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THE DAY OF THE WEEK EFFECT IN THE CRYPTO CURRENCY MARKET

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1. Introduction

There exists a

(1995), Hsaio and Solt (2004), and Caporale et al. (2016), whilst commodity markets were analysed by Singal and Tayal (2014), and the FOREX by Caporale et al. (2017). Ariel (1990), Fortune (1998) and Schwert (2003) all reported evidence against the Monday effect in developed markets, but this anomaly still appears to exist in many emerging markets (Caporale and Plastun, 2017).

The crypto currency market is rather young but sufficient data are now available to examine its properties. Dwyer (2014), Cheung et al. (2013) and Carrick (2016) show that it is much more volatile than other markets. Brown (2014) provides evidence of short-term price predictability of the BitCoin. The inefficiency of the BitCoin

We carry out Student's t, ANOVA and Kruskal-Wallis tests for the whole sample, and also for sub-samples in order to make comparisons between periods that might be characterised by an anomaly and the others. In addition we run multiple regressions including a dummy variable to identify the day of the week effect:

(2)

where – return in period *t;*

– mean return on the n day of the week

– a dummy variable for the n day of the week, equal to 1 for observations corresponding to that day and to 0 otherwise

– error term for period *t*.

The size, sign and statistical significance of the dummy coefficients provide information about possible anomalies.

- Expected payoff — mathematical expectation of a win. This parameter represents the average profit/loss for one trade. It also shows the expected profitability/unprofitability of the next trade;
- Total trades — total number of trade positions;
- Bars in test – the number of observations used for testing.

The findings are summarised in the “Graph” section of the “Report”: this represents the account balance and general account status considering open positions. The “Report” also provides full information about all the simulated transactions and their financial results.

To make sure that the results we obtain are statistically different from the random trading ones we carry out t-tests. We chose this approach instead of carrying out z-tests because the sample size is less than 100. A t-test compares the means from two samples to see whether they come from the same population. In our case the first is the average profit/loss factor of one trade applying the trading strategy, and the second is equal to zero because random trading (without transaction costs) should generate zero profit.

The null hypothesis (H0) is that the mean is the same in both samples, and the alternative (H1) that it is not. The computed values of the t-test are compared with the critical one at the 5% significance level. Failure to reject H0 implies that there are no advantages from exploiting the trading strategy being considered, whilst a rejection suggests that the adopted strategy can generate abnormal profits.

An example of the t-test is presented in Table 2.

Table 2: Example of the t-test for the trading strategy effectiveness evaluation: BitCoin testing in 2016

Parameter	Value
Number of the trades	51
Total profit	837

Average profit per trade	59

Table 4: Anomalies by day for the BitCoin

Day of the week	Average analysis	t-test	ANOVA	Kruskal - Wallis test	Regression analysis	Overall
Monday	+	+	+	+	+	5
Tuesday	-	-	-	-	-	0
Wednesday	+	-	-	-	+	2
Thursday	-	-	-	-	-	0
Friday	-	-	-	-	+	1

Since the anomaly occurs on Mondays (when returns are much higher than on the other days of the week) the trading strategy will be the following: open long positions on Monday and close them at the end of this day. The trading simulation results are reported in Table 5.

Table 5 Summary of the trading simulation results

Parameter	Full sample	2013	2014	2015	2016	2017
Profit trades (% of total)	60	75	39	60	59	71
Number of the trades	245	52	52	52	51	38
Total profit	16990	3730	-315	1076	837	11662
Average profit per trade	69	72	-6	21	16	307
Standard deviation	555	341	228	84	107	1288
t-test	2.01	1.56	-0.13	1.96	1.23	1.48
t critical (0,95)	1.78	1.78	1.78	1.78	1.78	1.78
Null hypothesis	rejected	confirmed	confirmed	rejected	confirmed	confirmed

In general this strategy is profitable, both for the full sample and for individual years, but in most cases the results are not statistically different from the random trading case, and therefore they do not represent evidence of market inefficiency.

5. Conclusions

This paper examines the day of the week effect in the crypto currency market focusing on BitCoin, LiteCoin, Ripple and Dash. Applying both parametric and non-parametric methods we find evidence of an anomaly (abnormal positive returns on Mondays) only in the case of BitCoin. Further, using a trading simulation approach we show that a trading

strategy based on this anomaly is profitable for the whole sample (2013-2017): it generates net profit with probability 60% and these results significantly differ from the random ones. However, in the case of individual years the opposite conclusions are reached. There is no evidence that the crypto currency market as a whole is inefficient.

Cross, F. (1973), The Behavior of Stock Prices on Fridays and Mondays. Financial Analysts Journal, November - December, 67-69.

Dwyer, G. P. (2014), The Economics of Bitcoin and Similar Private Digital Currencies, Journal of Financial Stability. vol. 17, 2014, pp. 81-91.

Fama, E. (1965), The Behavior of Stock-Market Prices. Journal of Business. 38:1, 34– 105.

Fields, M. (1931), Stock Prices: A Problem in Verification. Journal of Business, October. 415-418.

Fortune, P. (1998), Weekends Can Be Rough : Revisiting the Weekend Effect in Stock Prices. Federal Reserve Bank of Boston. Working Paper No. 98-6.

French, K. (1980), Stock Returns and the Weekend Effect, Journal of Financial Economics, 8, 1, 55-69.

Gibbons, M. and P. Hess (1981), Day Effects and Asset Returns, Journal of Business, 54, no, 4, 579-596.

Halaburda, H. and N. Gandal (2014), Competition in the Cryptocurrency Market. NET Institute Working Paper No. 14-17. Available at SSRN: https://ssrn.com/abstract=2506463 or http://dx.doi.org/10.2139/ssrn.2506463

Hsaio, P. and M. Solt (2004), Is the Weekend Effect Exploitable? Investment Management and Financial Innovations, 1, 53.

Jensen, M. (1978), Some Anomalous Evidence Regarding Market Efficiency, Journal of Financial Economics, 6:2/ 3, 95– 101.

Kurihara, Y. and A. Fukushima (2017), The Market Efficiency of Bitcoin: A Weekly Anomaly, Perspective Journal of Applied Finance & Banking, vol. 7, no. 3, 57-64.

Samuelson, P. (1965), Proof That Properly Anticipated Prices Fluctuate Randomly, Industrial Management Review, 6:2, 41– 49.

Rogalski, R. J. (1984), New Findings Regarding Day-of-the-Week Returns over Trading and Non-Trading Periods: A Note, Journal of Finance, Vol. 39, (December), 1603-1614.

Schwert, G. W. (2003), Anomalies and Market Efficiency. Handbook of the Economics of Finance. Elsevier Science B.V., Ch.5, 937-972.

Sias, R. W., Starks, L. T. (1995), The day-of-the week anomaly: the role of institutional investors, Financial Analyst Journal. May – June. 58-67.

Singal, V. and Tayal, J. (2014), Does Unconstrained Short Selling Result in Unbiased Security Prices? Evidence from the Weekend Effect eekend Ef, 1603

Appendix A

Table A1 Example of trading strategy testing report

Symbol		BTCUSD (1 Lot= 10 BTC)			
Period		Daily (D1) 2013.01.01 00:00 - 2017.09.22 00:00 (2013.01.01 - 2017.12.31)			
Parameters		Lots=1;			
Bars in test	2423	Ticks modelled	63927	Modelling quality	n/a
Mismatched charts errors	0				
Initial deposit	10000			Spread	2
Total net profit	16990	Gross profit	35137.7	Gross loss	-18147.7
Profit factor	1.94	Expected payoff	69.35		
Absolute drawdown	849.6	Maximal drawdown	6322.60 (22.68%)	Relative drawdown	39.54% (5983.00)
Total trades	245	Short positions (won %)	0 (0.00%)	Long positions (won %)	245 (60.00%)
		Profit trades (% of total)	147 (60.00%)	Loss trades (% of total)	98 (40.00%)
	Largest	profit trade	3811.8	loss trade	-4079.2
	Average	profit trade	239.03	loss trade	-185.18
	Maximum	consecutive wins (profit in money)			

Appendix B

Empirical results for the Day of the Week Effect

Average analysis

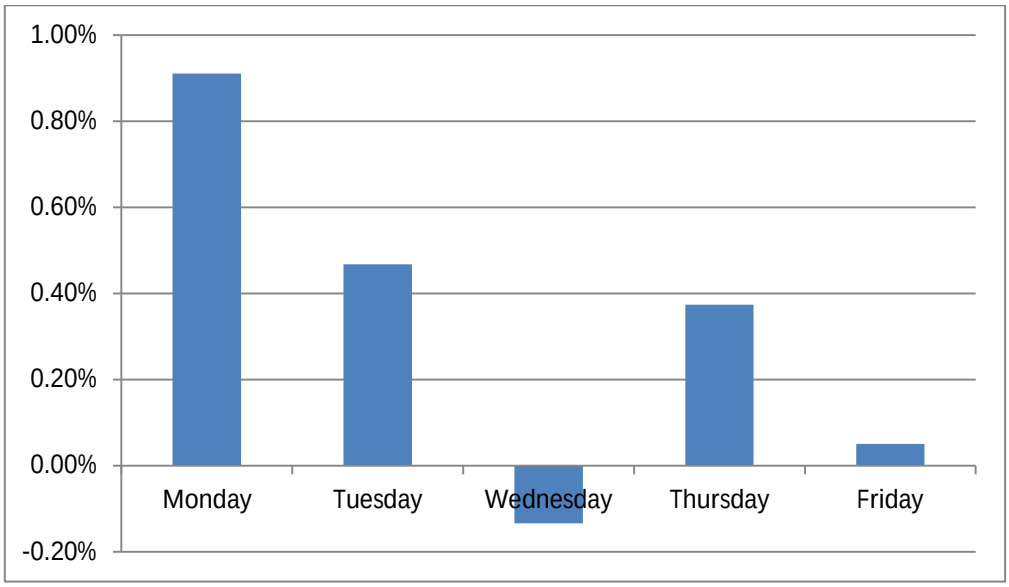

Figure B.1 – BitCoin

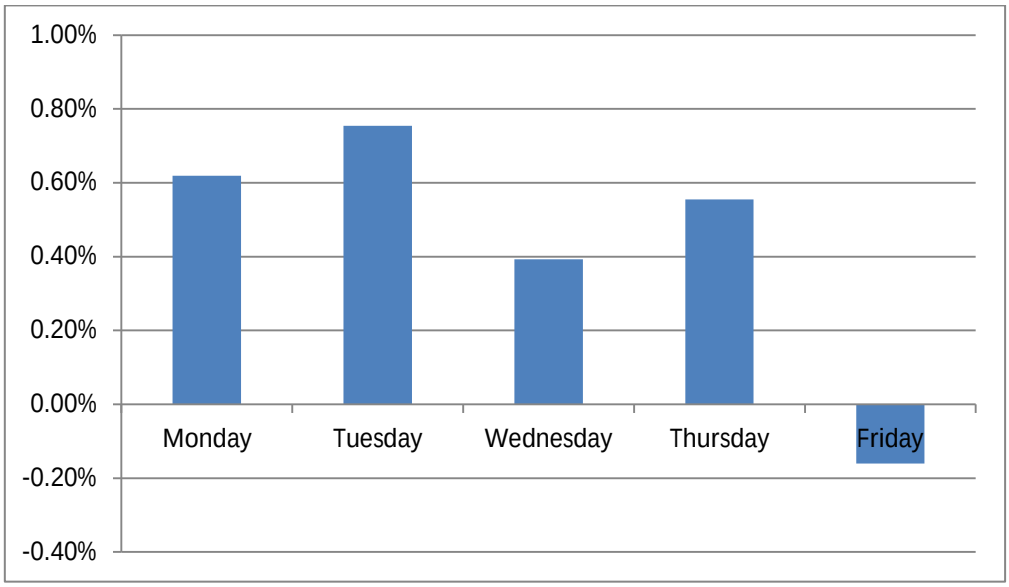

Figure B.2 – LiteCoin

Appendix E

Non-parametric tests: Kruskal -Wallis test