Xangle Research

Data-backed Trading

Back-testing result of Moving Averages Cross trading strategy

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Introduction

Thank you for accessing Xangle's latest research report. My name is Jehn Kim, the research analyst behind this piece.

Xangle is the global crypto disclosure platform aimed at providing **transparency & oversight into crypto** projects and their developments.
Based on the accumulated off-chain and on-chain data, we look to provide insights that will help you make **data-backed decisions**.

This report is about 'Moving Averages (MA)', a widely accepted trading index. We have back-tested Bitcoin and Ethereum's historic MA and price data to see which MA-based trading strategy would have yielded the best results.

Please feel free to email research@crossangle.io if you need more information. We would also love to hear your questions or feedback.
If you would like for us to do a data analysis on a different subject, please feel free to let us know as well.

June 22, 2020
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Assistant :TJ Kim

Summary

Back-testing of Bitcoin & Ethereum's past Moving Average (MA) data arrived at the following conclusions:

1) Bitcoin

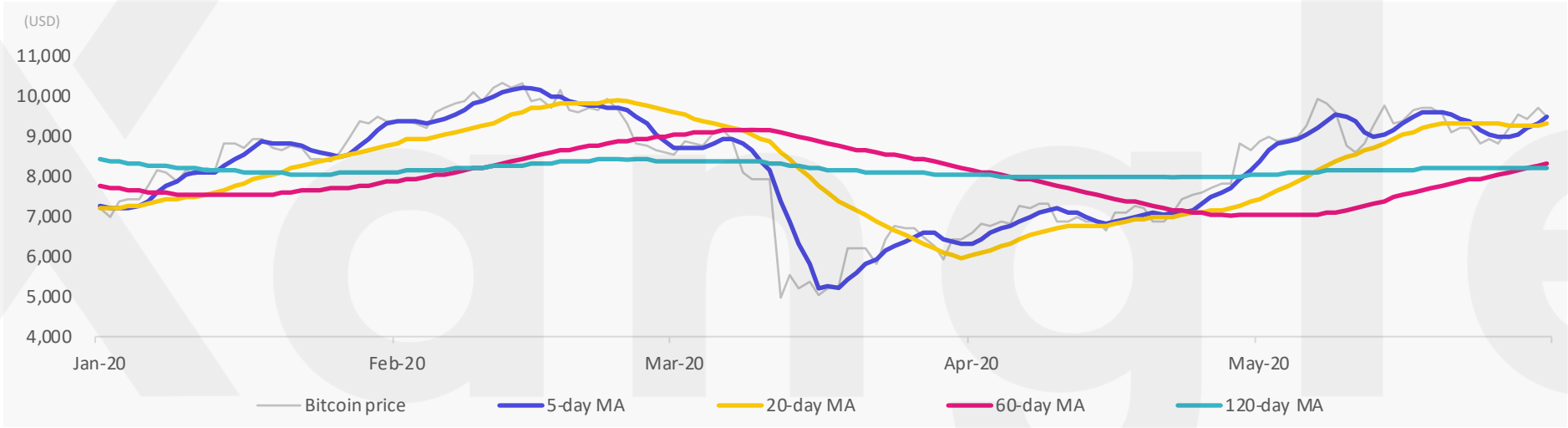
- **5-day and 20-day MA (its crosses)** showed the best mid/long-term results. Please refer to the price and 5-day MA for short-term results.
- During a bear market, a **combination of various MA pairs would be required to minimize any losses**.

2) Ethereum

- **5-day and 20-day MA (its crosses)** showed the best mid/long-term results, Please refer to the **price and 20-day MA**, outperformed recently.
- Combination of **(5-day and 20-day MA) pair** and **(price and 20-day MA) pair** outperformed the market.

What is a Moving Average?

The **Moving Average (MA)** is a **simple tool for technical analysis**.
Each data point on a MA trendline is an average of prices over the course of X-days, hence the terms ‘X-day MA’.
10, 20, 50, 100, and 200-day MA are some common intervals, but each trader can have their own setup.



- Moving Averages (MA) are commonly used to discover a general trend/direction of the price movement, to predict support/resistance levels.
- By using an average of prices over time, a MA effectively removes the noise generated by random short-term fluctuations.
- MA can be configured in various methods: an average of closing prices per day is the most common, and the time-interval is customizable.
- When the asset price and a MA intersect (a cross), many technical traders interpret it as a trading signal.

Source: Investopia.com

Trading Strategies: Crossovers

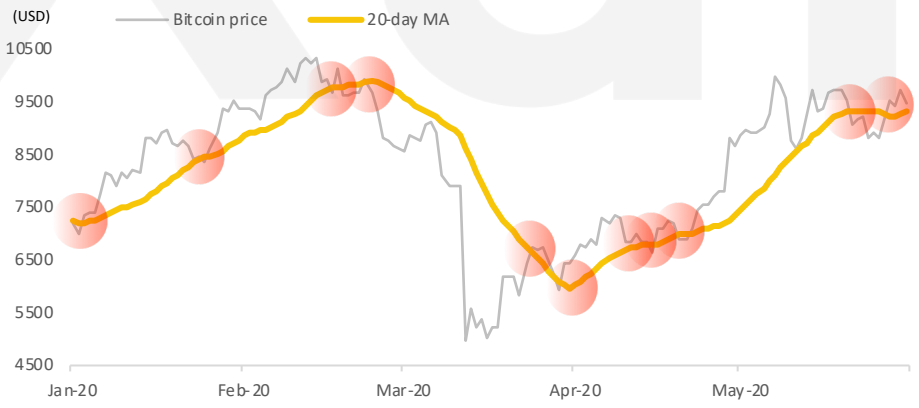
Moving Average (MA) Crossovers are a common trading strategy in financial markets.

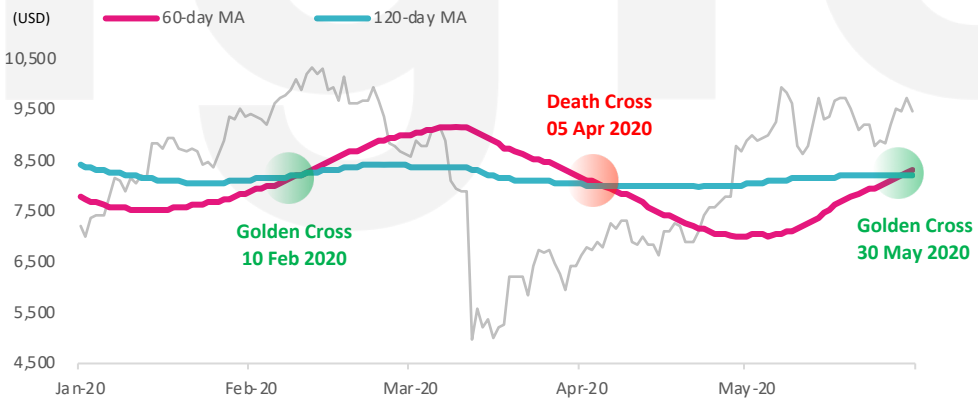
-> One common strategy is to react to a **crossover between the price trendline and a MA trendline**.
Trading signals are given when the price trendline crosses over or under a MA trendline (a signal for changing trends).

-> Another common strategy is to react to a **crossover between a short-term and a long-term MA trendline**.

When the short-term trendline crosses over the long-term, it is commonly interpreted as a bullish shift (a buy signal). The most common pairing in stock markets is between a 60-day MA and a 120-day MA (**a golden cross**).

When the short-term trendline crosses below the long-term, it is interpreted as a bearish shift (a sell signal).
The most common pairing is also between a 60-day and 120-day MA (**a death cross**).





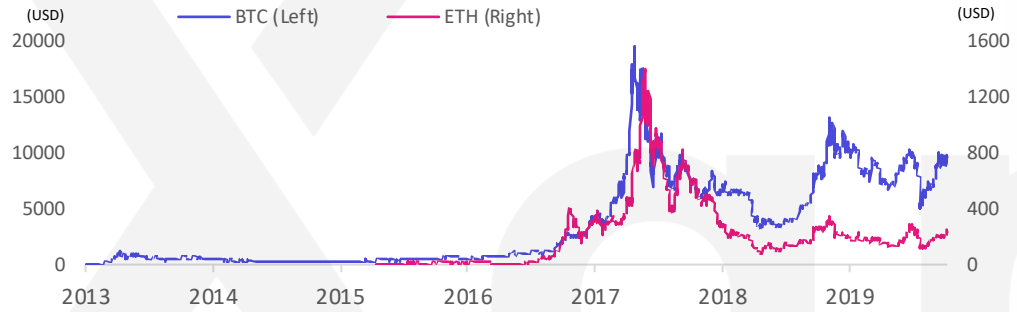
Source: Investopia.com

Data-driven Trading: Moving Average Crossovers

Moving Average (MA) Crossover Trading is a strategy of selling and buying when a crossover happens between Price and MA trendlines.
The following set of slides are a result of back-testing based on historical BTC & ETH Moving Average data (a simulation of profits/losses)

Annual Rate of Return (ARR) Comparison

Annual comparison to account for outlier cases like that of 2017.



BTC

Period*	Annual Profit
2013~2020	7,780%
2013	422%
2014	-58%
2015	37%
2016	122%
2017	1,318%
2018	-73%
2019	87%
2020	31%

*2013-08-26 ~ 2020-05-31

ETH

Period**	Annual Profit
2015~2020	26,682%
2015	8%
2016	741%
2017	9,162%
2018	-83%
2019	-8%
2020	77%

**2015-12-05 ~ 2020-05-31

Note: Assumed to have bought on Jan 1st, to have sold on Dec 31st (Except Year 1)

Back-testing of Moving Average Trading Strategies

Closing price, 5-day MA, 20-day MA, 60-day MA and 120-day MA

Price and one MA trendline:

- Buy when the price trendline crosses above a long-term MA.
- Sell when the price trendline crosses below a long-term MA.

A pair of Moving Average trendlines:

- Buy when a short-term MA crosses above a long-term MA.
- Sell when a short-term MA crosses below a long-term MA.

Two pairs of Moving Average trendlines:

Buy when one pair's short-term MA crosses above the long-term MA, and
Sell when the other pair's short-term MA crosses below the long-term MA

Note: 'Moving Average' in this report is equal to Simple Moving Average

Bitcoin: (5,20) MA crossover strategy would have beat the market more often than others.

Following tables are back-testing results (profit margins) based on each single-pair moving average crossovers.

1) When market is irrationally bullish, like 2016 and 2017, it is better to just hold rather than to trade. When bearish, it is better to trade.
2) Apart from 2016 and 2017, the (5,20) MA pair crossover trading beat the HODLers every time.
3) If you prefer short-term trading, (1,5) MA pair crossover trading looked better than others; best performer so far in 2020.

BTC

Single Pair MA	Profit	Trading counts
(1, 5)	48474%	282
(1, 20)	33190%	111
(5, 20)	21924%	63
No trading	7780%	1
(1, 120)	3875%	26
(5, 120)	3408%	15
(1, 60)	2461%	49
(60, 120)	2147%	10
(5, 60)	2010%	30
(20, 120)	1421%	9
(20, 60)	936%	20

Historically, Trading by (1,5), (1,20) and (5,20) beats the market

Note : (x,y) MA refer to trading strategy based on crosses between "x"-day MA and "y"-day MA; Buy when short-term MA crosses above the long-term MA and sell vise-versa; 1-day MA is equal to closing price of an asset

2013

Single Pair MA	Profit	Trading counts
(1, 5)	556%	9
(5, 20)	526%	2
No trading	422%	1
(1, 20)	353%	5

2014

Single Pair MA	Profit	Trading counts
(1, 120)	-4%	1
(1, 20)	-7%	12
(5, 120)	-12%	1
(1, 60)	-15%	7
(60, 120)	-16%	1
(5, 20)	-25%	7
(20, 120)	-28%	1
(5, 60)	-31%	6
(20, 60)	-32%	3
(1, 5)	-46%	49
No trading	-58%	1

2015

Single Pair MA	Profit	Trading counts
(5, 20)	104%	9
(1, 20)	64%	17
No trading	37%	1
(1, 5)	32%	49
(1, 60)	3%	6
(5, 60)	-1%	3
(20, 120)	-14%	1
(5, 120)	-17%	2
(1, 120)	-21%	5
(60, 120)	-26%	1
(20, 60)	-27%	3

2016

Single Pair MA	Profit	Trading counts
No trading	122%	1
(20, 120)	102%	2
(5, 20)	57%	9
(5, 60)	48%	1
(1, 120)	47%	5
(5, 120)	47%	3
(60, 120)	46%	1
(1, 60)	40%	5
(1, 5)	36%	39
(1, 20)	31%	18
(20, 60)	27%	1

2017

Single Pair MA	Profit	Trading counts
(1, 5)	1492%	31
No trading	1318%	1
(1, 20)	1096%	11
(5, 20)	1039%	6
(5, 60)	208%	4
(20, 60)	127%	2
(1, 60)	103%	7
(1, 120)	-1%	1

2018

Single Pair MA	Profit	Trading counts
(60, 120)	115%	2
(1, 20)	1%	14
(1, 5)	-9%	43
(20, 120)	-15%	1
(1, 120)	-21%	5
(1, 60)	-30%	7
(5, 120)	-31%	3
(20, 60)	-45%	3
(5, 60)	-45%	6
(5, 20)	-49%	12
No trading	-73%	1

2019

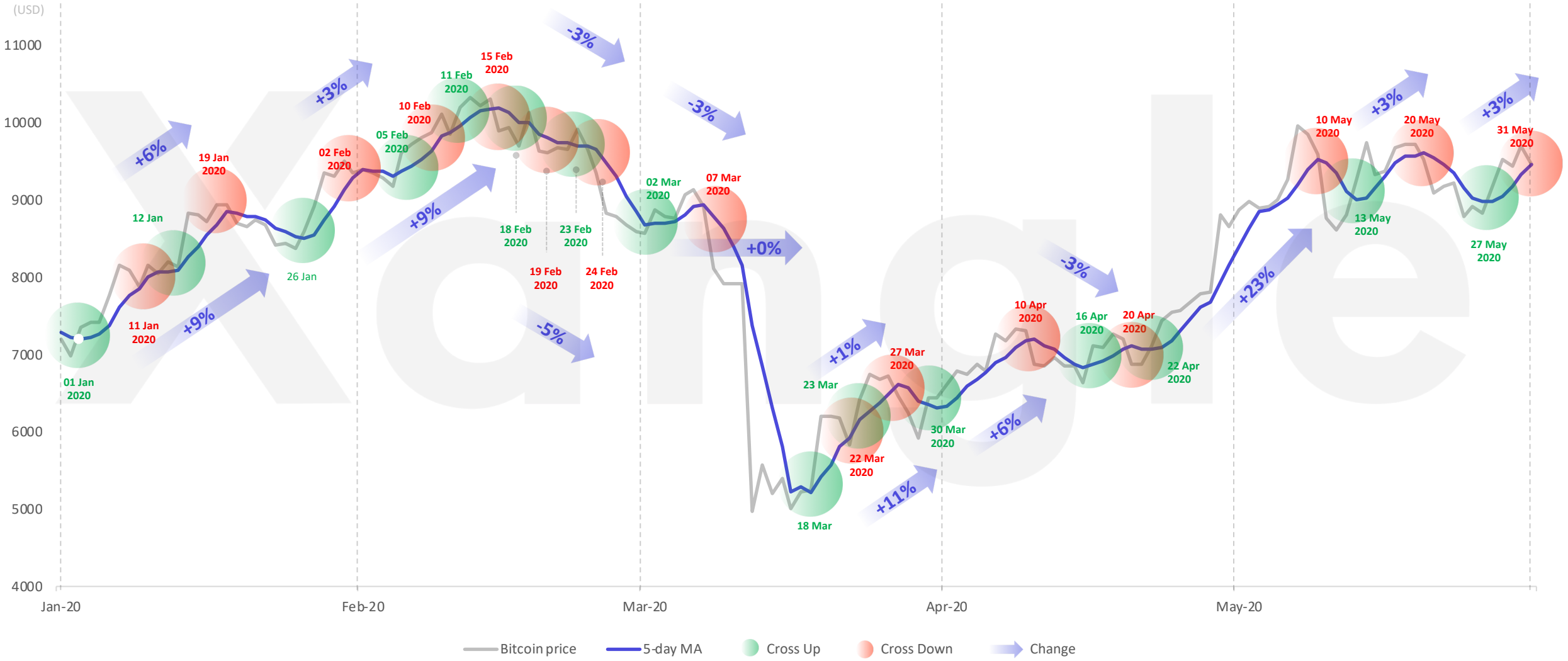
Single Pair MA	Profit	Trading counts
(5, 120)	155%	1
(20, 120)	121%	1
(1, 60)	114%	9
(5, 60)	112%	4
(60, 120)	108%	1
(20, 60)	104%	3
(5, 20)	91%	9
No trading	87%	1
(1, 5)	82%	43
(1, 20)	76%	20
(1, 120)	4%	1

2020

Single Pair MA	Profit	Trading counts
(1, 5)	76%	15
(5, 20)	70%	2
(1, 20)	33%	8
No trading	31%	1
(1, 60)	14%	1
(5, 60)	5%	1
(20, 60)	-1%	1
(1, 120)	-8%	1
(5, 120)	-10%	1
(60, 120)	-31%	1
(20, 120)	-40%	1

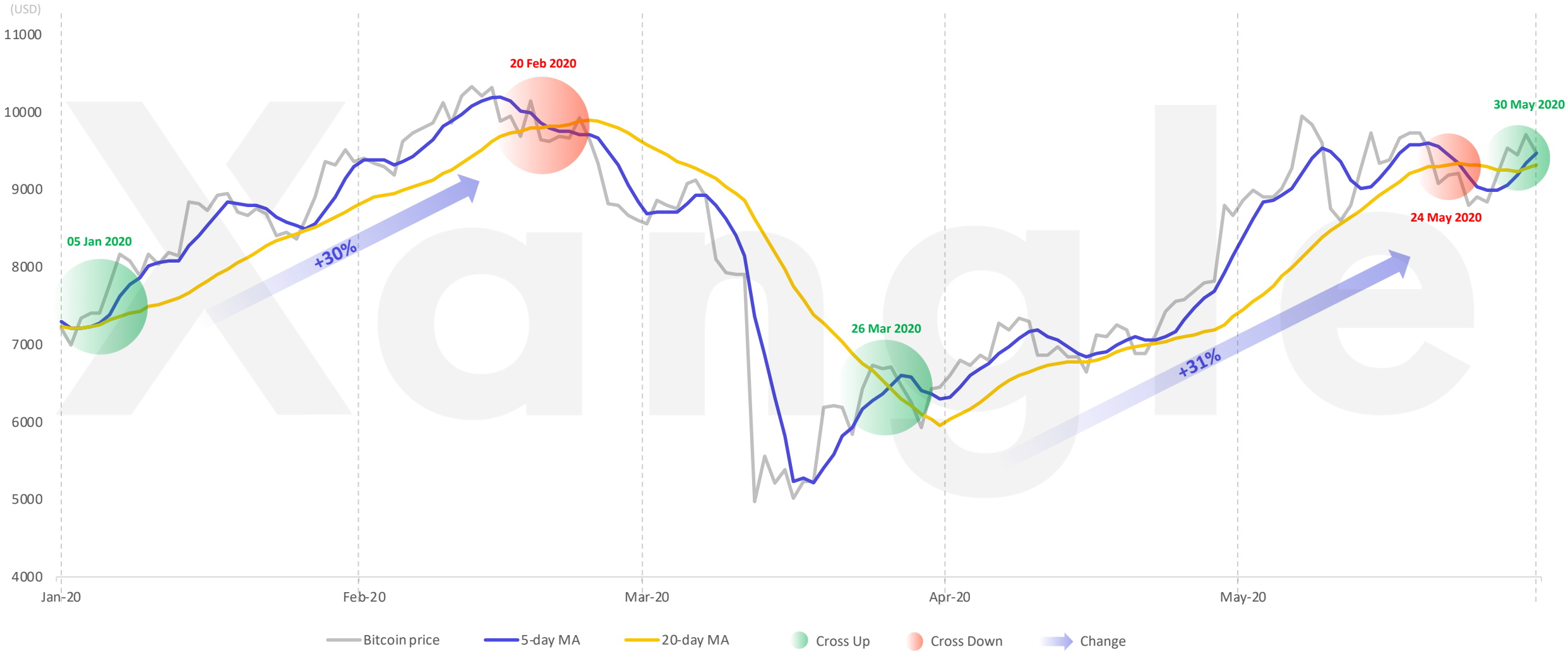
Bitcoin: Short-term (1,5) MA crossover strategy in 2020: 76% profit with 15 trades

(x,y) MA trading indicates a trading strategy using x-day and y-day MA trendlines. 1-day MA in this report indicates the price trendline.



Bitcoin: (5,20) MA crossover strategy in 2020: 70% profit with 2 trades

(x,y) MA trading indicates a trading strategy using x-day and y-day MA trendlines. 1-day MA in this report indicates the price trendline.



Bitcoin: Double-pair MA crossover trading performed better during bearish markets.

Following tables are back-testing results based on each double-pair moving averages crossover (Buy with one, Sell with another).

1) When BTC price is bearish, most double-pair of MA trading strategies outperformed the market.
2) In 2020, (1,20) and (1,5) / (1,60) and (1,2) double-pairs MA trading slightly outperformed (vs no trading).

2013-2020

Double Pair MA	Profit	Trading counts
(5, 20) G (1,20) D	19313%	59
No trading	7780%	1

2014

Double Pair MA	Profit	Trading counts
(60,120) G (1,5) D	11%	1
(1, 60) G (1,5) D	10%	7
(60, 120) G (1,20) D	9%	1
(60, 120) G (1, 60) D	6%	1
(1, 120) G (1, 60) D	5%	1
(1, 120) G (5, 60) D	5%	1
(5, 120) G (1, 60) D	4%	1
(1, 120) G (1,20) D	3%	1
(1, 120) G (20, 60) D	2%	1
(20,120) G (1,5) D	2%	1
No trading*	-58%	1

2015

Double Pair MA	Profit	Trading counts
(1,20) G (5, 20) D	67%	10
(5, 20) G (1,20) D	59%	10
(1, 60) G (5,20) D	39%	6
(5, 60) G (1,20) D	39%	5
No trading*	37%	1

2016

Double Pair MA	Profit	Trading counts
No trading	122%	1
(1, 120) G (5, 60) D	66%	1
(1, 60) G (5,60) D	53%	1
(60, 120) G (1, 60) D	49%	1
(1, 120) G (20, 60) D	46%	1
(5, 120) G (1, 120) D	41%	3
(5, 60) G (1, 60) D	39%	3
(5, 20) G (1,20) D	37%	9
(1, 60) G (20, 120) D	36%	2
(20, 120) G (1, 120) D	32%	1
(1, 60) G (20, 60) D	29%	2

2017

Double Pair MA	Profit	Trading counts
No trading	1318%	1
(5, 20) G (1,20) D	1150%	6
(1, 60) G (5,20) D	631%	4
(1, 60) G (1,20) D	591%	4
(1,20) G (5, 20) D	573%	6
(5, 60) G (1,20) D	543%	4
(20, 60) G (1,20) D	312%	3
(1, 60) G (5,60) D	220%	4
(1, 120) G (5, 20) D	141%	1
(1, 120) G (1,20) D	140%	1
(1, 120) G (5, 60) D	129%	1

2018

Double Pair MA	Profit	Trading counts
(1, 120) G (20, 120) D	444%	2
(1, 60) G (5, 120) D	97%	4
(20, 60) G (1, 120) D	93%	3
(1, 60) G (20, 120) D	43%	2
(1,5) G (120) D	19%	5
(1,20) G (60, 120) D	13%	2
(1,20) G (1,5) D	7%	15
(1,5) G (60,120) D	7%	2
(1, 60) G (1,120) D	5%	3
(5, 60) G (1, 120) D	4%	3
No trading*	-73%	1

2019

Double Pair MA	Profit	Trading counts
(1, 120) G (5, 60) D	168%	2
(1, 60) D (1, 120) G	158%	2
(1, 120) D (20, 120) G	144%	1
(20, 120) G (1, 60) D	143%	1
(5, 120) G (1, 120) D	141%	1
(5, 120) G (1, 60) D	140%	1
(20, 60) G (1, 60) D	137%	3
(60, 120) G (1, 60) D	135%	1
(5, 60) G (1, 60) D	107%	4
(1, 120) G (20, 60) D	95%	2
No trading	87%	1

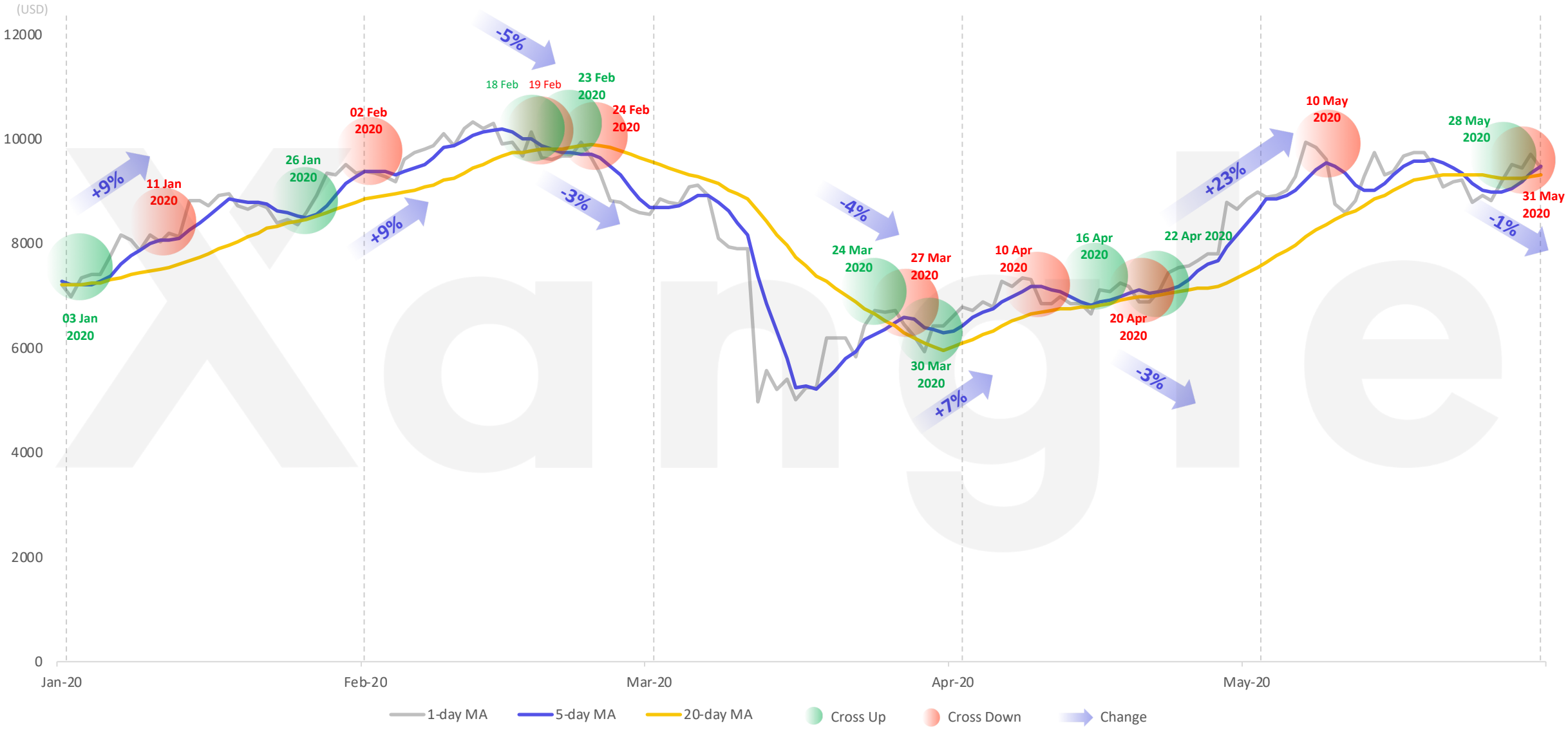
2020

Double Pair MA	Profit	Trading counts
(1,20) G (1,5) D	33%	1
(1, 60) G (1,20) D	32%	9
No trading	31%	2
(5, 60) G (1,20) D	23%	2
(20,60) G (1,5) D	23%	2
(20, 60) G (1,20) D	23%	2
(1, 60) G (1,5) D	22%	2
(5, 20) G (1, 60) D	19%	1
(1,20) G (5, 20) D	17%	3
(5,60) G (1,5) D	14%	2
(1, 60) G (5,60) D	11%	1

Note : 1) 'G' stands for 'Golden Cross', while 'D' stands for 'Death Cross' 2) *Every possible double pair combination was better than No trading 3) (x,y) MA refer to trading strategy based on crosses between "x"-day MA and "y"-day MA; Buy when short-term MA crosses over the long-term MA and sell vise-versa 4) Period: 2013-08-26~2020-05-31

Bitcoin: (1,20) and (1,5) double-pair MA crossover strategy in 2020: 33% profit with 9 trades

Buy at the (1,20) golden crosses: when price trendline crosses over the 20-day MA trendline. Sell at the (1,5) death crosses.



Ethereum: (1,20) MA crossover strategy looked better than others since 2018.

Following tables are back-testing results (profit margins) based on each single-pair moving average crossovers.

1) Apart from 2017, the (5,20) MA pair crossover trading beat the HODLers every time
2) Recently, (1,20) MA pair crossover trading looked better than others

ETH

Single Pair MA	Profit	Trading counts
(5, 20)	330792%	36
(1, 20)	284897%	63
(1, 5)	143345%	188
No trading	26682%	1
(20, 120)	4016%	7
(5, 120)	3410%	10
(5, 60)	2821%	17
(1, 60)	2729%	41
(60, 120)	2654%	5
(1, 120)	1633%	21
(20, 60)	1056%	11

Historically, Trading by (1,5), (1,20) and (5,20) beats the market

Note: (x,y) MA refer to trading strategy based on crosses between "x"-day MA and "y"-day MA; Buy when short-term MA crosses over the long-term MA and sell vise-versa; 1-day MA is equal to closing price of an asset

2015

Single Pair MA	Profit	Trading counts
(1, 5)	12%	1
No trading	8%	1

2016

Single Pair MA	Profit	Trading counts
(5, 20)	1281%	7
(1, 5)	1036%	37
No trading	741%	1
(5, 60)	3%	3
(1, 20)	-13%	16
(60, 120)	-20%	1
(20, 120)	-22%	2
(1, 120)	-24%	6
(20, 60)	-26%	2
(1, 60)	-32%	9

2017

Single Pair MA	Profit	Trading counts
No trading	9162%	1
(1, 5)	3450%	43
(20, 120)	2586%	1
(1, 60)	1715%	10
(1, 20)	1413%	8
(20, 60)	1318%	2
(5, 20)	1163%	5
(1, 120)	1150%	5
(5, 60)	1101%	5

2018

Single Pair MA	Profit	Trading counts
(1, 120)	-3%	1
(60, 120)	-6%	1
(5, 60)	-11%	2
(20, 60)	-14%	1
(20, 120)	-16%	1
(1, 5)	-20%	43
(1, 60)	-22%	6
(1, 20)	-45%	16
(5, 20)	-54%	10
No trading	-83%	1

2019

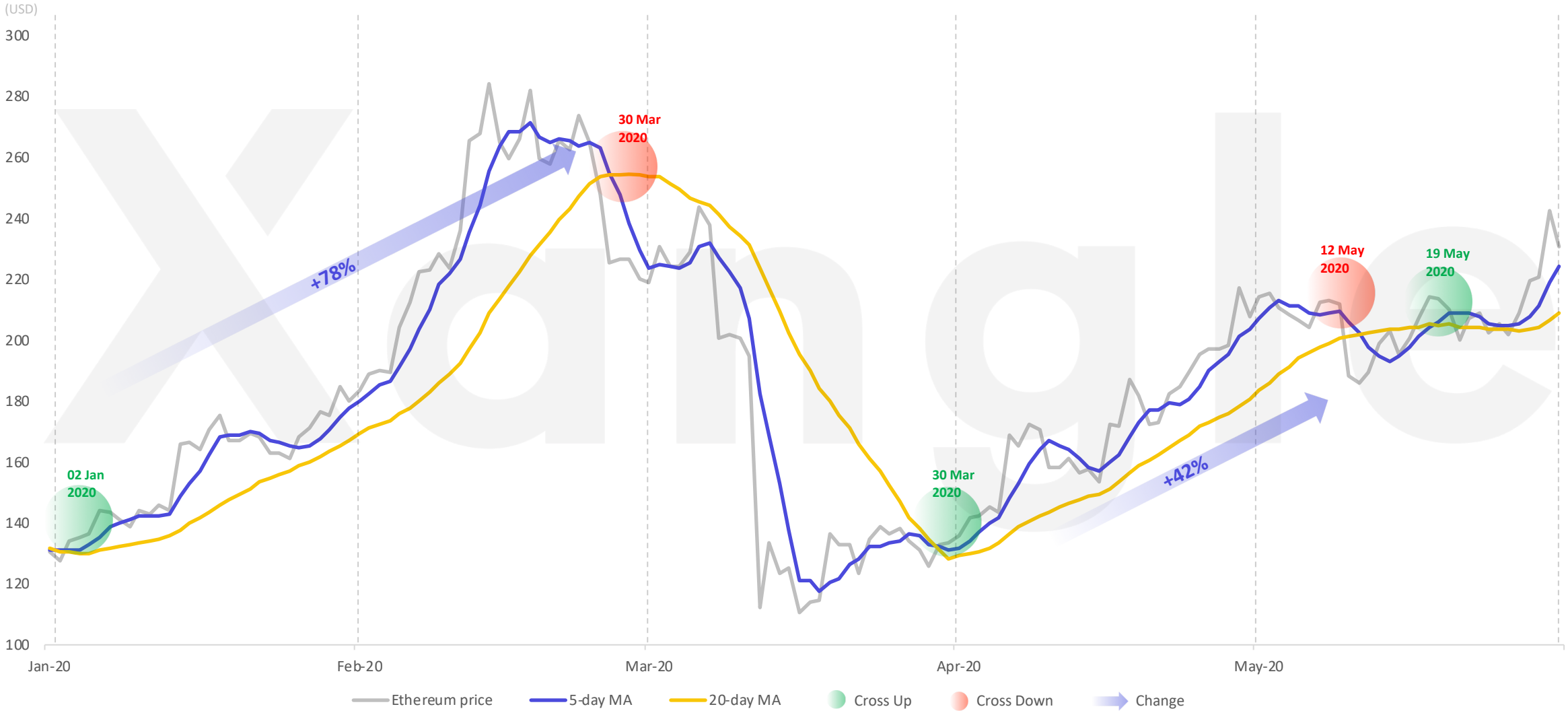
Single Pair MA	Profit	Trading counts
(20, 120)	55%	1
(1, 20)	54%	14
(60, 120)	40%	1
(5, 20)	30%	9
(1, 120)	17%	4
(1, 5)	17%	45
(5, 60)	0%	5
(1, 60)	-1%	12
No trading	-8%	1
(20, 60)	-29%	4

2020

Single Pair MA	Profit	Trading counts
(5, 20)	154%	2
(1, 20)	143%	5
No trading	77%	1
(1, 5)	42%	15
(5, 60)	17%	1
(1, 60)	-8%	1
(20, 120)	-25%	1
(20, 60)	-30%	1
(60, 120)	-31%	1
(1, 120)	-39%	4

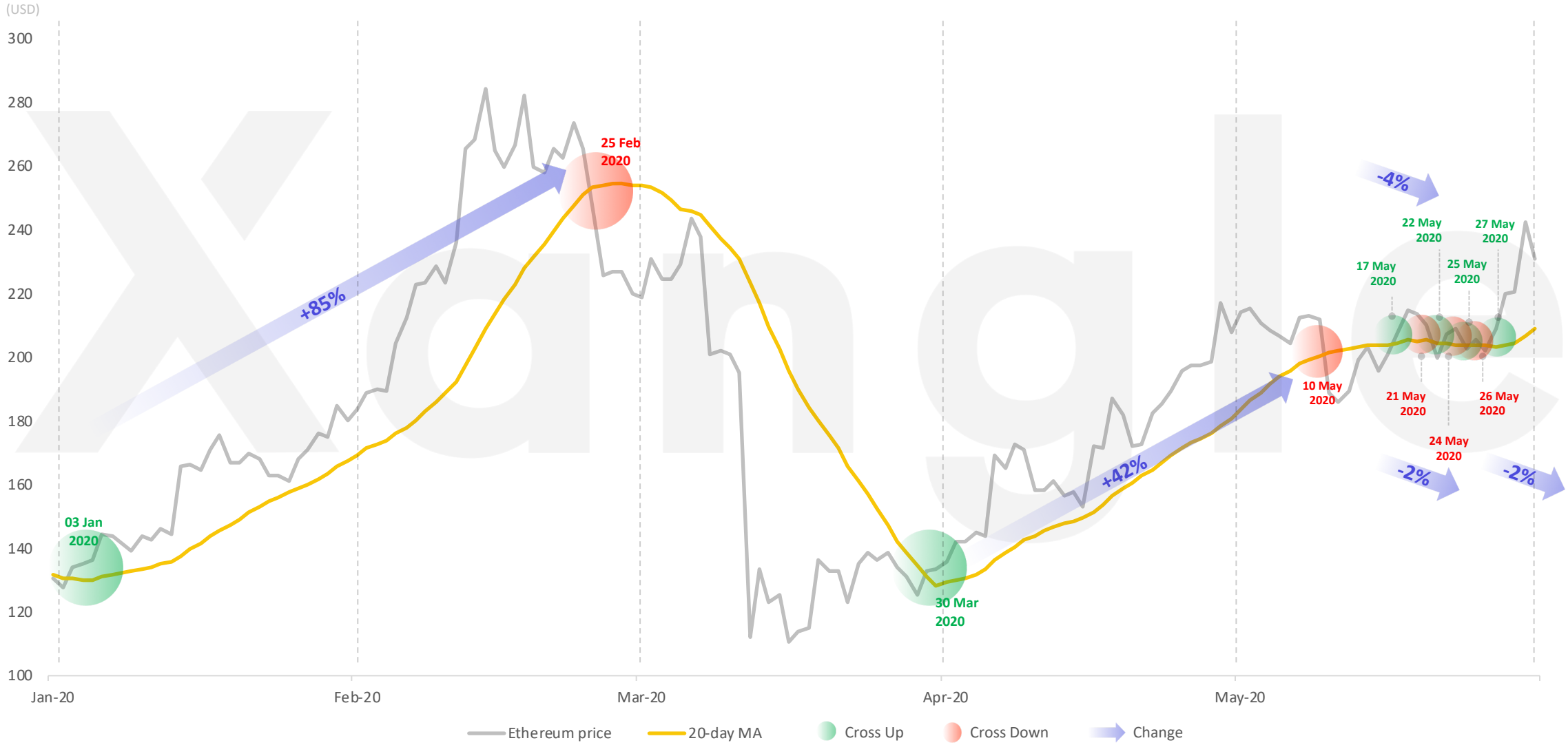
Ethereum: (5,20) MA crossover strategy in 2020: 154% profit with 2 trades

(x,y) MA indicates the use of x-day and y-day MA trendlines. Buy when short-term crosses above long-term, and sell vise-versa.



Ethereum: (1,20) MA crossover strategy in 2020: 143% profit with 5 trades

(x,y) MA indicates the use of x-day and y-day MA trendlines. Buy when short-term crosses above long-term, and sell vise-versa.



Ethereum: (5,20) and (1,20) double-pair MA crossover strategy outperformed.

Following tables are back-testing results based on each double-pair moving averages crossover (Buy with one, Sell with another).

1) When ETH price is bearish, most double-pair of MA trading strategies outperformed the market.
2) (5,20) and (1,20) double-pair MA crossover strategy outperformed.

2015-2020

Double Pair MA	Profit	Trading counts
(5,20) G (1,20) D	180946%	38
No trading	26682%	1

2016

Double Pair MA	Profit	Trading counts
(5,20) G (1,20) D	819%	7
No trading	741%	1

2017

Double Pair MA	Profit	Trading counts
No trading	9162%	1
(5,20) G (1,20) D	6766%	7
(1,120) G (1,60) D	3160%	4
(5,120) G (20,120) D	2612%	1
(1,120) G (5,60) D	2304%	3
(20,120) G (5,120) D	2241%	1
(5,120) G (1,60) D	2184%	2
(60,120) G (20,120) D	2125%	1
(20,120) G (1,60) D	2081%	2
(5,120) G (5,60) D	2003%	2
(20,120) G (5,60) D	1879%	2

2018

Double Pair MA	Profit	Trading counts
(5,60) G (1,120) D	187%	2
(5,60) G (5,120) D	168%	2
(1,60) G (20,60) D	162%	2
(5,60) G (20,60) D	153%	2
(5,120) G (1,120) D	149%	2
(20,60) G (1,120) D	147%	2
(1,120) G (5,120) D	138%	2
(1,20) G (1,120) D	53%	2
(1,20) G (5,120) D	42%	2
(5,20) G (1,120) D	18%	2
No trading*	-83%	1

2019

Double Pair MA	Profit	Trading counts
(60,120) G (1,60) D	102%	1
(20,120) G (1,60) D	97%	1
(60,120) G (5,60) D	71%	1
(60,120) G (5,120) D	70%	1
(20,120) G (5,60) D	67%	1
(20,120) G (5,120) D	66%	1
(60,120) G (20,60) D	66%	1
(20,120) G (20,60) D	63%	1
(60,120) G (20,120) D	58%	1
(5,20) G (1,20) D	55%	9
No trading**	-8%	1

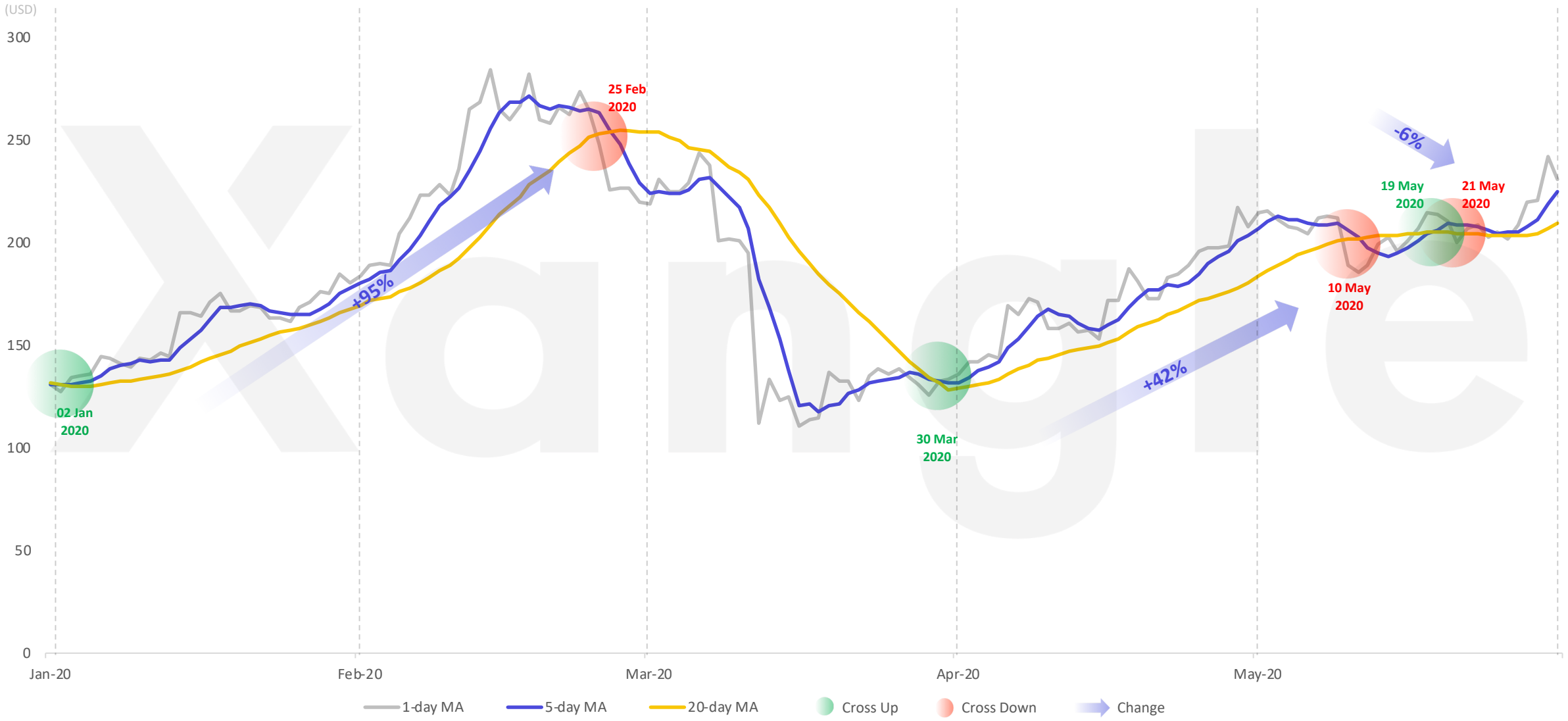
2020

Double Pair MA	Profit	Trading counts
(5,20) G (1,20) D	158%	3
(1,20) G (5,20) D	141%	2
No trading	77%	1
(1,120) G (1,5) D	75%	5
(5,20) G (1,120) D	64%	2
(5,60) G (1,20) D	63%	2
(1,60) G (1,20) D	63%	2
(1,120) G (1,20) D	61%	3
(1,20) G (1,120) D	56%	2
(5,120) G (1,20) D	55%	2
(5,20) G (5,60) D	53%	1

Note : 1) 'G' stands for 'Golden Cross', while 'D' stands for 'Death Cross' 2) *Every possible double pair combination was better than No trading; ** Some possible double pair combination was better than No trading. 3) (x,y) MA refer to trading strategy based on crosses between "x"-day MA and "y"-day MA; Buy when short-term MA crosses over the long-term MA and sell vise-versa. 4) Period: 2015-12-05~2020-05-31

Ethereum: (5,20) and (1,20) double-pair MA crossover strategy in 2020: 158% profit with 3 trades

Buy at the (5,20) golden crosses: when 5-day MA trendline crosses over the 20-day MA trendline. Sell at the (1,2) death crosses.



Thank you.

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