Appendix A Model Agnostic Approach to Stabilise Forecasts

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Appendix A.

Tables A.1 and A.2 respectively show the MAE and RMSE based accuracy and stability results of vertical stability experiments across the four experimental datasets. The best performing models in each group are italicized and the overall best performing models are highlighted in boldface.

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Table A.1: MAE based results of vertical stability experiments.

M4 M3 Favorita M5 M4 M3 Favorita M5 M4 M3 Favorita NBEATS Base 394.718 499.275 - - 194.963 176.017 - - 267.808 264.625 Stable 394.533 497.189 - - 135.807 127.870 - - 215.746 218.174 PI.0.2 393.223 498.985 - - 154.345 143.009 - - 243.425 241.940 PI.0.4 395.551 500.783 - - 125.200 119.618 - - 222.384 221.859 PI.0.5 398.032 502.488 - - 117.431 113.207 - - 213.275 212.978 PI.0.6 401.337 504.766 - - 115.009 110.552 - - 205.179 204.958 PI.0.8 410.212 510.865 - -	a M
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FI_0.8	-
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FI_1 457.857 543.402 0.000 0.000 0.000 0.000	
PR	-
1 10	
Base 457.977 563.163 2.426 5.321 140.825 149.688 0.488 1.380 226.883 214.089 0.5	2 2.31
PL-0.2 461.139 564.716 2.420 5.307 118.160 122.679 0.385 1.087 206.587 192.797 0.	6 2.17
PL-0.4 465.625 567.470 2.418 5.309 100.483 101.600 0.300 0.886 187.984 173.695 0.	7 2.05
PL.0.5 468.365 569.337 2.418 5.316 94.886 94.595 0.273 0.838 179.441 165.173 0.	0 2.00
PL-0.6 471.423 571.504 2.419 5.327 91.618 90.774 0.258 0.828 171.496 157.492 0.	7 1.96
PL-0.8 478.462 576.747 2.424 5.361 91.057 91.773 0.259 0.916 157.606 144.683 0.	1.90
PI_1 486.762 583.228 2.433 5.411 97.218 101.305 0.296 1.111 146.788 135.799 0.5	3 1.88
FL.0.2 461.411 564.888 2.420 5.306 117.078 121.870 0.385 1.085 203.611 190.000 0.	9 2.15
FL.0.4 467.156 568.434 2.416 5.302 93.363 95.116 0.289 0.827 173.984 160.487 0.	5 1.94
FL.0.5 471.254 571.167 2.416 5.305 81.010 81.645 0.243 0.707 155.681 142.773 0.	6 1.81
FI_0.6 476.517 574.778 2.417 5.312 68.023 67.790 0.197 0.588 134.273 122.417 0.	1 1.65
FI_0.8 492.500 585.843 2.426 5.350 38.506 37.389 0.105 0.339 78.967 71.171 0.	5 1.13
FI_1 521.661 605.974 2.450 5.555 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.00
LightGBM	
Base 473.849 562.678 2.567 5.161 157.665 166.004 0.404 1.010 236.394 235.818 0.5	5 1.95
PL_0.2 476.197 563.759 2.569 5.162 129.560 134.229 0.326 0.816 214.520 213.439 0.	8 1.84
PL_0.4 480.547 566.600 2.574 5.173 107.616 110.056 0.264 0.683 194.997 193.827 0.	6 1.75
PL.0.5 483.462 568.729 2.577 5.181 100.506 102.519 0.243 0.651 186.180 185.167 0.	
PL.0.6 486.851 571.299 2.580 5.191 97.267 99.269 0.231 0.646 178.056 177.283 0.	3 1.67
PL.0.8 494.957 577.710 2.588 5.219 99.323 103.287 0.231 0.698 164.162 164.068 0.	
PL1 504.699 585.668 2.598 5.255 109.686 116.230 0.255 0.815 154.010 154.979 0.3	4 1.582
FL.0.2 476.490 563.914 2.570 5.162 128.718 133.562 0.325 0.811 211.512 210.449 0.	
FL0.4 482.156 567.590 2.576 5.170 101.109 103.556 0.251 0.635 180.597 179.382 0.	
FL0.5 486.525 570.662 2.581 5.177 87.103 88.687 0.214 0.550 161.633 160.481 0.	
FL.0.6 492.314 574.868 2.587 5.187 72.597 73.527 0.177 0.465 139.485 138.453 0.	
FL0.8 510.365 588.532 2.605 5.224 40.508 40.670 0.097 0.277 82.205 81.592 0.	
FI_1 543.550 615.660 2.638 5.384 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.00

Table A.2: RMSE based results of vertical stability experiments.

		RMS	E			RMS	С		RMSC_I			
	M4	М3	Favorita	M5	M4	М3	Favorita	M5	M4	М3	Favorita	M5
NBEATS												
Base	468.469	591.192	-	_	207.259	184.008	-	-	303.638	298.414	-	_
Stable	467.117	589.290	-	-	143.592	133.437	-	-	244.804	247.956	-	-
PI_0.2	466.629	590.737	-	-	164.352	150.001	-	-	278.926	276.213	-	-
PI_0.4	468.886	592.655	-	-	134.745	127.173	-	-	258.316	257.125	-	-
PI_0.5	471.446	594.490	-	-	127.210	121.330	-	-	249.871	249.024	-	-
PI_0.6	474.900	596.897	-	-	125.411	119.575	-	-	242.839	242.063	-	-
PI_0.8	484.297	603.362	-	-	137.951	128.198	-	-	233.547	232.081	-	-
PI_1	496.698	611.882	-	-	167.302	150.487	-	-	231.533	227.968	-	-
FI_0.2	466.462	590.494	-	-	163.762	148.708	-	-	275.253	272.360	-	-
FI_0.4	468.537	591.908	-	-	125.545	116.670	-	-	239.726	238.193	-	-
FI_0.5	471.542	593.737	-	-	107.348	100.932	-	_	217.308	216.179	-	_
FI_0.6	476.438	596.740	-	-	89.180	84.803	-	-	190.302	189.442	-	-
FI_0.8	495.616	609.216	-	-	50.263	48.747	-	-	116.140	115.610	-	-
FI_1	539.491	640.988	-	-	0.000	0.000	-	-	0.000	0.000	-	-
PR												
Base	535.777	660.323	3.125	6.587	142.305	154.168	0.520	1.442	253.578	240.909	0.659	2.603
PI_0.2	538.443	661.296	3.119	6.571	120.240	127.049	0.412	1.145	233.970	219.884	0.590	2.455
PI_0.4	542.645	663.718	3.117	6.572	104.099	106.989	0.325	0.946	216.355	201.406	0.529	2.334
PI_0.5	545.310	665.472	3.117	6.579	99.259	100.812	0.297	0.898	208.467	193.370	0.503	2.285
PI_0.6	548.344	667.587	3.119	6.591	96.820	97.845	0.283	0.888	201.309	186.280	0.481	2.246
PI_0.8	555.508	672.886	3.126	6.626	98.749	101.549	0.289	0.980	189.592	175.280	0.448	2.196
PI_1	564.110	679.595	3.137	6.678	109.335	116.020	0.342	1.196	182.073	169.405	0.438	2.189
FI_0.2	538.635	661.373	3.119	6.569	118.971	126.027	0.411	1.141	230.674	216.738	0.582	2.433
FI_0.4	543.872	664.308	3.116	6.564	96.046	99.335	0.310	0.879	200.485	186.234	0.493	2.223
FI_0.5	547.778	666.745	3.117	6.566	84.082	85.886	0.262	0.755	181.188	167.326	0.440	2.086
FI_0.6	552.949	670.092	3.120	6.572	71.355	71.939	0.214	0.632	157.989	145.044	0.379	1.911
FI_0.8	569.466	681.028	3.133	6.609	41.516	40.663	0.115	0.371	95.253	86.439	0.224	1.338
FI_1	601.941	702.605	3.167	6.830	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LightGBM												
Base	551.580	660.952	3.167	6.361	165.394	179.361	0.449	1.119	268.626	270.842	0.642	2.223
PI_0.2	553.317	661.483	3.167	6.359	136.088	144.799	0.362	0.901	246.445	247.839	0.581	2.107
PI_0.4	557.316	664.123	3.170	6.367	114.446	119.745	0.294	0.757	227.108	228.155	0.527	2.010
PI_0.5	560.140	666.218	3.172	6.375	107.868	112.430	0.272	0.723	218.735	219.828	0.503	1.969
PI_0.6	563.491	668.819	3.175	6.386	105.050	109.769	0.260	0.717	211.355	212.661	0.483	1.934
PI_0.8	571.682	675.455	3.183	6.414	110.156	117.674	0.267	0.783	199.997	202.236	0.453	1.883
PI_1	581.709	683.872	3.193	6.453	127.040	138.871	0.308	0.934	194.016	197.775	0.437	1.863
FI_0.2	553.517	661.562	3.167	6.358	135.107	144.064	0.361	0.896	243.116	244.479	0.573	2.088
FI_0.4	558.560	664.743	3.171	6.362	106.803	111.996	0.279	0.701	210.703	211.490	0.491	1.914
FI_0.5	562.676	667.614	3.175	6.367	92.556	96.287	0.238	0.608	190.304	190.891	0.441	1.799
FI_0.6	568.319	671.696	3.180	6.375	77.782	80.294	0.198	0.514	165.917	166.358	0.382	1.649
FI_0.8	586.933	685.736	3.199	6.406	44.483	45.295	0.109	0.308	100.144	100.401	0.229	1.154
FI_1	624.029	715.230	3.237	6.577	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Tables A.3 and A.4 respectively show the MAE and RMSE based accuracy and stability results of horizontal stability experiments across the four experimental datasets. The best performing models in each group are italicized and the overall best performing models are highlighted in boldface.

Table A.3: MAE based results of horizontal stability experiments.

		MA	Ε		MAG	C		MAC_I				
	M4	М3	Favorita	M5	M4	М3	Favorita	M5	M4	М3	Favorita	M5
NBEATS												
Bas	e 394.718	499.275	-	_	134.376	213.987	-	_	227.159	332.556	_	-
PI_0.	2 395.853	502.700	-	-	111.622	174.836	-	-	210.924	307.938	-	-
PI_0.	4 399.912	509.828	-	-	95.540	147.076	-	-	197.034	287.171	-	-
PI_0.	5 402.767	514.548	-	-	91.136	140.087	-	-	190.923	278.401	-	-
PI_0.	6 406.096	519.994	-	-	90.280	138.512	-	-	185.418	270.782	-	-
PI_0.	8 414.004	532.899	-	-	96.200	148.812	-	-	176.432	258.878	-	-
PI_	1 423.414	548.274	-	-	108.536	170.653	-	-	170.406	251.339	-	-
FI_0.	2 395.882	502.870	-	-	110.342	173.540	-	-	207.982	303.648	-	-
FI_0.	4 400.712	511.377	-	-	87.452	135.625	-	-	182.623	265.981	-	-
FI_0.	5 404.702	517.840	-	_	75.870	116.670	_	_	166.049	241.683	_	_
FI_0.	6 410.092	526.370	-	_	63.869	97.269	-	-	145.728	212.029	-	_
FI_0.	8 427.619	552.548	-	_	36.841	54.854	-	-	89.058	129.554	-	_
FI_	1 462.590	602.756	-	-	0.000	0.000	-	-	0.000	0.000	-	-
PR												
Bas	e 457.977	563.163	2.426	5.321	84.115	193.529	0.646	0.806	154.122	334.116	0.838	1.771
PI_0.	2 458.768	564.833	2.427	5.324	71.767	165.378	0.512	0.726	144.034	311.440	0.772	1.728
PI_0.	4 460.127	568.983	2.435	5.334	63.150	145.159	0.414	0.683	135.063	291.628	0.722	1.696
PI_0.	5 461.010	571.941	2.441	5.341	60.707	139.285	0.386	0.677	131.027	282.893	0.703	1.684
PI_0.	6 462.025	575.431	2.448	5.350	59.856	136.964	0.382	0.681	127.305	274.976	0.689	1.675
PI_0.	8 464.442	583.992	2.468	5.373	62.236	141.832	0.432	0.718	120.872	261.742	0.671	1.663
PI_	1 467.373	594.489	2.494	5.402	68.180	155.713	0.521	0.784	115.895	252.152	0.669	1.662
FI_0.	2 458.902	564.866	2.427	5.324	70.655	162.566	0.508	0.699	141.909	306.679	0.761	1.715
FI_0.	4 460.859	569.868	2.434	5.336	57.116	130.586	0.382	0.564	124.880	268.988	0.668	1.636
FI_0.	5 462.375	574.133	2.440	5.344	49.974	113.574	0.322	0.483	113.567	244.276	0.608	1.583
FI_0.	6 464.405	579.966	2.447	5.355	42.393	95.594	0.262	0.396	99.639	214.076	0.536	1.512
FI_0.	8 471.064	598.962	2.473	5.383	24.778	54.790	0.142	0.211	60.778	130.350	0.331	1.226
FI_	1 485.115	639.090	2.535	5.579	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LightGBN	1											
Bas		562.678	2.567	5.161	81.285	148.911	0.533	0.720	163.983	264.938	0.787	1.524
PI_0.	, ,	564.775	2.567	5.168	69.503	123.632	0.428	0.651	153.472	246.933	0.734	1.485
PI_0.		568.546	2.573	5.183	61.547	106.278	0.353	0.612	143.784	230.916	0.690	1.457
PI_0.		571.004	2.577	5.193	59.497	102.145	0.332	0.606	139.279	223.689	0.671	1.447
PI_0.		573.808	2.582	5.205	58.919	101.544	0.329	0.608	135.025	217.063	0.656	1.439
PI_0.		580.468	2.594	5.233	61.074	107.958	0.364	0.638	127.319	205.641	0.632	1.430
PI_		588.472	2.609	5.267	66.282	121.241	0.428	0.696	120.836	196.892	0.617	1.431
FI_0.		564.993	2.566	5.169	68.576	122.602	0.426	0.629	151.343	243.566	0.723	1.472
FI_0.		570.024	2.567	5.186	56.155	97.843	0.328	0.511	133.490	214.309	0.640	1.399
FI_0.		573.824	2.566	5.198	49.664	85.309	0.281	0.441	121.519	194.943	0.584	1.351
FI_0.		578.842	2.565	5.212	42.700	72.262	0.232	0.363	106.705	171.117	0.515	1.287
FI_0.		594.154	2.559	5.238	25.734	42.320	0.129	0.194	65.140	104.529	0.318	1.038
FI_{-}	1 496.707	624.674	2.556	5.348	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table A.4: RMSE based results of horizontal stability experiments.

		RMS	E			RMS	С		RMSCJ			
	M4	М3	Favorita	M5	M4	М3	Favorita	M5	M4	М3	Favorita	M5
NBEATS												
Base	468.469	591.192	-	-	163.161	253.761	-	-	258.136	379.605	-	-
PI_0.2	469.951	595.571	-	-	133.781	206.475	-	-	239.014	350.515	-	-
PI_0.4	475.628	604.764	-	-	112.751	172.320	-	-	224.053	328.056	-	-
PI_0.5	479.624	610.943	-	-	107.632	163.892	-	-	218.625	320.070	-	-
PI_0.6	484.271	618.069	-	-	107.341	163.392	-	-	214.786	314.602	-	-
PI_0.8	495.281	634.880	-	-	120.047	184.098	-	-	211.929	311.318	-	-
PI_1	508.265	654.678	-	-	144.374	223.235	-	-	214.794	317.112	-	-
FI_0.2	469.908	595.634	-	-	132.668	205.043	-	-	235.616	345.424	-	-
FI_0.4	475.993	605.894	-	_	103.856	159.324	-	-	206.878	302.342	-	-
FI_0.5	480.859	613.672	_	_	89.499	136.644	-	_	188.454	274.980	-	-
FI_0.6	487.317	623.752	_	_	74.796	113.533	_	_	165.968	241.804	_	_
FI_0.8	507.858	654.571	_	_	42.458	63.489	_	_	102.698	149.260	_	-
FI_1	549.194	713.866	-	-	0.000	0.000	-	-	0.000	0.000	-	-
PR												
Base	535.777	660.323	3.125	6.587	100.623	229.583	0.789	1.048	173.514	378.959	0.960	2.015
PI_0.2	536.660	662.632	3.123	6.589	84.858	193.961	0.616	0.926	162.335	353.674	0.874	1.952
PI_0.4	538.340	667.922	3.130	6.599	73.933	169.189	0.491	0.857	153.402	333.705	0.813	1.914
PI_0.5	539.475	671.652	3.137	6.608	71.283	163.063	0.461	0.847	149.976	326.183	0.796	1.905
PI_0.6	540.805	676.080	3.146	6.618	70.996	162.212	0.462	0.855	147.337	320.522	0.788	1.903
PI_0.8	544.039	686.958	3.170	6.644	77.132	175.591	0.547	0.923	144.509	314.992	0.802	1.919
PI_1	548.016	700.383	3.203	6.678	89.705	203.558	0.698	1.044	144.801	316.793	0.849	1.960
FI_0.2	536.797	662.546	3.122	6.589	83.687	190.999	0.614	0.895	159.812	347.928	0.862	1.929
FI_0.4	539.090	668.280	3.126	6.601	66.900	152.164	0.457	0.714	141.133	306.039	0.749	1.811
FI_0.5	540.881	672.990	3.130	6.611	58.206	131.919	0.383	0.612	128.779	278.634	0.680	1.734
FI_0.6	543.276	679.448	3.137	6.622	49.073	110.666	0.310	0.503	113.516	245.055	0.599	1.640
FI_0.8	551.006	700.973	3.161	6.648	28.268	62.841	0.166	0.272	70.227	150.958	0.372	1.319
$FI_{-}1$	567.268	747.542	3.225	6.833	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LightGBM												
Base	551.580	660.952	3.167	6.361	99.339	179.370	0.644	0.934	183.905	299.995	0.898	1.753
PI_0.2	552.850	663.372	3.169	6.370	83.861	147.885	0.513	0.824	172.368	279.315	0.829	1.697
PI_0.4	554.917	667.941	3.177	6.388	73.135	125.572	0.418	0.761	162.820	262.735	0.779	1.663
PI_0.5	556.242	670.995	3.183	6.400	70.538	120.257	0.395	0.752	158.967	256.407	0.762	1.655
PI_0.6	557.757	674.538	3.190	6.415	70.264	120.162	0.395	0.759	155.809	251.591	0.753	1.653
PI_0.8	561.342	683.008	3.208	6.450	76.274	134.105	0.455	0.818	151.682	246.609	0.753	1.668
PI_1	565.641	693.189	3.232	6.493	88.557	160.268	0.567	0.925	150.396	247.354	0.777	1.707
FI_0.2	552.898	663.524	3.168	6.371	82.878	146.835	0.511	0.798	169.876	275.358	0.818	1.675
FI_0.4	555.158	669.106	3.170	6.394	66.816	116.194	0.389	0.639	150.557	242.821	0.719	1.566
FI_0.5	556.721	673.420	3.171	6.410	58.524	100.777	0.331	0.549	137.640	221.526	0.656	1.496
FI_0.6	558.698	679.098	3.172	6.427	49.761	84.797	0.273	0.452	121.552	195.288	0.579	1.409
FI_0.8	565.002	696.824	3.173	6.460	29.285	48.794	0.151	0.244	75.430	120.904	0.361	1.124
FI_1	579.705	733.031	3.188	6.586	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000