

Cash in the pocket, Cash in the cloud: cash holdings of Bitcoin users

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*The results are preliminary and incomplete, please do not cite. The views expressed are those of
the authors. No responsibility for them should be attributed to the Bank of Canada.*

Background and Motivation

Bitcoin is an interesting case study of a cryptocurrency.

- 1 Understand how/why consumers use digital currency.
 - *Will digital currency reduce demand for bank notes?*
 - *Should the central bank issue its own digital currency?*

⇒ Bitcoin versus cash (complements or substitutes)
- 2 Bitcoin users are a “hard-to-reach” population.
 - *Still a low percentage of the population are actual users.*
 - *Anonymity is a key feature.*

Bitcoin (BTC) as a currency?

To begin with basics, the term 'crypto-currency' is a misnomer 'crypto,' yes, but 'currency,' no. For something to be considered a currency, it must act as a reliable store of value, and you should be able to spend it easily. These instruments possess neither of these characteristics, so they do not constitute 'money.'

Governor Stephen S. Poloz, 14/12/2017

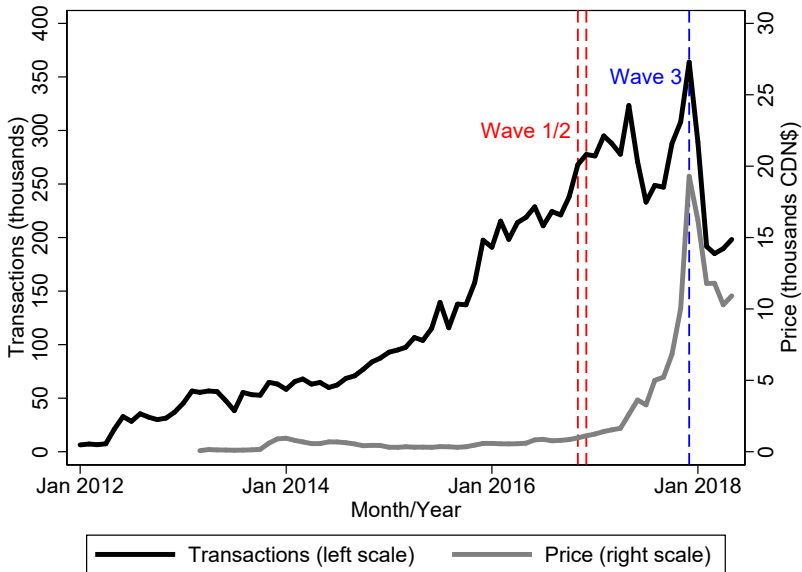
- Transaction versus store-of-value?

Henry, Huynh, & Nicholls (Journal of Digital Banking, 2018; Journal of Investing 2019)

12-2016, BTC Price ~ CAN\$1,000: Transaction motive.

12-2017, BTC Price ~ CAN\$20,000: Store-of-value motive.

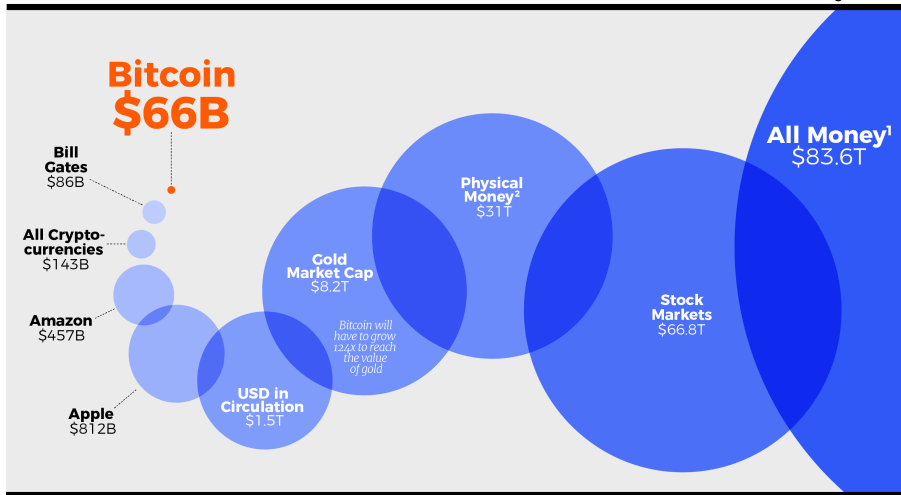
Bitcoin Prices and Trading Volumes



Bitcoin in Perspective

The market share for cryptocurrencies can grow a lot more

August 2017



Sources:

<https://howmuch.net/articles/worlds-money-in-perspective>
<https://coinmarketcap.com>
<https://www.forbes.com>
<https://www.federalreserve.gov>
<https://www.cia.gov>

¹All Money = money in any form including bank or other deposits as well as notes and coins.

²Physical Money = money in forms that can be used as a medium of exchange, generally notes, coins, and certain balances held by banks.



BITCOINIRA

Bitcoin Omnibus Survey (BTCOS)

- Commissioned by the Bank of Canada and conducted in three waves over two years:
 - Wave 1 (**11/2016**): $N = 999$ respondents.
 - Wave 2 (**12/2016**): $N = 998$ respondents.
 - Wave 3 (**12/2017**): $N = 2,623$ respondents.
 - *Weighted with respect to region, age, gender.*
- Online methodology, flexible and short questionnaire.
 - Waves 1-3: *Less than 5 minutes to complete.*
 - Wave 2: *Objective Knowledge questions.*
 - Wave 3: **Cash holdings**, *Usage, Beliefs about Adoption/Survival, Price Expectations, Network Size.*

This paper uses Wave 3 with the question about cash-holdings.

2018 Bitcoin Omnibus Survey: Awareness and Usage

Christopher S. Henry, Kim P. Huynh, Gradon Nicholls and Mitchell W. Nicholson

Results based on 2018 survey (between 2016 and 2018):

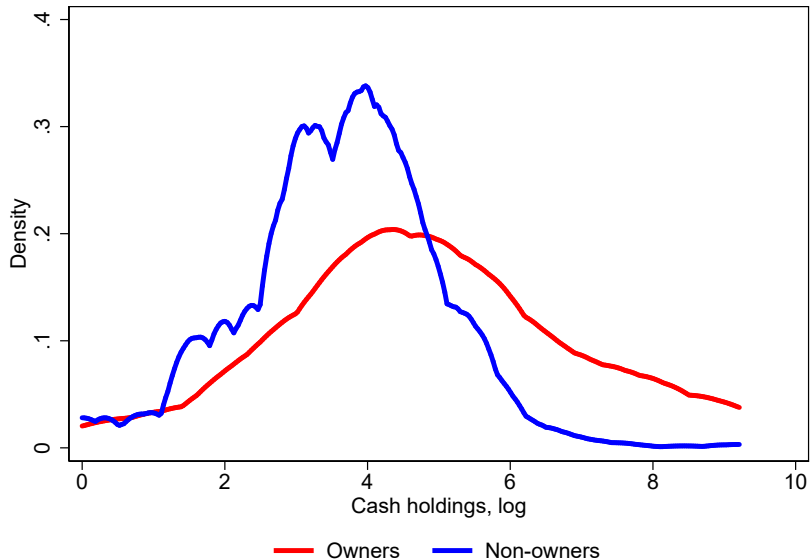
- The share of Canadians who were aware of Bitcoin increased: 62% to 89 %.
- The share of those who owned Bitcoin increased: 3% to 5 %.
- The share of past owners increased, suggesting an influx of Bitcoin owners who subsequently divested after the steep rise of prices in 2017.
- The main reason for owning Bitcoin remains speculation, though this share decreased slightly since 2017.
- The share of Canadians who reported using Bitcoin for transactions a few times a month or more increased.
- Bitcoin adopters differ from overall Canadians with respect to their financial literacy, preferences over payment methods, and cash holdings.

BTC adopters are cash intensive

| | Cash on hand | | No cash | N |
|-------------------------|--------------|--------|------------|-------|
| | mean | median | percentage | |
| Bitcoin adopters | | | | |
| 2017 BTCOS | 451 | 100 | 4 | 154 |
| 2017 MOP | 320 | 65 | 8 | 93 |
| Overall | | | | |
| 2013 MOP | 84 | 40 | 6 | 3,663 |
| 2017 BTCOS | 105 | 40 | 8 | 2,469 |
| 2017 MOP | 108 | 40 | 9 | 3,127 |

Note: Data are from the Bitcoin Omnibus Survey and Methods-of-Payment Survey. BTC adopters are: both current and past owners (BTCOS); and, those who have used digital currency at least once in the past year (MOP). 'No cash' is the percentage of respondents not having any cash on their person.

Figure 1: Kernel density, log of cash holdings by BTC ownership



Demographics and cash holdings

| Demographic | Proportion | | Cash holdings, median | |
|-----------------|------------|---------|-----------------------|---------|
| | BTC_no | BTC_yes | BTC_no | BTC_yes |
| 18-34 years | 0.23 | 0.63 | 20 | 100 |
| 35-54 years | 0.41 | 0.32 | 33 | 125 |
| 55+ years | 0.35 | 0.05 | 50 | 70 |
| Male | 0.45 | 0.73 | 45 | 100 |
| Female | 0.55 | 0.27 | 30 | 75 |
| <50k | 0.37 | 0.38 | 25 | 100 |
| 50k-99k | 0.40 | 0.40 | 40 | 100 |
| 100k+ | 0.23 | 0.21 | 50 | 110 |
| Retired | 0.23 | 0.03 | 50 | 83 |
| Employed | 0.58 | 0.85 | 35 | 100 |
| Unemployed/NILF | 0.18 | 0.12 | 20 | 129 |
| N | 2506 | 117 | 2506 | 117 |

Who Owns Bitcoin?

| | $\Pr(\text{BTC}=1 X)$ |
|---------------------|-----------------------|
| Log of age | -1.138*** (0.129) |
| Female | -0.564*** (0.097) |
| 50k-99k | 0.080 (0.105) |
| 100k+ | 0.004 (0.126) |
| Constant | 2.699*** (0.469) |
| No. of observations | 2623 |

Note: Baseline categories are Male, <50k income, from BC, retired, conducts all HH grocery shopping. Other variables included but not shown here: education, number of kids in HH, marital status, grocery shopping. Significance stars ***, **, and * represent 1%, 5% and 10% significance, respectively.

Identification

Functional Forms, Observables, Endogeneity

- $E(\text{Cash}|\text{Btc}, \text{Age}, \text{Age}^2, X) > E(\text{Cash}|\text{No} - \text{Btc}, \text{Age}, \text{Age}^2, X)$
- $Q_\tau(\text{Cash}|\text{Btc}, \text{Age}, X) > Q_\tau(\text{Cash}|\text{No} - \text{Btc}, \text{Age}, X)$
Endogeneous Selection?
- $Q_\tau(\text{Cash}|T = 1, \text{Age}, X) > Q_\tau(\text{Cash}|T = 0, \text{Age}, X)$, where T is a treatment indicator.
- $Q_\tau(\text{Cash}|\text{Btc}, \text{Age}, E[\text{Adopt}], X) > Q_\tau(\text{Cash}|\text{No} - \text{Btc}, \text{Age}, E[\text{Adopt}], X)$. where $E[\text{Adopt}]$ is the expected adoption rate in 15 years for BTC, a self-reported measure for both Bitcoin holders and No-Bitcoin holders.

Baseline OLS regressions

| | Model 1 | Model 2 |
|----------------|----------------------|----------------------|
| BTC owner | 1.203*** (0.135) | 1.201*** (0.135) |
| Age | 0.401*** (0.097) | -3.170* (1.765) |
| Age squared | | 0.489** (0.241) |
| Female | -0.400*** (0.057) | -0.397*** (0.057) |
| 50k-99k | 0.217*** (0.066) | 0.222*** (0.066) |
| 100k+ | 0.433*** (0.082) | 0.438*** (0.082) |
| N | 2412 | 2412 |
| R ² | 0.973 | 0.986 |

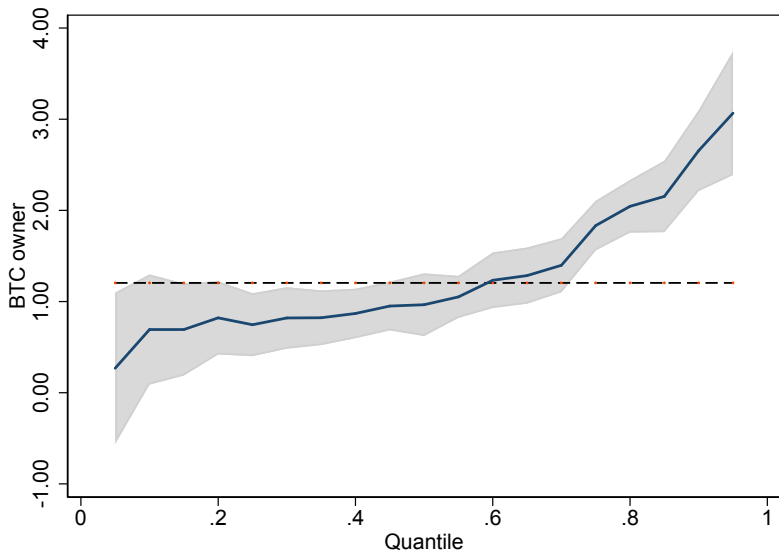
Note: Baseline categories are Male, <50k income, from BC, retired, conducts all HH grocery shopping. Other variables included but not shown here: education, number of kids in HH, marital status. Significance stars ***, **, and * represent 1%, 5% and 10% significance, respectively.

Quantile Regressions

| | OLS | QR_10 | QR_25 | QR_50 | QR_75 | QR_90 |
|-------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| BTC owner | 1.264*** (0.135) | 0.744** (0.290) | 0.600*** (0.199) | 1.116*** (0.150) | 1.762*** (0.148) | 2.424*** (0.220) |
| Log of age | 0.630*** (0.080) | 1.012*** (0.169) | 0.848*** (0.116) | 0.591*** (0.088) | 0.589*** (0.087) | 0.423*** (0.129) |
| Female | -0.388*** (0.056) | -0.563*** (0.121) | -0.393*** (0.083) | -0.250*** (0.063) | -0.322*** (0.062) | -0.416*** (0.092) |
| 50k-99k | 0.235*** (0.064) | 0.090 (0.134) | 0.254*** (0.092) | 0.235*** (0.070) | 0.217*** (0.069) | 0.293*** (0.102) |
| 100k+ | 0.440*** (0.077) | 0.358** (0.158) | 0.409*** (0.109) | 0.414*** (0.082) | 0.379*** (0.081) | 0.511*** (0.120) |
| No. of obs. | 2412 | 2412 | 2412 | 2412 | 2412 | 2412 |

Note: Baseline categories are Male, <50k income, from BC, retired, conducts all HH grocery shopping. Other variables included but not shown here: education, number of kids in HH, marital status, grocery shopping. Significance stars ***, **, and * represent 1%, 5% and 10% significance, respectively.

Figure 2: Quantile Results



Potential endogeneity/selection issues

- Do cash-intensive consumers prefer BTC too?
- Do BTC-holders distrust institutions/banks?
- Does the anonymity of cash and of BTC induces selection of holders?
- Do BTC-holders prefer liquidity and hence cash is a hedge?

Quantile Treatment Regressions

| | QTR_10 | QTR_25 | QTR_50 | QTR_75 | QTR_90 |
|-------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| BTC owner | 0.682 (0.457) | 0.557* (0.311) | 1.069*** (0.218) | 1.945*** (0.437) | 2.962*** (0.440) |
| Age | 0.876*** (0.221) | 0.769*** (0.150) | 0.563*** (0.091) | 0.580*** (0.085) | 0.443*** (0.134) |
| Female | -0.604*** (0.122) | -0.433*** (0.097) | -0.275*** (0.072) | -0.323*** (0.065) | -0.444*** (0.095) |
| 50k-99k | 0.018 (0.135) | 0.239** (0.104) | 0.245*** (0.079) | 0.218 *** (0.072) | 0.284** (0.114) |
| 100k+ | 0.258 (0.162) | 0.398*** (0.129) | 0.425*** (0.089) | 0.368*** (0.086) | 0.512*** (0.112) |
| No. of obs. | 2412 | 2412 | 2412 | 2412 | 2412 |

Note: Baseline categories are 18-34, Male, <50k income, from BC, retired, conducts all HH grocery shopping. Other variables included but not shown here: education, number of kids in HH, marital status, grocery shopping. Significance stars ***, **, and * represent 1%, 5% and 10% significance, respectively.

Figure 3: BTC Expected Adoption Rate as an instrument

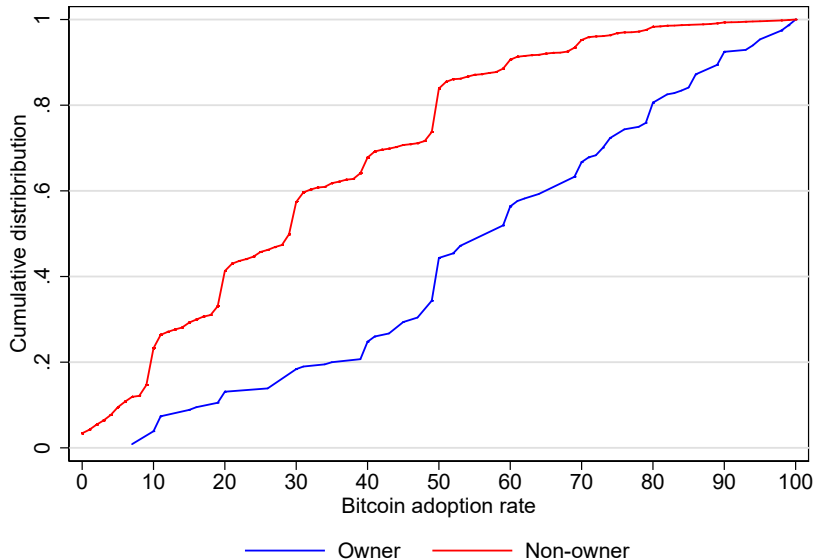


Figure 4: Control-Function Quantile Results

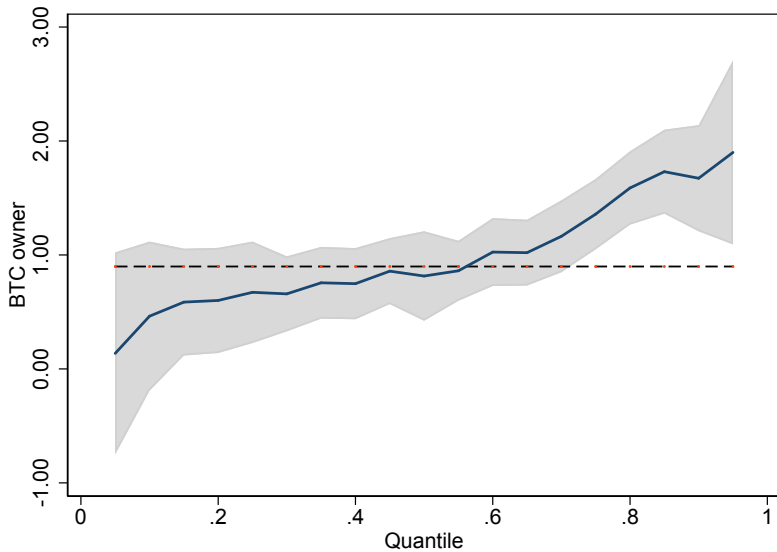
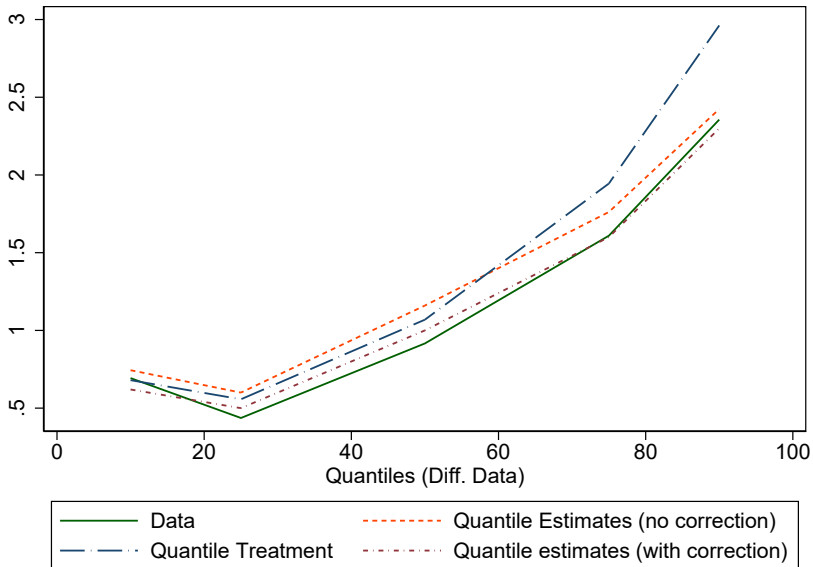


Figure 5: Quantile Results



Discussion of Results

- BTC-holders hold more cash.
- There is selection on the expected adoption rate for BTC in 15 years.
- The effect on cash holdings is heterogenous with for BTC-holders.