Dacon AI Bit Trader Competition

Day trading with ARIMA

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Abstract

1. We show using past information is important with non-autoregressive CATBOOST.

2. Using a simple linear model Autocorrelation Integrated Moving Average (ARIMA), we show that understanding longer time range helps forecasting.

3. We ranked **29**/138 (top 21%) in Dacon AI Bit Trader Competition.

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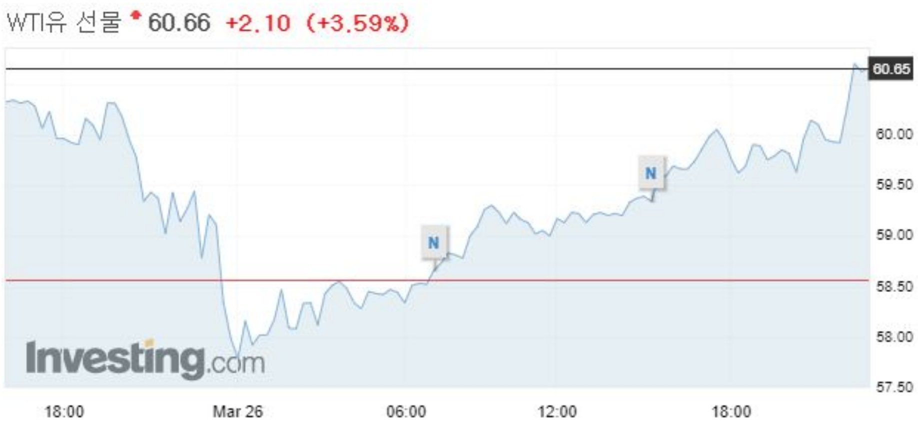
Introduction

Forecasting (time series analysis)



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Introduction

Our experiment on Dacon with CATBOOST shows that
non-autoregressive approach works poorer than chimpanzee.

Dacon: a bitcoin trading competition

CATBOOST: gradient boosting deep model, it forecasts with a current state only.

Autoregressive:

A statistical model is autoregressive if it predicts future values **based on past values**.

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Introduction

In our following experiments,
autoregressive models
outperform chimpanzee
and ranked 29/138 (top 21%) in Dacom competition.

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Approach: Statistical models

c is a constant. ϵ is a Normal(0, 1) white noise at time t. ψ and θ are parameters. μ is the expectation.

Autocorrelation (AR(p))

$$X_t = c + \sum_{i=1}^{p} \psi_i X_{t-i} + \epsilon_t$$

Moving Average (MA(q))

$$X_t = \mu + \epsilon_t + \sum_{i=1}^{q} \theta_i \epsilon_{t-i}$$

$$\mu = \sum_{i}^{t-1} w_i X_i$$

Autoregressive Moving Average (ARMA(p, q))

$$X_t = c + \epsilon_t + \sum_{i=1}^{p} \psi_i X_{t-i} + \sum_{i=1}^{q} \theta_i \epsilon_{t-i}$$

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Approach: ARIMA

Autoregressive Integrated Moving Average (ARIMA(p, d, q))

Backshift operator B.

$$BX_t = X_{t-1}$$

$$B(BX_t) = B^2 X_t = X_{t-2}$$

$$X_t' = X_t - X_{t-1} = X_t - BX_t = (1 - B)X_t$$

$$X_t'' = X_t - 2X_{t-1} + X_{t-2} = (1 - 2B + B^2)X_t = (1 - B)^2 X_t$$

$$X_t^d = (1 - B)^d X_t$$

ARIMA is modeled as following.

$$X_t^d = c + \psi_1 X_{t-1}^d + \ldots + \psi_p X_{t-p}^d + \theta_1 \epsilon_{t-1} + \ldots + \theta_q \epsilon_{t-q} + \epsilon_t$$

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Experiments

Implementation detail

ARIMA

Used default setting of *statsmodels* library in python to train.

ARIMA(p, 1, 1) for p in [8, 16, 32, 64] are used.

ARIMA X denotes ARIMA(X, 1, 1) model.

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Experiments

Implementation detail

Dacon dataset

- 10종류의 암호화폐
  - 비트코인 포함 (종류 모름)
- 529개의 샘플
  - 각 샘플은 coin index(0~9) 와 23시간 분봉 (open, high, low, close, volume, quate_av, trades, tb_base_av, tb_quote_av)
- 각 샘플에 대해서 23시 시점에 [0, 1]개 만큼 사서 2시간 안[0, 119]에 팔아야함
- 10,000 원시작
- 대회에 제출하여 채점

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Experiments

Results

Approach	Score
ARIMA(16, 1, 1)	10976.97647
ARIMA(64, 1, 1)	10952.20946
ARIMA(32, 1, 1)	10914.36141
ARIMA(8, 1, 1)	10797.23666
ARIMA(4, 1, 1)	10797.23666
Nothing	10000.0
Baseline-Chimpanzee2	8820.57
Baseline-Chimpanzee1	6640.34
CATBOOST	5222.54

#	팀	팀 멤버	점수	제출수	등록일
29	지아봇		10976.97646	7	2분 전
1	씩씩한오리너구리		26,085.52387	11	한 시간 전
2	Tinys		22,591.49509	7	하루 전
3	이산		20,717.95157	21	14시간 전
4	킹남지컴퍼니		19,640.13688	14	2시간 전
5	ToBigs		16,960.78941	19	한 시간 전
6	ModuWay		16,891.40409	11	5일 전
7	정재민		15,993.97509	20	2일 전
8	titanumm		15,758.45809	8	2일 전
9	버터		15,358.30881	23	3일 전
10	stat17_hb		15,282.79101	4	3일 전

Total 138 entries
Ranked top 21%

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Conclusion

- We need time information. (I.e., autoregressive model is essential.)
- To capture longer time distance, we need to use a ***deep*** *model*.
- Simple linear model (ARIMA) is effective.

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