

# Report on Bachelor / Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student:	Daniel Ondruška
Advisor:	doc. PhDr. Ladislav Křišťoufek Ph.D.
Title of the thesis:	Interplay between Bitcoin price and its mining difficulty

## OVERALL ASSESSMENT:

### Contribution

The thesis digs into an interesting offer (symbolized by the difficulty to mine cryptocurrencies) and price relationship (the prices of those cryptocurrencies). The ultimate goal is to help forecasting the price of Bitcoins, by exploiting information on the difficulty of production and the parallel developments of the second most important cryptocurrency, the Ethereum. The ultimate goal is to support business decisions: whether or not and when it may be profitable to start investing on mining cryptocurrencies. Regarding the most interesting results, the author concludes that "In this cross section model, price of Bitcoin is influenced by two lags of Ethereum apart from its own lags. Other interesting finding is that Ethereum price is driven by first lag of Bitcoin, which is driven mainly by itself, so in the end it looks like the hash rate of Bitcoin could play role in Ethereum price and therefore in Bitcoin price.". If I understand correctly, the thesis demonstrates a correlation between the two variables (prices and difficulty of mine) for those leading crypto currencies?

### Methods

The author dedicates a full section to describe the employed methodology. Still, part of the methodology is described in the next section. Additionally, the developments on those methodologies could be enriched. This section would be improved by using systematic references to justify hypothesis, rather than the author's opinion: „In my opinion these using data collected around this bubble are damaged and would deflect our results because mainly the prices were driven by speculant investors and were generally deviated.“ For example, why did he choose to use log prices/hash rates? Is it what is typically done in the literature?

The author should try to be as precise as possible: „I will use their lifelong price and hash rate data which should be available online (is it available??) and in the best .csv format. If any data were missing it should not be a big problem and I should be able to fill them up from another website (precise, again you did it. Do you have any reference for doing the same? ). For the practical part I will follow procedure of Filip et al. (2017). At first, we must test both these datasets for a unit root. We will use augmented dickey-fuller test with the maximum lag of 12“ (12 units of what?)“

Page 13. Did you conduct a correlation analysis? Graphically, it looks like there is a lag of at least 2 months between Bitcoin and Ethereum?

### Literature

The literature review is interesting and up to date. Though, it could have gained in clarity by formally ordering ideas. Additionally, the last part of the last paragraph is not part of the literature review. The thesis could be further improved with deeper readings and understandings. For example, virtual currencies cannot be spent twice, as all the transactions are recorded on the blockchain, and as there is a need of the number of the Bitcoin and the key/password to spend it. Miners are those computers/individuals/more and more companies solving the code and get rewarded by Bitcoins. The supply of Bitcoin is not stable, it is rising, as well as the difficulty to mine new blocks. The 21mn Bitcoin is the long term maximum number which can be mined. The difficulty to mine is rising and the reward for every mined block decreasing.

Part of the thesis is sometimes too simplistic, or the arguments lack a deeper understanding.

Regarding the costs of production, electricity prices (current and most importantly future – given the investments at stake) is key for the computers as well as for air-condition. Another key variable is the

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speed of the internet network and the distance for the server (time efficiency). Venezuela seems a weird choice... Iceland and Georgia are key production destinations.  
To my knowledge, there were several crashes of Bitcoins.

## Manuscript form

The manuscript is globally well written and a particular effort was done on the layout of the thesis. Still the student could have spent more time on the details. Additionally, some improvements could be made with missing references regarding the methodology and hypothesis.

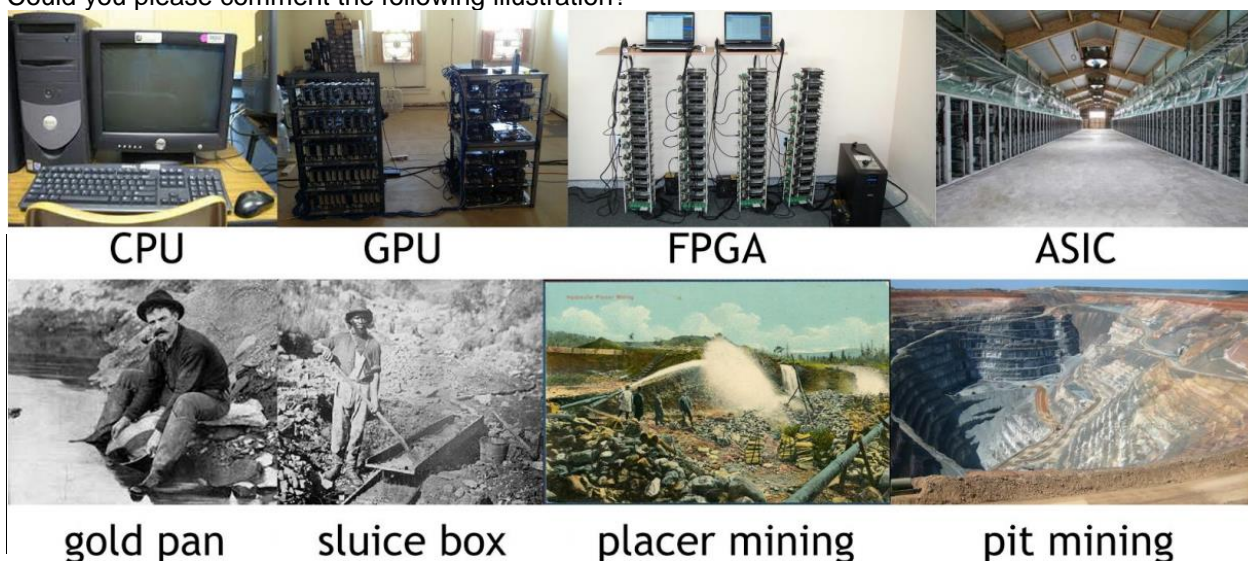
## Summary and suggested questions for the discussion during the defense

The thesis is ambitious and extremely up to date, given the ever rising interest for cryptocurrencies. It is a good start for future additional work. All in all, I would recommend a C.

### Suggested questions:

You use the past when describing the abuses of virtual currencies (drug, traffic, etc.). Are you sure that such misconduct is now over, in particular with the darkweb?

Could you please comment the following illustration?



Source: Narayanan et al., 2016

What could be, according to you, the role of crypto-exchanges in your model?

### **NAME OF THE REFEREE:**

Laure de Batz

**DATE OF EVALUATION:** 21/05/2019

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**Referee Signature**

### **EXPLANATION OF CATEGORIES AND SCALE:**

**CONTRIBUTION:** *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

Strong	Average	Weak
30	<u>15</u>	0

**METHODS:** *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

Strong	Average	Weak
30	<u>25</u>	0

**LITERATURE REVIEW:** *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

Strong	Average	Weak
20	<u>15</u>	0

**MANUSCRIPT FORM:** *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

Strong	Average	Weak
20	<u>16</u>	0

### **Overall grading:**

TOTAL	GRADE
91 – 100	A
81 - 90	B
71 - 80	C
61 – 70	D
51 – 60	E
0 – 50	F