

APPENDIX A. TABLES

Table 5.1: FTSE Bursa Malaysia ARCH Effect

Heteroskedasticity Test: ARCH				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
F-statistic	5.285890			0.0217
Obs*R-squared	5.271887			0.0217
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 08/17/20 Time: 16:22				
Sample (adjusted): 1/06/2015 12/31/2019				
Included observations: 1237 after adjustments				
C	0.000190	2.05E-05	9.292105	0.0000
RESID^2(-1)	0.065283	0.028395	2.299106	0.0217
R-squared	0.004262	Mean dependent var		0.000203
Adjusted R-squared	0.003456	S.D. dependent var		0.000691
S.E. of regression	0.000690	Akaike info criterion		-11.71764
Sum squared resid	0.000588	Schwarz criterion		-11.70936
Log likelihood	7249.358	Hannan-Quinn criter.		-11.71452
F-statistic	5.285890	Durbin-Watson stat		2.006742
Prob(F-statistic)	0.021665			

Table 5.2: SCS Explanatory Analysis On FTSE Bursa Malaysia

Dependent Variable: FTSE_BURSA(-1)				
Method: ML ARCH - Normal distribution				
Date: 08/26/20 Time: 19:32				
Sample (adjusted): 1/06/2015 12/30/2019				
Included observations: 1236 after adjustments				
Convergence achieved after 171 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(52) + C(53)*RESID(-1)^2 + C(54)*GARCH(-1)				
	Variance Equation			
C	6.31E-06	9.72E-07	6.487998	0.0000
RESID(-1)^2	0.184361	0.030613	6.022212	0.0000
GARCH(-1)	0.609378	0.049574	12.29231	0.0000
R-squared	0.075384	Mean dependent var		-0.002403
Adjusted R-squared	0.036370	S.D. dependent var		0.005421
S.E. of regression	0.005322	Akaike info criterion		-7.668201
Sum squared resid	0.033558	Schwarz criterion		-7.444527
Log likelihood	4792.948	Hannan-Quinn criter.		-7.584068
Durbin-Watson stat	2.191492			

Table 5.4: Downside Beta And Sortino Scores For SCS

<i>I-25</i>	<i>HV</i>	<i>EWMA</i>	<i>GARCH (1,1)</i>	<i>Sortino EWMA</i>	<i>SORTINO GARCH</i>	25	<i>HV</i>	<i>EWMA</i>	<i>GARCH (1,1)</i>	<i>Sortino EWMA</i>	<i>SORTINO GARCH</i>
1	7.66%	7.97%	8.72%	0.0%	0.0%	26	15.22%	16.40%	17.40%	-0.2%	-0.5%
2	31.46%	32.47%	35.04%	-0.2%	-1.2%	27	18.23%	19.06%	42.67%	1.7%	2.9%
3	21.65%	23.63%	29.01%	0.4%	1.6%	28	15.50%	17.04%	20.14%	-0.1%	-0.3%
4	13.10%	13.66%	14.69%	-2.4%	-5.5%	29	27.56%	29.64%	16.79%	-0.1%	-1.0%
5	18.25%	19.95%	19.08%	0.0%	0.2%	30	37.59%	39.58%	16.69%	-0.8%	-13.9%
6	10.83%	11.75%	11.81%	1.4%	3.0%	31	18.00%	19.61%	33.20%	2.0%	4.3%
7	36.11%	38.19%	41.38%	-0.6%	-4.2%	32	21.52%	21.51%	19.00%	-0.8%	-4.0%
8	13.19%	14.46%	14.70%	-1.5%	-3.9%	33	33.21%	33.81%	23.19%	0.5%	4.6%
9	14.81%	15.66%	17.77%	2.1%	5.6%	34	18.95%	20.05%	37.14%	-1.0%	-2.4%
10	21.60%	22.81%	23.25%	0.1%	0.5%	35	35.87%	37.00%	23.45%	-0.5%	-5.5%
11	6.99%	7.23%	9.76%	2.5%	3.1%	36	17.81%	19.13%	42.25%	1.2%	2.1%
12	28.61%	31.24%	30.20%	0.0%	-0.2%	37	21.73%	22.52%	26.49%	-0.7%	-2.4%
13	16.59%	17.63%	17.46%	-0.1%	-0.2%	38	22.15%	23.88%	23.88%	0.9%	4.4%
14	37.50%	39.76%	40.78%	-0.3%	-2.4%	39	21.53%	23.49%	25.78%	-0.6%	-2.6%
15	16.86%	18.49%	21.41%	-0.5%	-1.7%	40	14.76%	15.41%	24.36%	-0.2%	-0.6%
16	10.93%	11.68%	13.53%	0.3%	0.5%	41	20.50%	21.50%	25.84%	1.4%	5.0%
17	22.27%	24.54%	24.89%	-0.9%	-4.2%	42	13.12%	13.66%	23.04%	0.7%	1.0%
18	7.29%	7.63%	8.96%	2.2%	3.0%	43	22.98%	23.97%	14.04%	0.4%	3.2%
19	20.14%	21.54%	36.08%	-0.1%	-0.3%	44	21.60%	23.31%	24.87%	1.4%	6.1%
20	10.15%	10.97%	11.12%	2.1%	4.2%	45	14.86%	16.25%	27.00%	0.3%	0.5%
21	35.87%	36.98%	40.71%	-0.3%	-1.9%	46	11.40%	11.85%	16.80%	-4.2%	-8.0%
22	11.49%	12.20%	28.37%	1.4%	1.5%	47	20.70%	22.33%	14.31%	0.2%	1.4%
23	27.29%	27.85%	13.90%	-0.3%	-3.1%	48	14.35%	14.87%	22.85%	1.8%	3.8%
24	6.45%	6.59%	9.65%	9.1%	12.1%	49	16.56%	17.41%	22.38%	0.2%	0.6%
25	24.25%	26.36%	33.57%	0.7%	3.1%	50	12.92%	14.11%	19.21%	-1.1%	-2.1%

Table 5.5: Downside Beta And Sortino Scores For SCS

<i>I</i> - 25	<i>HV</i>	<i>EWMA</i>	<i>GARCH</i> (1,1)	<i>Sortino</i> <i>EWMA</i>	<i>SORTINO</i> <i>GARCH</i>	25 - 50	<i>HV</i>	<i>EWMA</i>	<i>GARCH</i> (1,1)	<i>Sortino</i> <i>EWMA</i>	<i>SORTINO</i> <i>GARCH</i>
1	7.66%	7.97%	8.72%	0.0%	0.0%	26	38.83%	42.31%	23.90%	-0.4%	-5.1%
2	14.18%	15.39%	15.58%	-1.1%	-1.2%	27	57.30%	59.19%	36.67%	-0.1%	-1.9%
3	10.52%	11.18%	10.92%	4.6%	1.6%	28	17.90%	19.48%	23.95%	-2.1%	-7.0%
4	12.10%	12.47%	30.03%	-0.6%	-5.5%	29	23.19%	24.93%	40.75%	-0.3%	-0.9%
5	18.13%	19.82%	23.76%	-2.1%	0.2%	30	35.05%	36.50%	45.04%	0.1%	0.3%
6	19.97%	20.51%	17.37%	-0.5%	3.0%	31	7.35%	7.86%	34.57%	2.4%	0.9%
7	16.31%	17.96%	12.70%	-1.1%	-4.2%	32	13.17%	12.49%	8.86%	-1.0%	-4.6%
8	10.59%	11.05%	20.11%	-0.6%	-3.9%	33	32.75%	34.62%	16.80%	0.1%	1.7%
9	30.40%	32.58%	63.27%	-0.4%	5.6%	34	13.16%	14.06%	14.98%	1.1%	2.6%
10	10.56%	11.22%	11.89%	5.4%	0.5%	35	5.74%	5.98%	15.84%	3.6%	1.7%
11	13.15%	13.97%	15.19%	0.4%	3.1%	36	21.93%	23.86%	23.73%	4.2%	19.8%
12	41.92%	43.36%	41.07%	-0.3%	-0.2%	37	21.33%	20.67%	25.49%	0.4%	1.5%
13	15.32%	17.16%	46.13%	-2.0%	-0.2%	38	19.24%	19.42%	23.42%	-0.3%	-1.3%
14	40.42%	42.50%	16.53%	0.0%	-2.4%	39	13.93%	14.72%	7.00%	-0.2%	-1.1%
15	19.30%	20.00%	20.84%	-1.1%	-1.7%	40	22.48%	24.10%	20.88%	1.3%	6.7%
16	14.51%	15.10%	11.34%	1.1%	0.5%	41	24.19%	26.16%	24.43%	-0.3%	-1.7%
17	19.21%	18.42%	15.90%	-0.8%	-4.2%	42	16.57%	17.82%	24.63%	-0.1%	-0.2%
18	13.57%	15.34%	14.84%	-0.9%	3.0%	43	13.64%	14.86%	14.82%	-2.5%	-7.0%
19	10.18%	10.66%	11.55%	1.2%	-0.3%	44	21.09%	23.40%	18.38%	-0.7%	-3.8%
20	8.72%	8.75%	28.09%	6.9%	4.2%	45	27.55%	28.50%	24.05%	0.4%	2.4%
21	17.91%	18.59%	8.98%	0.7%	-1.9%	46	19.93%	20.77%	30.62%	-1.1%	-3.0%
22	17.24%	17.91%	21.71%	0.4%	1.5%	47	37.65%	39.82%	21.77%	-0.7%	-9.9%
23	7.97%	8.43%	11.46%	3.7%	-3.1%	48	35.96%	38.62%	21.42%	-0.4%	-4.7%
24	10.49%	11.18%	17.58%	3.0%	12.1%	49	14.87%	16.47%	17.64%	-0.5%	-1.7%
25	16.06%	16.80%	41.59%	-0.6%	3.1%	50	13.70%	15.38%	39.90%	-2.0%	-2.2%



Table 5.6: SCS Results For GARCH Model Using E-Views

	Conditional Mean equation				Conditional Variance equation				Persistence	Log Likelihood		
	b_0		b_1		α_0 (1×10^6)		α_1	α_2	$\alpha_1 + \alpha_2$	Value		
1	-0.010	***	-0.059	***	251.000	**	-0.014	**	0.500	**	0.485	2998.341
2	-0.009	***	-0.033	***	158.000		-0.004	***	0.529		0.525	3382.264
3	-0.005	***	-0.071	***	35.500	*	-0.018	***	0.600	***	0.582	4129.631
4	-0.007	***	-0.010		3.290	***	0.024	***	0.954	***	0.978	3739.184
5	-0.004	***	-0.044		1.860	***	0.034	***	0.931	***	0.965	4356.500
6	-0.010	***	-0.077	*	1.890	***	0.027	***	0.972	***	0.999	2978.353
7	-0.005	***	-0.054		14.500	***	0.141	***	0.697	***	0.838	4116.226
8	-0.005	***	-0.032		14.400	***	-0.005	***	0.890	***	0.885	3899.545
9	-0.008	***	-0.037		75.900		-0.005		0.651		0.646	3469.993
10	-0.002	***	-0.040		18.400	***	0.633	***	-0.006		0.628	4826.878
11	-0.012	***	-0.080	*	52.100	***	0.042	***	0.814	***	0.856	3159.100
12	-0.006	***	-0.085	*	20.700	**	0.029	***	0.799	***	0.829	3831.197
13	-0.013	***	-0.044		24.500	***	0.015	***	0.949	***	0.963	2791.963
14	-0.005	***	-0.037		0.352	***	0.033	***	0.968	***	1.001	3896.468
15	-0.003	***	-0.019		0.356	***	0.034	***	0.966	***	1.000	4323.363
16	-0.009	***	-0.114	***	6.800	***	0.074	***	0.900	***	0.975	3519.606
17	-0.002	***	0.044		0.585	***	0.041	***	0.943	***	0.984	4777.143
18	-0.008	***	-0.231	***	4.980	***	0.396	***	0.745	***	1.140	3613.658
19	-0.004	***	-0.046		0.918	***	0.045	***	0.938	***	0.983	4463.479
20	-0.012	***	-0.046		296.000	**	-0.010	***	0.560	***	0.550	2830.649
21	-0.008	***	-0.048	**	23.500	***	-0.010	***	0.935	***	0.925	3230.601
22	-0.004	***	-0.043		9.770	***	0.066	***	0.811	***	0.877	4173.454
23	-0.002	***	-0.010		0.469	***	0.078	***	0.920	***	0.999	4987.964
24	-0.010	***	-0.042	***	191.000		-0.005		0.577		0.572	3214.203
25	-0.006	***	-0.037		13.900	***	0.091	***	0.800	***	0.890	3894.796
26	-0.013	***	-0.091	**	57.000	***	0.048	***	0.874	***	0.922	2763.422
27	-0.006	***	-0.094		63.200	***	0.197	***	0.411	***	0.608	3730.799
28	-0.005	***	0.024		1.410	***	0.048	***	0.941	***	0.989	3985.076
29	-0.008	***	0.118	***	3.620	***	0.027	***	0.965	***	0.993	3167.423
30	-0.008	***	-0.106	**	48.500	***	0.040	***	0.621	***	0.661	3727.680
31	-0.006	***	-0.054		217.000	***	0.074	***	-0.094	**	-0.020	3489.629
32	-0.010	***	-0.041		475.000	***	-0.011	***	0.142		0.130	2946.995
33	-0.005	***	0.029		0.507	***	0.034	***	0.969	***	1.003	3694.415
34	-0.011	***	-0.024		387.000	***	0.276	***	0.199	***	0.476	2825.798
35	-0.005	***	0.056	***	25.700	***	0.764	***	0.451	***	1.216	3739.213
36	-0.006	***	-0.002		24.700	***	0.030	***	0.862	***	0.891	3452.024
37	-0.008	***	-0.031		58.600	***	0.200	***	0.593	***	0.792	3445.149
38	-0.005	***	-0.010		117.000		-0.002		0.561		0.559	3543.301
39	-0.006	***	-0.013		32.200	***	0.168	***	0.686	***	0.854	3597.514
40	-0.004	***	-0.025		69.900	***	0.078	***	0.030		0.108	4106.036
41	-0.008	***	-0.022		172.000	***	0.036	***	0.261		0.298	3392.452
42	-0.007	***	-0.010		161.000	***	0.515	***	0.015		0.531	3463.159
43	-0.005	***	-0.022		4.310	***	0.071	***	0.891	***	0.963	3973.843
44	-0.003	***	0.025		4.590	***	0.128	***	0.827	***	0.955	4289.446
45	-0.007	***	0.027		40.800	***	0.084	***	0.720	***	0.804	3537.848
46	-0.007	***	-0.331	***	33.600	***	1.013	***	0.221	***	1.234	3921.697
47	-0.005	***	-0.044		25.400	***	0.135	***	0.702	***	0.836	3806.676
48	-0.005	***	-0.066	*	1.840	***	0.039	***	0.940	***	0.979	4134.998
49	-0.006	***	-0.020		43.100	***	0.160	***	0.460	***	0.620	3921.062
50	-0.007	***	0.038		72.400	***	0.151	***	0.544	***	0.694	3486.504

The table above shows the estimation results for Shariah-compliant portfolio using the GARCH (1,1) model. It highlights the mean and variance equations with the respective probability values. ***, **, * indicates the coefficients that are significant at 1%, 5% and 10% levels. Garch specification model is given by:

$$GARCH = \alpha_0 + \alpha_1 \varepsilon_{1,t-1}^2 + \alpha_2 \sigma_{1,t-1}^2$$

Where:

$\varepsilon_{1,t-1}^2$: Squared residual (-1)

$\sigma_{1,t-1}^2$: GARCH (-1)

Table 5.7: Conventional Portfolio Results For GARCH Model Using E-Views

	Conditional Mean equation			Conditional Variance equation			Persistence	Log Likelihood
	b_0	b_1	α_0 (1×10^6)	α_1	α_2	$\alpha_1 + \alpha_2$	Value	
1	-0.005 ***	0.023	4.980 ***	0.054 ***	0.897 ***	0.951	4015.803	
2	-0.004 ***	0.023	1.480 ***	-0.010 ***	0.979 ***	0.969	4414.955	
3	-0.003 **	0.012	151.000	-0.001	0.580	0.579	3382.291	
4	-0.006 ***	-0.046	99.300 *	-0.014 ***	0.570 **	0.556	3523.973	
5	-0.003 ***	-0.027	1.270 ***	0.064 ***	0.922 ***	0.986	4352.784	
6	-0.006 ***	0.040	124.000 ***	0.276 ***	-0.039	0.237	3727.274	
7	-0.013 ***	-0.151 ***	119.000 ***	2.192 ***	0.048 ***	2.240	2997.137	
8	-0.003 ***	0.030	13.200 ***	0.115 ***	0.655 ***	0.770	4358.876	
9	-0.004 ***	0.064 *	4.290 ***	0.014 ***	0.939 ***	0.953	4015.845	
10	-0.012 ***	-0.128 ***	0.237 *	-0.005 ***	1.007 ***	1.002	2937.954	
11	-0.012 ***	-0.040	4.270 ***	0.009 ***	0.987 ***	0.996	2680.739	
12	-0.006 ***	0.003	15.500 ***	0.070 ***	0.787 ***	0.856	3927.472	
13	-0.006 ***	-0.066	155.000 ***	0.042 ***	0.060	0.102	3610.597	
14	-0.003 ***	-0.053 *	4.040 *	-0.003	0.924 ***	0.921	4372.334	
15	-0.005 ***	-0.052	0.940 ***	0.003 ***	0.987 ***	0.990	3953.338	
16	-0.006 ***	-0.047	3.110 ***	0.045 ***	0.919 ***	0.964	4082.997	
17	-0.003 ***	-0.046	34.900 ***	0.328 ***	0.033 *	0.361	4472.174	
18	-0.006 ***	-0.018	125.000 ***	-0.003 **	0.602 ***	0.600	3444.512	
19	-0.003 ***	-0.040	1.330 ***	0.039 ***	0.919 ***	0.957	4707.580	
20	-0.005 ***	0.067 *	1.810 ***	0.047 ***	0.946 ***	0.993	3753.637	
21	-0.004 ***	-0.147 ***	5.860 ***	0.054 ***	0.834 ***	0.888	4390.572	
22	-0.005 ***	-0.075 **	3.050 ***	0.033 ***	0.943 ***	0.976	3871.336	
23	-0.015 ***	-0.078 ***	12.000 ***	0.022 ***	0.961 ***	0.983	2787.488	
24	-0.018 ***	-0.032	1233.000 ***	-0.015 ***	0.155	0.140	2296.221	
25	-0.005 ***	-0.018	210.000 ***	0.019 *	0.054	0.073	3439.998	
26	-0.011 ***	-0.021	76.000	-0.004	0.862 ***	0.858	2905.923	
27	-0.009 ***	-0.082 *	55.900 ***	0.068 ***	0.687 ***	0.755	3450.640	
28	-0.015 ***	-0.200 ***	3.380 *	0.018 ***	0.977 ***	0.995	2803.578	
29	-0.006 ***	-0.362 ***	-0.701	0.871 ***	0.704 ***	1.574	3612.461	
30	-0.012 ***	-0.083 **	221.000 ***	-0.024 ***	0.558 ***	0.533	3030.770	
31	-0.002 ***	0.043	1.030 ***	0.091 ***	0.876 ***	0.967	4852.428	
32	-0.002 ***	0.003	31.200 **	0.009 *	0.713 ***	0.722	3875.239	
33	-0.006 ***	-0.071 *	5.770 ***	0.089 ***	0.850 ***	0.939	4098.878	
34	-0.005 ***	-0.038 ***	35.900	-0.006	0.645 ***	0.639	4040.400	
35	-0.007 ***	-0.036	2.630 ***	0.033 ***	0.957 ***	0.990	3543.514	
36	-0.007 ***	0.094 ***	5.800 ***	0.054 ***	0.928 ***	0.982	3460.615	
37	-0.004 ***	0.003	3.810 ***	0.004 ***	0.980 ***	0.983	3474.179	
38	-0.001 ***	0.137 ***	1.720 ***	0.139 ***	0.786 ***	0.926	5114.446	
39	-0.005 ***	-0.021	77.100	-0.003 ***	0.557	0.553	3815.590	
40	-0.008 ***	-0.068 *	1.680 ***	0.021 ***	0.973 ***	0.994	3471.285	
41	-0.008 ***	0.004	0.752 ***	-0.007 ***	1.005 ***	0.998	3400.190	
42	-0.005 ***	0.067 **	0.381 **	0.029 ***	0.969 ***	0.998	3851.685	
43	-0.008 ***	-0.062 *	10.400 ***	0.070 ***	0.885 ***	0.955	3521.097	
44	-0.009 ***	-0.043	192.000	-0.010 **	0.493	0.483	3184.006	
45	-0.006 ***	-0.037	3.580 ***	0.020 ***	0.962 ***	0.982	3598.480	
46	-0.004 ***	-0.030	109.000 ***	-0.018 ***	0.416 ***	0.398	3571.581	
47	-0.005 ***	0.023	0.277 **	0.024 ***	0.976 ***	1.000	3990.128	
48	-0.013 ***	-0.046	172.000 ***	0.128 ***	0.593 ***	0.721	2862.221	
49	-0.007 ***	0.000 ***	-99189.000 ***	0.027 ***	0.950 ***	0.977	3871.593	
50	-0.011 ***	-0.021	76.000	-0.004	0.862 ***	0.858	2905.923	

The table above shows the estimation results for conventional portfolio using the GARCH (1,1) model. It highlights the mean and variance equations with the respective probability values. ***, **, * indicates the coefficients that are significant at 1%, 5% and 10% levels with similar GARCH specification as the Shariah-compliant model.

Table 5.8: F-Test For Downside Beta Using GARCH (1,1) Results

<i>F-Test Two-Sample for Variances</i>	SCS	CS
<i>Mean</i>	0.232822	0.237612
<i>Variance</i>	0.008667328	0.015896741
<i>Observations</i>	50	50
<i>df</i>	49	49
<i>F</i>	0.545226738	
<i>P(F<=f) one-tail</i>	0.018025411	
<i>F Critical one-tail</i>	0.622165468	

Table 5.9: F- Test For Sortino Ratio Using GARCH (1,1) Results

<i>F-Test Two-Sample for Variances</i>	SCS	CS
<i>Mean</i>	0.02311617	-0.00112
<i>Variance</i>	0.00141375	0.002558
<i>Observations</i>	50	50
<i>df</i>	49	49
<i>F</i>	0.55266181	
<i>P(F<=f) one-tail</i>	0.02017198	
<i>F Critical one-tail</i>	0.62216547	

Table 5.10: F-Test For Downside Beta Using Market Downside Beta Values

<i>F-Test Two-Sample for Variances</i>	SCS	CS
<i>Mean</i>	0.1398	0.1268
<i>Variance</i>	0.012414	0.010402
<i>Observations</i>	50	50
<i>df</i>	49	49
<i>F</i>	1.193471	
<i>P(F<=f) one-tail</i>	0.269118	
<i>F Critical one-tail</i>	1.607289	

Table 5.11: F-Test For Sortino Ratio Using The EWMA Scores

<i>F-Test Two-Sample for Variances</i>	SCS	CS
<i>Mean</i>	0.027206	0.000729
<i>Variance</i>	0.002011	0.002969
<i>Observations</i>	50	50
<i>df</i>	49	49
<i>F</i>	0.677387	
<i>P(F<=f) one-tail</i>	0.088167	
<i>F Critical one-tail</i>	0.622165	

APPENDIX B. FIGURES

Log Differenced FTSE BURSA

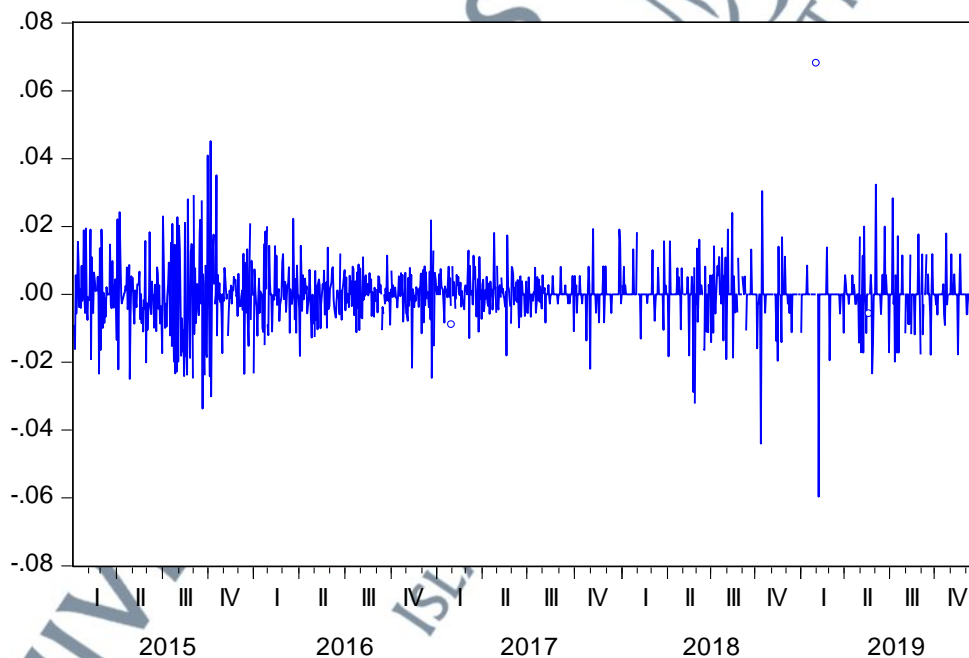


Figure 5.3: Stationarity Test for FTSE Bursa Malaysia.

There are clear evidences of clustering in the FTSE BURSA where small volatility movements are followed by small movements and high volatility movements are followed by high movements.

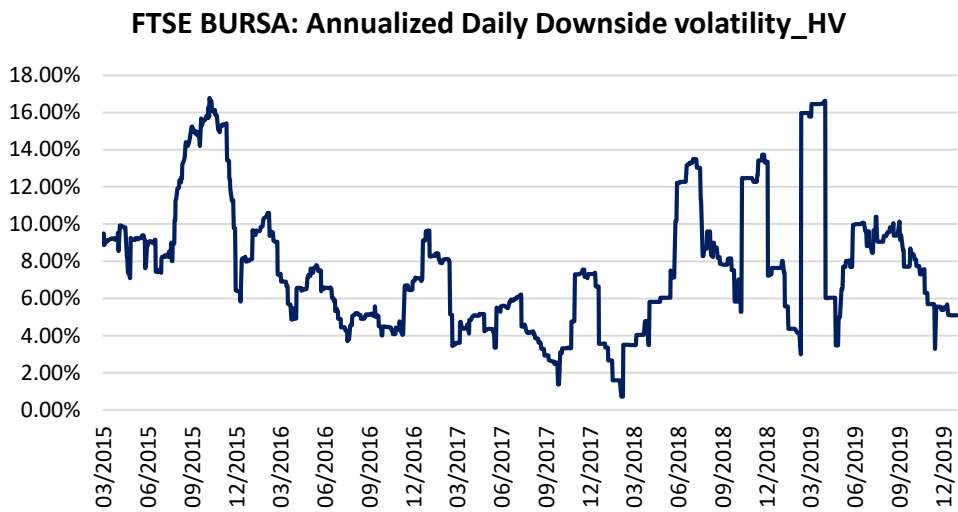


Figure 5.4: Downside Beta for FTSE Bursa Malaysia Using HV

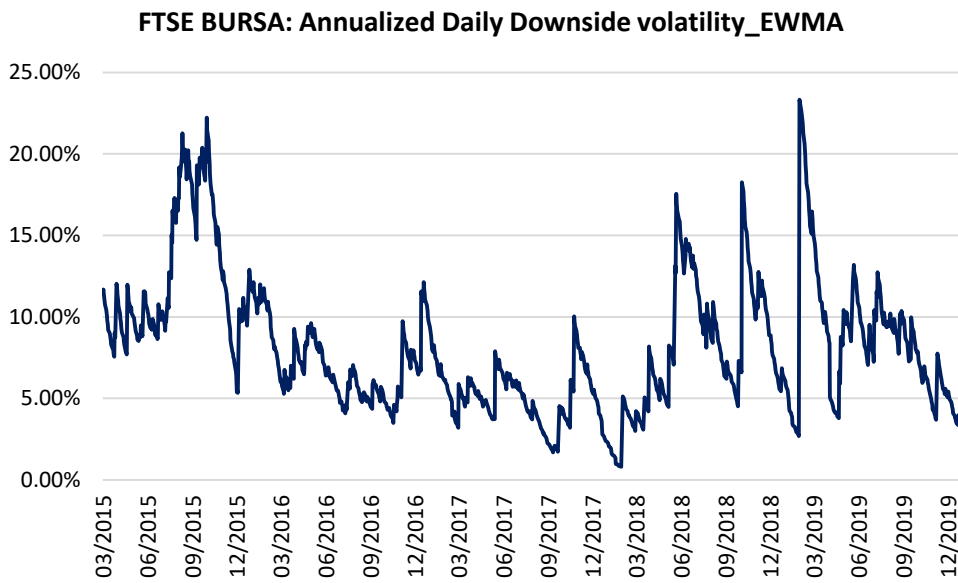


Figure 5.5: Downside Beta for FTSE Bursa Malaysia Using EWMA

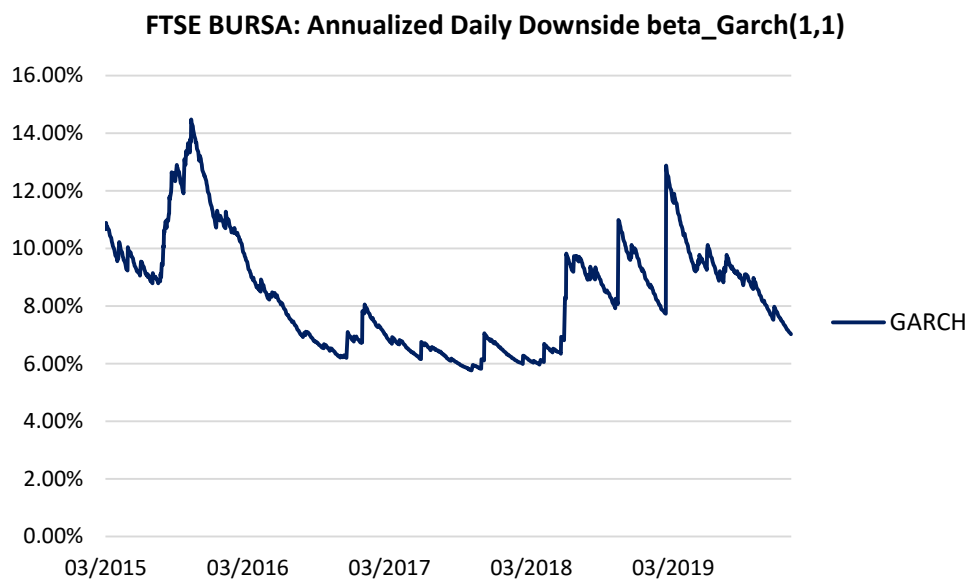


Figure 5.6: Downside Beta for FTSE Bursa Malaysia Using GARCH (1,1)

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