Department of
Economics and Finance

Working Paper No. 1917

Economics and Finance Working Paper Series

The trading simulation approach replicates the actions of traders by using appropriate algorithms for trading strategies based on the observed price patterns; its aim is to establish whether the detected anomalies can be exploited to generate abnormal profits. It should be mentioned that our analysis does not incorporate transaction costs such as spreads, broker or bank fees, swaps etc., and therefore is only a proxy for actual trading. However, in the case of Internet trading such costs are typically small and ignoring them does not affect the results.

The percentage results for an individual deal are computed as follows:

$$\% \quad = \left(\frac{}{} - 1\right) \times 100\% \tag{9}$$

where

- in two cases (BTCUSD positive overreactions and ETHUSD negative overreactions) a contrarian effect is detected.

On the basis of these results the following profitable strategies can be developed:

Strategy 1: when it becomes clear that the current day is an overreaction day (see the timing of overreaction parameter in Tables 3 and 4) a position in the direction of overreaction should be opened. This position should then be closed at the end of the day.

Strategy 2: at the beginning of the day after the overreaction a position in the direction of the overreaction should be opened. This position should then be closed on the basis of the timing parameters for the momentum effect displayed in Tables 3 and 4. If this effect is not present, a contrarian trading strategy should be used: at the beginning of the day after the overreaction a position in the opposite direction to the overreaction should be opened.

The trading simulation results for the two strategies are presented in Tables 5 (for positive overreactions) and 6 (for negative overreactions).

Table 5: Trading simulation results for the case of positive overreactions

Instrument	Number of trades. units	Number of successful trades. units	Number of successful trades. %	Profit. %	Profit % per year	Profit % per trade	t-test calculated value	t-test status
Strategy 1								

ETHUSD	57	43	75%	334.54%	111.51%	5.87%	7.84	rejected
Strategy 2								
BTCUSD	46	25	54.3%	52.0%	10.4%	1.13%	1.55	not rejected
LTCUSD	39	20	51.3%	75.8%	25.3%	1.94%	1.93	rejected
ETHUSD*	57	38	66.7%	225.6%	75.2%	3.96%	3.46	rejected

[redacted]

References

Aalborg, H.A., Molnár, P., and J.E. de Vries, (2019), What can explain the price, volatility and trading volume of Bitcoin? Finance Research Letters, 29, pp. 255-265.

Aiyagari, S. Rao and M. Gertler, (1999), Overreaction of Asset Prices in General Equilibrium. Review of Economic Dynamics, 2 (1), pp. 3 ±35.

Bariviera, A. F., (2017), The Inefficiency of Bitcoin Revisited: A Dynamic Approach. Economics Letters, Vol. 161, pp. 1-4.

Bartos, J., (2015), Does Bitcoin follow the hypothesis of efficient market?. International Journal of Economic Sciences, Vol. IV(2), pp. 10-23.

Bouri, E., Lau, C. K. M., Lucey, B., and D. Roubaud, (2018), Trading volume and the predictability of return and volatility in the cryptocurrency market. Finance Research Letters. doi:10.1016/j.frl.2018.08.015.

Caporale G. M., and A. Plastun, (2018), The day of the week effect in the cryptocurrency market Finance Research Letters Available online 19 November 2018, ISSN 1544-6123, https://doi.org/10.1016/j.frl.2018.11.012.

Caporale, G. and A. Plastun, (2019), Price overreactions in the cryptocurrency market, Journal of Economic Studies, Vol. 46 No. 5, pp. 1137-1155.

Caporale, G.M., Plastun, A. and V. Oliinyk, (2019), Bitcoin fluctuations and the frequency of price overreactions. Financial Markets and Portfolio Management, Volume 33, Issue 2, pp 109 ±131.

term

Caporale, G. M., Gil-Alana, L., and A. Plastun, (2018), Short-term Price Overreactions: Identification, Testing, Exploitation, Computational Economics, Volume 51, Issue 4, pp 913 ±940.

Cheung, A., E. Roca and J.-J. Su, (2015), Crypto-Currency Bubbles: An Application of the Phillips-Shi-Yu (2013) Methodology on Mt. Gox Bitcoin Prices. Applied Economics, vol. 47, 2015, pp. 2348-2358.

Chevapatrakul, T., and D. Mascia, (2019), Detecti1.9 p014.04 Tf1 0 0 1 70.824 324.41 Tr

-.32 8[.)[2)-4()4(1)4(8)-3(.)14.0308.-3(4)4(40 1 h.04 Tf1 neW* n871 0 595.32000008871 0 595.32 841.9

Figure A.2: Average hourly returns on overreaction and normal days: the case of negative overreactions, BTCUSD

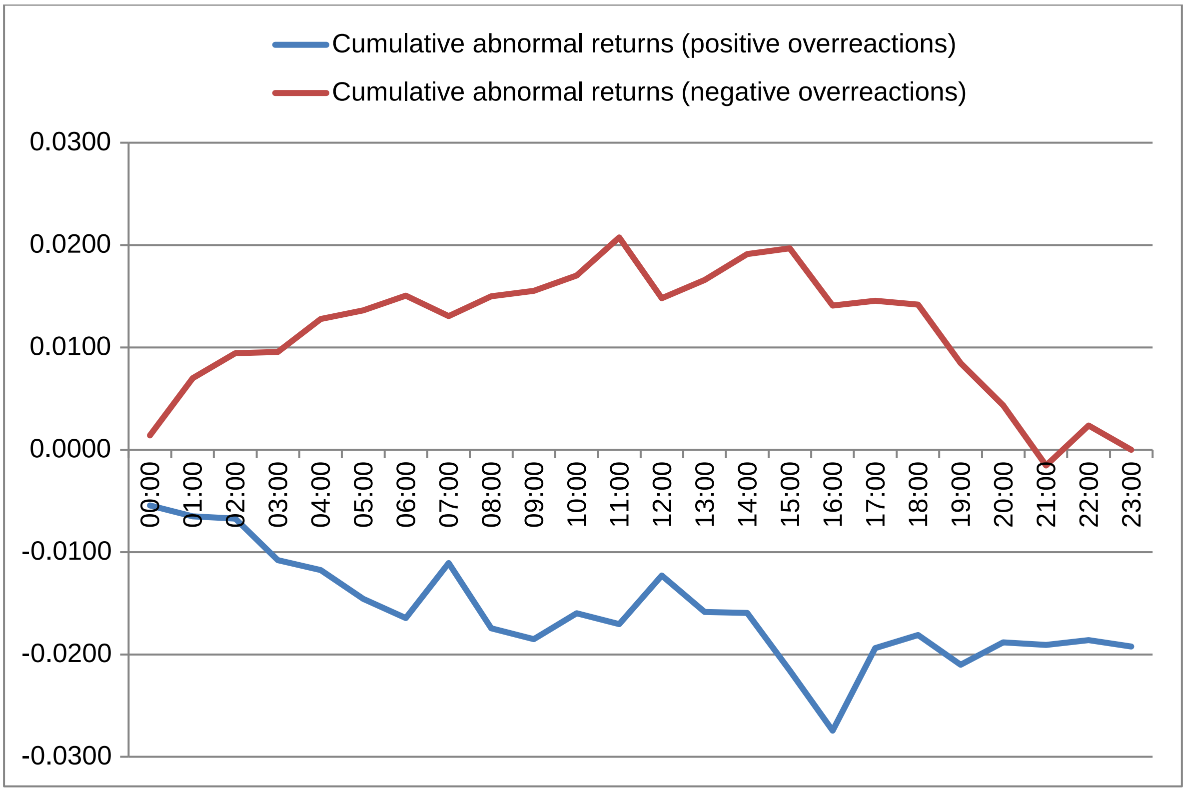
Table A.2: t-test of hourly returns on overreaction and normal days: the case of positive overreactions, BTCUSD

Hour	Average return on positive overreaction day (OD)	Standard deviation (OD)	Number of observations (OD)	Average return on usual day with positive returns (UD)	Standard deviation (UD)	Number of observation (UD)	t criterion
0:00	0.94%	1.16%	48	0.12%	0.81%	756	4.80

19:00	0.38%	1.55%	48	0.06%	0.69%	756	1.42
20:00	0.30%	1.80%	48	0.01%	0.70%	756	1.09
21:00	0.41%	1.25%	48	0.10%	0.79%	756	1.69
22:00	0.76%	1.59%	48	0.13%	0.73%	756	2.75
23:00	0.37%	1.14%	48	0.11%	0.73%	756	1.56

Table A.3:t-test of hourly re

Figure B.3: Dynamics ofcumulative abnormal returns, BTCUSD



Appendix C

LTCUSD: day of overreaction

Table C.1: Descriptive statistics forLTCUSD data: daily, hourly, days with

Figure C.2: Average hourly returns on overreaction and normal days: the case of negative overreactions, LTCUSD

Table C.2: t

18:00	0.89%	2.45%	37	-0.01%

Figure C.3: Dynamics of cumulative abnormal returns,LTCUSD

Table C.4: Cumulative abnormal returns: the case of positive and negative overreactions,LTCUSD

Hour	Positive overreactions			Negative overreactions		
	Abnormal returns	Cumulative abnormal returns	Overreaction cross	Abnormal returns	Cumulative abnormal returns	Overreaction cross
0:00	0.65%	0.65%	10.27%	-0.24%	-0.24%	-8.19%
1:00	0.54%	1.19%	9.77%	-0.44%	-0.68%	-7.52%
2:00	0.93%	2.12%	8.89%	-0.52%	-1.20%	-6.71%
3:00	0.37%	2.49%	8.61%	-0.49%	-1.70%	-5.99%
4:00	0.94%	3.43%	7.63%	-0.08%	-1.78%	-5.83%
5:00	0.28%	3.72%	7.42%	-0.51%	-2.29%	-5.16%
6:00	0.11%	3.83%	7.31%	-0.25%	-2.53%	-4.74%
7:00	0.31%	4.14%	7.04%	-0.44%	-2.97%	-4.12%
8:00	0.79%	4.93%	6.31%	-0.78%	-3.75%	-3.04%
9:00	0.58%	5.51%	5.77%	-0.78%	-4.53%	-2.02%

02%

14:00	-0.13%	3.36%	39	-0.08%	1.55%

Appendix E

ETHUSD: day of overreaction

Table E.1: Descriptive statistics for ETHUSD data: daily, hourly, days with positive and negative returns

Parameter	Daily data	Positive days	Negative days	Hourly data	Positive days (hourly data)	Negative days (hourly data)
Mean	0.0039	0.1626	-0.1355	0.0002	0.0066	-0.0054
Standard error	0.0018	0.0060	0.0056	0.0001	0.0007	0.0010
Median	0.0000	0.1484	-0.1225	0.0000	0.0040	-0.0032
Mode	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Std. Dev.	0.0613	0.0454	0.0426	0.0139	0.0233	0.0308
Variance	0.0038	0.0021	0.0018	0.0002	0.0005	0.0010
Kurtosis	3.3418	2.2361	1.9070	21.4268	3.9199	11.7349
Skewness	0.3911	1.5380	-1.4479	0.4050	0.4461	0.3255
Minimum	-0.2703	0.1143	-0.2703	-0.2347	-0.1138	-0.2347
Maximum	0.3029	0.3029	-0.0896	0.2371	0.1263	0.2371
Sum	4.7596	9.4321	-7.7234	5.6704	7.7909	-5.0130
Observations	1213	58	57	29100	1176	936

Figure E.1: Average hourly

Figure E.2: Average hourly returns on overreaction and normal days: the case of negative overreactions,

19:00	0.79%	2.10%	48	0.25%	1.27%	604	1.76
20:00	0.97%	2.43%	48	0.13%	1.33%	604	2.37
21:00	1.29%	2.34%	48	0.28%	1.30%	604	2.95
22:00	0.27%	2.98%	48	0.17%	1.26%	604	0.22
23:00	1.41%	2.60%	48	0.35%	1.35%	604	2.79

Table E.3: t-test of hourly returns on overreaction and normal days: the case of negative overreactions, ETHUSD

Hour

Figure E.3: Dynamics of cumulative abnormal returns,ETHUSD

Table E.4: Cumulative abnormal returns: the case of positive and negative overreactions,ETHUSD

Hour	Positive overreactions			Negative overreactions		
	Abnormal returns	CAR	Overreaction cross	Abnormal returns	CAR	Overreaction cross
0:00	0.62%	0.62%	5.68%	-0.84%	-0.84%	-7.77%
1:00	0.56%	1.17%	4.88%	-0.59%	-1.42%	-6.96%
2:00	0.57%	1.75%	4.11%	0.03%	-1.39%	-6.90%
3:00	0.42%	2.17%	3.49%	-0.53%	-1.92%	-6.17%
4:00	0.07%	2.24%	3.19%	-0.14%	-2.07%	-5.90%
5:00	0.59%	2.83%	2.50%	-0.65%	-2.71%	-5.12%
6:00	-0.22%	2.61%	2.60%	0.13%	-2.59%	-5.10%
7:00	0.46%	3.06%	1.95%	-1.35%	-3.94%	-3.51%
8:00	0.33%	3.39%	1.49%	-0.14%	-4.08%	-3.14%
9:00	0.03%	3.42%	1.35%	-0.12%	-4.20%	-2.79%
10:00	-0.17%	3.25%	1.49%	-0.45%	-4.65%	-2.15%
11:00	0.36%	3.61%	0.89%	-0.43%	-5.08%	-1.60%
12:00	1.12%	4.73%	-0.48%	-0.51%	-5.59%	-1.02%
13:00	0.74%	5.47%	-1.34%	-0.91%	-6.50%	0.05%
14:00	0.45%	5.92%	-1.94%	-0.21%	-6.71%	0.43%
15:00	0.64%	6.56%	-2.85%	-0.09%	-6.81%	0.69%
16:00	0.12%	6.68%	-3.21%	-0.45%	-7.25%	

7.25%7.25%

Appendix F

ETHUSD

13:00	0.23%	3.13%	57	-0.02%	1.57%	1213	0.60
14:00	0.11%	3.43%	57	-0.01%	1.62%	1213	0.27
15:00	0.48%	2.91%	57	0.05%	1.66%	1213	1.11
16:00	0.44%	2.92%	57	0.07%	1.61%	1213	0.94
17:00	-0.19%	2.17%	57	-0.06%	1.40%	1213	-0.46
18:00	0.49%	1.88%	57	0.01%	1.31%	1213	1.91
19:00	0.78%	3.12%	57	0.06%	1.36%	1213	