Table IFOAdadelta

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| GSPC | 48 | 0.050 | 0.184 | 0.893 | 0.056 | 0.194 | 0.915 | 0.049 | 0.178 | 0.872 | 0.046 | 0.180 | 0.852 | 0.045 | 0.173 | 0.826 |
| 96 | 0.092 | 0.248 | 1.038 | 0.117 | 0.269 | 1.016 | 0.081 | 0.233 | 1.046 | 0.081 | 0.241 | 1.100 | 0.082 | 0.239 | 1.042 |
| 192 | 0.183 | 0.348 | 1.197 | 0.226 | 0.384 | 1.379 | 0.194 | 0.358 | 1.279 | 0.216 | 0.377 | 1.377 | 0.186 | 0.347 | 1.120 |
| 384 | 0.576 | 0.606 | 1.467 | 0.604 | 0.626 | 1.493 | 0.635 | 0.643 | 1.534 | 0.621 | 0.628 | 1.577 | 0.583 | 0.607 | 1.451 |
| DJI | 48 | 0.117 | 0.280 | 1.225 | 0.117 | 0.278 | 1.233 | 0.101 | 0.260 | 1.273 | 0.066 | 0.219 | 1.490 | 0.048 | 0.176 | 1.108 |
| 96 | 0.188 | 0.356 | 1.458 | 0.168 | 0.337 | 1.405 | 0.146 | 0.310 | 1.334 | 0.159 | 0.323 | 1.249 | 0.085 | 0.235 | 1.237 |
| 192 | 0.418 | 0.562 | 2.168 | 0.391 | 0.541 | 2.079 | 0.372 | 0.522 | 1.992 | 0.331 | 0.486 | 1.841 | 0.299 | 0.453 | 1.802 |
| 384 | 0.739 | 0.732 | 2.059 | 0.730 | 0.724 | 2.014 | 0.703 | 0.696 | 1.846 | 0.683 | 0.686 | 1.845 | 0.735 | 0.708 | 1.773 |
| IXIC | 48 | 0.108 | 0.275 | 0.793 | 0.103 | 0.270 | 0.798 | 0.107 | 0.279 | 0.827 | 0.087 | 0.253 | 0.756 | 0.092 | 0.254 | 0.737 |
| 96 | 0.273 | 0.442 | 1.227 | 0.282 | 0.451 | 1.237 | 0.239 | 0.413 | 1.189 | 0.160 | 0.343 | 1.035 | 0.165 | 0.341 | 0.996 |
| 192 | 0.400 | 0.532 | 1.482 | 0.395 | 0.537 | 1.549 | 0.350 | 0.500 | 1.475 | 0.307 | 0.462 | 1.535 | 0.240 | 0.404 | 1.174 |
| 384 | 0.892 | 0.775 | 1.724 | 0.781 | 0.719 | 1.542 | 0.784 | 0.715 | 1.558 | 0.813 | 0.737 | 1.631 | 0.734 | 0.699 | 1.447 |
| FTSE | 48 | 0.057 | 0.191 | 0.942 | 0.058 | 0.192 | 0.949 | 0.061 | 0.195 | 0.951 | 0.069 | 0.210 | 1.059 | 0.063 | 0.200 | 0.965 |
| 96 | 0.093 | 0.238 | 1.125 | 0.090 | 0.230 | 1.070 | 0.101 | 0.245 | 1.136 | 0.123 | 0.277 | 1.273 | 0.110 | 0.260 | 1.165 |
| 192 | 0.284 | 0.453 | 1.614 | 0.296 | 0.462 | 1.608 | 0.237 | 0.405 | 1.388 | 0.316 | 0.487 | 1.705 | 0.317 | 0.480 | 1.543 |
| 384 | 0.600 | 0.676 | 2.023 | 0.614 | 0.688 | 2.078 | 0.602 | 0.678 | 2.032 | 0.612 | 0.692 | 2.164 | 0.681 | 0.734 | 2.107 |
| GDAXI | 48 | 0.042 | 0.158 | 0.745 | 0.044 | 0.163 | 0.744 | 0.048 | 0.172 | 0.775 | 0.047 | 0.173 | 0.767 | 0.047 | 0.170 | 0.751 |
| 96 | 0.097 | 0.252 | 1.183 | 0.106 | 0.265 | 1.241 | 0.104 | 0.262 | 1.237 | 0.104 | 0.262 | 1.207 | 0.083 | 0225 | 0.986 |
| 192 | 0.232 | 0.404 | 1.500 | 0.231 | 0.403 | 1.494 | 0.226 | 0.397 | 1.576 | 0.217 | 0.375 | 1.586 | 0.207 | 0.362 | 1.408 |
| 384 | 0.328 | 0.472 | 1.253 | 0.321 | 0.471 | 1.262 | 0.398 | 0.515 | 1.623 | 0.442 | 0.539 | 1.783 | 0.362 | 0.481 | 1.419 |
| N225 | 48 | 0.087 | 0.226 | 1.300 | 0.081 | 0.216 | 1.166 | 0.093 | 0.239 | 0.956 | 0.103 | 0.253 | 1.368 | 0.070 | 0.196 | 1.247 |
| 96 | 0.169 | 0.312 | 2.375 | 0.158 | 0.299 | 2.034 | 0.142 | 0.277 | 1.833 | 0.207 | 0.362 | 2.646 | 0.137 | 0.266 | 2.214 |
| 192 | 0.230 | 0.381 | 2.099 | 0.224 | 0.377 | 2.177 | 0.203 | 0.355 | 2.049 | 0.249 | 0.411 | 2.453 | 0.130 | 0.272 | 2.033 |
| 384 | 0.753 | 0.734 | 2.089 | 0.740 | 0.725 | 2.067 | 0.683 | 0.678 | 1.886 | 0.734 | 0.726 | 2.112 | 0.682 | 0.678 | 1.907 |

Table 2 IFOAdam

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| GSPC | 48 | 0.049 | 0.166 | 0.843 | 0.052 | 0.166 | 0.880 | 0.050 | 0.163 | 0.861 | 0.052 | 0.165 | 0.857 | 0.050 | 0.173 | 0.862 |
| 96 | 0.091 | 0.226 | 1.012 | 0.075 | 0.208 | 0.980 | 0.074 | 0.208 | 0.964 | 0.071 | 0.210 | 0.940 | 0.130 | 0.262 | 1.117 |
| 192 | 0.179 | 0.333 | 1.113 | 0.175 | 0.332 | 1.104 | 0.178 | 0.332 | 1.097 | 0.170 | 0.332 | 1.155 | 0.186 | 0.346 | 1.120 |
| 384 | 0.462 | 0.544 | 1.084 | 0.454 | 0.534 | 1.145 | 0.443 | 0.529 | 1.135 | 0.497 | 0.551 | 1.269 | 0.501 | 0.564 | 1.228 |
| DJI | 48 | 0.045 | 0.167 | 1.012 | 0.045 | 0.166 | 0.998 | 0.040 | 0.156 | 1.019 | 0.035 | 0.149 | 1.051 | 0.095 | 0.245 | 1.105 |
| 96 | 0.146 | 0.315 | 1.474 | 0.128 | 0.287 | 1.208 | 0.091 | 0.239 | 1.143 | 0.082 | 0.228 | 1.339 | 0.096 | 0.248 | 1.327 |
| 192 | 0.277 | 0.433 | 1.539 | 0.278 | 0.434 | 1.555 | 0.246 | 0.386 | 1.253 | 0.246 | 0.404 | 1.416 | 0.192 | 0.347 | 1.183 |
| 384 | 0.587 | 0.614 | 1.583 | 0.552 | 0.596 | 1.580 | 0.566 | 0.600 | 1.540 | 0.558 | 0.594 | 1.527 | 0.486 | 0.547 | 1.387 |
| IXIC | 48 | 0.066 | 0.198 | 0.627 | 0.062 | 0.195 | 0.615 | 0.066 | 0.201 | 0.614 | 0.057 | 0.192 | 0.592 | 0.096 | 0.250 | 0.702 |
| 96 | 0.166 | 0.313 | 0.863 | 0.113 | 0.266 | 0.792 | 0.111 | 0.267 | 0.790 | 0.101 | 0.261 | 0.779 | 0.465 | 0.540 | 1.105 |
| 192 | 0.250 | 0.391 | 1.150 | 0.240 | 0.388 | 1.137 | 0.234 | 0.380 | 1.121 | 0.211 | 0.374 | 1.126 | 0.389 | 0.495 | 1.184 |
| 384 | 0.634 | 0.648 | 1.244 | 0.640 | 0.649 | 1.260 | 0.666 | 0.667 | 1.294 | 0.704 | 0.698 | 1.385 | 0.712 | 0.706 | 1.399 |
| FTSE | 48 | 0.053 | 0.183 | 0.880 | 0.056 | 0.190 | 0.903 | 0.054 | 0.185 | 0.898 | 0.057 | 0.189 | 0.934 | 0.064 | 0.203 | 0.971 |
| 96 | 0.090 | 0.233 | 1.054 | 0.091 | 0.236 | 1.065 | 0.099 | 0.246 | 1.115 | 0.106 | 0.251 | 1.135 | 0.098 | 0.246 | 1.111 |
| 192 | 0.244 | 0.414 | 1.373 | 0.253 | 0.421 | 1.378 | 0.262 | 0.430 | 1.425 | 0.261 | 0.434 | 1.443 | 0.252 | 0.421 | 1.304 |
| 384 | 0.570 | 0.651 | 1.854 | 0.574 | 0.653 | 1.850 | 0.580 | 0.657 | 1.840 | 0.563 | 0.650 | 1.869 | 0.576 | 0.640 | 1.548 |
| GDAXI | 48 | 0.048 | 0.167 | 0.750 | 0.046 | 0.165 | 0.750 | 0.041 | 0.154 | 0.726 | 0.038 | 0.145 | 0.664 | 0.043 | 0.157 | 0.730 |
| 96 | 0.087 | 0.238 | 1.107 | 0.084 | 0.231 | 1.078 | 0.085 | 0.233 | 1.081 | 0.082 | 0.226 | 1.027 | 0.089 | 0.238 | 1.108 |
| 192 | 0.208 | 0.374 | 1.444 | 0.198 | 0.364 | 1.428 | 0.193 | 0.358 | 1.418 | 0.196 | 0.358 | 1.450 | 0.205 | 0.372 | 1.457 |
| 384 | 0.351 | 0.480 | 1.231 | 0.408 | 0.512 | 1.152 | 0.339 | 0.477 | 1.229 | 0.362 | 0.486 | 1.526 | 0.343 | 0.476 | 1.336 |
| N225 | 48 | 0.056 | 0.179 | 0.967 | 0.054 | 0.175 | 1.012 | 0.054 | 0.175 | 0.979 | 0.055 | 0.176 | 0.906 | 0.062 | 0.188 | 1.059 |
| 96 | 0.098 | 0.225 | 1.750 | 0.093 | 0.217 | 1.763 | 0.095 | 0.221 | 1.743 | 0.123 | 0.252 | 1.839 | 0.119 | 0.248 | 1.821 |
| 192 | 0.140 | 0.283 | 1.715 | 0.120 | 0.260 | 1.469 | 0.134 | 0.274 | 1.618 | 0.154 | 0.301 | 1.819 | 0.120 | 0.255 | 1.537 |
| 384 | 0.622 | 0.626 | 1.664 | 0.620 | 0.620 | 1.648 | 0.531 | 0.556 | 1.392 | 0.619 | 0.630 | 1.755 | 0.614 | 0.610 | 1.533 |

Table 3 IFOAdam+

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| GSPC | 48 | 0.063 | 0.198 | 0.898 | 0.051 | 0.172 | 0.859 | 0.053 | 0.167 | 0.883 | 0.044 | 0.155 | 0.795 | 0.050 | 0.167 | 0.864 |
| 96 | 0.089 | 0.222 | 1.044 | 0.091 | 0.222 | 1.051 | 0.084 | 0.218 | 1.036 | 0.067 | 0.207 | 0.933 | 0.104 | 0.250 | 1.021 |
| 192 | 0.190 | 0.346 | 1.100 | 0.179 | 0.339 | 1.110 | 0.171 | 0.331 | 1.110 | 0.173 | 0.335 | 1.156 | 0.187 | 0.348 | 1.177 |
| 384 | 0.454 | 0.532 | 1.174 | 0.458 | 0.542 | 1.181 | 0.463 | 0.537 | 1.188 | 0.503 | 0.552 | 1.279 | 0.519 | 0.569 | 1.312 |
| DJI | 48 | 0.211 | 0.378 | 1.397 | 0.141 | 0.316 | 1.486 | 0.040 | 0.159 | 1.021 | 0.035 | 0.149 | 1.061 | 0.066 | 0.205 | 1.151 |
| 96 | 0.128 | 0.290 | 1.169 | 0.153 | 0.316 | 1.116 | 0.091 | 0.245 | 1.271 | 0.082 | 0.226 | 1.327 | 0.109 | 0.267 | 1.181 |
| 192 | 0.298 | 0.454 | 1.645 | 0.227 | 0.391 | 1.453 | 0.192 | 0.354 | 1.305 | 0.242 | 0.404 | 1.492 | 0.189 | 0.343 | 1.069 |
| 384 | 0.602 | 0.623 | 1.628 | 0.592 | 0.616 | 1.547 | 0.541 | 0.575 | 1.463 | 0.551 | 0.587 | 1.507 | 0.646 | 0.638 | 1.541 |
| IXIC | 48 | 0.412 | 0.508 | 0.993 | 0.124 | 0.273 | 0.762 | 0.061 | 0.191 | 0.596 | 0.057 | 0.192 | 0.590 | 0.091 | 0.236 | 0.673 |
| 96 | 0.137 | 0.286 | 0.834 | 0.119 | 0.269 | 0.807 | 0.127 | 0.281 | 0.813 | 0.101 | 0.262 | 0.780 | 0.128 | 0.289 | 0.829 |
| 192 | 0.259 | 0.406 | 1.190 | 0.248 | 0.399 | 1.168 | 0.407 | 0.491 | 1.122 | 0.213 | 0.375 | 1.134 | 0.266 | 0.414 | 1.181 |
| 384 | 0.665 | 0.664 | 1.274 | 0.652 | 0.657 | 1.254 | 0.675 | 0.677 | 1.345 | 0.645 | 0.644 | 1.333 | 0.695 | 0.699 | 1.276 |
| FTSE | 48 | 0.117 | 0.277 | 1.211 | 0.058 | 0.193 | 0.899 | 0.055 | 0.187 | 0.903 | 0.057 | 0.189 | 0.933 | 0.066 | 0.205 | 0.949 |
| 96 | 0.083 | 0.228 | 1.055 | 0.088 | 0.234 | 1.087 | 0.091 | 0.237 | 1.105 | 0.104 | 0.249 | 1.117 | 0.117 | 0.270 | 1.174 |
| 192 | 0.179 | 0.347 | 1.161 | 0.194 | 0.363 | 1.203 | 0.221 | 0.389 | 1.303 | 0.269 | 0.442 | 1.477 | 0.292 | 0.463 | 1.460 |
| 384 | 0.507 | 0.593 | 1.596 | 0.530 | 0.616 | 1.689 | 0.578 | 0.648 | 1.748 | 0.565 | 0.651 | 1.865 | 0.600 | 0.670 | 1.849 |
| GDAXI | 48 | 0.041 | 0.153 | 0.706 | 0.042 | 0.157 | 0.733 | 0.041 | 0.152 | 0.716 | 0.037 | 0.144 | 0.656 | 0.045 | 0.163 | 0.763 |
| 96 | 0.080 | 0.222 | 1.054 | 0.080 | 0.223 | 1.049 | 0.080 | 0.224 | 1.057 | 0.082 | 0.225 | 1.024 | 0.093 | 0.242 | 1.069 |
| 192 | 0.204 | 0.372 | 1.428 | 0.196 | 0.364 | 1.437 | 0.195 | 0.364 | 1.390 | 0.197 | 0.359 | 1.453 | 0.211 | 0.377 | 1.418 |
| 384 | 0.355 | 0.482 | 1.429 | 0.348 | 0.477 | 1.392 | 0.336 | 0.470 | 1.313 | 0.369 | 0.487 | 1.534 | 0.352 | 0.478 | 1.411 |
| N225 | 48 | 0.077 | 0.210 | 1.206 | 0.096 | 0.238 | 1.178 | 0.061 | 0.185 | 1.165 | 0.054 | 0.175 | 0.907 | 0.072 | 0.202 | 1.135 |
| 96 | 0.126 | 0.261 | 1.657 | 0.105 | 0.241 | 1.535 | 0.106 | 0.237 | 1.650 | 0.122 | 0.252 | 1.838 | 0.128 | 0.289 | 1.581 |
| 192 | 0.160 | 0.310 | 1.607 | 0.150 | 0.296 | 1.422 | 0.128 | 0.270 | 1.431 | 0.165 | 0.314 | 1.878 | 0.239 | 0.401 | 1.405 |
| 384 | 0.607 | 0.617 | 1.656 | 0.592 | 0.618 | 1.301 | 0.571 | 0.587 | 1.417 | 0.632 | 0.639 | 1.775 | 0.663 | 0.653 | 1.490 |

ETT based on IFOAdam

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| ETTh1 | 48 | 0.131 | 0.281 | 1.064 | 0.092 | 0.237 | 1.053 | 0.088 | 0.229 | 1.028 | 0.059 | 0.182 | 0.913 | 0.074 | 0.213 | 0.948 |
| 96 | 0.182 | 0.334 | 1.235 | 0.195 | 0.342 | 1.185 | 0.123 | 0.269 | 1.244 | 0.087 | 0.224 | 1.157 | 0.097 | 0.238 | 1.149 |
| 192 | 0.208 | 0.356 | 1.452 | 0.208 | 0.357 | 1.464 | 0.139 | 0.290 | 1.397 | 0.115 | 0.259 | 1.294 | 0.125 | 0.275 | 1.331 |
| 384 | 0.150 | 0.308 | 1.282 | 0.179 | 0.335 | 1.277 | 0.138 | 0.294 | 1.262 | 0.131 | 0.287 | 1.276 | 0.137 | 0.296 | 1.323 |
| ETTh2 | 48 | 0.292 | 0.441 | 1.240 | 0.269 | 0.418 | 1.170 | 0.203 | 0.359 | 1.058 | 0.138 | 0.276 | 0.805 | 0.180 | 0.327 | 1.014 |
| 96 | 0.300 | 0.434 | 1.376 | 0.327 | 0.453 | 1.267 | 0.291 | 0.426 | 1.398 | 0.200 | 0.336 | 0.997 | 0.262 | 0.394 | 1.145 |
| 192 | 0.374 | 0.485 | 1.611 | 0.370 | 0.480 | 1.466 | 0.348 | 0.477 | 1.384 | 0.250 | 0.386 | 1.124 | 0.315 | 0.443 | 1.368 |
| 384 | 0.432 | 0.514 | 1.711 | 0.362 | 0.482 | 1.458 | 0.358 | 0.484 | 1.580 | 0.277 | 0.411 | 1.187 | 0.333 | 0.457 | 1.425 |
| ETTm1 | 48 | 0.302 | 0.455 | 1.211 | 0.485 | 0.591 | 1.325 | 0.207 | 0.373 | 1.160 | 0.107 | 0.245 | 0.710 | 0.119 | 0.256 | 0.755 |
| 96 | 0.256 | 0.416 | 1.233 | 0.244 | 0.397 | 1.065 | 0.284 | 0.438 | 1.325 | 0.119 | 0.261 | 0.748 | 0.156 | 0.310 | 0.870 |
| 192 | 0.252 | 0.403 | 1.203 | 0.248 | 0.399 | 1.231 | 0.259 | 0.414 | 1.233 | 0.159 | 0.310 | 0.904 | 0.227 | 0.380 | 1.002 |
| 384 | 0.293 | 0.435 | 1.258 | 0.292 | 0.432 | 1.260 | 0.289 | 0.424 | 1.307 | 0.219 | 0.363 | 1.108 | 0.290 | 0.430 | 1.231 |
| ETTm2 | 48 | 0.059 | 0.185 | 0.804 | 0.048 | 0.163 | 0.772 | 0.043 | 0.160 | 0.717 | 0.031 | 0.124 | 0.617 | 0.031 | 0.130 | 0.639 |
| 96 | 0.069 | 0.199 | 0.964 | 0.056 | 0.178 | 0.881 | 0.055 | 0.174 | 0.867 | 0.039 | 0.139 | 0.737 | 0.043 | 0.152 | 0.732 |
| 192 | 0.102 | 0.241 | 1.055 | 0.083 | 0.219 | 1.059 | 0.068 | 0.194 | 1.010 | 0.057 | 0.173 | 0.941 | 0.066 | 0.192 | 0.898 |
| 384 | 0.122 | 0.272 | 1.424 | 0.110 | 0.253 | 1.314 | 0.096 | 0.234 | 1.276 | 0.086 | 0.218 | 1.186 | 0.098 | 0.235 | 1.110 |

ETT based on IFOAdam+

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| ETTh1 | 48 | 0.101 | 0.246 | 1.083 | 0.089 | 0.230 | 1.110 | 0.095 | 0.239 | 1.008 | 0.059 | 0.182 | 0.911 | 0.080 | 0.222 | 0.980 |
| 96 | 0.123 | 0.270 | 1.287 | 0.116 | 0.261 | 1.325 | 0.115 | 0.263 | 1.299 | 0.087 | 0.224 | 1.157 | 0.104 | 0.251 | 1.190 |
| 192 | 0.199 | 0.347 | 1.249 | 0.145 | 0.297 | 1.394 | 0.131 | 0.278 | 1.473 | 0.115 | 0.259 | 1.288 | 0.126 | 0.279 | 1.401 |
| 384 | 0.255 | 0.397 | 1.154 | 0.211 | 0.364 | 1.224 | 0.139 | 0.293 | 1.278 | 0.132 | 0.287 | 1.261 | 0.151 | 0.311 | 1.332 |
| ETTh2 | 48 | 0.331 | 0.444 | 1.357 | 0.297 | 0.428 | 1.048 | 0.265 | 0.404 | 1.096 | 0.138 | 0.276 | 0.806 | 0.218 | 0.369 | 1.156 |
| 96 | 0.318 | 0.452 | 1.342 | 0.307 | 0.435 | 1.375 | 0.323 | 0.452 | 1.151 | 0.200 | 0.336 | 0.996 | 0.351 | 0.463 | 1.235 |
| 192 | 0.398 | 0.497 | 1.449 | 0.412 | 0.504 | 1.456 | 0.355 | 0.480 | 1.395 | 0.250 | 0.386 | 1.124 | 0.393 | 0.496 | 1.418 |
| 384 | 0.387 | 0.491 | 1.651 | 0.402 | 0.499 | 1.702 | 0.378 | 0.486 | 1.627 | 0.277 | 0.411 | 1.186 | 0.408 | 0.504 | 1.505 |
| ETTm1 | 48 | 0.684 | 0.670 | 2.331 | 0.351 | 0.451 | 1.607 | 0.268 | 0.395 | 1.373 | 0.108 | 0.246 | 0.712 | 0.153 | 0.298 | 0.901 |
| 96 | 0.279 | 0.426 | 1.049 | 0.226 | 0.391 | 1.242 | 0.190 | 0.339 | 0.975 | 0.119 | 0.261 | 0.748 | 0.175 | 0.332 | 1.040 |
| 192 | 0.307 | 0.446 | 1.315 | 0.270 | 0.433 | 1.436 | 0.253 | 0.412 | 1.209 | 0.158 | 0.309 | 0.899 | 0.336 | 0.482 | 1.244 |
| 384 | 0.307 | 0.435 | 1.198 | 0.281 | 0.431 | 1.440 | 0.273 | 0.414 | 1.410 | 0.214 | 0.356 | 1.087 | 0.330 | 0.445 | 1.963 |
| ETTm2 | 48 | 0.059 | 0.185 | 0.794 | 0.037 | 0.140 | 0.688 | 0.069 | 0.205 | 0.929 | 0.030 | 0.122 | 0.614 | 0.044 | 0.161 | 0.714 |
| 96 | 0.063 | 0.188 | 0.913 | 0.072 | 0.208 | 0.856 | 0.049 | 0.168 | 0.782 | 0.039 | 0.139 | 0.738 | 0.055 | 0.176 | 0.800 |
| 192 | 0.105 | 0.251 | 1.224 | 0.089 | 0.222 | 1.037 | 0.072 | 0.201 | 0.896 | 0.057 | 0.172 | 0.927 | 0.061 | 0.189 | 0.898 |
| 384 | 0.119 | 0.269 | 1.399 | 0.122 | 0.272 | 1.262 | 0.105 | 0.254 | 1.098 | 0.087 | 0.218 | 1.184 | 0.097 | 0.238 | 1.134 |

Stock Index based on IFOAdadelta

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| GSPC | 192 | 0.183 | 0.348 | 1.197 | 0.226 | 0.384 | 1.379 | 0.194 | 0.358 | 1.279 | 0.216 | 0.377 | 1.377 | 0.186 | 0.347 | 1.120 |
| 384 | 0.576 | 0.606 | 1.467 | 0.604 | 0.626 | 1.493 | 0.635 | 0.643 | 1.534 | 0.621 | 0.628 | 1.577 | 0.583 | 0.607 | 1.451 |
| 192+ | 0.248 | 0.404 | 1.125 | 0.225 | 0.380 | 1.181 | 0.215 | 0.379 | 1.280 | 0.216 | 0.378 | 1.388 | 0.310 | 0.450 | 1.068 |
| 384+ | 0.617 | 0.633 | 1.589 | 0.553 | 0.590 | 1.458 | 0.653 | 0.647 | 1.631 | 0.624 | 0.626 | 1.566 | 0.454 | 0.547 | 1.064 |
| DJI | 192 | 0.418 | 0.562 | 2.168 | 0.391 | 0.541 | 2.079 | 0.372 | 0.522 | 1.992 | 0.331 | 0.486 | 1.841 | 0.299 | 0.453 | 1.802 |
| 384 | 0.739 | 0.732 | 2.059 | 0.730 | 0.724 | 2.104 | 0.703 | 0.696 | 1.846 | 0.683 | 0.686 | 1.845 | 0.735 | 0.708 | 1.773 |
| 192+ | 0.423 | 0.560 | 2.029 | 0.410 | 0.550 | 1.981 | 0.353 | 0.501 | 1.796 | 0.315 | 0.471 | 1.731 | 0.324 | 0.479 | 1.771 |
| 384+ | 0.790 | 0.758 | 2.068 | 0.790 | 0.760 | 2.092 | 0.760 | 0.735 | 1.960 | 0.727 | 0.714 | 1.904 | 0.734 | 0.717 | 1.901 |
| IXIC | 192 | 0.400 | 0.532 | 1.482 | 0.395 | 0.537 | 1.549 | 0.350 | 0.500 | 1.475 | 0.307 | 0.462 | 1.535 | 0.240 | 0.404 | 1.174 |
| 384 | 0.892 | 0.775 | 1.724 | 0.781 | 0.719 | 1.542 | 0.784 | 0.715 | 1.558 | 0.813 | 0.737 | 1.631 | 0.734 | 0.699 | 1.447 |
| 192+ | 0.550 | 0.625 | 1.861 | 0.522 | 0.611 | 1.806 | 0.416 | 0.542 | 1.614 | 0.315 | 0.468 | 1.560 | 0.350 | 0.485 | 1.465 |
| 384+ | 1.104 | 0.873 | 2.076 | 1.169 | 0.904 | 2.176 | 0.911 | 0.786 | 1.809 | 0.833 | 0.746 | 1.677 | 0.851 | 0.755 | 1.659 |
| FTSE | 192 | 0.284 | 0.453 | 1.614 | 0.296 | 0.462 | 1.608 | 0.237 | 0.405 | 1.388 | 0.316 | 0.487 | 1.705 | 0.317 | 0.480 | 1.543 |
| 384 | 0.600 | 0.676 | 2.023 | 0.614 | 0.688 | 2.078 | 0.602 | 0.678 | 2.032 | 0.612 | 0.692 | 2.164 | 0.681 | 0.734 | 2.107 |
| 192+ | 0.251 | 0.422 | 1.491 | 0.273 | 0.443 | 1.478 | 0.304 | 0.476 | 1.636 | 0.327 | 0.497 | 1.750 | 0.326 | 0.496 | 1.684 |
| 384+ | 0.547 | 0.614 | 1.514 | 0.553 | 0.647 | 1.940 | 0.571 | 0.655 | 1.912 | 0.590 | 0.676 | 2.093 | 0.645 | 0.715 | 2.159 |
| GDAXI | 192 | 0.232 | 0.404 | 1.500 | 0.231 | 0.403 | 1.494 | 0.226 | 0.397 | 1.576 | 0.217 | 0.375 | 1.586 | 0.207 | 0.362 | 1.408 |
| 384 | 0.328 | 0.472 | 1.253 | 0.321 | 0.471 | 1.262 | 0.398 | 0.515 | 1.623 | 0.442 | 0.539 | 1.783 | 0.362 | 0.481 | 1.419 |
| 192+ | 0.194 | 0.364 | 1.460 | 0.222 | 0.385 | 1.321 | 0.201 | 0.366 | 1.460 | 0.214 | 0.374 | 1.573 | 0.191 | 0.360 | 1.402 |
| 384+ | 0.378 | 0.507 | 1.170 | 0.377 | 0.499 | 1.557 | 0.381 | 0.498 | 1.498 | 0.452 | 0.544 | 1.771 | 0.465 | 0.542 | 1.506 |
| N225 | 192 | 0.230 | 0.381 | 2.099 | 0.224 | 0.377 | 2.177 | 0.203 | 0.355 | 2.049 | 0.249 | 0.411 | 2.453 | 0.130 | 0.272 | 2.033 |
| 384 | 0.753 | 0.734 | 2.089 | 0.740 | 0.725 | 2.067 | 0.683 | 0.678 | 1.886 | 0.734 | 0.726 | 2.112 | 0.682 | 0.678 | 1.907 |
| 192+ | 0.256 | 0.412 | 2.296 | 0.255 | 0.410 | 2.313 | 0.238 | 0.389 | 2.113 | 0.249 | 0.409 | 2.436 | 0.193 | 0.345 | 2.130 |
| 384+ | 0.751 | 0.732 | 2.083 | 0.732 | 0.720 | 2.057 | 0.698 | 0.691 | 1.938 | 0.720 | 0.714 | 2.064 | 0.670 | 0.670 | 1.906 |

Stock Index based on IFOAdagrad

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| GSPC | 192 | 0.213 | 0.379 | 1.277 | 0.196 | 0.363 | 1.225 | 0.196 | 0.360 | 1.221 | 0.193 | 0.358 | 1.266 | 0.405 | 0.504 | 1.088 |
| 384 | 0.693 | 0.673 | 1.428 | 0.635 | 0.635 | 1.590 | 0.525 | 0.568 | 1.319 | 0.564 | 0.583 | 1.405 | 0.558 | 0.594 | 1.249 |
| 192+ | 0.189 | 0.352 | 1.163 | 0.189 | 0.351 | 1.159 | 0.184 | 0.346 | 1.152 | 0.175 | 0.337 | 1.172 | 0.222 | 0.382 | 1.205 |
| 384+ | 0.540 | 0.577 | 1.362 | 0.546 | 0.580 | 1.370 | 0.528 | 0.572 | 1.335 | 0.511 | 0.556 | 1.297 | 0.537 | 0.588 | 1.357 |
| DJI | 192 | 0.343 | 0.483 | 1.601 | 0.532 | 0.635 | 2.183 | 0.409 | 0.541 | 1.840 | 0.468 | 0.577 | 2.015 | 0.336 | 0.464 | 1.314 |
| 384 | 1.203 | 0.993 | 2.758 | 0.825 | 0.753 | 1.744 | 0.868 | 0.784 | 1.952 | 1.067 | 0.922 | 2.477 | 1.072 | 0.882 | 2.050 |
| 192+ | 0.265 | 0.424 | 1.560 | 0.244 | 0.409 | 1.588 | 0.217 | 0.378 | 1.451 | 0.340 | 0.498 | 1.921 | 0.293 | 0.447 | 1.584 |
| 384+ | 0.661 | 0.670 | 1.784 | 0.689 | 0.682 | 1.806 | 0.637 | 0.639 | 1.653 | 0.700 | 0.693 | 1.811 | 0.634 | 0.628 | 1.484 |
| IXIC | 192 | 0.275 | 0.436 | 1.351 | 0.286 | 0.438 | 1.245 | 0.515 | 0.578 | 1.083 | 0.290 | 0.449 | 1.414 | 0.669 | 0.675 | 1.848 |
| 384 | 0.691 | 0.678 | 1.416 | 0.758 | 0.712 | 1.515 | 0.728 | 0.693 | 1.406 | 0.777 | 0.708 | 1.620 | 1.075 | 0.855 | 1.893 |
| 192+ | 0.247 | 0.408 | 1.238 | 0.243 | 0.406 | 1.239 | 0.241 | 0.404 | 1.232 | 0.244 | 0.408 | 1.248 | 0.254 | 0.415 | 1.259 |
| 384+ | 0.707 | 0.689 | 1.410 | 0.698 | 0.688 | 1.380 | 0.690 | 0.688 | 1.358 | 0.730 | 0.698 | 1.481 | 0.710 | 0.702 | 1.311 |
| FTSE | 192 | 0.286 | 0.454 | 1.656 | 0.278 | 0.440 | 1.449 | 0.282 | 0.442 | 1.421 | 0.364 | 0.518 | 1.758 | 0.310 | 0.474 | 1.692 |
| 384 | 0.651 | 0.701 | 1.978 | 0.660 | 0.707 | 2.044 | 0.641 | 0.680 | 1.651 | 0.687 | 0.737 | 2.368 | 0.638 | 0.687 | 1.891 |
| 192+ | 0.230 | 0.401 | 1.354 | 0.219 | 0.390 | 1.309 | 0.228 | 0.399 | 1.321 | 0.283 | 0.454 | 1.545 | 0.265 | 0.437 | 1.412 |
| 384+ | 0.514 | 0.609 | 1.702 | 0.522 | 0.602 | 1.595 | 0.557 | 0.639 | 1.795 | 0.608 | 0.685 | 2.049 | 0.573 | 0.655 | 1.842 |
| GDAXI | 192 | 0.261 | 0.415 | 1.283 | 0.213 | 0.381 | 1.392 | 0.212 | 0.383 | 1.474 | 0.215 | 0.375 | 1.588 | 0.304 | 0.455 | 1.494 |
| 384 | 0.351 | 0.494 | 1.169 | 0.338 | 0.477 | 1.279 | 0.455 | 0.554 | 1.141 | 0.462 | 0.539 | 1.646 | 0.437 | 0.534 | 1.393 |
| 192+ | 0.207 | 0.373 | 1.492 | 0.197 | 0.364 | 1.450 | 0.203 | 0.369 | 1.427 | 0.195 | 0.357 | 1.453 | 0.239 | 0.395 | 1.625 |
| 384+ | 0.351 | 0.479 | 1.401 | 0.347 | 0.477 | 1.424 | 0.351 | 0.479 | 1.387 | 0.380 | 0.494 | 1.541 | 0.405 | 0510 | 1.468 |
| N225 | 192 | 0.237 | 0.394 | 2.193 | 0.220 | 0.369 | 1.834 | 0.206 | 0.353 | 1.498 | 0.240 | 0.397 | 2.166 | 0.513 | 0.572 | 1.269 |
| 384 | 0.773 | 0.728 | 1.861 | 0.700 | 0.684 | 1.104 | 0.779 | 0.732 | 1.883 | 0.878 | 0.784 | 1.979 | 1.079 | 0.883 | 1.675 |
| 192+ | 0.191 | 0.337 | 1.954 | 0.180 | 0.326 | 2.083 | 0.166 | 0.310 | 2.025 | 0.201 | 0.357 | 2.263 | 0.179 | 0.327 | 2.073 |
| 384+ | 0.697 | 0.689 | 1.935 | 0.642 | 0.644 | 1.777 | 0.576 | 0.595 | 1.526 | 0.695 | 0.691 | 1.963 | 0.575 | 0.597 | 1.452 |

Stock Index based on IFORMSprop

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 0.7 | | | 0.8 | | | 0.9 | | | 1.0 | | | 1.1 | | |
| Metric | | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE | MSE | MAE | RSE |
| GSPC | 192 | 0.195 | 0.349 | 1.116 | 0.176 | 0.340 | 1.156 | 0.175 | 0.340 | 1.183 | 0.215 | 0.378 | 1.373 | 0.194 | 0.356 | 1.196 |
| 384 | 0.480 | 0.547 | 1.272 | 0.492 | 0.553 | 1.285 | 0.514 | 0.562 | 1.309 | 0.598 | 0.617 | 1.487 | 0.500 | 0.557 | 1.253 |
| 192+ | 0.181 | 0.339 | 1.131 | 0.175 | 0.336 | 1.134 | 0.194 | 0.356 | 1.188 | 0.213 | 0.376 | 1.374 | 0.239 | 0.403 | 1.189 |
| 384+ | 0.478 | 0.542 | 1.240 | 0.498 | 0.553 | 1.295 | 0.487 | 0.553 | 1.256 | 0.596 | 0.611 | 1.513 | 0.584 | 0.612 | 1.383 |
| DJI | 192 | 0.313 | 0.469 | 1.697 | 0.315 | 0.469 | 1.661 | 0.296 | 0.456 | 1.653 | 0.289 | 0.451 | 1.651 | 0.298 | 0.451 | 1.697 |
| 384 | 0.670 | 0.677 | 1.821 | 0.699 | 0.698 | 1.877 | 0.601 | 0.626 | 1.657 | 0.666 | 0.671 | 1.765 | 0.508 | 0.557 | 1.416 |
| 192+ | 0.297 | 0.453 | 1.682 | 0.293 | 0.449 | 1.619 | 0.206 | 0.367 | 1.432 | 0.330 | 0.484 | 1.813 | 0.363 | 0.514 | 1.875 |
| 384+ | 0.568 | 0.607 | 1.662 | 0.558 | 0.595 | 1.598 | 0.537 | 0.579 | 1.489 | 0.588 | 0.618 | 1.646 | 0.608 | 0.626 | 1.607 |
| IXIC | 192 | 0.282 | 0.443 | 1.378 | 0.309 | 0.463 | 1.404 | 0.324 | 0.469 | 1.359 | 0.338 | 0.482 | 1.422 | 0.288 | 0.429 | 1.205 |
| 384 | 0.744 | 0.690 | 1.540 | 0.773 | 0.718 | 1.561 | 0.793 | 0.731 | 1.588 | 0.796 | 0.734 | 1.606 | 0.747 | 0.716 | 1.466 |
| 192+ | 0.341 | 0.478 | 1.267 | 0.333 | 0.488 | 1.436 | 0.247 | 0.414 | 1.254 | 0.335 | 0.480 | 1.448 | 0.308 | 0.451 | 1.188 |
| 384+ | 0.762 | 0.716 | 1.556 | 0.733 | 0.707 | 1.491 | 0.721 | 0.703 | 1.466 | 0.803 | 0.738 | 1.616 | 0.838 | 0.758 | 1.653 |
| FTSE | 192 | 0.251 | 0.425 | 1.497 | 0.257 | 0.430 | 1.491 | 0.249 | 0.421 | 1.424 | 0.267 | 0.443 | 1.524 | 0.256 | 0.424 | 1.363 |
| 384 | 0.581 | 0.663 | 1.961 | 0.589 | 0.667 | 1.962 | 0.595 | 0.672 | 1.974 | 0.591 | 0.674 | 2.033 | 0.607 | 0.676 | 1.909 |
| 192+ | 0.237 | 0.413 | 1.441 | 0.246 | 0.420 | 1.449 | 0.242 | 0.414 | 1.408 | 0.272 | 0.447 | 1.531 | 0.275 | 0.448 | 1.479 |
| 384+ | 0.531 | 0.627 | 1.820 | 0.537 | 0.633 | 1.828 | 0.561 | 0.646 | 1.842 | 0.590 | 0.671 | 2.006 | 0.587 | 0.664 | 1.788 |
| GDAXI | 192 | 0.196 | 0.363 | 1.421 | 0.202 | 0.367 | 1.453 | 0.195 | 0.361 | 1.462 | 0.216 | 0.375 | 1.575 | 0.210 | 0.373 | 1.465 |
| 384 | 0.351 | 0.489 | 1.220 | 0.349 | 0.477 | 1.373 | 0.363 | 0.485 | 1.434 | 0.412 | 0.519 | 1.680 | 0.366 | 0.488 | 1.376 |
| 192+ | 0.214 | 0.381 | 1.417 | 0.193 | 0.360 | 1.471 | 0.191 | 0.358 | 1.417 | 0.217 | 0.376 | 1.585 | 0.223 | 0.381 | 1.498 |
| 384+ | 0.350 | 0.477 | 1.370 | 0.349 | 0.476 | 1.435 | 0.337 | 0.471 | 1.393 | 0.413 | 0.519 | 1.701 | 0.395 | 0.505 | 1.534 |
| N225 | 192 | 0.190 | 0.340 | 2.097 | 0.178 | 0.326 | 2.005 | 0.174 | 0.325 | 2.094 | 0.204 | 0.361 | 2.252 | 0.152 | 0.296 | 1.687 |
| 384 | 0.673 | 0.670 | 1.872 | 0.628 | 0.632 | 1.724 | 0.652 | 0.655 | 1.826 | 0.638 | 0.648 | 1.842 | 0.631 | 0.633 | 1.741 |
| 192+ | 0.239 | 0.393 | 2.231 | 0.220 | 0.373 | 2.200 | 0.195 | 0.345 | 2.139 | 0.228 | 0.386 | 2.283 | 0.184 | 0.335 | 2.172 |
| 384+ | 0.684 | 0.681 | 1.920 | 0.647 | 0.652 | 1.830 | 0.623 | 0.632 | 1.767 | 0.660 | 0.665 | 1.899 | 0.604 | 0.617 | 1.757 |