

# A Digital Gold Rush: The Impact of Bitcoins and Blockchains on Ontario's Mining Sector

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September 2018

## Should You Worry?

“The rapidly accelerating popularity and price in cryptocurrencies, such as Bitcoin, diverted substantial amounts of capital away from precious metals last year.”

- Thomson Reuters

“Cryptocurrencies are cannibalizing demand for gold.”

- Fundstrat Global Advisors

“Investors are dumping gold to buy Bitcoin.”

- ACG Analytics



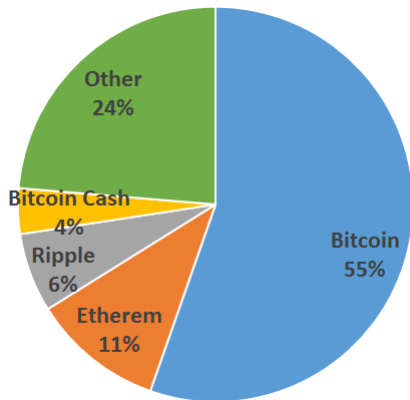
# Understanding the Technology

# Bitcoins, Blockchains, and Cryptocurrencies?!?

- **Blockchain** - An innovation for storing and distributing information in a decentralized way.
  - Think of it as simply a list that records user ids with some number beside it.
  - This list is constantly being shared among all users.
- **Cryptocurrency** - A digital currency that is created using blockchain technology.
- **Bitcoin** - The first, and currently most popular, cryptocurrency.
  - Bitcoin's current market cap: \$US 110 billion.
  - Many others exist: Ethereum, Bitcoin Cash, Ripple.

## Relative Size of Major Cryptocurrencies

- The total market cap of all (nearly 2,000) cryptocurrencies is currently \$US 198 billion.



# How do Blockchains Work?

| Account          | Amount |
|------------------|--------|
| f5833b205 (Karl) | 5.3    |
| fe42953db (John) | 1.4    |
| d67f8d240        | 3.8    |

- If Karl wishes to send one Bitcoin to John, he broadcasts a message to all the other users of Bitcoin saying:
  - f5833b205 sends 1 Bitcoin to fe42953db.
- A private key is required to verify that the owner of the account is the one who actually sent the message.
  - If you lose your private key you lose access to your Bitcoins, and there is no way to recover them.

# How do Blockchains Work?

| Account          | Amount |    |
|------------------|--------|----|
| f5833b205 (Karl) | 5.3    | -1 |
| fe42953db (John) | 1.4    | +1 |
| d67f8d240        | 3.8    |    |

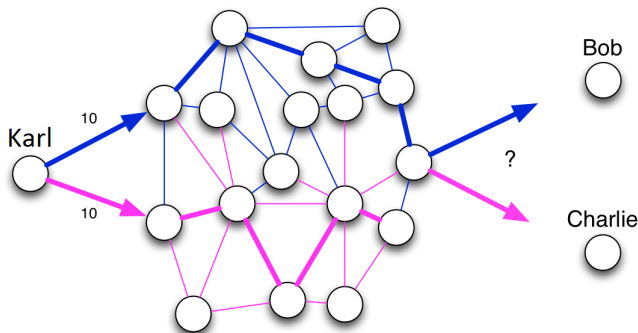
- All the users update their version of the list.

| Account          | Amount |
|------------------|--------|
| f5833b205 (Karl) | 4.3    |
| fe42953db (John) | 2.4    |
| d67f8d240        | 3.8    |



# Problem!

- **Problem:** Network lag and delays might lead to the Bitcoin ledger being different on different computers.
- How do we ensure that everyone using Bitcoin has the same list?
  - In other words, how can we be sure that the sender of a Bitcoin actually has a Bitcoin to send?



# Bitcoin Miners

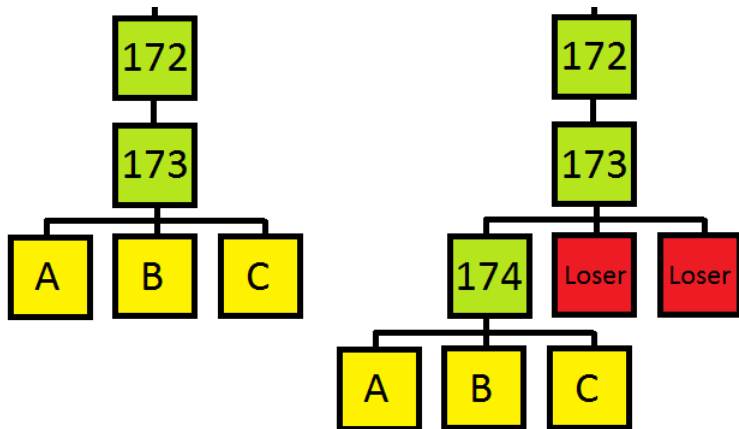
- Everyone using Bitcoin must collectively agree on:
  - ① Which transactions are legitimate.
  - ② The order of transactions (to prevent double spending).
- The blockchain solves this problem, by keeping track of every past Bitcoin transaction, thus telling us where every Bitcoin resides.
- **Bitcoin Miners** are individuals who, in return for Bitcoins and small fees, use their computers to keep everyone's list the same.



# Bitcoin Miners

- All recent Bitcoin transactions wait in a “Pending Transactions Area.”
- Miners group some pending transactions together in a **block** and try to add it to chain of previously verified blocks.
- Who decides which block is added to the chain?
  - Miners from all over the world are racing to have their computers solve a complex mathematical problem.
  - The first computer to solve it wins, and gets to link their block to the previous blocks.
  - All other users update their chain to reflect this new addition.
- By design, a new block is added to the chain approximately every 10 minutes.

# How do Blockchains Work?



# Bitcoin Farm



# Bitcoins Through an Economics Lens

# Why do we need Bitcoins?

- Bitcoin seems like a complicated solution to a problem that doesn't exist.
- What are the arguments that have been put forward in support of Bitcoin?
  - 1 Lowering transaction costs.
  - 2 End fractional reserve banking.
  - 3 Reduce the government's role in the economy.

# Transaction Fees

- Currently electronic transactions require the use of a **trusted third party**.

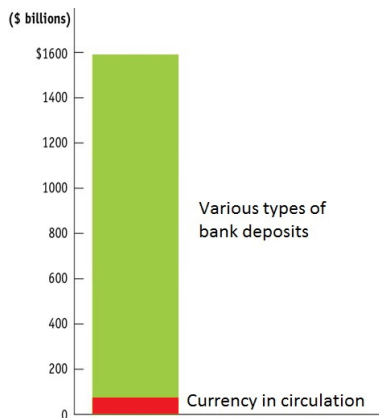


- They can charge high fees:
  - Paypal: 2.9%.
  - Visa: 1.43% - 2.4%.
  - Western Union: As high as 10%.



# Fractional Reserve Banking

- Some people don't like the idea of **fractional reserve banking**.
  - Currently only \$2,000 in cash exists for every Canadian.

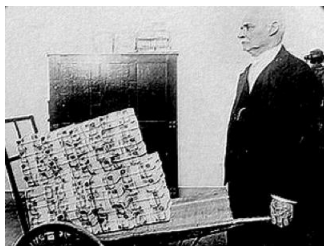


# Fractional Reserve Banking

- Bank failures are rare in Canada, but common in other countries.
- 8 in the US in 2017.
- 157 in the US in 2010.
- Since 1970 there have been 117 systematic banking crises that have occurred in 93 countries.

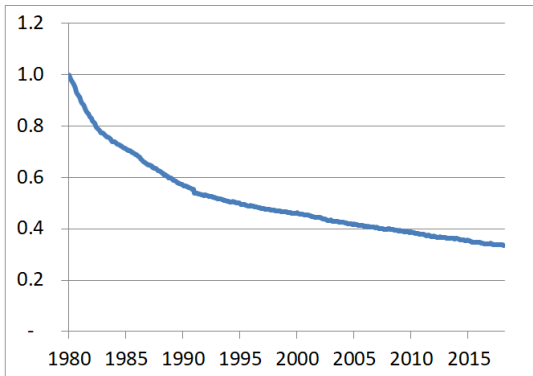
# Government - Inflation

- Some people don't like the government to have control over the amount of money in the economy.
  - Some governments print a lot of money, causing **inflation**.



## Government - Inflation

- Even with modest inflation in Canada (2% per year), the value of the dollar is steadily eroded over time.
- A dollar today is only worth one third of its 1980 value.



## Government - Intervention

- Some people don't like that governments can freeze assets and track money.
- The decentralized and anonymous nature of Bitcoin is appealing.



# Is Bitcoin Money?

- Is Bitcoin currently serving the role of money in the economy?
- For an economist, money fulfills three simultaneous roles:
  - 1 Medium of exchange.
  - 2 Store of value.
  - 3 Unit of account.

# What is Money?

- Why does an economy need money?
  - Avoid the **double coincidence of wants** problem.
  - Without money we would have a **barter** economy.



# Medium of Exchange

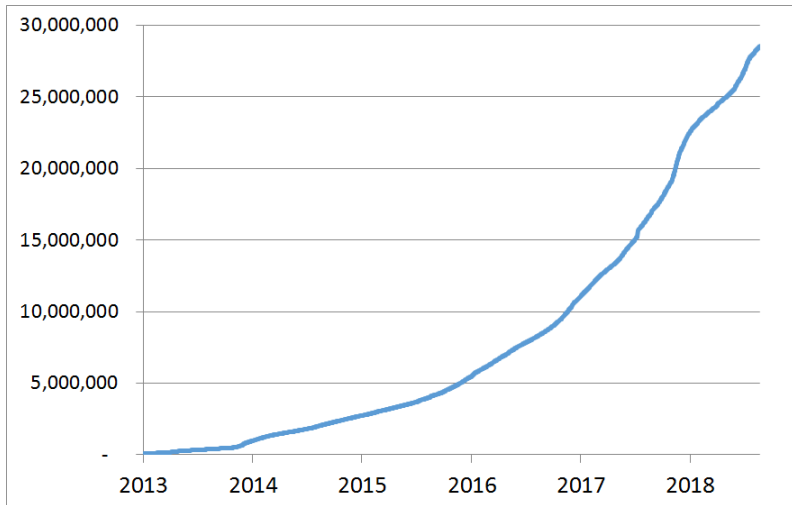
- Over 200,000 Bitcoin transactions per day, and growing.
  - [▶ Link](#)
- Over 25 million users and growing.
- Accepted by over 100,000 merchants.
  - Including: Microsoft, Subway, Virgin, Expedia.



# Daily Transactions



# Users



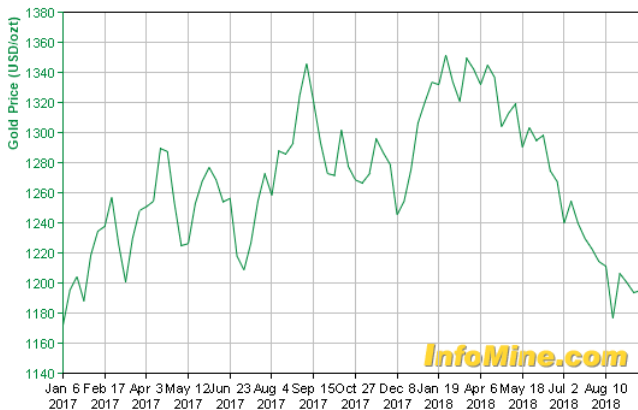
## Store of Value

- The price of a Bitcoin is very volatile.
- \$1,000 invested at the beginning of 2017 would now be worth \$6,415.



# Store of Value

- The price of gold is less volatile.
- \$1,000 invested at the beginning of 2017 would now be worth \$1,046.



# Store of Value

- The Stock Market is also less volatile.
- This shows the change in the value of the Dow Jones Industrial Average.
- \$1,000 invested at the beginning of 2017 would now be worth \$1,326.



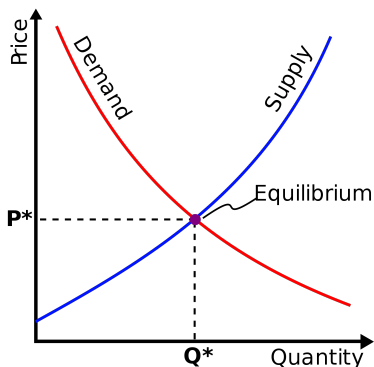
# Is Bitcoin Money?

- Although Bitcoin is used as a medium of exchange, it is not a good store of value and is not used as a unit of account.
- We can thus conclude that Bitcoin is currently NOT money.
- As time passes it may become more widely used, thus becoming money.
- In the interim though, it is a speculative asset, much like gold.
- This is a potential problem for gold, as people might substitute away from gold and towards Bitcoin.

# Understanding the Demand for Gold

# Determining the Price of Gold

- The price of a good is determined through the interaction of demand and supply.
- Increasing demand will cause the price of gold to rise.
- Increasing supply will cause the price of gold to fall.



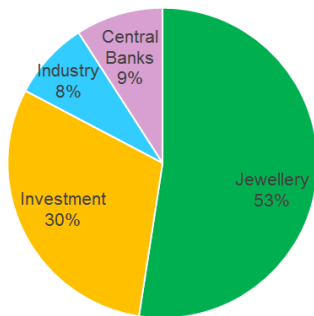


# Price of Gold



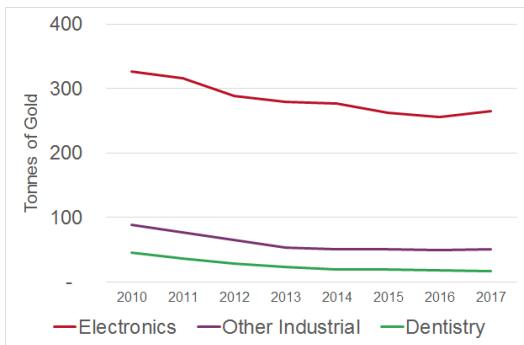
# Demand for Gold

- The demand for gold can be divided into four categories:
  - 1 Industry
  - 2 Jewellery
  - 3 Central Banks
  - 4 Investment



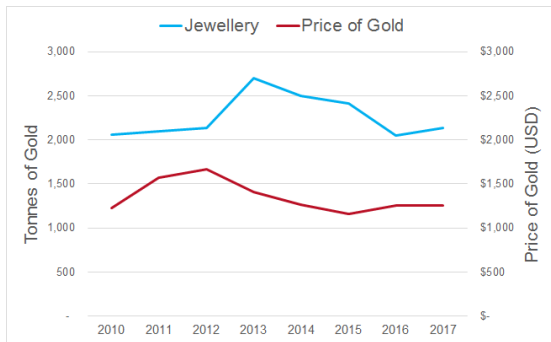
# Industry

- The demand for gold in industry has been steadily decreasing recently, regardless of price fluctuations.
- There is no reason to believe that Bitcoin will have a direct impact on industrial demand.



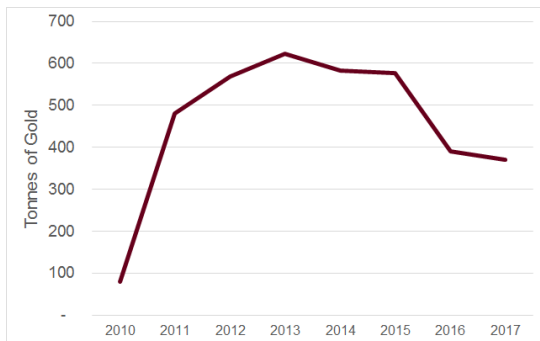
# Jewellery

- Demand for gold for jewellery has been declining lately following a Chinese-led surge in 2013.
- Some evidence that the demand is sensitive to the price of gold.
- Demand for jewellery will be unlikely to be directly impacted by Bitcoin.



# Central Banks

- Demand for gold by Central Banks has been positive over the past decade, after selling off some of their gold over the previous decade.
- In general though, gold is becoming a less important component of the total reserves held by banks.



# Central Banks

- Could Central Banks begin to hold Bitcoin and other cryptocurrencies instead of gold? Almost certainly.
- Central Banks typically hold a diversified set of assets, some of which could be Bitcoin.
- Given the relatively small size of this demand in the gold market, and the correspondingly small adjustment, it is unlikely to have a large impact on the price of gold.



# Investments

- People hold gold for a number of investment reasons.
  - They may believe the price of gold will increase in the future.
  - Interest rates may be low.
  - Inflation may be high, causing the value of currency to fall.
  - Political uncertainty may lead to currency devaluation.



Source: Merk Investments, U.S. Treasury, Bloomberg  
\* Yields on 10-Year Treasury Inflation-Protected Securities (TIPS)

© Merk Investments LLC

# Investments

- Gold is appealing for a number of reasons, some of which are similar to Bitcoin's appeal.
  - Scarce.
  - Outside government control.
  - Outside the banking system.
  - Tangible and looks good.

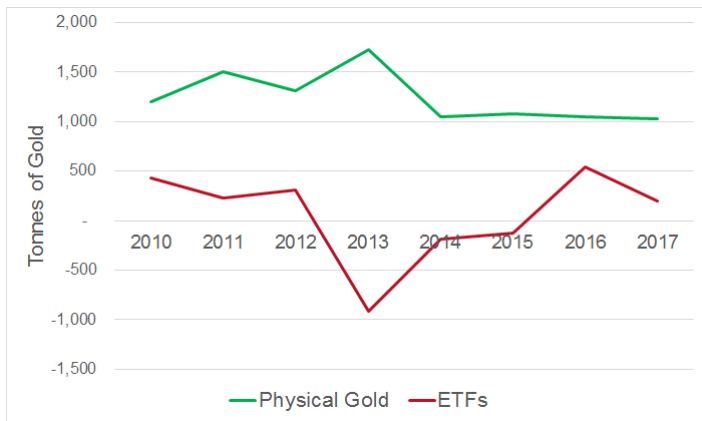




# Investments

- Gold as an investment can be held in two forms:
  - Physical gold bars or coins.
  - Exchange-traded funds (ETFs) and similar products.
- Why would people hold physical gold when an ETF is available?
  - Anonymous
  - Tangible
  - Free from any third party.

# Investments



# Investments

- I suspect that most holders of physical gold would be unwilling to move to a non-tangible asset.
- Demand for physical gold is still present even when ETFs are available.
- However, holders of gold ETFs may be willing to move to Bitcoin.

# Supply of Gold

- The supply of new gold to the market will be determined, in part, by the cost of establishing a new mine and the cost of extraction.
- Investing in new mines is relatively risky.
- Investing in Bitcoin is relatively risky.
- It is possible that certain investors who would otherwise invest in mines, may instead begin to invest in Bitcoin.

# Supply of Gold

- With fewer investors, the cost of raising capital will increase.
- This means fewer mines will develop, leading to less gold on the market, and thus an increase in the price of gold.
- It is unclear how strong this effect may be. If the fundamentals of the mine are still good, it should still attract investment.

# Bitcoins vs Gold



# Similarities and Differences

## Similarities

|   | <b>Gold</b>           | <b>Bitcoin</b>        |
|---|-----------------------|-----------------------|
| 1 | Scarce                | Scarce                |
| 2 | Free from government? | Free from government? |
| 3 | Anonymous             | Anonymous             |

## Differences

|   | <b>Gold</b>   | <b>Bitcoin</b> |
|---|---------------|----------------|
| 1 | Tangible      | Intangible     |
| 2 | Long History  | Short History  |
| 3 | Understood    | Mysterious     |
| 4 | Robust market | Limited market |

## Who are Current Bitcoin Users?

- Are users of Bitcoin and buyers of gold similar?
- We don't know - Bitcoin users are anonymous.
- What do we suspect about them?
  - Age: more young users but older users hold more coins.
  - Gender: 90% men.
  - Nationality: North America and Europe.
  - Philosophy: Libertarian.





## Do the Price Move Together?

- One could examine the co-movements of the price of Bitcoin and gold to see how they relate.
- Positive co-movements suggest gold and Bitcoins are complements, while negative co-movements suggest substitutes.
- Little evidence of any relationship.



# Will Bitcoin Replace Gold?

- Bitcoin will never completely replace gold as an investment.
- However, investment demand for gold will likely suffer slightly.
  - Demand for physical gold may decline as Bitcoin is anonymous and scarce.
  - Demand for ETF gold may slacken as investors diversify.
- Bitcoin is likely to push out some Central Bank demand for gold.
- If these cause the price of gold to fall, increased jewellery demand may partially compensate.

# Future of Bitcoin

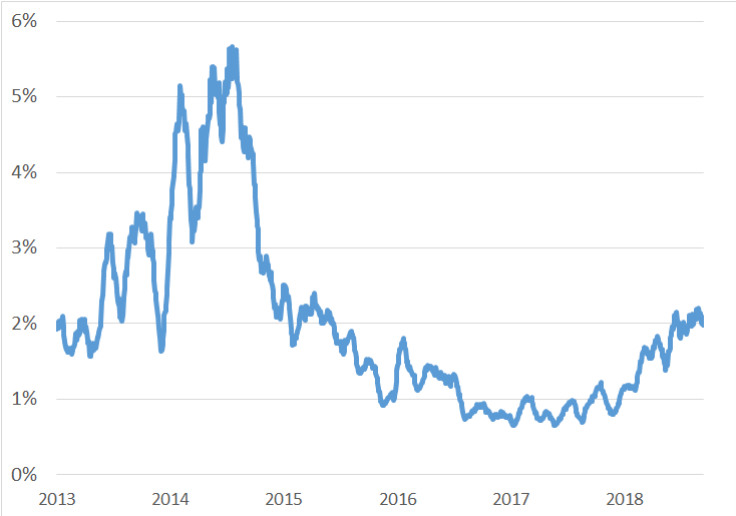
- The big question going forward is: Will Bitcoin ultimately be used as a currency, or simply as a speculative asset?
- If it becomes widely used as a currency, this may negate much of the demand for gold as an investment.
- Bitcoin does not suffer from inflation or government manipulation, so hedging with gold becomes less necessary.



# Bitcoin Problems

- Blocksize limits the number of transactions to 7 per second.
  - Paypal currently handles 193 transactions per second.
  - Visa handles 1667 transactions per second (but could handle 56,000).
- 10 minute delay for a block to be added to the chain.
- Fees to pay the miners.
  - Currently around 2%.
  - Likely to go up once all the Bitcoins have been mined.
- Facilitates illegal transactions?
- Losing your key means losing your money. No recourse.

# Bitcoin Fees



# Bitcoin Benefits

- Can reduce the cost of transactions.
- Removes government intervention in the economy.
  - No more inflation - great for developing countries.
  - Government cannot observe how I spend my money.
- Technology seems secure and adaptable.



# Energy Use

- Energy use is astronomical!
- Current estimated use is 73.2 terawatt hours per year.
  - This could power 6.8 million US households for a year.
  - 13.4% of Canada's use!
  - Carbon footprint of 35,830 kilotons of CO<sub>2</sub>, equivalent to 6.9 million extra cars on the road.
- 1 Bitcoin transaction requires 875 kilowatt-hours of electricity.
- 100,000 Visa transactions require 169 kilowatt-hours of electricity.



# Conclusion



## Conclusion

- Blockchain technology is very innovative and disruptive.
- I don't think its future is in the creation of a new currency.
- The current technological limitations prevent it from replacing physical currencies.
- People are very innovative, and these problems may be overcome in the future.



# Conclusion

I see three possible futures:

- 1 Bitcoin fails to become money, people stop using it, and it disappears.
- 2 Bitcoin fails to become money, however it maintains a small role as a speculative asset.
  - Likely to be too small to have a major impact on gold.
- 3 Technological problems are overcome, and Bitcoin becomes money.
  - Likely some investment demand will be diverted away from gold and towards holding Bitcoin.
  - Increased demand for jewellery may partially compensate.

# Conclusion

- In the short-term, fear of missing out may induce movement away from gold and towards Bitcoin.
- Going forward, be aware of
  - 1 Changes in the technology.
  - 2 Attempts to regulate.

- I work in the Economics Department at Lakehead University.
- I'm also part of The Centre of Excellence for Sustainable Mining and Exploration (CESME) at Lakehead.
- My research examines the productivity and competitiveness of Ontario mines.
- I'm always looking for ways to partner with industry.