(2,2)	6.16	13.07	2.14	7.51	0.81	0.22	-4753.62	7	4.0056	4.0013	9.7
NA-GARCH(1,1)	7.34	14.39	1.88	7.07	0.65	0.09	-4760.27	4	4.0086	4.0064	10.0
NA-GARCH(2,1)	6.37	13.15	1.87	7.40	1.00	0.27	-4752.20	6	4.0035	4.0000	10.4
NA-GARCH(1,2)	7.53	14.33	1.66	6.93	0.66	0.12	-4758.47	5	4.0080	4.0051	10.6
NA-GARCH(2,2)	6.60	13.26	1.68	7.29	0.98	0.29	-4751.81	7	4.0040	3.9998	10.6
V-GARCH(1,1)	7.09	13.70	2.11	7.55	0.53	0.26	-4765.23	4	4.0128	4.0106	10.1
V-GARCH(2,1)	3.94	9.80	2.53	7.21	1.02	0.41	-4755.09	6	4.0060	4.0024	9.6
V-GARCH(1,2)	7.35	13.67	1.92	7.41	0.52	0.29	-4763.60	5	4.0123	4.0094	10.6
V-GARCH(2,2)	3.63	9.32	2.55	7.10	1.05	0.41	-4754.52	7	4.0063	4.0021	9.5
THR-GARCH(1,1)	11.11	16.87	0.96	5.67	0.70	0.25	-4735.06	4	3.9874	3.9852	12.4
THR-GARCH(2,1)	9.97	16.37	1.06	6.01	0.90	0.34	-4729.37	6	3.9843	3.9808	11.4
THR-GARCH(1,2)	11.22	17.39	1.10	5.85	0.71	0.27	-4733.19	5	3.9867	3.9838	11.8
THR-GARCH(2,2)	9.97	16.36	1.07	6.01	0.90	0.34	-4729.37	7	3.9852	3.9809	11.4
GJR-GARCH(1,1)	6.32	12.44	1.29	5.93	0.43	0.05	-4758.03	4	4.0068	4.0046	10.7
GJR-GARCH(2,1)	6.37	12.26	1.12	6.22	0.48	0.07	-4756.01	6	4.0067	4.0032	11.1
GJR-GARCH(1,2)	6.35	12.31	1.18	5.86	0.42	0.05	-4756.42	5	4.0062	4.0034	10.9
GJR-GARCH(2,2)	6.59	10.59	1.67	4.92	0.18	0.13	-4750.81	7	4.0032	3.9990	8.3
LOG-GARCH(1,1)	11.94	16.86	1.20	5.45	0.15	0.02	-4750.30	3	3.9994	3.9978	11.1
LOG-GARCH(2,1)	9.76	16.32	2.06	6.01	0.42	0.05	-4743.22	4	3.9943	3.9921	8.3
LOG-GARCH(1,2)	11.55	17.18	1.43	5.74	0.25	0.05	-4746.50	4	3.9971	3.9949	9.9
LOG-GARCH(2,2)	9.85	16.14	2.26	6.28	0.37	0.01	-4742.25	5	3.9943	3.9915	7.8
EGARCH(1,1)	10.92	16.57	1.08	5.86	0.62	0.26	-4735.31	4	3.9876	3.9854	12.2
EGARCH(2,1)	8.64	14.95	1.13	5.89	0.88	0.38	-4729.29	6	3.9843	3.9807	11.4
EGARCH(1,2)	10.69	16.92	1.28	6.01	0.64	0.30	-4733.22	5	3.9867	3.9839	11.6
EGARCH(2,2)	8.55	14.84	1.16	5.90	0.88	0.38	-4729.25	7	3.9851	3.9808	11.3
NGARCH(1,1)	14.02	17.83	0.85	4.69	0.27	0.05	-4747.73	4	3.9981	3.9959	12.3
NGARCH(2,1)	13.45	19.29	1.50	5.37	0.61	0.09	-4738.34	5	3.9910	3.9882	8.5
NGARCH(1,2)	14.26	18.73	0.98	4.89	0.38	0.10	-4743.46	5	3.9953	3.9925	10.9
NGARCH(2,2)	13.52	19.26	1.59	5.55	0.56	0.07	-4738.00	6	3.9916	3.9880	8.2
A-PARCH(1,1)	12.34	17.69	0.82	5.15	0.81	0.35	-4732.24	5	3.9859	3.9830	13.0
A-PARCH(2,1)	10.55	16.62	0.74	4.76	0.91	0.39	-4722.93	7	3.9797	3.9755	10.8
A-PARCH(1,2)	12.65	18.09	0.89	5.32	0.75	0.33	-4730.50	6	3.9853	3.9817	12.5
A-PARCH(2,2)	10.56	16.64	0.73	4.75	0.92	0.39	-4722.92	8	3.9806	3.9756	10.9
GQ-ARCH(1,1)	7.23	14.36	1.86	7.14	0.42	0.07	-4761.61	4	4.0098	4.0076	9.8
GQ-ARCH(2,1)	5.87	11.13	1.35	5.95	1.21	0.17	-4751.76	7	4.0040	3.9998	8.2
GQ-ARCH(1,2)	7.41	14.39	1.67	7.04	0.42	0.09	-4759.90	5	4.0092	4.0063	10.3
GQ-ARCH(2,2)	1.00	1.41	0.89	2.74	0.04	0.61	-4750.67	8	4.0039	3.9989	9.1
H-GARCH(1,1)	13.17	17.32	0.76	4.87	0.86	0.47	-4731.32	7	3.9868	3.9826	13.7
AUG-GARCH(1,1)	13.23	17.37	0.75	4.83	0.91	0.46	-4731.95	9	3.9890	3.9833	13.6

Table A.2.

Table A.2 - continued

IBM

Panel B: Models with Gaussian error distribution and constant in mean

Base model	R^2_{intra}	R^{*2}_{intra}	$R^2_{i.o.}$	$R^{*2}_{i.o.}$	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	1.99	5.64	3.16	3.72	0.70	0.59	-4819.30	3	4.0575	4.0559	30.5
LGARCH(1,1)	6.32	11.63	1.93	5.91	0.08	0.04	-4772.14	4	4.0186	4.0164	8.6
LGARCH(2,1)	3.28	7.03	2.81	4.97	0.10	0.17	-4767.45	5	4.0155	4.0127	7.2
LGARCH(1,2)	5.55	10.60	2.07	5.66	0.09	0.07	-4770.02	5	4.0177	4.0148	8.2
LGARCH(2,2)	5.53	10.00	3.02	6.15	0.11	0.11	-4763.68	6	4.0132	4.0097	6.6
IGARCH(1,1)	2.59	5.18	1.23	3.01	0.00	0.67	-4776.66	3	4.0216	4.0200	9.7
IGARCH(2,1)	2.73	5.96	2.77	4.60	0.07	0.21	-4769.79	4	4.0167	4.0145	6.8
IGARCH(1,2)	2.51	5.15	1.46	3.24	0.00	0.57	-4773.92	4	4.0201	4.0179	8.8
IGARCH(2,2)	5.03	9.13	2.97	5.87	0.09	0.15	-4766.27	5	4.0145	4.0117	6.3
TS-GARCH(1,1)	12.22	17.37	1.06	5.40	0.20	0.04	-4746.93	4	3.9974	3.9952	11.2
TS-GARCH(2,1)	10.77	17.78	1.97	6.23	0.48	0.08	-4742.39	5	3.9944	3.9916	8.2
TS-GARCH(1,2)	12.22	18.00	1.25	5.72	0.28	0.07	-4743.91	5	3.9957	3.9929	10.1
TS-GARCH(2,2)	11.70	18.30	1.73	6.23	0.40	0.07	-4741.74	6	3.9947	3.9912	8.6
A-GARCH(1,1)	7.23	14.37	1.86	7.14	0.43	0.07	-4760.43	5	4.0096	4.0068	9.6
A-GARCH(2,1)	6.31	13.26	2.09	7.55	0.80	0.23	-4752.69	7	4.0048	4.0005	9.7
A-GARCH(1,2)	7.42	14.40	1.67	7.04	0.42	0.10	-4758.73	6	4.0090	4.0055	10.1
A-GARCH(2,2)	6.18	13.10	2.13	7.53	0.81	0.22	-4752.62	8	4.0056	4.0006	9.6
NA-GARCH(1,1)	7.32	14.37	1.87	7.06	0.65	0.10	-4759.06	5	4.0085	4.0056	9.8
NA-GARCH(2,1)	6.36	13.12	1.84	7.37	1.00	0.28	-4751.10	7	4.0035	3.9992	10.3
NA-GARCH(1,2)	7.52	14.32	1.65	6.92	0.65	0.12	-4757.27	6	4.0078	4.0043	10.5
NA-GARCH(2,2)	6.57	13.22	1.67	7.28	0.98	0.29	-4750.76	8	4.0040	3.9990	10.4
V-GARCH(1,1)	7.05	13.66	2.10	7.53	0.53	0.27	-4764.08	5	4.0127	4.0098	10.0
V-GARCH(2,1)	3.95	9.80	2.49	7.20	1.02	0.41	-4754.17	7	4.0060	4.0018	9.5
V-GARCH(1,2)	7.32	13.63	1.89	7.39	0.52	0.29	-4762.45	6	4.0122	4.0086	10.5
V-GARCH(2,2)	3.64	9.33	2.52	7.10	1.05	0.42	-4753.59	8	4.0064	4.0014	9.4
THR-GARCH(1,1)	11.07	16.94	0.96	5.68	0.69	0.25	-4733.95	5	3.9873	3.9845	12.3
THR-GARCH(2,1)	10.00	16.45	1.05	6.03	0.90	0.35	-4728.62	7	3.9845	3.9803	11.3
THR-GARCH(1,2)	11.19	17.44	1.09	5.86	0.71	0.27	-4732.16	6	3.9867	3.9831	11.7
THR-GARCH(2,2)	9.98	16.43	1.05	6.03	0.90	0.35	-4728.62	8	3.9854	3.9804	11.3
GJR-GARCH(1,1)	6.30	12.41	1.26	5.90	0.45	0.06	-4756.09	5	4.0060	4.0031	10.6
GJR-GARCH(2,1)	6.36	12.21	1.08	6.13	0.49	0.08	-4754.15	7	4.0060	4.0018	11.0
GJR-GARCH(1,2)	6.34	12.26	1.15	5.83	0.44	0.06	-4754.48	6	4.0055	4.0019	10.8
GJR-GARCH(2,2)	6.62	10.69	1.64	4.96	0.20	0.12	-4749.73	8	4.0031	3.9982	8.2
LOG-GARCH(1,1)	11.90	17.19	1.21	5.62	0.18	0.04	-4747.16	4	3.9976	3.9954	10.9
LOG-GARCH(2,1)	10.20	16.91	1.97	6.17	0.41	0.07	-4741.50	5	3.9937	3.9908	8.4
LOG-GARCH(1,2)	11.54	17.48	1.44	5.89	0.27	0.08	-4743.80	5	3.9956	3.9928	9.8
LOG-GARCH(2,2)	10.34	16.75	2.17	6.43	0.36	0.02	-4740.68	6	3.9938	3.9903	7.8
EGARCH(1,1)	10.89	16.66	1.08	5.88	0.62	0.27	-4734.17	5	3.9875	3.9847	12.1
EGARCH(2,1)	8.73	15.10	1.12	5.94	0.88	0.39	-4728.56	7	3.9845	3.9802	11.3
EGARCH(1,2)	10.69	17.00	1.27	6.03	0.63	0.31	-4732.18	6	3.9867	3.9831	11.5
EGARCH(2,2)	8.64	14.99	1.15	5.94	0.88	0.39	-4728.53	8	3.9853	3.9803	11.2
NGARCH(1,1)	15.13	18.04	0.63	3.85	0.32	0.28	-4741.08	5	3.9933	3.9905	13.4
NGARCH(2,1)	14.65	19.92	1.22	5.07	0.61	0.21	-4735.08	6	3.9891	3.9856	9.0
NGARCH(1,2)	15.25	18.95	0.74	4.19	0.41	0.30	-4737.55	6	3.9912	3.9877	11.6
NGARCH(2,2)	14.70	19.86	1.33	5.29	0.57	0.19	-4734.93	7	3.9898	3.9856	8.5
A-PARCH(1,1)	12.59	17.90	0.75	4.93	0.77	0.40	-4730.54	6	3.9853	3.9818	13.1
A-PARCH(2,1)	10.69	16.54	0.58	4.23	0.83	0.43	-4720.82	8	3.9788	3.9738	10.9
A-PARCH(1,2)	12.96	18.69	0.88	5.10	0.80	0.44	-4728.33	7	3.9843	3.9800	12.0
A-PARCH(2,2)	10.58	16.34	0.53	4.13	0.82	0.43	-4720.79	9	3.9796	3.9739	11.1
GQ-ARCH(1,1)	7.23	14.37	1.86	7.14	0.43	0.07	-4760.43	5	4.0096	4.0068	9.6
GQ-ARCH(2,1)	5.92	11.16	1.33	5.95	1.21	0.18	-4750.76	8	4.0040	3.9990	8.2
GQ-ARCH(1,2)	7.43	14.40	1.67	7.04	0.42	0.10	-4758.73	6	4.0090	4.0055	10.1
GQ-ARCH(2,2)	1.07	1.51	0.92	2.82	0.04	0.62	-4749.98	9	4.0042	3.9985	8.9
H-GARCH(1,1)	13.11	17.30	0.77	4.95	0.84	0.49	-4730.39	8	3.9869	3.9819	13.5
AUG-GARCH(1,1)	13.15	17.32	0.76	4.85	0.91	0.48	-4731.05	10	3.9891	3.9826	13.6

Table A.2.

Table A.2 - continued

IBM

Panel C: Models with Gaussian error distribution and constant and GARCH in mean

Base model	R^2_{intra}	R^{*2}_{intra}	$R^2_{i.+o.}$	$R^{*2}_{i.+o.}$	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	1.99	5.62	3.14	3.71	0.70	0.59	-4819.20	4	4.0582	4.0560	30.2
LGARCH(1,1)	6.50	11.96	1.95	6.07	0.10	0.03	-4771.45	5	4.0189	4.0160	8.7
LGARCH(2,1)	3.39	7.27	2.81	5.07	0.12	0.16	-4766.79	6	4.0158	4.0123	7.4
LGARCH(1,2)	5.78	11.05	2.09	5.87	0.12	0.05	-4769.37	6	4.0180	4.0144	8.3
LGARCH(2,2)	5.92	10.63	3.03	6.38	0.14	0.09	-4762.71	7	4.0132	4.0090	6.7
IGARCH(1,1)	2.60	5.27	1.22	3.05	0.00	0.66	-4776.05	4	4.0219	4.0197	9.9
IGARCH(2,1)	2.88	6.29	2.78	4.74	0.09	0.19	-4769.07	5	4.0169	4.0140	7.0
IGARCH(1,2)	2.54	5.27	1.46	3.29	0.00	0.55	-4773.30	5	4.0204	4.0176	9.1
IGARCH(2,2)	5.60	10.07	3.01	6.21	0.12	0.11	-4765.16	6	4.0144	4.0109	6.4
TS-GARCH(1,1)	11.65	17.06	1.02	5.32	0.23	0.03	-4746.33	5	3.9978	3.9949	11.3
TS-GARCH(2,1)	10.73	17.83	1.99	6.31	0.50	0.09	-4742.19	6	3.9951	3.9916	8.3
TS-GARCH(1,2)	11.83	17.83	1.23	5.73	0.31	0.08	-4743.41	6	3.9961	3.9926	10.2
TS-GARCH(2,2)	11.30	18.21	1.84	6.37	0.44	0.10	-4741.63	7	3.9955	3.9912	8.5
A-GARCH(1,1)	7.22	14.35	1.86	7.13	0.46	0.08	-4759.92	6	4.0100	4.0065	9.7
A-GARCH(2,1)	6.38	13.33	2.08	7.55	0.80	0.22	-4752.55	8	4.0055	4.0005	9.8
A-GARCH(1,2)	7.41	14.37	1.67	7.03	0.45	0.10	-4758.24	7	4.0095	4.0052	10.2
A-GARCH(2,2)	6.25	13.17	2.11	7.53	0.81	0.22	-4752.49	9	4.0063	4.0006	9.7
NA-GARCH(1,1)	7.30	14.35	1.87	7.05	0.65	0.10	-4759.02	6	4.0093	4.0057	9.9
NA-GARCH(2,1)	6.30	13.09	1.88	7.39	1.01	0.28	-4751.05	8	4.0042	3.9993	10.2
NA-GARCH(1,2)	7.52	14.32	1.65	6.92	0.66	0.12	-4757.25	7	4.0086	4.0044	10.5
NA-GARCH(2,2)	6.55	13.20	1.67	7.28	0.98	0.30	-4750.70	9	4.0048	3.9991	10.4
V-GARCH(1,1)	7.15	13.74	2.11	7.56	0.55	0.28	-4763.38	6	4.0129	4.0094	10.1
V-GARCH(2,1)	4.00	9.91	2.53	7.23	1.02	0.41	-4753.95	8	4.0067	4.0017	9.6
V-GARCH(1,2)	7.39	13.72	1.94	7.43	0.55	0.29	-4761.80	7	4.0125	4.0082	10.5
V-GARCH(2,2)	3.72	9.44	2.52	7.12	1.05	0.41	-4753.38	9	4.0071	4.0013	9.5
THR-GARCH(1,1)	10.97	16.88	0.95	5.66	0.70	0.25	-4733.91	6	3.9881	3.9846	12.3
THR-GARCH(2,1)	10.00	16.45	1.05	6.04	0.90	0.35	-4728.60	8	3.9854	3.9804	11.3
THR-GARCH(1,2)	11.10	17.38	1.09	5.83	0.72	0.27	-4732.13	7	3.9875	3.9832	11.7
THR-GARCH(2,2)	9.99	16.43	1.06	6.04	0.90	0.35	-4728.60	9	3.9862	3.9805	11.3
GJR-GARCH(1,1)	6.29	12.39	1.25	5.90	0.45	0.06	-4756.08	6	4.0068	4.0033	10.6
GJR-GARCH(2,1)	6.34	12.18	1.08	6.12	0.49	0.08	-4754.13	8	4.0068	4.0019	11.0
GJR-GARCH(1,2)	6.33	12.24	1.14	5.82	0.44	0.06	-4754.47	7	4.0063	4.0020	10.8
GJR-GARCH(2,2)	6.72	10.81	1.67	5.00	0.20	0.11	-4749.54	9	4.0038	3.9981	8.2
LOG-GARCH(1,1)	11.56	17.04	1.19	5.61	0.20	0.05	-4746.55	5	3.9979	3.9951	11.0
LOG-GARCH(2,1)	10.05	16.87	1.95	6.22	0.42	0.08	-4741.07	6	3.9942	3.9906	8.5
LOG-GARCH(1,2)	11.24	17.34	1.41	5.90	0.29	0.09	-4743.29	6	3.9960	3.9925	9.9
LOG-GARCH(2,2)	10.40	16.89	2.16	6.52	0.38	0.03	-4740.25	7	3.9943	3.9901	7.8
EGARCH(1,1)	10.79	16.60	1.07	5.86	0.63	0.27	-4734.08	6	3.9883	3.9847	12.1
EGARCH(2,1)	8.73	15.10	1.12	5.94	0.88	0.39	-4728.55	8	3.9853	3.9803	11.3
EGARCH(1,2)	10.60	16.94	1.27	6.00	0.65	0.31	-4732.10	7	3.9875	3.9832	11.5
EGARCH(2,2)	8.64	14.99	1.15	5.94	0.88	0.39	-4728.52	9	3.9861	3.9804	11.2
NGARCH(1,1)	13.36	17.60	0.64	4.11	0.32	0.21	-4740.82	6	3.9940	3.9904	13.7
NGARCH(2,1)	13.85	19.59	1.21	5.29	0.58	0.22	-4734.73	7	3.9897	3.9854	9.0
NGARCH(1,2)	13.25	18.55	0.82	4.66	0.45	0.20	-4737.78	7	3.9922	3.9880	11.2
NGARCH(2,2)	13.93	19.63	1.37	5.49	0.59	0.21	-4734.57	8	3.9904	3.9854	8.3
A-PARCH(1,1)	11.64	17.40	0.74	4.98	0.75	0.44	-4729.68	7	3.9854	3.9812	12.8
A-PARCH(2,1)	10.48	16.89	0.67	4.66	0.83	0.49	-4720.68	9	3.9795	3.9738	10.5
A-PARCH(1,2)	12.14	18.06	0.81	5.07	0.70	0.47	-4727.63	8	3.9845	3.9796	12.0
A-PARCH(2,2)	10.63	16.98	0.62	4.52	0.85	0.48	-4720.57	10	3.9803	3.9738	10.6
GQ-ARCH(1,1)	7.22	14.35	1.86	7.13	0.46	0.08	-4759.92	6	4.0100	4.0065	9.7
GQ-ARCH(2,1)	6.00	11.25	1.32	5.96	1.22	0.17	-4750.59	9	4.0047	3.9990	8.3
GQ-ARCH(1,2)	7.41	14.37	1.67	7.02	0.45	0.10	-4758.24	7	4.0095	4.0052	10.2
GQ-ARCH(2,2)	1.68	2.44	1.10	3.42	0.01	0.49	-4749.61	10	4.0047	3.9982	8.8
H-GARCH(1,1)	12.96	17.48	0.77	4.92	0.89	0.45	-4730.36	9	3.9877	3.9820	13.6
AUG-GARCH(1,1)	13.35	17.70	0.77	4.91	0.87	0.43	-4730.93	11	3.9898	3.9826	13.5

Table A.2.

Table A.2 - continued

IBM

Panel D: Models with t distributed errors

Base model	R^2_{intra}	R^{*2}_{intra}	$R^2_{i.o.}$	$R^{*2}_{i.o.}$	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	1.93	5.58	3.10	3.59	0.70	0.56	-4648.83	3	3.9140	3.9124	29.3
LGARCH(1,1)	3.97	7.49	1.51	4.05	0.01	0.36	-4623.09	4	3.8932	3.8910	9.8
LGARCH(2,1)	3.57	7.93	3.20	5.52	0.20	0.05	-4617.34	5	3.8892	3.8864	7.4
LGARCH(1,2)	3.91	7.75	1.97	4.57	0.05	0.19	-4620.27	5	3.8917	3.8888	8.9
LGARCH(2,2)	4.10	8.53	3.17	5.74	0.19	0.09	-4617.03	6	3.8898	3.8863	6.9
IGARCH(1,1)	2.23	4.41	1.15	2.67	0.01	0.81	-4627.67	3	3.8962	3.8946	10.6
IGARCH(2,1)	2.80	6.36	3.11	4.94	0.14	0.09	-4620.74	4	3.8912	3.8890	7.0
IGARCH(1,2)	2.31	4.78	1.56	3.22	0.00	0.51	-4624.70	4	3.8946	3.8924	9.3
IGARCH(2,2)	3.51	7.28	3.10	5.31	0.14	0.14	-4620.31	5	3.8917	3.8889	6.6
TS-GARCH(1,1)	11.98	16.82	1.05	5.10	0.21	0.00	-4612.39	4	3.8842	3.8820	12.0
TS-GARCH(2,1)	11.15	17.70	1.84	6.04	0.44	0.03	-4607.65	5	3.8811	3.8782	8.5
TS-GARCH(1,2)	11.90	17.53	1.29	5.47	0.32	0.03	-4609.34	5	3.8825	3.8796	10.5
TS-GARCH(2,2)	11.17	17.71	1.84	6.06	0.43	0.03	-4607.65	6	3.8819	3.8784	8.5
A-GARCH(1,1)	6.50	13.11	1.79	6.54	0.32	0.00	-4619.67	5	3.8912	3.8883	9.3
A-GARCH(2,1)	5.04	11.50	3.25	6.80	0.39	0.00	-4615.54	7	3.8894	3.8851	7.7
A-GARCH(1,2)	6.04	12.80	2.20	6.70	0.37	0.01	-4617.25	6	3.8900	3.8864	8.8
A-GARCH(2,2)	8.79	14.69	2.67	7.14	0.28	0.01	-4613.18	8	3.8882	3.8833	7.0
NA-GARCH(1,1)	7.13	14.07	1.88	6.92	0.53	0.04	-4618.92	5	3.8906	3.8877	9.5
NA-GARCH(2,1)	7.14	14.08	1.88	6.92	0.52	0.04	-4617.36	7	3.8909	3.8867	9.5
NA-GARCH(1,2)	6.68	13.89	2.30	7.11	0.56	0.05	-4616.67	6	3.8895	3.8860	8.9
NA-GARCH(2,2)	6.48	13.56	2.33	6.93	0.50	0.03	-4616.54	8	3.8911	3.8861	8.7
V-GARCH(1,1)	6.28	12.62	2.07	6.89	0.39	0.06	-4621.05	5	3.8923	3.8895	10.4
V-GARCH(2,1)	3.84	9.97	3.51	7.10	0.59	0.08	-4617.83	7	3.8913	3.8871	8.7
V-GARCH(1,2)	5.57	12.09	2.61	7.09	0.44	0.11	-4618.64	6	3.8912	3.8876	9.7
V-GARCH(2,2)	5.95	11.67	3.44	6.92	0.19	0.01	-4616.56	8	3.8911	3.8861	7.6
THR-GARCH(1,1)	11.75	17.54	1.02	5.83	0.58	0.22	-4607.52	5	3.8810	3.8781	11.9
THR-GARCH(2,1)	11.63	19.14	1.78	6.55	0.66	0.22	-4604.25	7	3.8799	3.8756	9.6
THR-GARCH(1,2)	11.53	18.18	1.29	6.06	0.67	0.30	-4604.84	6	3.8795	3.8760	11.0
THR-GARCH(2,2)	16.02	21.74	1.50	6.72	0.72	0.09	-4602.30	8	3.8791	3.8741	9.4
GJR-GARCH(1,1)	5.88	11.79	1.27	5.67	0.38	0.00	-4618.57	5	3.8903	3.8874	9.4
GJR-GARCH(2,1)	4.74	11.08	3.15	5.52	0.26	0.00	-4613.18	7	3.8874	3.8832	7.7
GJR-GARCH(1,2)	5.57	11.84	1.71	5.87	0.49	0.02	-4615.90	6	3.8889	3.8853	9.2
GJR-GARCH(2,2)	7.60	13.20	2.56	5.70	0.18	0.15	-4611.02	8	3.8864	3.8815	7.0
LOG-GARCH(1,1)	11.75	16.71	1.17	5.29	0.17	0.01	-4612.39	4	3.8842	3.8820	11.7
LOG-GARCH(2,1)	9.74	16.41	2.10	6.08	0.41	0.07	-4607.52	5	3.8810	3.8781	8.5
LOG-GARCH(1,2)	11.23	17.04	1.48	5.66	0.32	0.07	-4609.15	5	3.8823	3.8795	10.1
LOG-GARCH(2,2)	9.75	16.40	2.12	6.12	0.41	0.07	-4607.51	6	3.8818	3.8783	8.4
EGARCH(1,1)	11.52	17.26	1.14	5.99	0.52	0.22	-4607.45	5	3.8809	3.8780	11.7
EGARCH(2,1)	9.92	17.74	2.12	6.44	0.53	0.28	-4603.41	7	3.8792	3.8749	9.8
EGARCH(1,2)	10.59	17.31	1.51	6.10	0.64	0.39	-4604.40	6	3.8792	3.8756	11.0
EGARCH(2,2)	15.00	20.97	1.89	6.86	0.52	0.07	-4602.70	8	3.8794	3.8744	9.1
NGARCH(1,1)	14.09	17.94	0.85	4.61	0.29	0.05	-4611.27	5	3.8841	3.8813	13.4
NGARCH(2,1)	13.48	19.24	1.43	5.48	0.49	0.09	-4606.69	6	3.8811	3.8776	9.4
NGARCH(1,2)	14.14	18.87	1.00	4.85	0.43	0.12	-4608.10	6	3.8823	3.8787	11.7
NGARCH(2,2)	13.45	19.24	1.41	5.42	0.51	0.10	-4606.68	7	3.8819	3.8777	9.5
A-PARCH(1,1)	13.03	18.24	0.87	5.32	0.63	0.34	-4606.40	6	3.8809	3.8773	12.8
A-PARCH(2,1)	13.22	20.06	1.46	6.05	0.67	0.36	-4602.94	8	3.8796	3.8746	10.1
A-PARCH(1,2)	12.97	19.04	1.07	5.51	0.71	0.43	-4603.69	7	3.8794	3.8752	11.4
A-PARCH(2,2)	16.96	22.44	1.35	6.61	0.85	0.18	-4602.06	9	3.8797	3.8740	10.0
GQ-ARCH(1,1)	6.50	13.11	1.79	6.54	0.32	0.00	-4619.67	5	3.8912	3.8883	9.3
GQ-ARCH(2,1)	2.07	3.27	1.53	3.13	0.21	0.18	-4611.58	8	3.8869	3.8819	5.5
GQ-ARCH(1,2)	6.05	12.80	2.20	6.70	0.37	0.01	-4617.25	6	3.8900	3.8864	8.8
GQ-ARCH(2,2)	2.86	3.13	1.24	3.42	0.00	0.63	-4609.10	9	3.8857	3.8799	6.3
H-GARCH(1,1)	13.60	17.54	0.76	4.82	0.76	0.47	-4607.26	8	3.8833	3.8783	13.9
AUG-GARCH(1,1)	13.54	17.88	0.79	5.07	0.70	0.40	-4606.74	10	3.8845	3.8780	13.3

Table A.2.

Table A.2 - continued

IBM

Panel E: Models with t distributed errors and constant in mean

Base model	R^2_{intra}	R^{*2}_{intra}	$R^2_{i.+o.}$	$R^{*2}_{i.+o.}$	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	1.97	5.69	3.14	3.65	0.70	0.58	-4648.31	4	3.9144	3.9122	29.5
LGARCH(1,1)	4.08	7.74	1.53	4.16	0.01	0.34	-4622.53	5	3.8936	3.8907	9.7
LGARCH(2,1)	3.66	8.15	3.23	5.61	0.21	0.04	-4616.83	6	3.8896	3.8861	7.4
LGARCH(1,2)	4.02	7.99	1.98	4.67	0.06	0.17	-4619.72	6	3.8921	3.8885	8.9
LGARCH(2,2)	4.26	8.83	3.19	5.86	0.20	0.09	-4616.50	7	3.8902	3.8859	6.9
IGARCH(1,1)	2.30	4.59	1.16	2.75	0.01	0.78	-4627.15	4	3.8966	3.8944	10.4
IGARCH(2,1)	2.88	6.55	3.14	5.02	0.15	0.09	-4620.26	5	3.8917	3.8888	7.0
IGARCH(1,2)	2.38	4.96	1.58	3.30	0.00	0.48	-4624.19	5	3.8950	3.8921	9.1
IGARCH(2,2)	3.66	7.57	3.12	5.42	0.14	0.14	-4619.80	6	3.8921	3.8886	6.5
TS-GARCH(1,1)	11.94	16.92	1.05	5.14	0.21	0.01	-4611.80	5	3.8846	3.8817	11.9
TS-GARCH(2,1)	11.21	17.88	1.84	6.11	0.45	0.04	-4607.19	6	3.8815	3.8780	8.5
TS-GARCH(1,2)	11.87	17.63	1.29	5.52	0.33	0.04	-4608.81	6	3.8829	3.8793	10.5
TS-GARCH(2,2)	11.24	17.89	1.84	6.13	0.44	0.04	-4607.19	7	3.8824	3.8781	8.5
A-GARCH(1,1)	6.45	13.04	1.78	6.50	0.32	0.00	-4619.30	6	3.8917	3.8882	9.3
A-GARCH(2,1)	5.03	11.51	3.24	6.81	0.40	0.00	-4615.19	8	3.8899	3.8850	7.7
A-GARCH(1,2)	6.01	12.74	2.19	6.67	0.37	0.01	-4616.90	7	3.8905	3.8863	8.8
A-GARCH(2,2)	8.77	14.71	2.68	7.15	0.28	0.01	-4612.93	9	3.8889	3.8832	6.9
NA-GARCH(1,1)	7.08	14.01	1.87	6.89	0.52	0.04	-4618.57	6	3.8911	3.8876	9.4
NA-GARCH(2,1)	7.09	14.03	1.87	6.94	0.53	0.04	-4617.03	8	3.8915	3.8865	9.4
NA-GARCH(1,2)	6.64	13.83	2.29	7.08	0.55	0.05	-4616.32	7	3.8900	3.8858	8.9
NA-GARCH(2,2)	6.76	14.08	2.31	7.29	0.61	0.07	-4616.27	9	3.8917	3.8860	9.0
V-GARCH(1,1)	6.22	12.53	2.05	6.84	0.39	0.06	-4620.67	6	3.8929	3.8893	10.4
V-GARCH(2,1)	3.40	8.93	3.18	6.62	0.63	0.06	-4617.75	8	3.8921	3.8871	8.9
V-GARCH(1,2)	5.50	11.98	2.59	7.03	0.44	0.11	-4618.27	7	3.8917	3.8874	9.7
V-GARCH(2,2)	4.03	10.31	3.65	7.06	0.47	0.06	-4616.84	9	3.8922	3.8864	8.6
THR-GARCH(1,1)	11.71	17.56	1.02	5.83	0.58	0.22	-4607.23	6	3.8816	3.8780	11.9
THR-GARCH(2,1)	11.66	19.28	1.80	6.50	0.61	0.23	-4603.59	8	3.8802	3.8752	9.6
THR-GARCH(1,2)	11.51	18.20	1.29	6.06	0.67	0.30	-4604.59	7	3.8802	3.8759	10.9
THR-GARCH(2,2)	16.12	22.07	1.57	6.88	0.67	0.10	-4602.26	9	3.8799	3.8742	9.1
GJR-GARCH(1,1)	5.89	11.83	1.26	5.67	0.39	0.00	-4618.04	6	3.8907	3.8871	9.4
GJR-GARCH(2,1)	4.82	11.24	3.11	5.57	0.28	0.00	-4612.82	8	3.8879	3.8830	7.7
GJR-GARCH(1,2)	5.57	11.88	1.70	5.87	0.50	0.02	-4615.41	7	3.8893	3.8850	9.2
GJR-GARCH(2,2)	7.65	13.31	2.55	5.74	0.19	0.14	-4610.71	9	3.8870	3.8813	7.0
LOG-GARCH(1,1)	11.72	16.82	1.17	5.34	0.18	0.01	-4611.79	5	3.8845	3.8817	11.6
LOG-GARCH(2,1)	9.80	16.59	2.11	6.15	0.42	0.08	-4607.02	6	3.8814	3.8778	8.5
LOG-GARCH(1,2)	11.22	17.15	1.49	5.72	0.33	0.08	-4608.59	6	3.8827	3.8792	10.1
LOG-GARCH(2,2)	9.82	16.58	2.12	6.19	0.42	0.08	-4607.01	7	3.8822	3.8780	8.4
EGARCH(1,1)	11.49	17.28	1.14	5.99	0.53	0.22	-4607.13	6	3.8815	3.8779	11.6
EGARCH(2,1)	9.96	17.79	2.11	6.46	0.53	0.28	-4603.16	8	3.8798	3.8748	9.8
EGARCH(1,2)	10.58	17.35	1.51	6.10	0.65	0.39	-4604.12	7	3.8798	3.8755	11.0
EGARCH(2,2)	14.98	20.98	1.88	6.87	0.53	0.07	-4602.46	9	3.8801	3.8743	9.0
NGARCH(1,1)	14.22	18.01	0.80	4.48	0.30	0.08	-4610.54	6	3.8843	3.8808	13.7
NGARCH(2,1)	13.62	19.43	1.40	5.48	0.50	0.12	-4606.25	7	3.8816	3.8773	9.5
NGARCH(1,2)	14.23	18.97	0.95	4.76	0.44	0.15	-4607.47	7	3.8826	3.8783	11.8
NGARCH(2,2)	13.60	19.43	1.37	5.42	0.51	0.12	-4606.24	8	3.8824	3.8774	9.6
A-PARCH(1,1)	13.03	18.28	0.85	5.26	0.62	0.36	-4606.13	7	3.8815	3.8772	12.8
A-PARCH(2,1)	13.24	19.71	1.24	5.78	0.71	0.37	-4603.15	9	3.8806	3.8749	10.4
A-PARCH(1,2)	12.70	18.75	1.04	5.55	0.72	0.44	-4603.68	8	3.8802	3.8753	11.7
A-PARCH(2,2)	12.96	19.64	1.22	5.72	0.74	0.42	-4602.97	10	3.8813	3.8749	10.6
GQ-ARCH(1,1)	6.46	13.05	1.78	6.51	0.32	0.00	-4619.30	6	3.8917	3.8882	9.3
GQ-ARCH(2,1)	2.02	3.18	1.52	3.09	0.19	0.18	-4611.14	9	3.8874	3.8816	5.5
GQ-ARCH(1,2)	6.00	12.74	2.20	6.67	0.37	0.01	-4616.90	7	3.8905	3.8863	8.8
GQ-ARCH(2,2)	2.97	3.29	1.27	3.49	0.00	0.62	-4608.92	10	3.8863	3.8799	6.2
H-GARCH(1,1)	13.78	17.75	0.77	4.95	0.66	0.49	-4606.43	9	3.8834	3.8777	13.6
AUG-GARCH(1,1)	13.32	17.82	0.81	5.14	0.71	0.41	-4606.57	11	3.8852	3.8780	13.2

Table A.2.

Table A.2 - continued

IBM

Panel F: Models with t distributed errors and constant and GARCH in mean

Base model	R^2_{intra}	R^{*2}_{intra}	$R^2_{i.+o.}$	$R^{*2}_{i.+o.}$	R^2_{inter}	R^{*2}_{inter}	Max L	# par	Akaike	Schwarz	LB(15)
LGARCH(1,0)	1.98	5.67	3.11	3.62	0.70	0.58	-4648.01	5	3.9150	3.9122	28.9
LGARCH(1,1)	4.31	8.20	1.56	4.36	0.03	0.29	-4622.15	6	3.8941	3.8906	9.7
LGARCH(2,1)	3.81	8.46	3.24	5.74	0.23	0.04	-4616.42	7	3.8901	3.8859	7.5
LGARCH(1,2)	4.23	8.42	2.01	4.86	0.08	0.14	-4619.33	7	3.8926	3.8883	8.9
LGARCH(2,2)	4.41	9.13	3.20	5.97	0.22	0.08	-4616.12	8	3.8907	3.8857	7.0
IGARCH(1,1)	2.41	4.83	1.19	2.86	0.00	0.73	-4626.90	5	3.8973	3.8944	10.5
IGARCH(2,1)	3.01	6.84	3.16	5.15	0.17	0.07	-4619.90	6	3.8922	3.8887	7.1
IGARCH(1,2)	2.50	5.22	1.60	3.41	0.01	0.45	-4623.92	6	3.8956	3.8921	9.2
IGARCH(2,2)	3.85	7.92	3.14	5.56	0.16	0.13	-4619.46	7	3.8927	3.8884	6.6
TS-GARCH(1,1)	11.70	16.86	1.02	5.15	0.22	0.01	-4611.45	6	3.8851	3.8816	11.9
TS-GARCH(2,1)	11.18	17.95	1.83	6.18	0.46	0.05	-4606.94	7	3.8822	3.8779	8.6
TS-GARCH(1,2)	11.69	17.60	1.27	5.54	0.34	0.05	-4608.50	7	3.8835	3.8792	10.5
TS-GARCH(2,2)	11.20	17.96	1.84	6.19	0.46	0.05	-4606.94	8	3.8830	3.8780	8.6
A-GARCH(1,1)	6.58	13.23	1.81	6.60	0.33	0.01	-4619.03	7	3.8923	3.8881	9.3
A-GARCH(2,1)	5.10	11.59	3.29	6.83	0.39	0.00	-4614.79	9	3.8904	3.8847	7.7
A-GARCH(1,2)	6.12	12.95	2.23	6.78	0.39	0.02	-4616.58	8	3.8911	3.8861	8.9
A-GARCH(2,2)	8.92	14.78	2.70	7.19	0.31	0.01	-4612.32	10	3.8892	3.8827	6.9
NA-GARCH(1,1)	7.11	14.04	1.88	6.92	0.53	0.04	-4618.43	7	3.8918	3.8876	9.4
NA-GARCH(2,1)	7.10	14.02	1.88	6.86	0.50	0.03	-4616.89	9	3.8922	3.8865	9.4
NA-GARCH(1,2)	6.64	13.84	2.32	7.11	0.57	0.06	-4616.13	8	3.8907	3.8857	8.9
NA-GARCH(2,2)	6.71	14.00	2.33	7.23	0.59	0.06	-4616.11	10	3.8924	3.8859	9.0
V-GARCH(1,1)	6.35	12.72	2.09	6.94	0.40	0.06	-4620.53	7	3.8936	3.8893	10.4
V-GARCH(2,1)	3.64	9.47	3.15	6.90	0.71	0.11	-4617.78	9	3.8930	3.8872	9.0
V-GARCH(1,2)	5.83	12.48	2.64	7.27	0.45	0.13	-4618.73	8	3.8929	3.8879	9.5
V-GARCH(2,2)	6.33	11.85	3.37	6.89	0.17	0.01	-4615.93	10	3.8922	3.8858	7.5
THR-GARCH(1,1)	11.63	17.50	1.01	5.81	0.58	0.23	-4607.14	7	3.8823	3.8781	11.9
THR-GARCH(2,1)	11.56	19.21	1.82	6.48	0.60	0.23	-4603.42	9	3.8809	3.8752	9.5
THR-GARCH(1,2)	11.42	18.13	1.28	6.05	0.68	0.31	-4604.48	8	3.8809	3.8759	11.0
THR-GARCH(2,2)	15.84	21.60	1.49	6.70	0.75	0.10	-4601.85	10	3.8804	3.8739	9.3
GJR-GARCH(1,1)	5.93	11.88	1.27	5.70	0.39	0.00	-4618.03	7	3.8915	3.8872	9.4
GJR-GARCH(2,1)	4.80	11.15	3.17	5.57	0.26	0.00	-4612.63	9	3.8886	3.8829	7.7
GJR-GARCH(1,2)	5.61	11.93	1.71	5.91	0.50	0.02	-4615.37	8	3.8901	3.8851	9.2
GJR-GARCH(2,2)	7.73	13.29	2.57	5.77	0.19	0.14	-4610.52	10	3.8877	3.8812	7.0
LOG-GARCH(1,1)	11.56	16.80	1.16	5.36	0.19	0.02	-4611.47	6	3.8851	3.8816	11.6
LOG-GARCH(2,1)	9.69	16.59	2.11	6.22	0.44	0.10	-4606.71	7	3.8820	3.8777	8.5
LOG-GARCH(1,2)	11.09	17.14	1.47	5.75	0.34	0.10	-4608.29	7	3.8833	3.8790	10.1
LOG-GARCH(2,2)	9.71	16.59	2.13	6.24	0.43	0.10	-4606.71	8	3.8828	3.8778	8.5
EGARCH(1,1)	11.45	17.25	1.14	5.98	0.53	0.23	-4607.06	7	3.8823	3.8780	11.7
EGARCH(2,1)	9.90	17.74	2.13	6.45	0.53	0.29	-4603.04	9	3.8806	3.8748	9.8
EGARCH(1,2)	10.53	17.29	1.50	6.10	0.66	0.40	-4604.02	8	3.8805	3.8756	11.0
EGARCH(2,2)	15.01	20.94	1.87	6.87	0.54	0.08	-4602.33	10	3.8808	3.8743	9.0
NGARCH(1,1)	13.34	17.71	0.79	4.60	0.27	0.08	-4610.41	7	3.8851	3.8808	13.1
NGARCH(2,1)	13.32	19.33	1.39	5.55	0.52	0.14	-4606.08	8	3.8823	3.8773	9.5
NGARCH(1,2)	13.63	18.46	0.78	4.45	0.44	0.18	-4608.08	8	3.8840	3.8790	12.4
NGARCH(2,2)	13.30	19.33	1.36	5.49	0.52	0.15	-4606.06	9	3.8831	3.8774	9.6
A-PARCH(1,1)	12.81	18.10	0.82	5.19	0.63	0.39	-4605.99	8	3.8822	3.8772	12.8
A-PARCH(2,1)	12.62	18.26	0.83	5.28	0.66	0.46	-4603.96	10	3.8822	3.8757	12.1
A-PARCH(1,2)	12.41	17.86	0.74	4.87	0.66	0.47	-4605.07	9	3.8823	3.8765	12.9
A-PARCH(2,2)	12.96	19.14	1.00	5.24	0.69	0.47	-4603.50	11	3.8826	3.8754	10.8
GQ-ARCH(1,1)	6.59	13.23	1.81	6.60	0.33	0.01	-4619.03	7	3.8923	3.8881	9.3
GQ-ARCH(2,1)	2.21	3.51	1.61	3.28	0.20	0.17	-4610.75	10	3.8879	3.8814	5.6
GQ-ARCH(1,2)	6.12	12.94	2.23	6.78	0.39	0.02	-4616.58	8	3.8911	3.8861	8.9
GQ-ARCH(2,2)	3.65	4.20	1.44	3.94	0.00	0.51	-4608.47	11	3.8868	3.8796	6.0
H-GARCH(1,1)	13.49	17.80	0.77	5.00	0.71	0.42	-4607.27	10	3.8850	3.8785	13.6
AUG-GARCH(1,1)	13.23	17.82	0.79	5.15	0.72	0.37	-4606.62	12	3.8861	3.8781	13.2

Table A.2.

2. Ranking of Volatility Models

Table A.4: Models with Gaussian error distribution and mean zero

Model	Exchange Rate Data						IBM Data						Mean
	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	
ARCH(1)	4.6	4.0	0.9	4.3	8.2	5.5	1.5	1.5	1.5	8.2	28.6	20.7	7.4
GARCH(1,1)	86.0	93.6	97.6	93.3	89.7	90.9	42.6	40.7	42.2	36.8	35.0	35.3	65.3
GARCH(2,1)	84.5	87.5	94.8	86.6	86.6	89.1	25.5	15.2	28.6	12.5	14.3	12.8	53.2
GARCH(1,2)	85.1	80.5	65.3	87.5	91.8	91.8	40.7	30.7	41.6	25.2	27.7	28.9	58.1
GARCH(2,2)	89.1	88.4	72.6	92.1	96.4	96.4	43.2	29.2	42.6	18.2	23.7	21.6	59.4
IGARCH(1,1)	7.3	7.9	17.9	8.8	6.1	8.2	13.1	3.6	14.6	1.8	2.4	2.1	7.8
IGARCH(2,1)	6.7	7.6	17.0	8.5	5.8	7.9	15.8	7.0	17.0	5.2	5.5	5.5	9.1
IGARCH(1,2)	4.0	6.1	14.6	7.9	4.6	6.4	13.7	4.3	14.9	2.1	3.0	2.7	7.0
IGARCH(2,2)	10.6	8.8	14.0	6.1	7.9	8.8	37.1	8.8	31.9	7.3	7.0	6.4	12.9
TS-GARCH(1,1)	54.4	58.7	73.6	61.1	35.3	40.1	86.3	68.7	84.5	29.5	24.0	24.3	53.4
TS-GARCH(2,1)	57.1	57.4	72.3	58.4	32.5	38.3	72.6	68.1	82.7	35.3	31.3	31.6	53.1
TS-GARCH(1,2)	91.8	88.8	86.6	84.2	76.6	72.6	87.2	71.1	90.3	33.1	26.7	27.1	69.7
TS-GARCH(2,2)	94.8	95.7	91.2	93.0	82.4	79.9	79.3	69.9	85.7	35.9	31.6	31.0	72.5
A-GARCH(1,1)	71.7	78.1	86.0	79.6	79.6	82.7	47.1	65.0	49.5	81.5	70.5	72.3	72.0
A-GARCH(2,1)	60.5	59.9	54.1	62.3	67.5	74.8	36.5	38.6	30.7	66.6	58.4	62.3	56.0
A-GARCH(1,2)	85.7	81.2	66.3	86.9	92.7	92.7	45.0	63.8	46.5	86.0	74.8	80.2	75.2
A-GARCH(2,2)	20.1	19.5	8.5	18.8	40.1	41.0	31.6	35.6	29.8	62.9	56.5	59.0	35.3
NA-GARCH(1,1)	56.5	68.7	75.7	72.9	71.7	77.2	49.5	59.9	49.8	73.6	64.1	67.2	65.6
NA-GARCH(2,1)	47.1	51.7	50.2	54.1	54.7	60.5	27.7	29.8	20.4	45.3	41.0	51.4	44.5
NA-GARCH(1,2)	87.5	82.1	69.3	84.5	93.0	92.1	48.6	57.8	45.6	74.8	67.5	70.5	72.8
NA-GARCH(2,2)	8.8	9.1	2.1	10.0	16.1	17.3	29.2	28.6	20.1	44.7	37.7	48.0	22.6
V-GARCH(1,1)	31.9	40.7	36.8	39.5	80.9	71.7	8.5	24.9	9.1	90.9	99.4	99.4	52.8
V-GARCH(2,1)	31.3	29.2	24.9	27.1	70.8	55.0	4.3	14.0	4.3	51.7	82.7	80.5	39.6
V-GARCH(1,2)	28.0	36.5	24.0	45.6	84.5	77.5	9.1	24.0	8.5	89.4	99.1	99.1	52.1
V-GARCH(2,2)	18.2	15.8	10.0	13.1	44.1	35.0	3.3	12.8	3.3	46.2	78.7	76.9	29.8
THR-GARCH(1,1)	25.2	27.7	37.4	35.6	19.8	23.1	69.9	60.5	64.4	28.6	22.8	28.3	36.9
THR-GARCH(2,1)	24.3	25.2	30.4	29.5	14.0	15.8	55.9	41.9	58.7	25.8	18.5	22.2	30.2
THR-GARCH(1,2)	91.2	86.6	84.2	80.9	66.9	62.3	71.4	61.1	72.6	28.0	22.2	28.0	62.9
THR-GARCH(2,2)	8.5	11.2	10.9	14.0	10.0	10.9	55.6	41.6	58.4	25.5	18.2	21.9	23.9
GJR-GARCH(1,1)	79.0	89.7	95.7	91.2	84.8	88.4	26.1	23.7	28.3	41.3	52.9	63.2	63.7
GJR-GARCH(2,1)	69.3	75.1	83.9	79.0	77.5	81.2	18.8	19.1	16.1	35.6	48.6	58.7	55.2
GJR-GARCH(1,2)	83.6	78.7	58.7	82.7	90.6	90.0	24.6	20.7	24.0	39.2	55.0	64.7	59.4
GJR-GARCH(2,2)	15.2	17.9	16.1	20.7	41.3	44.4	49.8	32.8	50.5	21.9	28.9	30.4	30.8
LOG-GARCH(1,1)	81.2	72.0	79.0	65.0	52.0	51.7	82.1	77.8	81.8	43.2	36.2	34.3	63.0
LOG-GARCH(2,1)	84.2	69.6	76.3	59.6	51.4	51.1	63.2	47.7	67.5	20.4	16.4	16.1	52.0
LOG-GARCH(1,2)	99.4	98.5	93.9	99.4	97.6	97.3	79.0	73.6	81.2	38.6	33.1	31.9	77.0
LOG-GARCH(2,2)	100.0	100.0	95.1	99.7	99.4	99.1	62.9	42.2	62.0	17.9	13.4	13.7	67.1
EGARCH(1,1)	37.1	38.6	40.7	38.6	38.6	36.5	70.8	76.6	63.2	60.2	56.8	55.3	51.1
EGARCH(2,1)	42.9	39.5	41.6	38.3	35.6	33.7	53.2	50.5	52.9	38.9	35.3	39.8	41.8
EGARCH(1,2)	99.7	99.7	95.4	98.5	97.9	97.6	68.7	73.3	69.6	55.0	52.6	53.2	80.1
EGARCH(2,2)	11.6	13.4	13.1	15.5	14.9	15.2	52.9	48.0	51.4	37.7	34.7	38.6	28.9
NGARCH(1,1)	83.0	91.2	97.9	92.4	72.3	79.0	96.7	67.5	90.9	21.0	17.6	15.5	68.7
NGARCH(2,1)	80.2	81.8	96.4	83.9	64.7	74.5	83.6	34.0	77.5	11.9	9.1	9.1	58.9
NGARCH(1,2)	92.7	94.8	88.8	95.1	88.4	87.2	97.3	67.2	92.7	19.5	14.9	14.6	71.1
NGARCH(2,2)	94.5	96.4	93.0	98.8	92.1	91.5	83.9	33.1	74.5	11.6	8.8	8.8	65.6
A-PARCH(1,1)	43.8	60.8	76.6	71.4	46.5	51.4	81.2	53.2	69.3	21.6	15.5	16.7	50.7
A-PARCH(2,1)	38.3	48.6	58.1	58.1	37.7	43.5	56.2	31.6	57.8	17.3	12.5	13.1	39.4
A-PARCH(1,2)	93.0	95.4	89.7	95.4	89.1	87.8	84.5	55.0	76.3	22.5	16.1	17.0	68.5
A-PARCH(2,2)	52.0	65.0	52.9	75.7	63.8	66.3	56.5	31.9	58.1	17.6	12.2	13.4	47.1
GQ-ARCH(1,1)	71.4	77.8	86.3	79.9	79.3	83.0	47.4	65.7	49.2	81.8	70.8	72.6	72.1
GQ-ARCH(2,1)	77.8	95.1	99.7	97.0	80.5	91.2	18.2	27.7	13.1	48.0	48.0	52.3	62.4
GQ-ARCH(1,2)	85.4	80.9	66.0	87.2	92.4	92.4	45.3	64.1	46.8	85.7	74.5	79.9	75.1
GQ-ARCH(2,2)	21.3	22.2	21.6	25.2	27.1	27.4	9.7	8.2	9.4	9.7	12.8	11.6	17.2
H-GARCH(1,1)	39.5	48.0	54.7	49.2	44.7	46.8	67.8	18.5	56.5	10.6	8.2	8.2	37.7
AUG-GARCH(1,1)	43.5	46.8	47.7	44.7	50.8	48.9	58.1	12.2	51.1	9.1	6.4	7.0	35.5

Relative performance ranking. Each row corresponds to a particular model, and a score shows the percentage of models (out of the total of 330) that performed worse than the particular model, measured in terms of a given loss function. Thus, the worst, median, and best models score 0, 50, and 100 respectively. The loss functions, given in (5), . . . , (10), are here denoted by L₁, . . . , L₆. The last column is the average of the 12 scores.

Table A.5: Models with Gaussian error distribution and constant mean

Model	Exchange Rate Data						IBM Data						Mean
	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	
ARCH(1)	4.9	4.3	1.2	4.6	8.5	5.8	1.2	1.2	1.2	8.5	29.5	21.0	7.6
GARCH(1,1)	84.8	91.8	97.3	92.7	87.2	89.7	43.5	45.0	43.8	45.0	39.8	38.9	66.6
GARCH(2,1)	82.4	85.7	91.5	83.3	85.7	88.1	29.5	15.8	31.0	13.4	15.8	14.3	53.0
GARCH(1,2)	87.8	84.2	68.4	86.3	94.5	94.2	41.9	37.4	42.9	34.0	33.7	33.7	61.6
GARCH(2,2)	89.7	90.3	74.8	91.8	97.0	97.0	48.3	34.7	43.2	22.2	27.4	26.1	61.9
IGARCH(1,1)	7.0	7.3	16.7	8.2	5.5	7.6	14.0	4.9	17.3	2.7	3.3	3.0	8.1
IGARCH(2,1)	5.8	6.4	15.2	7.0	4.9	7.0	16.7	7.3	19.8	5.8	5.8	5.8	8.9
IGARCH(1,2)	2.7	5.5	12.2	6.4	3.6	4.6	14.9	5.8	16.7	3.6	4.3	3.6	7.0
IGARCH(2,2)	10.3	8.5	11.2	5.8	7.6	8.5	40.4	9.1	37.7	7.6	7.3	6.7	13.4
TS-GARCH(1,1)	45.0	48.9	59.9	49.5	29.5	32.5	86.6	70.2	86.0	32.5	24.6	25.5	49.2
TS-GARCH(2,1)	46.5	47.4	60.8	46.8	28.6	32.2	72.9	69.0	85.1	38.3	32.5	33.4	49.5
TS-GARCH(1,2)	90.9	86.3	81.8	80.5	76.3	71.4	86.9	72.6	91.2	35.0	28.0	29.8	69.2
TS-GARCH(2,2)	94.2	92.4	87.8	89.4	83.3	81.5	84.2	75.1	91.8	40.1	32.8	33.1	73.8
A-GARCH(1,1)	71.1	77.5	85.4	78.7	80.2	83.6	45.9	64.7	48.6	83.0	71.1	72.9	71.9
A-GARCH(2,1)	60.2	59.6	53.8	62.0	68.4	75.4	36.8	39.5	30.4	67.2	59.9	64.4	56.5
A-GARCH(1,2)	86.3	83.0	67.2	88.4	93.3	95.1	43.8	63.2	45.0	87.2	76.3	82.1	75.9
A-GARCH(2,2)	20.4	19.8	8.2	18.5	40.7	41.6	31.9	36.2	29.2	63.8	58.7	62.0	35.9
NA-GARCH(1,1)	58.1	69.3	73.9	73.3	74.8	79.3	49.2	60.2	48.9	74.2	65.0	68.4	66.2
NA-GARCH(2,1)	48.9	53.5	50.5	57.1	55.6	63.2	27.1	29.5	19.5	46.5	43.2	52.0	45.5
NA-GARCH(1,2)	88.4	85.1	69.0	85.4	94.8	93.6	48.0	58.1	44.4	76.0	68.4	71.4	73.6
NA-GARCH(2,2)	9.7	9.7	2.4	10.6	17.9	18.5	28.3	28.9	19.1	45.9	38.9	48.9	23.3
V-GARCH(1,1)	30.4	40.1	35.9	40.1	81.8	73.9	7.3	23.1	8.2	89.1	98.8	98.8	52.3
V-GARCH(2,1)	30.7	29.5	24.6	28.0	73.6	55.9	4.0	13.7	4.0	50.5	83.0	80.9	39.8
V-GARCH(1,2)	27.1	37.1	23.7	46.5	86.3	78.4	7.9	21.9	7.6	88.1	98.5	98.5	51.8
V-GARCH(2,2)	17.9	15.5	9.7	13.7	44.4	35.9	3.0	12.5	3.0	45.6	79.0	77.5	29.8
THR-GARCH(1,1)	24.9	27.1	35.0	33.1	19.5	21.9	70.2	61.4	66.3	30.1	23.4	29.5	36.9
THR-GARCH(2,1)	24.6	24.6	29.5	27.7	14.3	16.1	57.1	43.5	59.6	26.7	19.1	24.0	30.6
THR-GARCH(1,2)	90.3	84.8	80.9	77.5	69.9	66.9	71.7	64.4	75.4	30.4	23.1	29.2	63.7
THR-GARCH(2,2)	10.0	11.6	10.6	12.2	10.6	11.9	56.8	43.2	59.0	26.4	18.8	23.7	24.6
GJR-GARCH(1,1)	77.5	87.8	94.5	90.0	83.9	86.9	26.7	25.8	28.0	41.9	55.3	63.5	63.5
GJR-GARCH(2,1)	69.6	74.2	83.0	76.9	78.1	80.9	21.6	20.1	16.4	36.5	51.4	60.5	55.7
GJR-GARCH(1,2)	82.1	76.0	56.8	82.1	90.9	90.3	25.2	21.3	23.1	39.8	56.2	65.3	59.1
GJR-GARCH(2,2)	16.1	17.6	15.8	20.4	42.6	45.0	50.2	34.3	50.2	24.0	30.7	32.2	31.6
LOG-GARCH(1,1)	72.3	64.1	65.0	56.2	48.6	45.6	82.7	78.7	83.6	47.4	38.3	35.9	59.9
LOG-GARCH(2,1)	78.4	62.9	63.2	51.1	48.3	46.2	66.9	61.7	76.9	26.1	21.3	21.3	52.0
LOG-GARCH(1,2)	98.2	98.2	90.6	96.7	99.1	98.8	80.2	76.9	83.9	42.9	34.0	34.0	77.8
LOG-GARCH(2,2)	99.1	99.4	92.1	99.1	99.7	99.4	67.5	51.7	68.7	20.1	20.1	18.2	69.6
EGARCH(1,1)	36.8	38.0	38.9	37.1	37.4	35.6	70.5	77.2	64.1	61.4	57.8	55.6	50.9
EGARCH(2,1)	44.1	39.2	40.1	36.8	37.1	34.3	54.4	53.8	54.7	42.6	37.1	41.9	43.0
EGARCH(1,2)	97.3	97.6	89.4	96.0	98.5	98.2	69.0	74.5	70.2	58.4	53.8	53.8	79.7
EGARCH(2,2)	11.9	13.7	12.8	15.2	18.2	17.6	53.8	52.9	53.5	40.7	36.5	40.7	30.6
NGARCH(1,1)	76.6	85.4	96.7	85.7	61.1	69.6	98.8	70.8	89.4	24.3	24.3	23.4	67.2
NGARCH(2,1)	73.9	78.4	92.4	81.2	56.8	65.7	94.8	45.9	86.6	14.9	11.9	10.9	59.4
NGARCH(1,2)	93.6	94.5	88.4	94.5	88.1	86.0	98.5	69.6	92.4	23.1	20.7	19.8	72.4
NGARCH(2,2)	95.4	96.7	93.3	97.9	96.0	93.3	94.5	45.3	81.5	14.0	11.6	11.2	69.2
A-PARCH(1,1)	41.6	58.4	71.1	66.3	45.3	49.5	83.3	52.3	68.1	19.8	14.6	15.8	48.8
A-PARCH(2,1)	38.6	47.7	57.1	55.6	38.3	43.2	55.3	22.5	54.4	15.5	10.9	11.9	37.6
A-PARCH(1,2)	92.4	93.3	87.2	93.6	88.8	86.3	85.1	52.0	76.6	19.1	13.1	15.2	66.9
A-PARCH(2,2)	49.8	63.2	51.1	74.8	64.1	67.2	55.0	21.6	52.0	15.8	11.2	12.5	44.9
GQ-ARCH(1,1)	70.8	77.2	85.1	78.4	79.9	83.3	45.6	65.3	48.3	83.3	71.4	73.3	71.8
GQ-ARCH(2,1)	69.0	91.5	99.4	94.8	77.8	89.4	18.5	28.3	12.8	49.2	50.2	53.5	61.2
GQ-ARCH(1,2)	86.6	83.3	67.5	88.8	93.6	95.4	44.1	63.5	45.9	87.5	76.6	82.4	76.3
GQ-ARCH(2,2)	21.6	22.8	22.2	26.1	27.7	29.2	10.3	8.5	9.7	10.3	13.7	12.2	17.9
H-GARCH(1,1)	42.6	52.3	55.6	52.0	48.0	50.5	71.1	22.8	57.1	12.2	9.4	9.4	40.2
AUG-GARCH(1,1)	41.3	45.0	45.6	42.9	50.2	47.7	59.6	15.5	52.6	10.0	7.6	7.9	35.5

Relative performance ranking. Each row corresponds to a particular model, and a score shows the percentage of models (out of the total of 330) that performed worse than the particular model, measured in terms of a given loss function. Thus, the worst, median, and best models score 0, 50, and 100 respectively. The loss functions, given in (5), . . . , (10), are here denoted by L_1, \dots, L_6 . The last column is the average of the 12 scores.

Table A.6: Models with Gaussian error distribution and GARCH-in-mean

Model	Exchange Rate Data						IBM Data						Mean
	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	
ARCH(1)	5.2	4.6	1.5	4.9	8.8	6.7	0.9	0.9	0.9	7.9	29.2	20.4	7.6
GARCH(1,1)	81.8	90.6	97.0	90.6	85.1	88.8	46.2	45.6	46.2	49.8	43.5	44.1	67.4
GARCH(2,1)	81.5	83.9	90.9	83.0	84.2	86.6	30.4	16.4	31.6	14.3	17.0	14.9	52.9
GARCH(1,2)	88.1	83.6	68.1	86.0	95.4	94.5	42.9	41.3	43.5	37.1	34.3	34.7	62.5
GARCH(2,2)	90.0	90.0	74.2	91.5	96.7	96.7	50.5	35.3	47.1	23.4	30.1	28.6	62.8
IGARCH(1,1)	6.4	7.0	16.4	7.6	4.3	5.2	14.6	5.5	18.5	3.3	4.0	4.0	8.1
IGARCH(2,1)	6.1	6.7	15.5	7.3	5.2	7.3	17.3	7.9	21.6	6.1	6.1	6.1	9.4
IGARCH(1,2)	3.0	5.8	12.5	6.7	4.0	4.9	15.2	6.1	17.6	4.0	4.9	4.6	7.4
IGARCH(2,2)	8.2	8.2	9.1	5.5	6.4	6.1	42.2	10.3	41.9	8.8	7.9	7.3	13.5
TS-GARCH(1,1)	45.6	49.2	60.2	49.8	30.1	33.4	83.0	67.8	82.4	29.8	21.9	23.1	48.0
TS-GARCH(2,1)	48.3	48.3	62.0	47.4	29.2	32.8	72.3	68.4	84.8	37.4	31.9	32.5	49.6
TS-GARCH(1,2)	90.6	86.0	82.1	80.2	76.0	70.8	84.8	69.3	87.5	33.4	25.5	26.7	67.8
TS-GARCH(2,2)	93.9	92.1	87.5	89.1	83.0	80.5	80.5	70.5	88.1	38.0	31.0	31.3	72.1
A-GARCH(1,1)	68.7	76.6	84.8	78.1	79.0	82.4	46.5	62.9	47.4	80.9	70.2	72.0	70.8
A-GARCH(2,1)	61.4	60.2	53.5	62.6	69.3	76.6	37.4	41.0	31.3	67.5	59.6	63.8	57.0
A-GARCH(1,2)	86.9	82.4	66.6	87.8	93.9	94.8	44.7	62.3	45.3	85.1	73.6	79.0	75.2
A-GARCH(2,2)	19.8	20.1	8.8	19.1	40.4	41.9	35.6	38.3	30.1	64.7	58.1	61.1	36.5
NA-GARCH(1,1)	56.8	69.0	74.5	73.6	73.9	78.7	48.9	59.3	47.7	73.9	64.4	68.1	65.7
NA-GARCH(2,1)	50.8	54.1	49.8	54.4	56.2	63.5	25.8	27.4	18.8	44.1	41.3	51.7	44.8
NA-GARCH(1,2)	88.8	84.5	68.7	85.1	95.7	93.9	47.7	56.8	44.1	75.4	67.8	71.1	73.3
NA-GARCH(2,2)	9.1	9.4	1.8	10.3	16.7	17.9	27.4	27.1	17.9	44.4	38.6	48.3	22.4
V-GARCH(1,1)	30.1	40.4	36.5	40.4	81.2	73.6	8.2	24.6	8.8	91.2	100.0	99.7	52.9
V-GARCH(2,1)	31.6	29.8	24.3	28.3	74.2	56.2	4.6	14.9	4.6	53.2	84.8	82.7	40.8
V-GARCH(1,2)	26.4	36.8	23.4	46.2	86.0	78.1	8.8	24.3	7.9	90.6	99.7	100.0	52.4
V-GARCH(2,2)	17.6	15.2	9.4	12.8	43.8	35.3	3.6	13.1	3.6	47.7	81.5	79.3	30.2
THR-GARCH(1,1)	28.3	28.0	36.2	34.3	21.6	23.7	68.4	59.6	64.7	29.2	22.5	27.7	37.0
THR-GARCH(2,1)	27.7	25.8	31.3	29.2	15.8	19.8	57.8	44.4	59.9	27.4	20.4	25.2	32.0
THR-GARCH(1,2)	89.4	80.2	79.3	76.3	65.7	61.7	69.6	60.8	72.3	28.9	21.6	27.4	61.1
THR-GARCH(2,2)	9.4	10.9	10.3	11.9	10.3	11.2	57.4	43.8	59.3	27.1	19.8	24.6	24.7
GJR-GARCH(1,1)	75.1	86.9	94.2	89.7	82.1	85.1	26.4	25.5	26.7	42.2	55.9	64.1	62.8
GJR-GARCH(2,1)	70.5	74.5	82.7	77.2	78.4	82.1	20.4	19.8	15.8	36.2	52.3	61.7	56.0
GJR-GARCH(1,2)	82.7	76.9	57.4	82.4	91.2	90.6	24.9	21.0	22.5	39.5	57.1	65.7	59.3
GJR-GARCH(2,2)	15.5	17.3	14.9	19.5	42.9	45.3	50.8	33.7	50.8	22.8	30.4	30.7	31.2
LOG-GARCH(1,1)	73.3	64.4	64.1	55.9	48.9	45.9	79.9	77.5	80.5	43.8	35.6	35.0	58.7
LOG-GARCH(2,1)	79.3	63.8	64.7	51.7	49.5	47.1	65.3	55.9	75.1	24.9	21.0	20.1	51.5
LOG-GARCH(1,2)	97.6	97.9	90.3	96.4	98.8	98.5	77.5	72.0	80.9	41.0	33.4	32.8	76.4
LOG-GARCH(2,2)	98.8	99.1	91.8	98.2	100.0	99.7	67.2	46.5	67.8	18.5	17.3	16.4	68.4
EGARCH(1,1)	38.0	38.3	39.2	38.0	39.5	37.7	69.3	74.8	62.9	59.6	55.6	55.0	50.7
EGARCH(2,1)	48.6	41.6	42.9	37.7	38.9	37.4	54.1	53.5	54.1	41.6	36.8	41.0	44.0
EGARCH(1,2)	97.0	97.3	89.1	95.7	98.2	97.9	68.1	72.3	69.0	55.3	51.7	52.6	78.7
EGARCH(2,2)	11.2	13.1	11.9	14.6	17.6	17.0	53.5	52.6	53.2	40.4	35.9	40.1	30.1
NGARCH(1,1)	74.5	81.5	96.0	84.8	60.2	68.7	91.5	66.0	84.2	20.7	19.5	19.1	63.9
NGARCH(2,1)	74.2	79.0	92.7	81.5	57.1	66.6	88.4	44.7	82.1	14.6	10.6	10.6	58.5
NGARCH(1,2)	93.3	94.2	88.1	94.2	87.8	85.7	85.7	39.8	77.8	13.1	10.3	10.0	65.0
NGARCH(2,2)	95.1	97.0	93.6	97.6	95.1	93.0	85.4	35.0	77.2	12.8	10.0	9.7	66.8
A-PARCH(1,1)	43.2	59.0	71.7	66.6	46.2	50.2	72.0	49.5	60.5	24.6	16.7	19.5	48.3
A-PARCH(2,1)	40.7	49.8	57.8	56.8	39.8	44.1	58.4	35.9	56.8	21.3	14.0	17.9	41.1
A-PARCH(1,2)	92.1	93.0	86.9	93.9	89.4	87.5	76.6	50.8	63.5	23.7	15.2	18.8	66.0
A-PARCH(2,2)	49.2	61.7	50.8	74.2	61.7	65.3	54.7	19.5	55.3	13.7	9.7	10.3	43.8
GQ-ARCH(1,1)	68.4	76.3	84.5	77.8	78.7	81.8	46.8	62.6	48.0	80.5	69.9	71.7	70.6
GQ-ARCH(2,1)	83.3	96.0	100.0	97.3	83.6	96.0	21.3	30.4	14.0	50.2	51.1	54.1	64.8
GQ-ARCH(1,2)	87.2	82.7	66.9	88.1	94.2	95.7	44.4	62.0	44.7	84.8	73.9	79.6	75.4
GQ-ARCH(2,2)	20.7	21.9	21.9	25.5	25.8	27.1	14.3	10.0	11.2	10.9	17.9	14.0	18.4
H-GARCH(1,1)	40.4	42.6	41.9	40.7	43.5	43.8	66.3	18.8	57.4	11.2	8.5	8.5	35.3
AUG-GARCH(1,1)	44.7	45.3	43.8	42.2	50.5	48.0	58.7	14.6	55.0	9.4	6.7	7.6	35.5

Relative performance ranking. Each row corresponds to a particular model, and a score shows the percentage of models (out of the total of 330) that performed worse than the particular model, measured in terms of a given loss function. Thus, the worst, median, and best models score 0, 50, and 100 respectively. The loss functions, given in (5), . . . , (10), are here denoted by L₁, . . . , L₆. The last column is the average of the 12 scores.

Table A.7: Models with t -distributed errors and zero mean

Model	Exchange Rate Data						IBM Data						Mean
	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	
ARCH(1)	3.3	1.8	0.0	0.6	6.7	3.6	0.3	0.3	0.6	6.4	24.9	17.6	5.5
GARCH(1,1)	77.2	73.9	83.3	72.0	69.0	71.1	19.1	23.4	20.7	31.0	40.1	36.8	51.5
GARCH(2,1)	79.6	73.3	82.4	69.6	74.5	75.7	19.5	20.4	23.7	27.7	37.4	35.6	51.6
GARCH(1,2)	72.0	62.0	53.2	60.5	71.4	69.9	19.8	25.2	21.3	31.3	39.2	36.5	46.9
GARCH(2,2)	80.9	75.4	63.8	75.4	85.4	84.8	28.6	30.1	27.7	30.7	39.5	37.1	54.9
IGARCH(1,1)	2.4	3.6	6.4	3.3	1.8	2.1	9.4	1.8	11.9	0.0	0.0	0.0	3.6
IGARCH(2,1)	2.1	3.3	6.7	3.6	2.4	2.7	12.2	4.0	15.2	2.4	1.8	1.8	4.9
IGARCH(1,2)	1.8	3.0	5.8	3.0	2.1	2.4	10.6	2.4	12.5	0.9	0.6	0.6	3.8
IGARCH(2,2)	7.9	5.2	7.9	5.2	3.3	3.3	16.4	6.4	21.0	4.6	3.6	4.3	7.4
TS-GARCH(1,1)	34.7	32.5	41.0	34.7	15.2	15.5	78.4	80.2	83.0	53.8	47.7	45.3	46.8
TS-GARCH(2,1)	35.9	34.0	43.5	35.3	17.3	18.2	74.2	78.1	86.9	48.3	42.6	39.2	46.1
TS-GARCH(1,2)	47.7	44.7	47.4	44.1	30.4	30.1	79.6	81.5	87.8	56.5	45.9	42.6	53.2
TS-GARCH(2,2)	59.6	67.2	71.4	71.7	47.7	50.8	75.1	78.4	87.2	48.6	42.9	39.5	61.7
A-GARCH(1,1)	72.9	70.2	78.1	67.5	66.0	67.5	34.7	49.8	33.4	84.2	86.0	86.6	66.4
A-GARCH(2,1)	60.8	54.7	49.2	48.6	58.1	59.9	34.3	42.9	38.6	55.6	62.6	57.8	51.9
A-GARCH(1,2)	58.4	50.2	41.3	55.3	62.3	64.4	33.1	47.1	36.5	77.2	77.5	77.8	56.8
A-GARCH(2,2)	19.5	18.5	11.6	16.1	31.6	31.3	52.3	71.7	56.2	77.8	83.6	76.6	45.6
NA-GARCH(1,1)	66.9	66.9	72.0	64.7	60.5	62.6	41.3	58.7	39.5	96.0	91.2	93.0	67.8
NA-GARCH(2,1)	56.2	51.4	49.5	47.7	53.8	56.5	41.6	59.0	40.4	95.7	90.6	92.4	61.2
NA-GARCH(1,2)	61.1	55.6	44.1	60.8	69.6	70.2	39.2	55.6	41.3	93.9	88.1	89.1	64.1
NA-GARCH(2,2)	12.8	12.5	7.0	11.6	21.9	24.3	38.3	54.1	41.0	87.8	86.9	87.8	40.5
V-GARCH(1,1)	29.8	34.7	30.1	30.4	67.2	52.9	6.1	18.2	6.7	72.6	97.9	97.9	45.4
V-GARCH(2,1)	34.0	34.3	27.1	30.1	77.2	57.8	1.8	11.2	1.8	48.9	93.3	91.5	42.4
V-GARCH(1,2)	22.2	21.0	20.4	19.8	41.0	28.6	5.2	17.3	5.5	71.1	97.3	97.3	37.2
V-GARCH(2,2)	13.7	10.0	4.3	9.1	21.0	12.5	11.9	26.4	10.0	68.4	94.8	94.8	31.4
THR-GARCH(1,1)	23.7	24.0	27.7	24.0	11.9	11.6	77.2	88.8	74.2	88.4	75.4	74.2	50.1
THR-GARCH(2,1)	23.1	23.1	25.2	21.9	9.7	9.4	82.4	83.6	94.2	63.2	48.3	50.2	44.5
THR-GARCH(1,2)	48.0	46.2	47.1	45.3	38.0	39.2	74.8	89.4	79.0	90.0	75.7	75.7	62.4
THR-GARCH(2,2)	12.5	14.3	19.5	17.0	11.2	13.4	99.4	99.7	99.4	92.7	83.3	76.3	53.2
GJR-GARCH(1,1)	67.8	69.9	78.4	70.2	65.0	67.8	24.0	36.5	26.1	68.1	80.2	84.2	61.5
GJR-GARCH(2,1)	63.2	61.1	62.3	59.9	59.6	64.1	28.0	39.2	34.7	51.1	62.0	58.4	53.6
GJR-GARCH(1,2)	47.4	41.0	33.7	43.8	56.5	58.1	22.5	37.7	27.4	69.0	79.9	83.9	50.1
GJR-GARCH(2,2)	16.7	17.0	18.8	16.7	31.9	36.2	51.1	66.3	51.7	64.4	65.3	66.3	41.9
LOG-GARCH(1,1)	55.9	42.2	44.7	36.2	29.8	25.5	66.6	82.4	73.9	71.7	67.2	61.4	54.8
LOG-GARCH(2,1)	66.0	45.6	48.0	37.4	33.4	30.7	59.9	74.2	65.3	61.1	60.5	54.7	53.1
LOG-GARCH(1,2)	96.4	87.2	67.8	71.1	82.7	72.3	64.7	81.2	72.9	72.3	64.7	57.4	74.2
LOG-GARCH(2,2)	97.9	92.7	81.5	79.3	90.0	79.6	60.5	73.9	65.0	60.5	60.2	54.4	74.6
EGARCH(1,1)	35.6	30.7	33.4	28.6	24.0	21.6	65.0	90.6	61.7	99.1	95.7	95.7	56.8
EGARCH(2,1)	40.1	31.6	31.0	25.8	23.7	21.3	61.1	83.9	71.4	92.1	84.2	83.6	54.2
EGARCH(1,2)	80.5	55.3	35.6	47.1	59.9	49.8	62.6	86.3	62.6	97.0	94.2	93.9	68.7
EGARCH(2,2)	15.8	14.9	18.2	14.9	15.5	14.9	97.9	98.5	98.8	97.6	91.8	88.4	55.6
NGARCH(1,1)	51.4	53.8	62.9	53.2	32.8	36.8	93.3	90.9	93.6	54.4	53.5	47.7	60.4
NGARCH(2,1)	55.0	55.0	65.7	52.3	36.2	40.4	93.6	87.8	96.7	50.8	46.8	45.0	60.4
NGARCH(1,2)	58.7	55.9	55.3	55.0	42.2	42.6	95.1	93.9	96.0	57.8	48.9	45.9	62.3
NGARCH(2,2)	65.7	71.4	76.9	75.1	51.1	53.8	92.1	87.5	97.0	51.4	46.5	44.4	67.7
A-PARCH(1,1)	35.0	37.7	48.6	41.9	24.6	25.2	88.8	95.7	79.9	81.2	72.9	69.9	58.5
A-PARCH(2,1)	29.2	28.3	37.1	33.7	18.8	20.7	92.4	97.6	97.3	76.3	68.7	67.5	55.6
A-PARCH(1,2)	46.2	46.5	44.4	48.9	45.6	44.7	89.4	97.0	91.5	82.7	72.6	69.6	64.9
A-PARCH(2,2)	25.8	28.9	31.9	39.2	27.4	31.0	100.0	100.0	100.0	96.7	87.8	83.0	62.6
GQ-ARCH(1,1)	73.6	70.8	78.7	68.1	66.3	68.1	35.0	50.2	33.7	84.5	86.3	86.9	66.8
GQ-ARCH(2,1)	74.8	88.1	98.8	90.3	71.1	83.9	6.7	9.4	4.9	16.4	29.8	26.4	50.1
GQ-ARCH(1,2)	59.3	50.8	43.2	56.5	63.2	64.7	32.8	47.4	36.2	77.5	77.8	78.1	57.3
GQ-ARCH(2,2)	18.5	20.4	21.0	21.3	17.0	20.4	15.5	13.4	10.6	16.1	26.4	22.5	18.6
H-GARCH(1,1)	76.9	79.9	90.0	81.8	59.0	59.3	96.0	81.8	69.9	46.8	45.6	45.6	69.4
AUG-GARCH(1,1)	45.3	51.1	61.1	54.7	34.3	38.9	95.4	84.5	78.4	49.5	42.2	41.6	56.4

Relative performance ranking. Each row corresponds to a particular model, and a score shows the percentage of models (out of the total of 330) that performed worse than the particular model, measured in terms of a given loss function. Thus, the worst, median, and best models score 0, 50, and 100 respectively. The loss functions, given in (5), ..., (10), are here denoted by L₁, ..., L₆. The last column is the average of the 12 scores.

Table A.8: Models with t -distributed errors and constant mean

Model	Exchange Rate Data						IBM Data						Mean
	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	
ARCH(1)	3.6	2.1	0.3	1.2	7.0	4.0	0.0	0.0	0.0	6.7	25.8	18.5	5.8
GARCH(1,1)	76.3	73.6	81.2	70.5	72.6	73.3	20.1	26.1	21.9	31.9	41.9	37.7	52.3
GARCH(2,1)	78.7	72.3	79.6	68.7	75.4	76.3	20.7	22.2	24.6	28.3	38.0	36.2	51.7
GARCH(1,2)	79.9	68.1	58.4	64.1	76.9	75.1	21.0	28.0	22.2	32.8	40.7	37.4	50.4
GARCH(2,2)	83.9	79.3	70.8	76.0	87.5	85.4	30.1	32.5	28.9	32.2	41.6	38.3	57.2
IGARCH(1,1)	1.5	1.2	4.6	2.4	0.9	0.9	10.0	2.1	12.2	0.3	0.3	0.3	3.1
IGARCH(2,1)	1.2	1.5	4.9	2.7	1.5	1.8	12.8	4.6	15.5	3.0	2.1	2.4	4.5
IGARCH(1,2)	0.9	0.9	4.0	2.1	1.2	1.2	10.9	3.0	13.4	1.2	1.2	1.2	3.4
IGARCH(2,2)	7.6	4.9	7.3	4.0	3.0	3.0	17.0	6.7	23.4	4.9	4.6	4.9	7.6
TS-GARCH(1,1)	34.3	31.0	38.3	32.2	16.4	16.7	78.1	80.9	83.3	56.8	50.5	46.5	47.1
TS-GARCH(2,1)	36.2	33.1	42.2	32.5	18.5	19.1	76.0	79.0	89.7	52.6	44.4	42.9	47.2
TS-GARCH(1,2)	50.5	44.1	45.9	41.3	31.0	29.8	78.7	83.0	88.8	59.3	47.1	44.7	53.7
TS-GARCH(2,2)	63.8	68.4	69.6	68.4	49.2	52.0	76.9	79.3	90.0	52.0	44.7	43.5	63.1
A-GARCH(1,1)	75.7	72.9	80.5	69.9	72.0	72.9	33.7	48.9	32.2	83.6	85.4	86.0	67.8
A-GARCH(2,1)	65.0	58.1	51.7	53.5	62.9	65.0	32.2	42.6	37.1	57.1	63.2	59.6	54.0
A-GARCH(1,2)	64.1	56.5	46.2	59.3	70.2	70.5	31.0	46.8	34.0	76.9	78.4	78.7	59.4
A-GARCH(2,2)	21.0	19.1	14.3	17.9	33.7	34.0	52.0	71.4	55.6	78.4	84.5	77.2	46.6
NA-GARCH(1,1)	72.6	71.1	77.8	67.8	68.7	69.0	39.8	57.1	38.3	94.8	90.9	92.7	70.1
NA-GARCH(2,1)	62.9	56.2	51.4	50.8	57.4	60.2	39.5	56.5	36.8	96.4	92.1	94.5	62.9
NA-GARCH(1,2)	63.5	57.1	45.0	61.4	73.3	74.2	38.0	54.7	39.8	93.3	88.8	89.7	64.9
NA-GARCH(2,2)	14.0	14.0	7.6	13.4	24.9	26.4	38.9	56.2	40.7	95.1	89.4	90.9	42.6
V-GARCH(1,1)	32.5	35.9	31.6	31.6	72.9	54.1	5.5	17.6	6.1	72.0	97.6	97.6	46.3
V-GARCH(2,1)	33.1	28.6	25.5	24.3	65.3	52.6	2.1	10.9	2.4	43.5	89.7	88.1	38.9
V-GARCH(1,2)	21.9	21.3	20.7	21.0	41.9	30.4	4.9	16.7	5.2	69.9	97.0	97.0	37.3
V-GARCH(2,2)	14.3	10.6	5.2	9.7	22.5	14.0	6.4	17.0	7.3	59.9	93.9	91.8	29.4
THR-GARCH(1,1)	25.5	24.3	28.9	23.7	13.1	13.1	74.5	89.1	73.6	90.3	76.0	75.4	50.6
THR-GARCH(2,1)	24.0	23.7	25.8	22.2	11.6	10.3	81.5	93.6	93.3	86.9	72.3	70.8	51.3
THR-GARCH(1,2)	45.9	43.2	42.6	42.6	39.2	39.5	73.9	90.0	79.3	91.5	76.9	76.0	61.7
THR-GARCH(2,2)	13.1	14.6	19.8	17.3	12.2	14.6	99.7	98.2	99.7	78.1	72.0	67.8	50.6
GJR-GARCH(1,1)	70.2	70.5	77.2	69.0	68.1	69.3	23.7	36.8	25.2	68.7	81.8	85.4	62.2
GJR-GARCH(2,1)	66.3	62.3	61.4	59.0	62.0	66.0	28.9	40.4	35.3	54.1	62.9	62.9	55.1
GJR-GARCH(1,2)	51.7	43.5	34.7	45.0	63.5	63.8	21.9	38.0	26.4	70.5	82.4	85.1	52.2
GJR-GARCH(2,2)	17.3	18.2	19.1	17.6	35.0	40.7	51.4	66.6	52.3	66.9	66.0	66.9	43.2
LOG-GARCH(1,1)	52.9	39.8	40.4	34.0	31.3	25.8	66.0	85.4	74.8	73.3	69.0	65.0	54.8
LOG-GARCH(2,1)	64.4	43.8	46.5	35.9	36.5	31.6	60.8	76.3	66.9	65.0	62.3	57.1	53.9
LOG-GARCH(1,2)	96.7	89.1	70.2	70.8	86.9	77.8	64.4	82.7	73.3	74.5	66.3	60.8	76.1
LOG-GARCH(2,2)	98.5	93.9	80.2	76.6	91.5	84.2	61.7	76.0	66.6	64.1	61.7	56.8	76.0
EGARCH(1,1)	37.7	31.9	32.8	26.7	25.2	23.4	64.1	90.3	61.4	100.0	96.0	96.0	57.1
EGARCH(2,1)	44.4	33.4	33.1	26.4	26.4	24.0	61.4	84.8	72.0	93.0	85.1	84.5	55.7
EGARCH(1,2)	68.1	45.9	29.2	43.5	58.4	48.6	62.3	86.6	62.3	97.9	94.5	94.2	66.0
EGARCH(2,2)	17.0	16.1	18.5	15.8	20.4	19.5	97.6	99.1	98.5	98.8	93.0	90.3	57.0
NGARCH(1,1)	51.1	52.0	59.6	48.3	34.0	38.0	95.7	93.3	94.5	57.4	57.4	49.5	60.9
NGARCH(2,1)	54.1	52.9	62.6	48.0	36.8	39.8	94.2	91.8	97.6	55.9	49.8	47.4	60.9
NGARCH(1,2)	62.0	57.8	56.2	52.9	43.2	42.9	96.4	95.1	96.4	63.5	54.4	48.6	64.1
NGARCH(2,2)	67.2	71.7	73.3	72.6	51.7	54.7	93.9	91.5	97.9	56.2	49.2	47.1	68.9
A-PARCH(1,1)	36.5	38.9	48.9	41.6	26.1	27.7	89.1	96.0	79.6	82.4	73.3	70.2	59.2
A-PARCH(2,1)	32.8	31.3	37.7	33.4	20.7	22.5	93.0	93.0	95.1	67.8	59.3	55.9	53.5
A-PARCH(1,2)	61.7	60.5	56.5	63.8	52.9	54.4	87.8	94.8	85.4	79.6	71.7	69.3	69.9
A-PARCH(2,2)	28.6	32.2	29.8	38.9	34.7	38.6	89.7	96.7	94.8	79.3	69.3	69.0	58.5
GQ-ARCH(1,1)	75.4	72.6	79.9	69.3	70.5	72.0	34.0	49.2	32.5	83.9	85.7	86.3	67.6
GQ-ARCH(2,1)	76.0	89.4	99.1	90.9	75.1	84.5	7.0	9.7	6.4	15.2	26.1	22.8	50.2
GQ-ARCH(1,2)	66.6	59.3	48.3	63.5	75.7	76.0	31.3	46.2	34.3	76.6	78.1	78.4	61.2
GQ-ARCH(2,2)	18.8	20.7	22.5	22.8	19.1	22.2	16.1	14.3	10.9	17.0	27.1	24.9	19.7
H-GARCH(1,1)	78.1	75.7	83.6	72.3	66.6	59.6	97.0	87.2	68.4	54.7	53.2	50.8	70.6
AUG-GARCH(1,1)	53.2	52.6	55.9	45.9	41.6	41.3	91.8	86.9	76.0	60.8	52.0	51.1	59.1

Relative performance ranking. Each row corresponds to a particular model, and a score shows the percentage of models (out of the total of 330) that performed worse than the particular model, measured in terms of a given loss function. Thus, the worst, median, and best models score 0, 50, and 100 respectively. The loss functions, given in (5), ..., (10), are here denoted by L₁, ..., L₆. The last column is the average of the 12 scores.

Table A.9: Models with t -distributed errors and GARCH-in-mean

Model	Exchange Rate Data						IBM Data						Mean
	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	
ARCH(1)	4.3	2.7	0.6	1.8	7.3	4.3	0.6	0.6	0.3	7.0	25.2	17.3	6.0
GARCH(1,1)	59.9	63.5	70.5	62.9	54.4	57.1	22.2	31.3	22.8	34.3	46.2	42.2	47.3
GARCH(2,1)	64.7	66.0	72.9	64.4	58.7	61.1	23.1	26.7	25.5	31.6	40.4	38.0	47.8
GARCH(1,2)	69.9	61.4	54.4	58.7	62.6	62.9	22.8	32.2	24.3	34.7	45.3	41.3	47.5
GARCH(2,2)	91.5	98.8	98.5	100.0	97.3	100.0	30.7	33.4	29.5	33.7	43.8	40.4	66.5
IGARCH(1,1)	0.0	0.0	2.7	0.0	0.0	0.0	11.2	2.7	13.7	0.6	0.9	0.9	2.7
IGARCH(2,1)	0.6	0.6	3.3	1.5	0.6	0.6	13.4	5.2	18.2	4.3	2.7	3.3	4.5
IGARCH(1,2)	0.3	0.3	3.0	0.3	0.3	0.3	11.6	3.3	14.3	1.5	1.5	1.5	3.2
IGARCH(2,2)	5.5	2.4	3.6	0.9	2.7	1.5	17.6	7.6	24.9	5.5	5.2	5.2	6.9
TS-GARCH(1,1)	26.7	24.9	30.7	24.9	12.8	12.2	75.7	80.5	80.2	58.7	50.8	46.8	43.7
TS-GARCH(2,1)	28.9	26.1	35.3	27.4	13.7	14.3	75.4	79.9	88.4	53.5	45.0	43.8	44.3
TS-GARCH(1,2)	49.5	44.4	45.3	41.0	30.7	28.3	77.8	83.3	86.3	62.6	47.4	46.2	53.6
TS-GARCH(2,2)	55.3	65.7	64.4	67.2	47.1	49.2	76.3	79.6	89.1	52.9	44.1	43.2	61.2
A-GARCH(1,1)	62.3	66.3	75.1	65.3	55.3	58.4	35.9	51.1	32.8	86.3	87.2	87.2	63.6
A-GARCH(2,1)	52.6	53.2	52.0	50.2	52.6	55.6	35.3	44.1	38.0	58.1	63.5	59.9	51.2
A-GARCH(1,2)	57.8	49.5	39.5	52.6	60.8	61.4	33.4	48.6	35.6	79.0	80.9	81.8	56.7
A-GARCH(2,2)	19.1	18.8	13.7	16.4	28.3	28.9	52.6	72.9	55.9	80.2	86.6	81.2	46.2
NA-GARCH(1,1)	65.3	67.5	77.5	66.0	57.8	60.8	40.1	57.4	37.4	95.4	91.5	93.6	67.5
NA-GARCH(2,1)	53.5	54.4	52.6	50.5	52.3	55.3	41.0	58.4	39.2	94.5	90.3	92.1	61.2
NA-GARCH(1,2)	53.8	47.1	38.0	51.4	59.3	59.0	37.7	54.4	38.9	93.6	88.4	90.0	59.3
NA-GARCH(2,2)	12.2	12.2	6.1	11.2	20.1	22.8	38.6	55.3	40.1	94.2	89.1	90.6	41.0
V-GARCH(1,1)	31.0	35.0	32.2	31.3	67.8	53.2	5.8	17.9	5.8	72.9	98.2	98.2	45.8
V-GARCH(2,1)	33.4	30.4	26.4	24.6	64.4	52.3	2.4	11.6	2.1	47.1	90.0	89.4	39.5
V-GARCH(1,2)	22.8	22.5	21.3	21.6	45.9	34.7	2.7	11.9	2.7	62.0	96.4	96.7	36.8
V-GARCH(2,2)	14.6	10.3	5.5	9.4	21.3	12.8	12.5	31.0	10.3	70.2	95.1	95.1	32.3
THR-GARCH(1,1)	23.4	23.4	26.7	22.5	10.9	9.7	73.6	88.1	70.8	88.8	74.2	73.6	48.8
THR-GARCH(2,1)	22.5	21.6	22.8	20.1	9.1	9.1	80.9	91.2	93.0	79.9	68.1	68.7	48.9
THR-GARCH(1,2)	41.0	36.2	32.5	35.0	33.1	31.9	73.3	88.4	78.7	89.7	75.1	75.1	57.5
THR-GARCH(2,2)	10.9	12.8	17.3	12.5	9.4	10.0	99.1	99.4	99.1	91.8	79.6	74.8	51.4
GJR-GARCH(1,1)	57.4	62.6	69.9	63.2	54.1	56.8	24.3	37.1	25.8	69.3	82.1	85.7	57.4
GJR-GARCH(2,1)	52.3	56.8	59.3	57.4	53.5	57.4	29.8	40.1	35.9	52.3	61.4	58.1	51.2
GJR-GARCH(1,2)	41.9	35.3	27.4	36.5	55.0	53.5	23.4	38.9	27.1	70.8	81.2	84.8	48.0
GJR-GARCH(2,2)	16.4	16.4	17.6	14.3	32.2	37.1	51.7	66.9	53.8	66.3	65.7	66.6	42.1
LOG-GARCH(1,1)	38.9	32.8	34.3	28.9	24.3	21.0	65.7	85.1	71.7	75.1	69.6	66.0	51.1
LOG-GARCH(2,1)	46.8	37.4	38.6	31.0	28.0	24.9	59.0	75.4	65.7	66.0	61.1	56.5	49.2
LOG-GARCH(1,2)	95.7	79.6	59.0	60.2	81.5	68.4	63.5	82.1	71.1	75.7	66.9	62.6	72.2
LOG-GARCH(2,2)	96.0	90.9	76.0	73.9	90.3	80.2	59.3	75.7	66.0	65.3	60.8	56.2	74.2
EGARCH(1,1)	33.7	26.7	28.3	23.4	22.2	18.8	63.8	89.7	60.8	99.4	95.4	95.4	54.8
EGARCH(2,1)	35.3	27.4	28.0	23.1	22.8	20.1	60.2	84.2	70.5	92.4	83.9	83.3	52.6
EGARCH(1,2)	42.2	30.1	23.1	30.7	49.8	42.2	62.0	85.7	61.1	97.3	93.6	93.3	59.3
EGARCH(2,2)	13.4	11.9	13.4	10.9	13.4	10.6	98.2	98.8	98.2	98.5	92.4	88.8	54.0
NGARCH(1,1)	37.4	41.3	52.3	43.2	25.5	26.7	88.1	94.5	90.6	71.4	66.6	60.2	58.2
NGARCH(2,1)	39.8	42.9	55.0	44.4	26.7	29.5	90.9	92.4	95.7	62.3	54.1	49.8	57.0
NGARCH(1,2)	67.5	64.7	60.5	61.7	47.4	46.5	92.7	94.2	93.9	65.7	59.0	52.9	67.2
NGARCH(2,2)	54.7	65.3	63.5	66.9	46.8	48.3	90.3	92.1	95.4	61.7	54.7	50.5	65.9
A-PARCH(1,1)	32.2	35.6	46.8	39.8	23.4	24.6	87.5	95.4	78.1	85.4	77.2	73.9	58.3
A-PARCH(2,1)	26.1	25.5	34.0	29.8	14.6	16.4	86.0	97.9	63.8	98.2	92.7	91.2	56.4
A-PARCH(1,2)	39.2	33.7	28.6	32.8	35.9	33.1	81.8	97.3	60.2	99.7	96.7	96.4	61.3
A-PARCH(2,2)	27.4	26.4	26.1	31.9	28.9	28.0	90.0	92.7	92.1	69.6	63.8	59.3	53.0
GQ-ARCH(1,1)	62.6	66.6	75.4	65.7	55.9	58.7	36.2	51.4	33.1	86.6	87.5	87.5	63.9
GQ-ARCH(2,1)	50.2	74.8	98.2	83.6	53.2	76.9	7.6	10.6	7.0	16.7	28.3	25.8	44.4
GQ-ARCH(1,2)	59.0	50.5	39.8	53.8	61.4	62.0	32.5	48.3	35.0	78.7	80.5	81.5	56.9
GQ-ARCH(2,2)	14.9	16.7	20.1	18.2	12.5	13.7	17.9	16.1	11.6	18.8	32.2	30.1	18.6
H-GARCH(1,1)	55.6	67.8	85.7	74.5	45.0	47.4	90.6	96.4	67.2	82.1	79.3	74.5	72.2
AUG-GARCH(1,1)	29.5	41.9	61.7	57.8	23.1	26.1	91.2	86.0	75.7	59.0	49.5	49.2	54.2

Relative performance ranking. Each row corresponds to a particular model, and a score shows the percentage of models (out of the total of 330) that performed worse than the particular model, measured in terms of a given loss function. Thus, the worst, median, and best models score 0, 50, and 100 respectively. The loss functions, given in (5), ..., (10), are here denoted by L_1, \dots, L_6 . The last column is the average of the 12 scores.

3. Density Plots for Exchange Rate Data - DM-\$

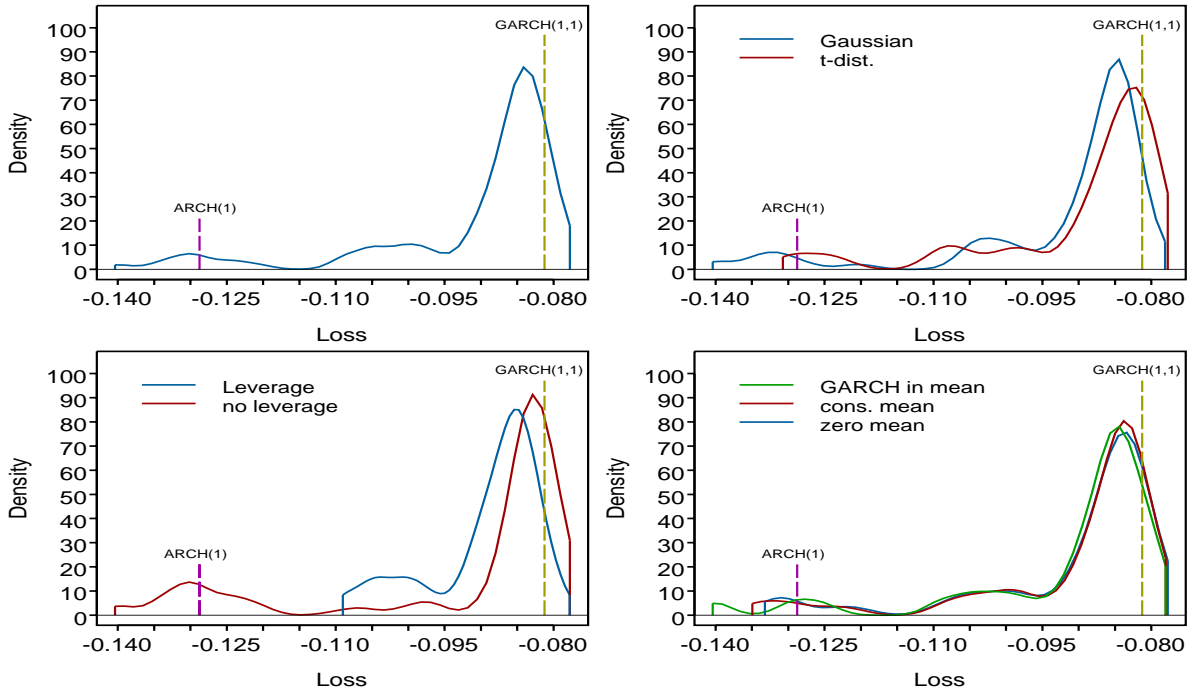


Figure 1: Density plots for MSE_2 loss function.

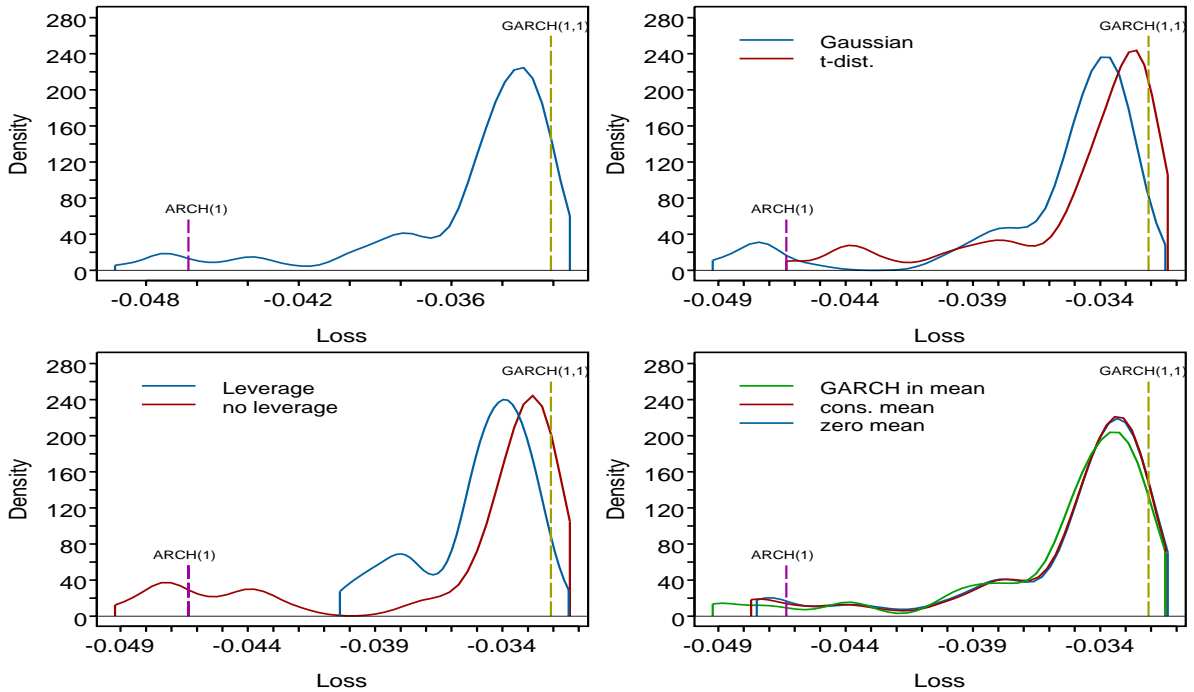


Figure 2: Density plots for MSE_1 loss function.

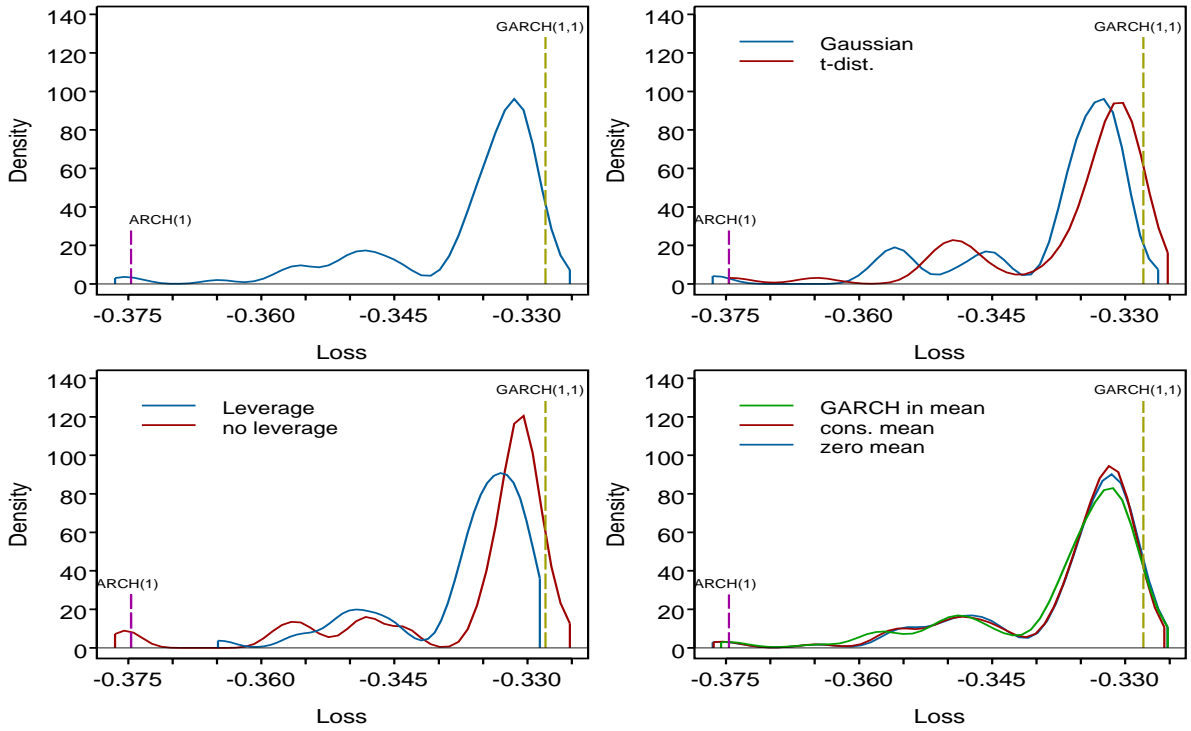


Figure 3: Density plots for QLIKE loss function.

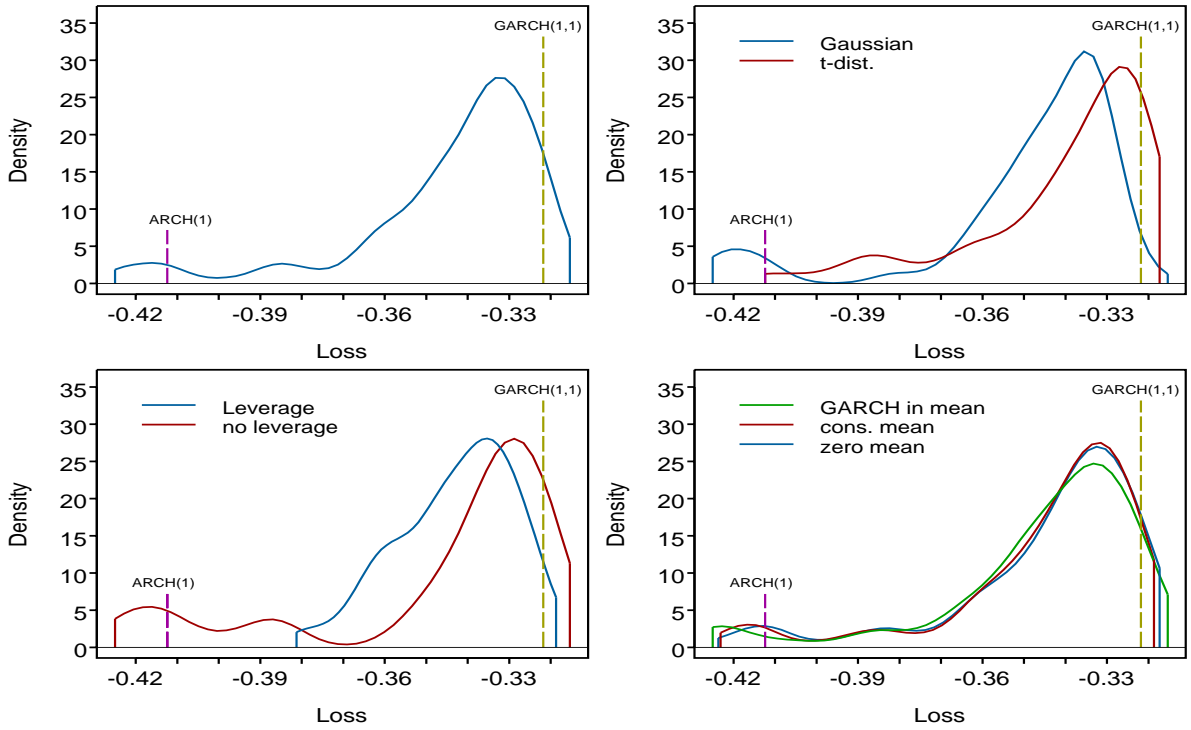


Figure 4: Density plots for R2LOG loss function.

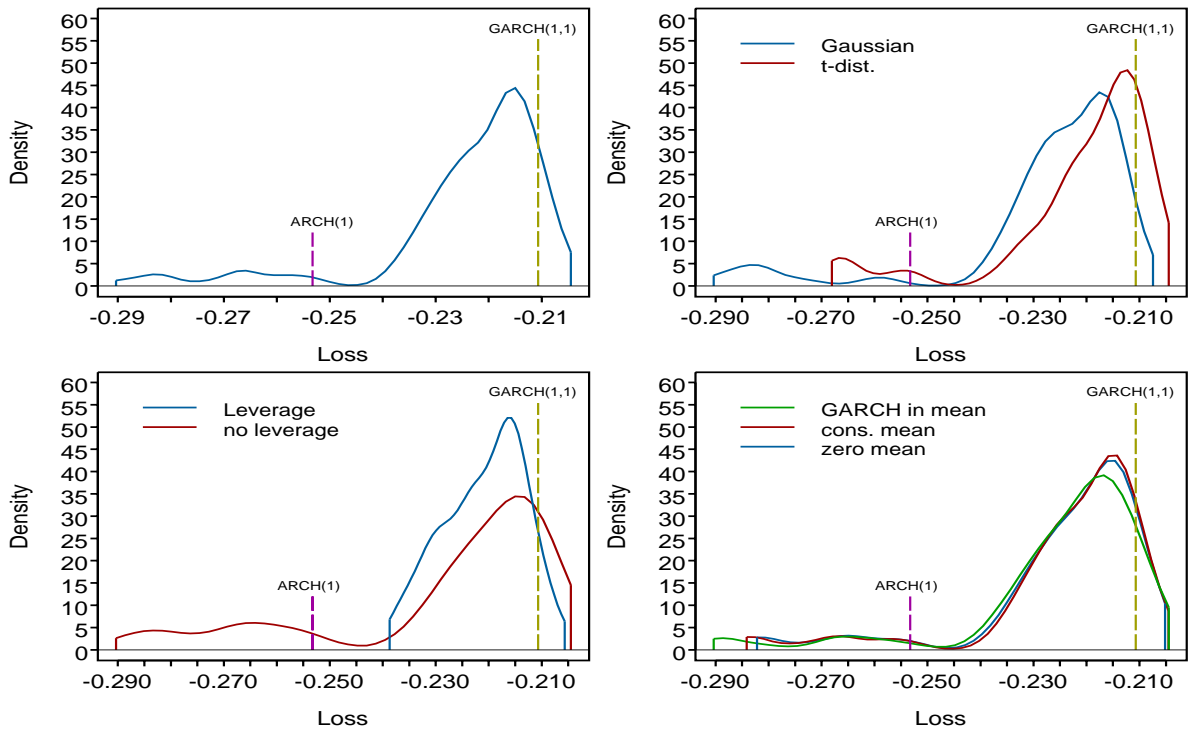


Figure 5: Density plots for MAD_2 loss function.

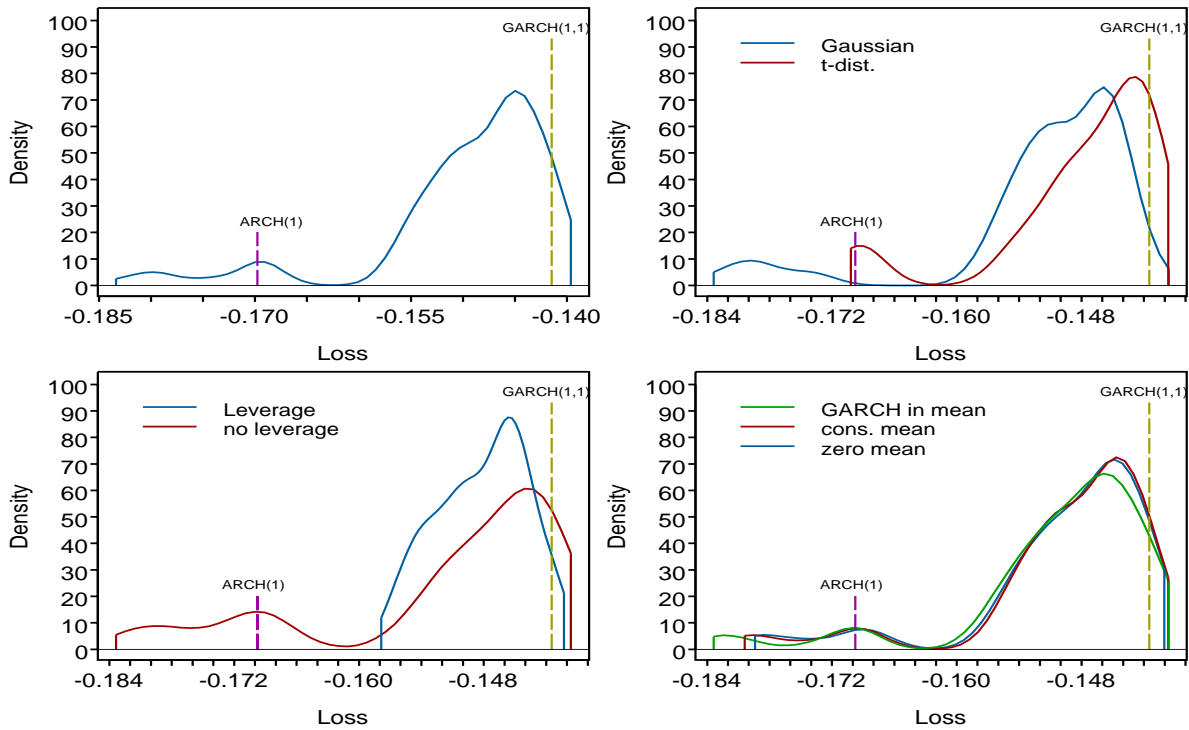


Figure 6: Density plots for MAD_1 loss function.

4. Density Plots for Equity Data - IBM

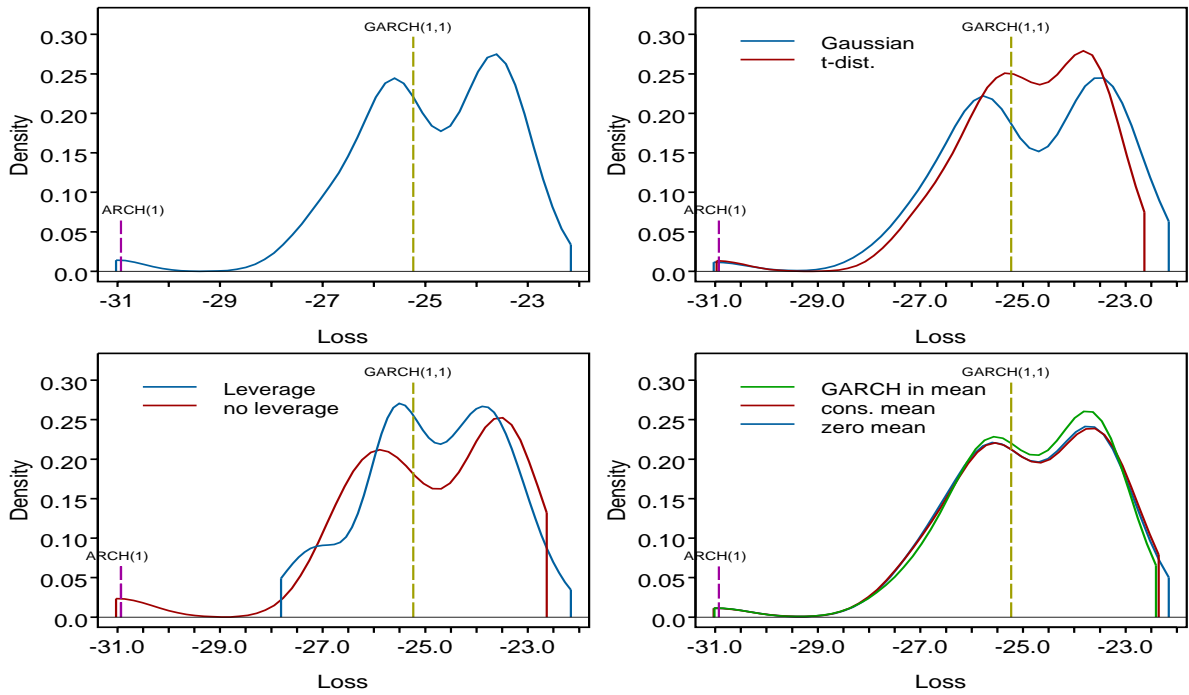


Figure 7: Density plots for MSE_2 loss function.

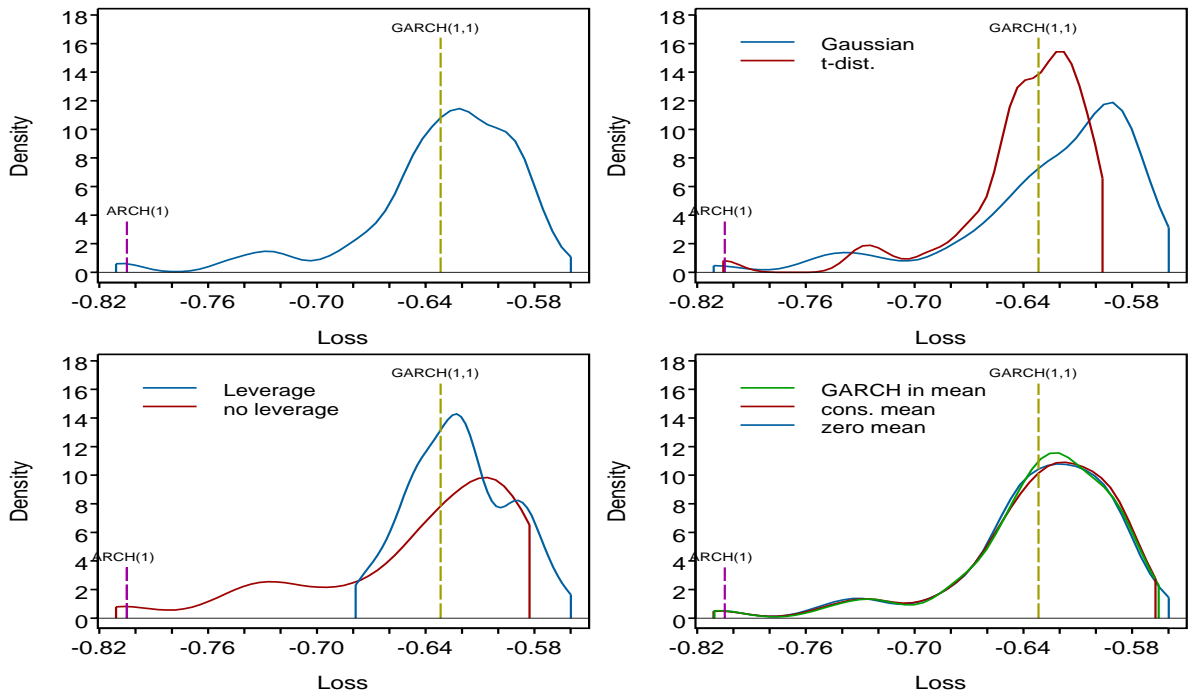


Figure 8: Density plots for MSE_1 loss function.

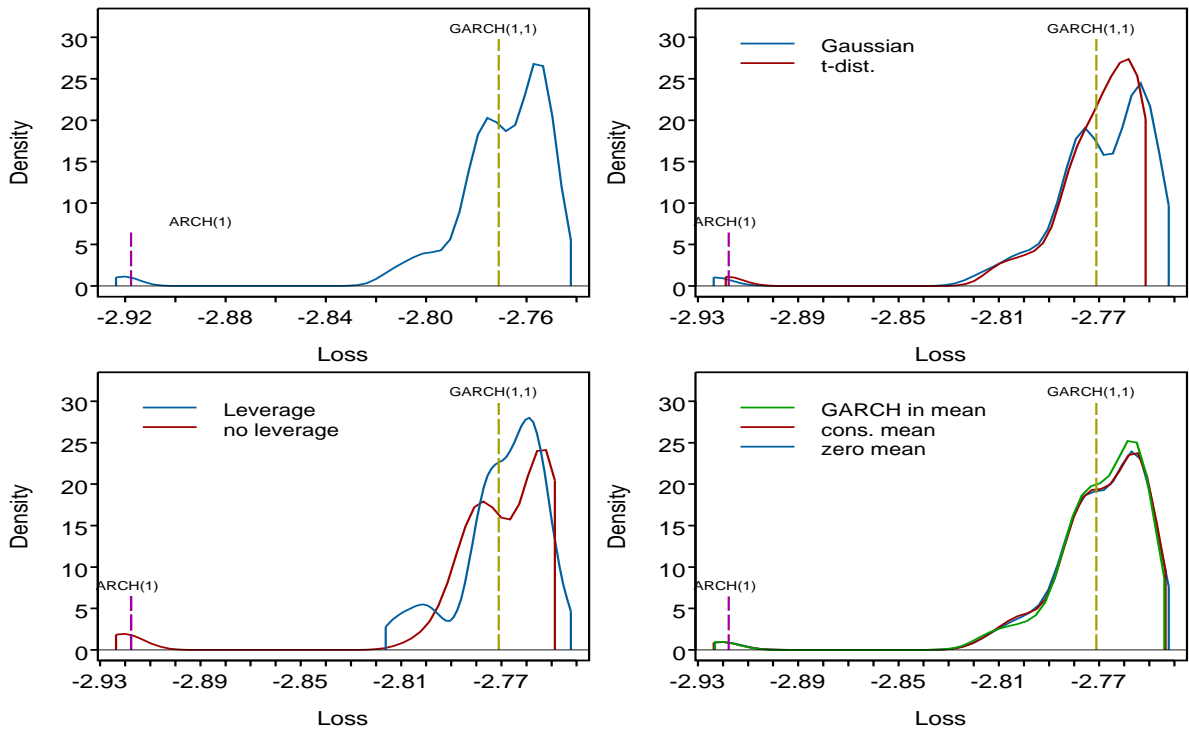


Figure 9: Density plots for QLIKE loss function.

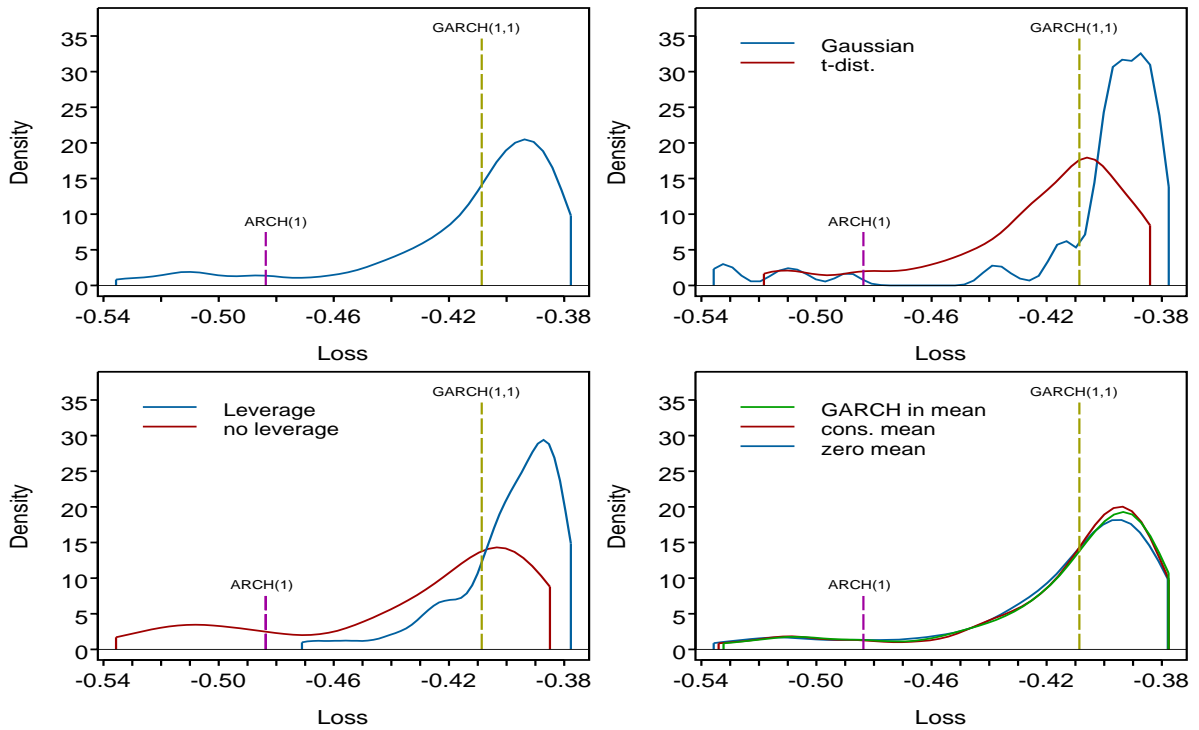


Figure 10: Density plots for R2LOG loss function.

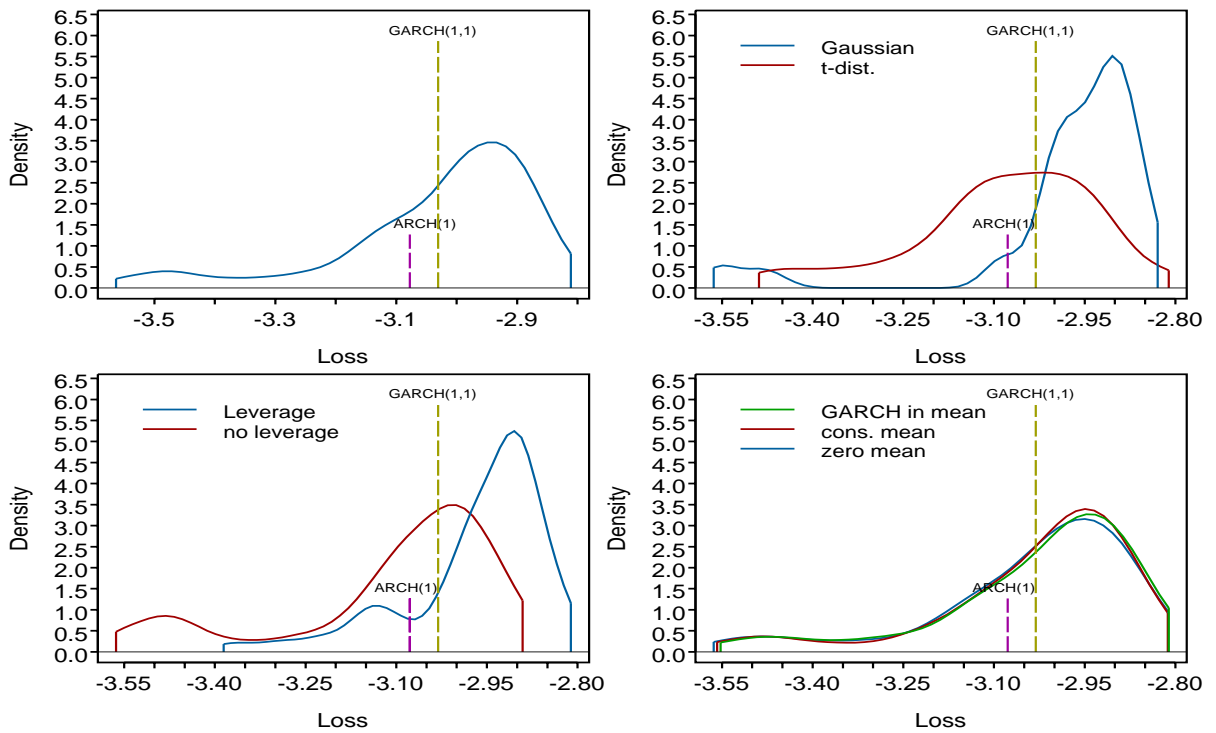


Figure 11: Density plots for MAD_2 loss function.

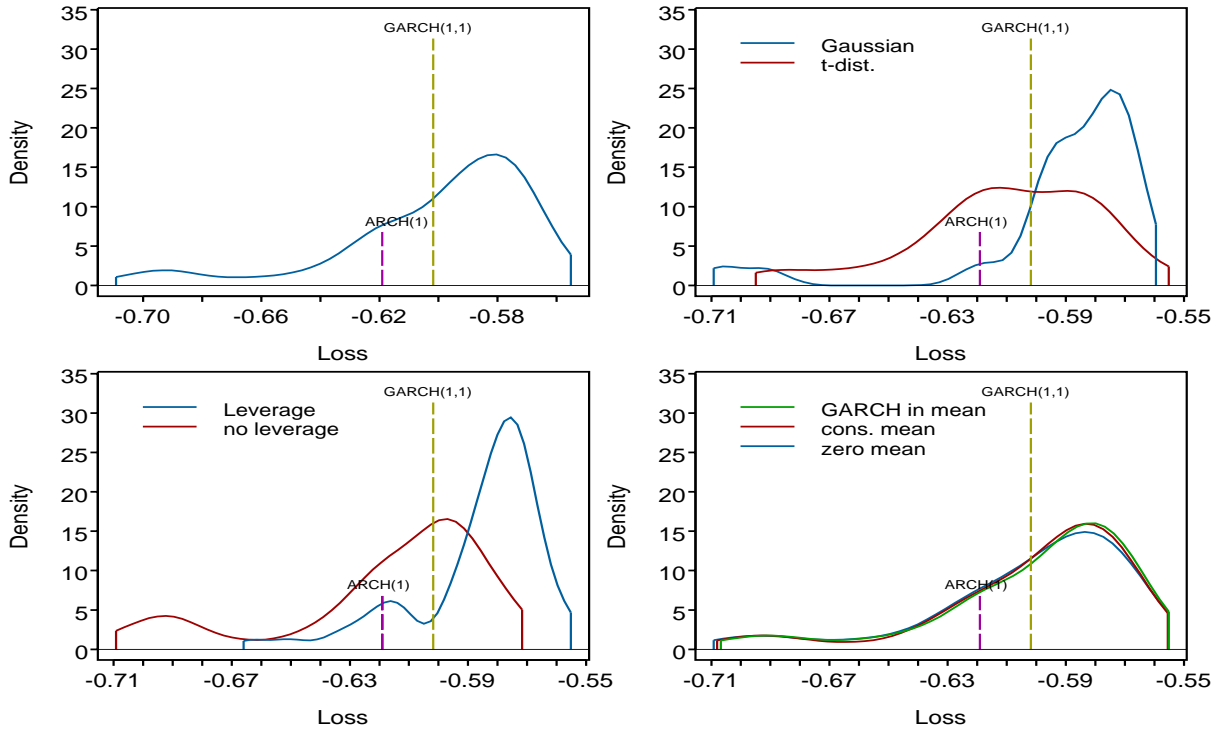


Figure 12: Density plots for MAD_1 loss function.