

Résultat Gaussian-GARCH-HN:

Estimation	Gaussian-GARCH-HN				
Parameters	M^{Ess} Ret	M^{Ess} Ret-opt	M^{Ess} Ret-VIX	M^{Qua} Rett-opt	M^{Qua} Ret-VIX
a_0	$2.176 e^{-11}$ ($0.003 e^{-05}$)	$1.874 e^{-04}$ ($0.045 e^{-07}$)	$3.285 e^{-05}$ ($0.156 e^{-09}$)	$4.454 e^{-04}$ ($0.078 e^{-06}$)	$3.779 e^{-08}$ ($0.014 e^{-04}$)
a_1	$3.285 e^{-04}$ ($0.782 e^{-07}$)	$3.345 e^{-04}$ ($0.891 e^{-07}$)	$3.600 e^{-04}$ ($1.264 e^{-07}$)	$3.257 e^{-05}$ ($2.451 e^{-07}$)	$1.279 e^{-05}$ ($1.564 e^{-06}$)
a_2	— —	— —	— —	— —	— —
b_1	$6.255 e^{-01}$ ($0.213 e^{-03}$)	$1.124 e^{-03}$ ($0.739 e^{-03}$)	$2.510 e^{-01}$ ($0.049 e^{-03}$)	$1.123 e^{-03}$ ($0.077 e^{-03}$)	$9.221 e^{-01}$ ($0.037 e^{-03}$)
γ	$8.622 e^{+00}$ ($0.048 e^{-08}$)	$1.142 e^{+00}$ ($0.785 e^{-08}$)	$9.258 e^{+00}$ ($0.028 e^{-08}$)	$8.424 e^{+00}$ ($0.001 e^{-07}$)	$9.750 e^{+00}$ ($0.001 e^{-06}$)
λ_0	$2.300 e^{-03}$ ($0.007 e^{-02}$)	$6.573 e^{-01}$ ($0.004 e^{-02}$)	$1.353 e^{-06}$ ($0.002 e^{-02}$)	$6.573 e^{-01}$ ($0.001 e^{-03}$)	$8.882 e^{-07}$ ($0.008 e^{-02}$)
γ^*	— —	— —	— —	— —	— —
π	— —	— —	— —	$1.382 e^{+00}$ (0.00009)	$1.356 e^{+00}$ (0.00204)
ϱ	— —	— —	0.9718 (0.00001)	— —	0.843 (0.00001)
Times (h)	0.0034	17.453	0.00191	27.802	0.0016
Model Properties :			—	—	—
Persistence	—	—	—	—	—
Log-likelihood	3601.888	6157.784	5391.126	6375.122	4508.567
Pricing performances :			—	—	—
in-IVRMSE	0.06380	0.05609	0.05737	0.05231	0.05397
out-IVRMSE	0.08184	0.07343	0.07463	0.06875	0.07031
Predictibility of VIX :			—	—	—
MPE_{VIX}	0.98350	0.87433	0.81234	0.81472	0.77446
MAE_{VIX}	0.99918	0.90143	0.83630	0.82288	0.74113
$RMS E_{VIX}$	1.19059	1.22255	1.00021	1.12682	0.96737

Table 1: Summary fits of Joint MLE-estimation procedure with Returns data, Option>Returns data or VIX>Returns data in of sample 2009-2010.

Résultat Gaussian-GARCH-GJR:

Estimation	Gaussian-GARCH-GJR	
Parameters	M^{Ess} Ret	M^{Ess} Ret-VIX
a_0	$1.445 e^{-05}$ (0.00075)	$4.966 e^{-06}$ (0.00008)
a_1	$3.107 e^{-01}$ (0.00450)	$1.240 e^{-02}$ (0.00120)
a_2	$1.055 e^{-01}$ (0.00001)	$2.314 e^{-02}$ (0.00001)
b_1	$6.311 e^{-01}$ (0.00001)	$8.504 e^{-01}$ (0.00001)
γ	— —	— —
λ_0	$4.208 e^{-03}$ (0.00481)	$1.989 e^{-01}$ (0.00261)
γ^*	— —	— —
ϱ	— —	0.8924 (0.01179)
Times (h)	0.0018	0.0066
Model Properties :		
Persistence	—	—
Annualized volatility	—	—
Leverage coefficient	—	—
Log-likelihood	5284.952	6075.361
Pricing performances :		
IVRMSE in sample	0.061832	0.052961
IVRMSE out of sample	0.069847	0.064482
Predictibility of VIX : :		
MPE_{VIX}	0.860545	0.654981
MAE_{VIX}	0.980997	0.639153
$RMS E_{VIX}$	1.001299	0.803589

Table 2: Summary fits of Joint MLE-estimation procedure of historical parameters with Option>Returns data or VIX>Returns data in of sample 2009-2010.

Résultat IG-GARCH:

Table 3: Estimated parameters for the IG model and the two stochastic discount factors.

Joint-Estimation	Returns	Returns-Option		Returns-VIX	
Model		M_t^{ess}	M_t^{Ushp}	M_t^{ess}	M_t^{Ushp}
Parameters :					
w	$9.8322 e^{-06}$	$9.9095 e^{-06}$	$9.9109 e^{-06}$	$1.0166 e^{-06}$	$9.8762 e^{-06}$
Stand.Dev	(0.00485)	(0.00452)	(0.00301)	(0.00248)	(0.00752)
b	$1.2158 e^{-03}$	$1.4019 e^{-03}$	$2.0123 e^{-03}$	$2.0418 e^{-03}$	$8.6267 e^{-03}$
Stand.Dev	(0.00001)	(0.00001)	(0.00015)	(0.00045)	(0.00003)
c	$4.5438 e^{-05}$	$5.1407 e^{-05}$	$4.7859 e^{-05}$	$4.5018 e^{-05}$	$4.4913 e^{-05}$
Stand.Dev	(0.00428)	(0.00035)	(0.00025)	(0.00002)	(0.00001)
a	$3.3174 e^{+03}$	$3.0174 e^{+03}$	$3.3174 e^{+02}$	$3.3175 e^{+03}$	$3.3174 e^{+03}$
Stand.Dev	(0.00004)	(0.01520)	(0.03471)	(0.01450)	(0.00001)
η	$-7.5313 e^{-03}$	$-9.0121 e^{-03}$	$-8.176 e^{-03}$	$-7.465 e^{-03}$	$-7.516 e^{-03}$
Stand.Dev	(0.00150)	(0.00457)	(0.00145)	(0.00365)	(0.00096)
ν	$1.2596 e^{+02}$	$1.2592 e^{+02}$	$1.2584 e^{+02}$	$1.2588 e^{+02}$	$1.2583 e^{+02}$
Stand.Dev	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
π	—	—	1.1305	—	1.2971
Stand.Dev	—	—	(0.00072)	—	(0.00108)
ϱ	—	—	—	$9.9455 e^{-01}$	$9.9625 e^{-01}$
Stand.Dev	—	—	—	(0.00150)	(0.00206)
Model Properties :					
Times (h)	0.0097	19.5574	20.4178	0.0028	0.0041
Persistence	—	—	—	—	—
Annualized volatility	—	—	—	—	—
Leverage coefficient	—	—	—	—	—
Log-likelihood	3873.447	8919.914	8930.341	4451.978	4625.001
Pricing performances :					
IVRMSE in sample	0.054358	0.046160	0.043546	0.046483	0.043872
IVRMSE out of sample	0.067427	0.061058	0.056641	0.061834	0.057568
Predictibility of VIX : :					
MPE_{VIX}	0.9851	0.7248	0.7187	0.6709	0.6392
MAE_{VIX}	1.0967	0.7408	0.7293	0.6823	0.6505
$RMS E_{VIX}$	1.2023	0.8682	0.8593	0.8210	0.7846