

# Report on Bachelor / Master Thesis

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

<b>Student:</b>	<b>Bc. Josef Kurka</b>
<b>Advisor:</b>	<b>prof. Ing. Oldřich Dědek, CSc.</b>
<b>Title of the thesis:</b>	<b>Does Bitcoin Have Potential to Co-Function with Fiat Money</b>

## **OVERALL ASSESSMENT** (provided in English, Czech, or Slovak):

A very important function of money is that it serves as a store of value. Virtual currencies like Bitcoins exhibit a high volatility and therefore they are not good options for storing value. Josef Kurka examines dynamics of volatility of Bitcoin and compares the drivers of volatility to those of stocks, commodities and currencies. He also investigates the interconnections between markets with Bitcoins, currencies, stocks and commodities by estimating volatility spillovers. The author concludes, among others, that volatility of Bitcoin decreases over time (but it is still quite high) and that market for Bitcoin is most closely interconnected with commodity market.

Several students at the IES have focused on Bitcoins recently. I have supervised thesis of Jiří Šafka who analyzed volatility of Bitcoin (Virtual Currencies in Real Economy: Bitcoin, 2014). Bitcoin demand studied Martin Janota (Digital Currencies: Analysis of Bitcoin Demand, 2013). The master thesis of Josef Kurka contributes nicely to this line of research.

I have the following remarks and comments:

1. Some concepts important for the thesis should be explained in detail at the very beginning. For example what the double-spending is. From page 1 of the thesis, the reader might be even led astray when the author states:

*„It was designed as an alternative currency to traditional banks backed currencies. Need for a central institution to oversee all transactions, and protect them against double-spending, causes high transaction costs of the traditional banking system (Nakamoto, 2008).“*

It looks like that the double spending problem is inherent to traditional banks backed currencies and the issue does not arise to Bitcoins. But that is not true. E-money has the double spending issue too. I would recommend to spend much more time to explain these concepts to the reader. A very good reference is a paper by the IMF about centralized and de-centralized payment systems available at:

<https://www.imf.org/external/pubs/ft/sdn/2016/sdn1603.pdf>

2. Similarly the key concept of the leverage effect should be explained in detail. The author states:

*„Stock market volatility is documented to be influenced by asymmetric reaction to positive and negative returns, the “leverage effect” (Corsi & Reno, 2012; Bouchaud et. al, 2001), and the same asymmetry is documented also for volatility of commodities (Du et. al., 2009; Cheong, 2009; Morana, 2011). Currency markets, on the other hand, display different type of irregularity, negative correlation between trading volume in the past period and present volatility (Fung & Patterson, 1998; Scott & Tucker, 1988).“*

I do not find this to be a sufficient explanation.

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3. I wonder whether the author understands all he has covered in his thesis. Specifically, when I read chapter 3, I find it very challenging, for example (pages 15 and 16):

*“Blockchain would not work, if anyone could edit it at any time. Proof-of-work ensures blockchain is not editable by anyone, but the user who succeeds to solve it. Proof-of-work is a solution to a complex computational puzzle. These users who invest effort into finding the proof-of-work are called “miners”. Incentive for miners is a reward they get for finding the proof-of-work. Nowadays the reward is a certain amount of BTC, which will decrease with every 210.000 blocks until all Bitcoins are in circulation. After that, miners will be incentivized by transaction fees added by individual payees. Anyone is welcome to become a node in the Bitcoin blockchain; however, nowadays the probability of finding the proof-of-work when working alone is negligible. Miners work on finding the proof-of-work by the “trial and error” method, usually using powerful computers. Due to low probability of finding the proof-of-work individually, miners associate themselves into groups called mining pools.”*

*“Each transaction begins with a user of Bitcoin broadcasting his intention to complete a transaction to all nodes. From the received requests, nodes form cornerstones of the blockchain: transaction blocks. Once transactions have been broadcasted to nodes, they start searching for the proof-of-work, and one of them eventually finds it, whereby proof-of-work difficulty is adjusted to sustain constant Bitcoin generation pace<sup>16</sup>. When the proof-of-work is found, the block is broadcasted to all nodes, who examine, if none of transaction contained has already been spent. When nodes recognize all transactions as valid, they confirm authenticity of the block by adding its hash to the next block created. By iterative addition of blocks, the blockchain is formed.”*

Clearly understanding of the above mentioned methods requires understanding of software engineering, IT and complex mathematics. It is quite possible that Josef Kurka masters all he needs to understand it. I am always concerned for people to not use instruments, techniques and financial products they do not understand enough. E.g. I would not be willing to use Bitcoins or invest in Bitcoins since my understanding is quite limited.

4. The main reference is the paper by Nakamoto (2008). But surprisingly, I cannot find it in Bibliography.
5. In the relevant literature part, on p. 10, there is a claim of Schlichter (2012):

*Schlichter (2012) claims contemporary paper money system is not sustainable, and banks are deemed to collapse on a large scale. Place for a whole new system will arise when that happens.*

Well, that is potentially very interesting reference but I think the author should explain why Schlichter (2012) thinks that the today’s system is not sustainable and why banks will collapse. Just this excerpt from Schlichter sounds like a bombastic newspaper headline.

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6. I would prefer if the theses contained only pages 23 – 47. This is the core of the thesis - modelling of volatility.

Minor comments:

7. The Czech and English abstracts are not the same, the translation into Czech does not contain all information provided in abstract written in English.
8. On the very first page, there is a typo: instead of: prof. Ing. Oldřich Dědek, **CsC**. there should be: prof. Ing. Oldřich Dědek, **CSc**.

I consider the thesis to be an applied work based on the Quantitative Finance course taught by Dr. Baruník. The author used several volatility models he has mastered in the Quantitative Finance course and applied it to Bitcoin.

I consider the master thesis of Mr. Kurka to be of high quality. It states clearly research questions, uses appropriate methodology to provide answers and contributes to our knowledge of volatility of Bitcoin and of potential of Bitcoin to replace traditional fiat currencies in general.

Therefore, I suggest a grade of 1 (excellent).

## **SUMMARY OF POINTS AWARDED** (for details, see below):

<b>CATEGORY</b>	<b>POINTS</b>
<i>Literature</i> (max. 20 points)	18
<i>Methods</i> (max. 30 points)	28
<i>Contribution</i> (max. 30 points)	24
<i>Manuscript Form</i> (max. 20 points)	19
<b>TOTAL POINTS</b> (max. 100 points)	<b>89</b>
<b>GRADE</b> (1 – 2 – 3 – 4)	<b>1</b>

**NAME OF THE REFEREE: PhDr. Pavel Vacek, Ph.D.**

**DATE OF EVALUATION: 15 June 2016**

**Pavel Vacek**

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**Referee Signature**

**EXPLANATION OF CATEGORIES AND SCALE:**

**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                          10                          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                          15                          0

**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                          15                          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                          10                          0

**Overall grading:**

TOTAL POINTS	GRADE		
81 – 100	<b>1</b>	= excellent	= výborně
61 – 80	<b>2</b>	= good	= velmi dobře
41 – 60	<b>3</b>	= satisfactory	= dobře
0 – 40	<b>4</b>	= fail	= nedoporučuji k obhajobě