

ARIMA – GARCH TRADING STRATEGY ON DIFFERENT ECONOMIC INDICATORS

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OUTLINE

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The strategy's performance in
different economic indicators

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ARIMA – GARCH

ARIMA

- A generalization of an autoregressive moving average (ARMA) model.
 - Applied in cases where data show evidence of non-stationarity.
 - An initial differencing step can be applied one or more times to eliminate the non-stationarity.
 - We assume a stationary time series for our analysis. ($d = 0$)
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- Our looping procedure will provide us with the “best” fitting ARMA model, in terms of the Akaike Information Criterion(AIC) and then choose the parameters (p,d,q) .

ARIMA – GARCH

GARCH

- A statistical model used in analyzing time-series data where the variance error is believed to be serially autocorrelated.
 - Assume that the variance of the error term follows an autoregressive moving average process.
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- GARCH(1,1) is for a single time series. In GARCH(1,1) model, current volatility is influenced by past innovation to volatility. Therefore, we use GARCH(1,1) in our model.

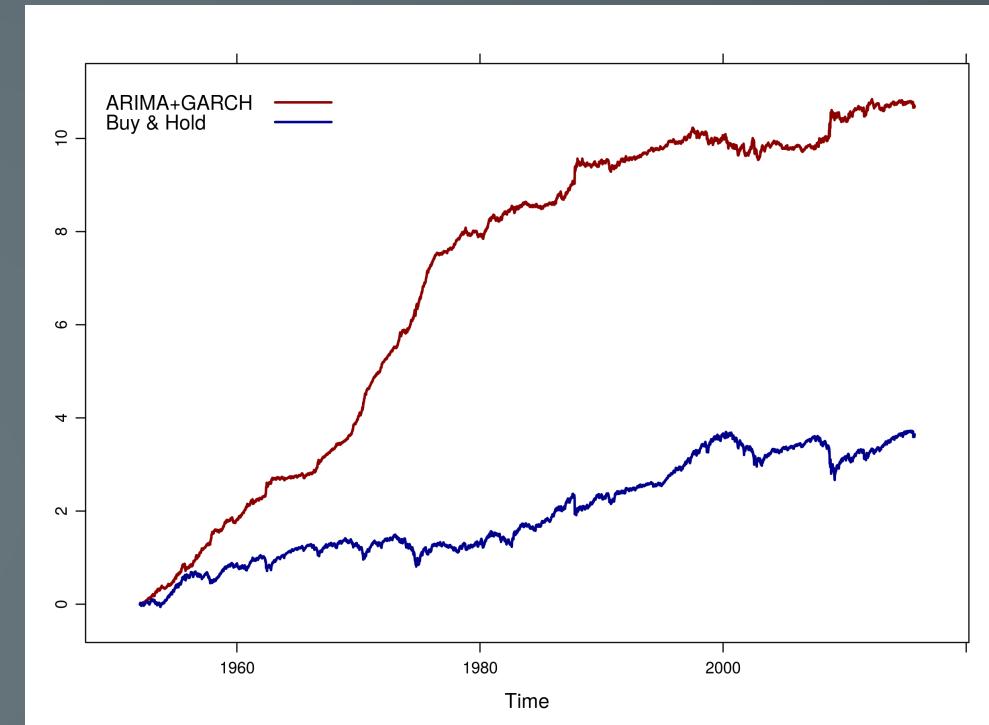
STRATEGY OVERVIEW

The strategy is carried out
on a ‘rolling’ basis:

1. For each day, N, the previous K days of the differenced logarithmic returns of a stock market index are used as a window for fitting an optimal ARIMA and GARCH model.
2. The combined model is used to make a prediction for the next day returns.
3. If the prediction is negative the stock is shorted at the previous close, while if it is positive it is longed.
4. If the prediction is the same direction as the previous day then nothing is changed.

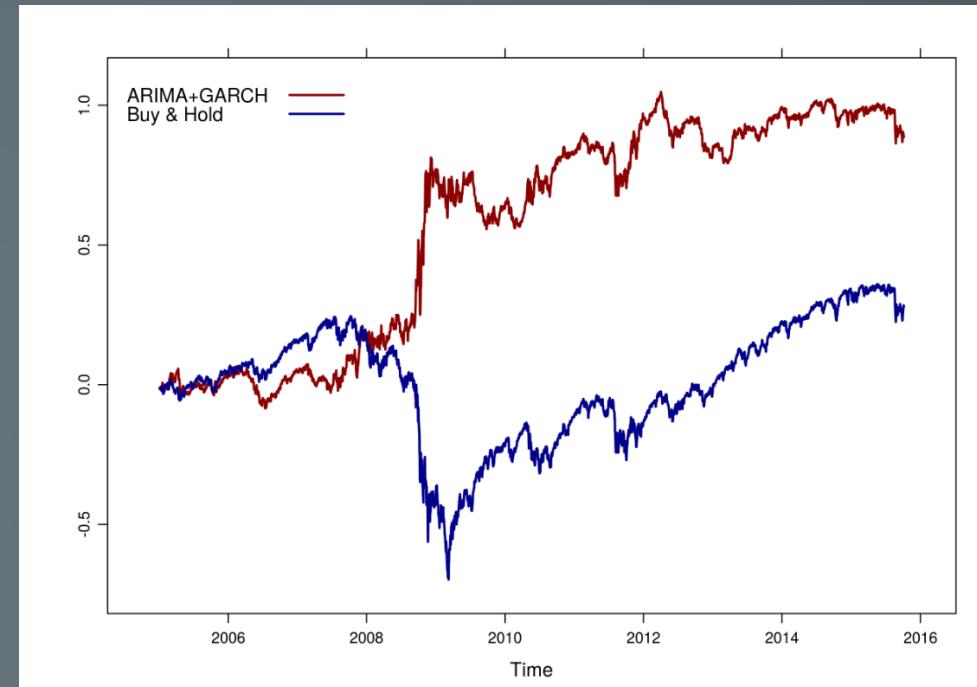
S&P 500

Scope : 1950 - 2015



S&P 500

Scope : 2006 - 2016

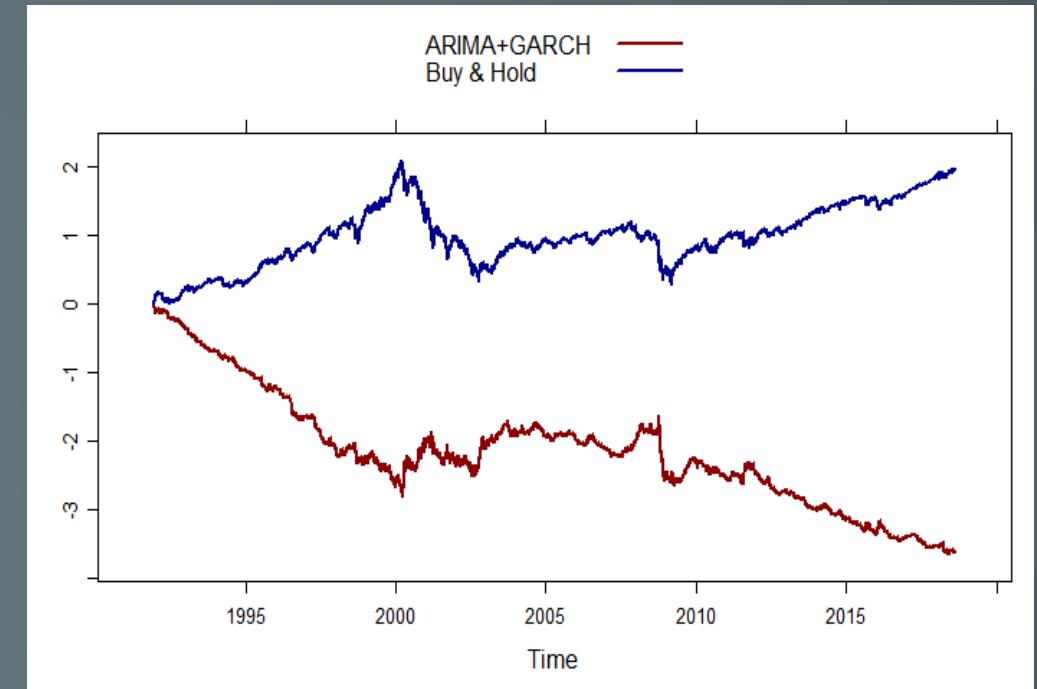


NASDAQ

ARIMA(3,0,5) - GARCH(1,1)

Scope : 1990 – 2020

Reason:
2000 recession (Dot-com bubble)

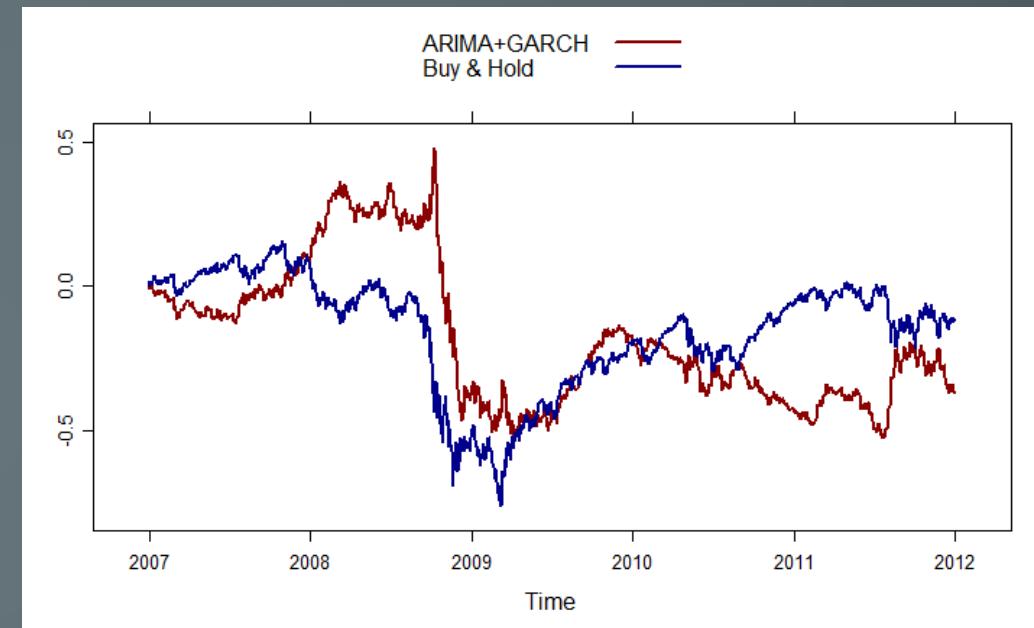


NASDAQ

ARIMA(3,0,5) - GARCH(1,1)

Scope : 2007 – 2012

Reason:
2008 recession

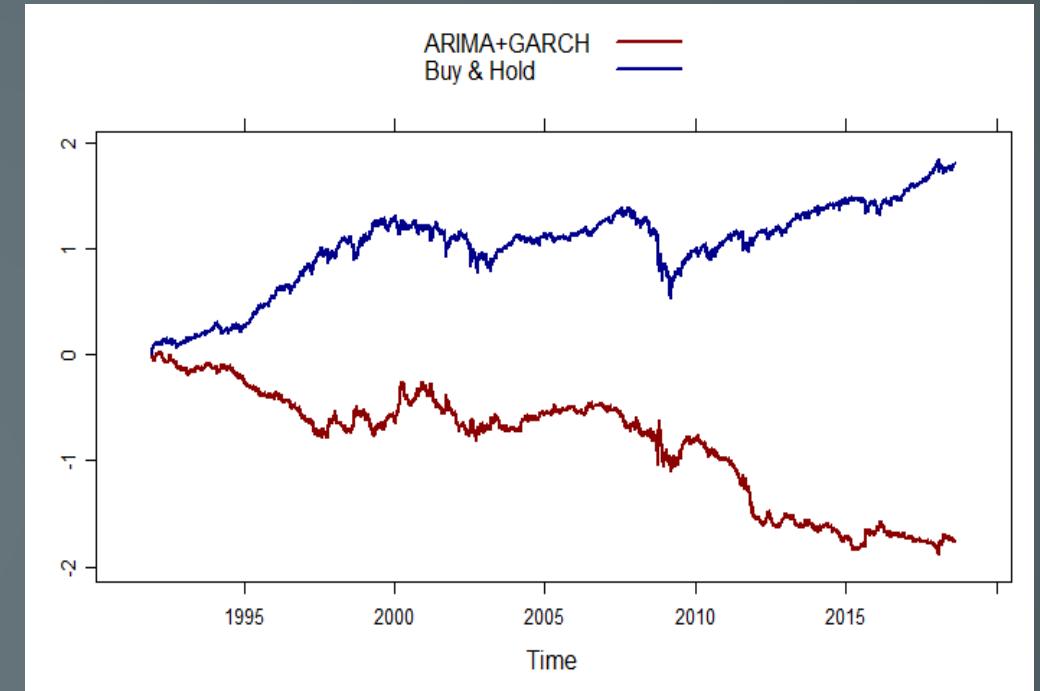


DOW-JONES

ARIMA(4,0,4) - GARCH(1,1)

Scope : 1990 – 2020

Reason:
2000 recession (Dot-com bubble)

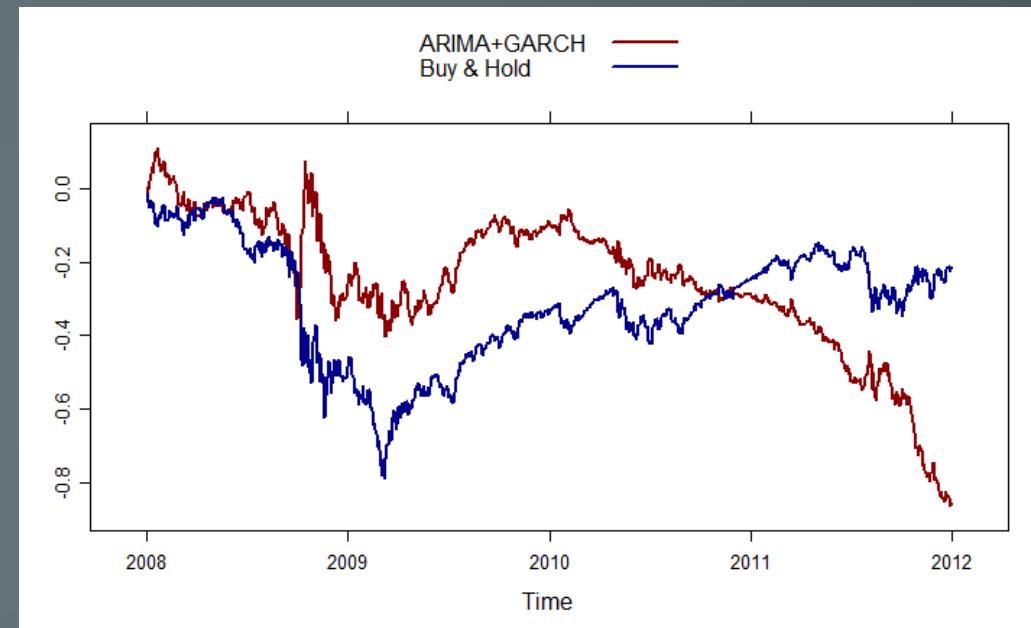


DOW-JONES

ARIMA(4,0,4) - GARCH(1,1)

Scope : 2008 – 2012

Reason:
2008 recession

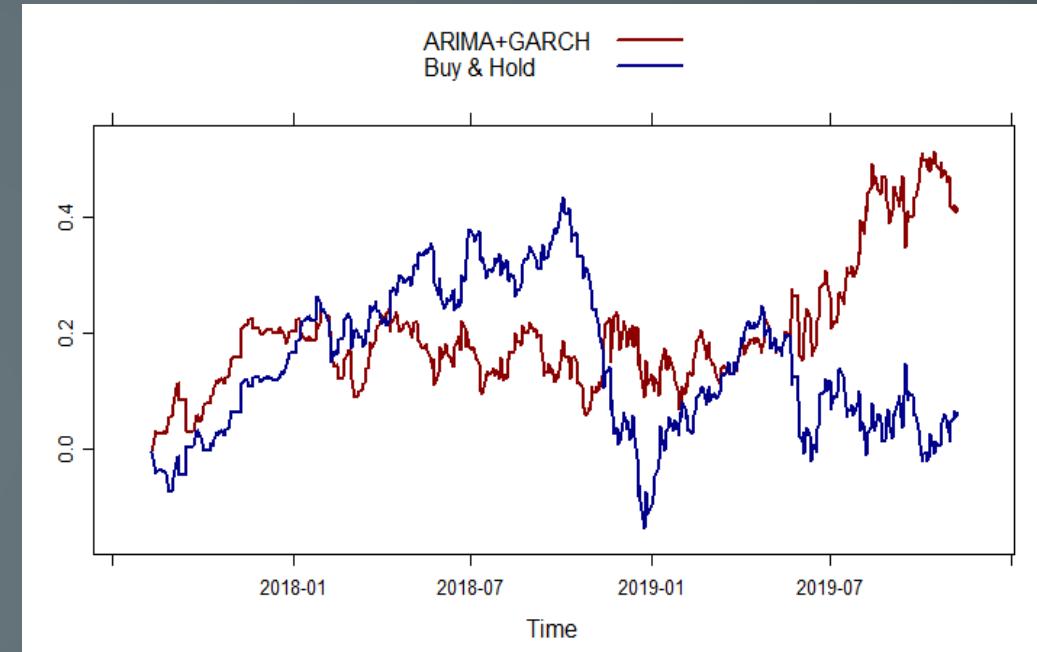


CRUDE OIL

ARIMA(1,0,0) - GARCH(1,1)

Scope : 2017.07 – 2020.04

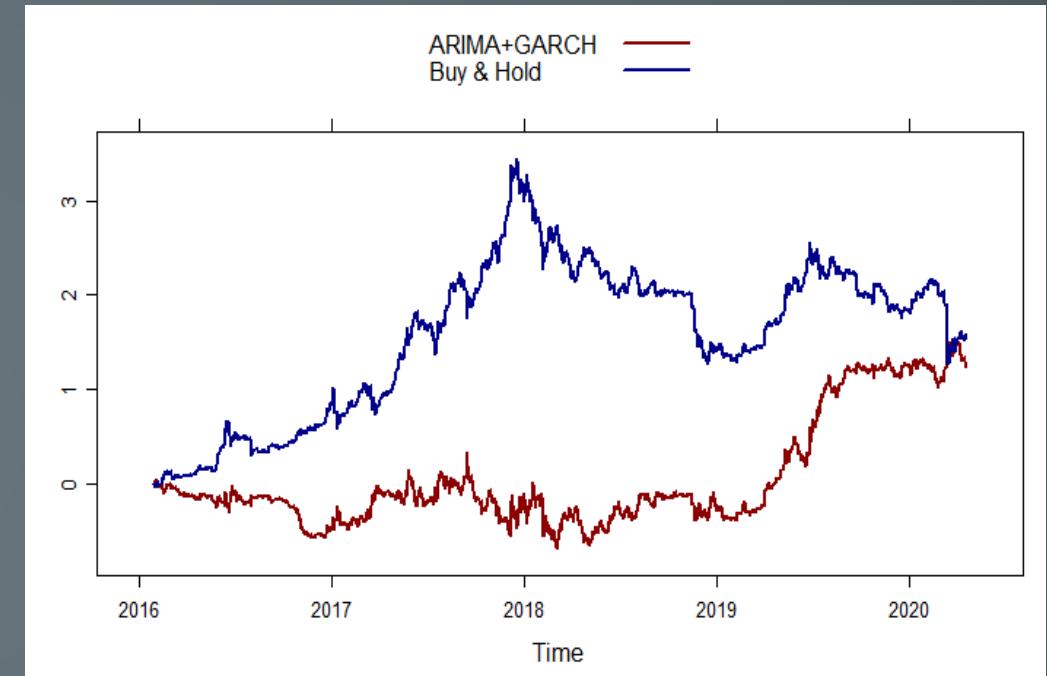
Reason:
2018.10-2019.01: Increase in production



BITCOIN

ARIMA(1,0,1) - GARCH(1,1)

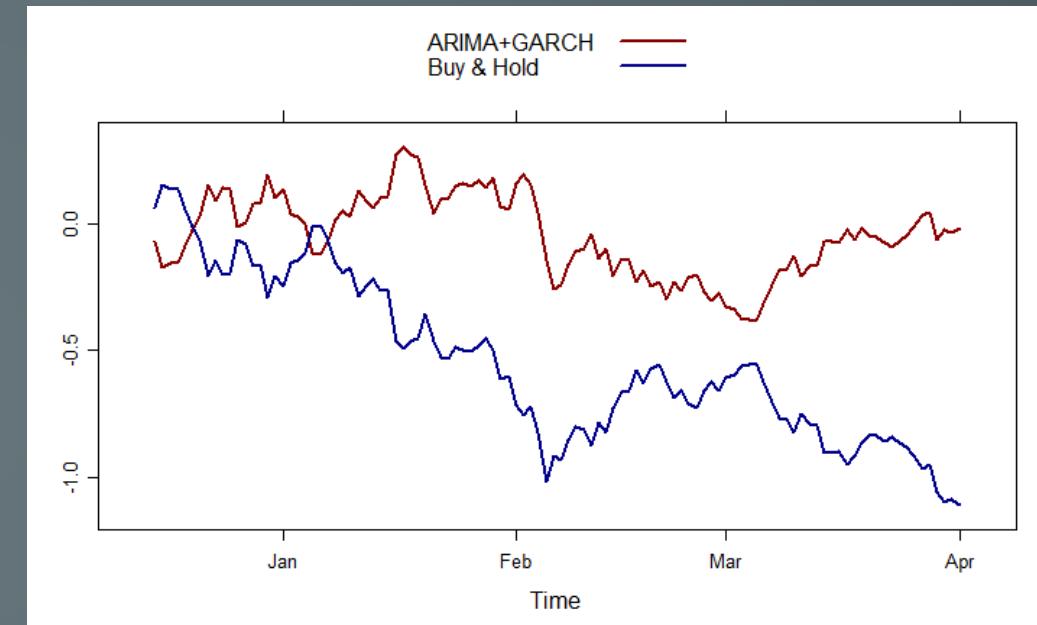
Scope : 2016 - 2020



BITCOIN

ARIMA(1,0,1) - GARCH(1,1)

Scope : 2017.12 – 2018.04



CONCLUSION FOR THE STRATEGY

- The strategy performs well in crisis because there is likely to be a significant serial correlation in the period and it will be well-captured by the ARIMA and GARCH models.
- In the long run, it basically didn't perform better than buy & hold in the normal time (without crisis) during these 30 years for most of the main indicators.
- We should start using our strategy after there is a 'Black Swan' event.

APPENDIX

- Reference: <https://www.quantstart.com/articles/ARIMA-GARCH-Trading-Strategy-on-the-SP500-Stock-Market-Index-Using-R/>
- Data source: <https://finance.yahoo.com>



THANK YOU