比特幣以時間序列作為預測實驗記錄

* 資料集：全部歷史資料、去除前兩年歷史資料、去除前四年歷史資料
* 測試集：30%、20%、10%、7筆
* 基礎模型：線性回歸(LR)、支持向量機(SVM)、隨機森林(RF)、Holt-Winters(HW)、ARIMA、Prophet
* 指標：MAE、RMSE
* 合計：3\*4\*6=72個組合
* 實際收益：假設一直持有該金融產品，測試集中持有最後一天價格減去持有第一天價格，以符合正情況。
* 預期收益：使用該預測模型進行買賣金融產品，如預測明天會漲，則今天就買進，反之。其中包括獲利與止損。
* 比特幣全部歷史資料(測試集=30%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **92.4403** | **136.9155** | 16280.2714 | 20772.2527 | 11.1660 | 25.9078 |
| SVM | 135.1549 | 295.1449 | **912.4505** | **1365.1765** | 11.1660 | -44.2423 |
| RF | 137.7124 | 289.4985 | 956.6456 | 1394.8989 | 11.1660 | -25.1117 |
| HW | 298.4938 | 581.7033 | 1888.4202 | 2655.0415 | 11.1660 | 61.3694 |
| ARIMA | 134.6812 | 292.9861 | 16727.4768 | 21144.4220 | 11.1660 | -32.2823 |
| Prophet | 951.4799 | 1456.9989 | 18831.0226 | 23806.2874 | 11.1660 | -54.3303 |

* 比特幣全部歷史資料(測試集=20%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **282.9675** | **406.3982** | 5141.4172 | 5603.3220 | -50.0142 | 13.5845 |
| SVM | 299.1729 | 715.7188 | 1207.4761 | 1435.4923 | -50.0142 | 30.1615 |
| RF | 299.4418 | 720.6602 | **871.2547** | **1141.5552** | -50.0142 | 44.1637 |
| HW | 619.4679 | 1415.7438 | 1425.1652 | 1968.2855 | -50.0142 | 30.3056 |
| ARIMA | 291.9234 | 720.4557 | 32147.3485 | 34092.6781 | -50.0142 | -16.5843 |
| Prophet | 2808.1543 | 4352.5959 | 59365.1517 | 64822.6680 | -50.0142 | -51.0586 |

* 比特幣全部歷史資料(測試集=10%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **307.6436** | **435.5870** | 1563.4940 | 1976.8621 | 32.5272 | 24.0570 |
| SVM | 361.7959 | 802.0467 | **374.0793** | **563.6780** | 32.5272 | 5.9714 |
| RF | 364.9187 | 805.2678 | 378.3588 | 565.6379 | 32.5272 | -3.3879 |
| HW | 769.1125 | 1576.8874 | 908.0036 | 1216.9369 | 32.5272 | 5.7033 |
| ARIMA | 357.9975 | 803.3335 | 5313.6661 | 6430.5176 | 32.5272 | -5.4960 |
| Prophet | 2992.0678 | 4425.4472 | 8003.9794 | 9065.4144 | 32.5272 | -0.8223 |

* 比特幣全部歷史資料(測試集=7)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **299.8742** | **419.9437** | 202.1724 | 240.5839 | 59.2500 | 23.7546 |
| SVM | 363.7813 | 782.1170 | 177.5363 | 260.7088 | 59.2500 | 113.9629 |
| RF | 364.8807 | 785.2084 | **163.1277** | **256.4969** | 59.2500 | 113.9629 |
| HW | 783.5873 | 1545.4479 | 619.1845 | 738.4078 | 59.2500 | 137.9043 |
| ARIMA | 360.0922 | 783.4747 | 228.8358 | 293.9485 | 59.2500 | -91.6634 |
| Prophet | 3392.8547 | 5151.0740 | 13743.3535 | 13747.5065 | 59.2500 | -59.2500 |

* 比特幣歷史資料去除前兩年(測試集=30%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **266.5376** | **389.8285** | 5142.8048 | 5944.5961 | -2.6383 | 30.0183 |
| SVM | 347.2656 | 765.6565 | 1147.0644 | 1413.7620 | -2.6383 | 37.2278 |
| RF | 349.8536 | 757.9405 | **861.0209** | **1204.8450** | -2.6383 | 16.4954 |
| HW | 762.6160 | 1514.3655 | 1571.0243 | 2212.5570 | -2.6383 | 21.9331 |
| ARIMA | 347.4149 | 764.6884 | 10571.0182 | 12752.8289 | -2.7898 | 16.0874 |
| Prophet | 3114.2710 | 4524.8053 | 64351.3929 | 73707.6464 | -2.7898 | 11.3744 |

* 比特幣歷史資料去除前兩年(測試集=20%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **325.9556** | **472.3749** | 6326.9336 | 6718.4269 | -29.6603 | 41.5333 |
| SVM | 456.8791 | 922.3858 | **638.1438** | **841.7617** | -29.6603 | -13.4393 |
| RF | 459.9930 | 917.6840 | 749.8365 | 934.1522 | -29.6603 | -29.4272 |
| HW | 984.2643 | 1814.2805 | 1111.9436 | 1519.2761 | -29.6603 | 24.8403 |
| ARIMA | 455.2227 | 920.7802 | 19195.1458 | 20264.0526 | -30.0224 | 1.9860 |
| Prophet | 2988.5762 | 4252.7395 | 20860.0738 | 21993.9635 | -30.0224 | -13.8101 |

* 比特幣歷史資料去除前兩年(測試集=10%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **325.7061** | **461.8139** | 1154.5675 | 1462.9379 | 49.1671 | 14.4751 |
| SVM | 473.9315 | 918.9813 | **417.1298** | **598.7634** | 49.1671 | -26.1085 |
| RF | 478.3779 | 915.1068 | 466.9845 | 640.7243 | 49.1671 | -25.0259 |
| HW | 1015.4550 | 1804.7670 | 965.4660 | 1275.7009 | 49.1671 | -0.3421 |
| ARIMA | 470.7024 | 917.8075 | 8184.3856 | 9297.3885 | 50.0854 | 3.0684 |
| Prophet | 3248.2623 | 4469.6431 | 18964.3080 | 22299.1754 | 50.0854 | -54.5875 |

* 比特幣歷史資料去除前兩年(測試集=7)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **316.0384** | **449.5560** | **162.7401** | **221.9851** | 59.2500 | 113.8724 |
| SVM | 464.6195 | 893.0523 | 172.2085 | 259.1532 | 59.2500 | 67.7220 |
| RF | 466.3863 | 888.7746 | 176.8809 | 261.0616 | 59.2500 | 113.9629 |
| HW | 1011.4618 | 1760.0990 | 619.1845 | 738.4078 | 59.2500 | 137.9043 |
| ARIMA | 462.7511 | 890.2117 | 228.8358 | 293.9487 | 59.2500 | -91.6634 |
| Prophet | 3973.1855 | 5347.9099 | 10765.1355 | 10768.8396 | 59.2500 | -137.9043 |

* 比特幣歷史資料去除前四年(測試集=30%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **363.8530** | **530.4038** | 7349.1592 | 7962.2961 | -16.7944 | 2.2211 |
| SVM | 587.8500 | 1097.8551 | **822.4535** | **1022.7547** | -16.7944 | -24.6592 |
| RF | 596.5676 | 1088.8634 | 844.3521 | 1058.4416 | -16.7944 | -24.0245 |
| HW | 1276.8101 | 2180.1914 | 1200.0582 | 1656.0368 | -16.7944 | 20.5525 |
| ARIMA | 593.2303 | 1113.2386 | 13089.3220 | 14422.1116 | -14.2910 | -14.8841 |
| Prophet | 3263.4717 | 4213.8655 | 27304.2607 | 28730.7826 | -14.2910 | 36.7465 |

* 比特幣歷史資料去除前四年(測試集=20%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **377.1698** | **535.6765** | 1705.6093 | 2197.4185 | 17.4142 | 5.9425 |
| SVM | 617.3041 | 1107.4037 | **506.2214** | **694.7119** | 17.4142 | -9.1893 |
| RF | 625.5768 | 1101.3973 | 769.6357 | 996.3484 | 17.4142 | -3.0056 |
| HW | 1334.1691 | 2191.1968 | 940.7383 | 1245.6954 | 17.4142 | 8.3486 |
| ARIMA | 621.2062 | 1119.9366 | 4265.6570 | 4771.1281 | 24.0226 | 9.5865 |
| Prophet | 2276.6193 | 2906.8701 | 27912.5603 | 33176.1195 | 24.0226 | -7.5644 |

* 比特幣歷史資料去除前四年(測試集=10%)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **363.7260** | **521.5083** | 1354.5580 | 1617.7870 | 42.8174 | 18.6534 |
| SVM | 587.4012 | 1060.3533 | **495.7383** | **669.7878** | 42.8174 | -23.5622 |
| RF | 592.6256 | 1055.5321 | 690.6409 | 852.5735 | 42.8174 | -40.2788 |
| HW | 1273.4706 | 2093.5124 | 1075.6218 | 1394.6989 | 42.8174 | -31.2021 |
| ARIMA | 590.4307 | 1071.9694 | 5838.4346 | 6295.7907 | 40.7276 | 17.9969 |
| Prophet | 2391.3731 | 3148.3133 | 17139.3132 | 19127.4340 | 40.7276 | 53.2821 |

* 比特幣歷史資料去除前四年(測試集=7)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 基礎模型 | 訓練集 | | 測試集 | | 實際收益 | 預期收益 |
| MAE | RMSE | MAE | RMSE |
| LR | **346.8168** | **493.3013** | 195.3610 | 243.8312 | 59.2500 | 67.7220 |
| SVM | 572.9972 | 1027.7055 | **166.0129** | **239.2898** | 59.2500 | 67.7220 |
| RF | 576.6509 | 1023.8132 | 166.1067 | 259.3265 | 59.2500 | 67.7220 |
| HW | 1255.6469 | 2036.1991 | 619.1845 | 738.4078 | 59.2500 | 137.9043 |
| ARIMA | 575.9716 | 1037.6511 | 229.0523 | 294.7772 | 59.2500 | -91.6634 |
| Prophet | 2026.5089 | 2717.0845 | 2301.3280 | 2311.5153 | 59.2500 | 59.2500 |