

[Re-Running] Bitcoin Fair Value: A First Assessment

We model this assessment on David Woo's December 2013 report: "[Bitcoin: a first assessment](#)" (Bank of America / Merrill Lynch). Mr. Woo begins with an extensive and apt summary of the bitcoin ecosystem, and we highly recommend reading his report. He goes on to analyze bitcoin's fair value using an equity-equivalence framework. We re-run Mr. Woo's value analysis (and then some) below, using what we consider more appropriate methodology and comparative metrics for a currency/commodity hybrid such as bitcoin.

We agree with Mr. Woo that bitcoin is both a medium of exchange and a store of value. We also agree that it's easiest to assess fair value by treating these uses separately. Additionally, we would like to note that the below analysis represents various bitcoin success-scenarios which may or may not occur, and that fair **present** value is therefore some weighted discount to the below success-case values. We treat this further in our conclusion.

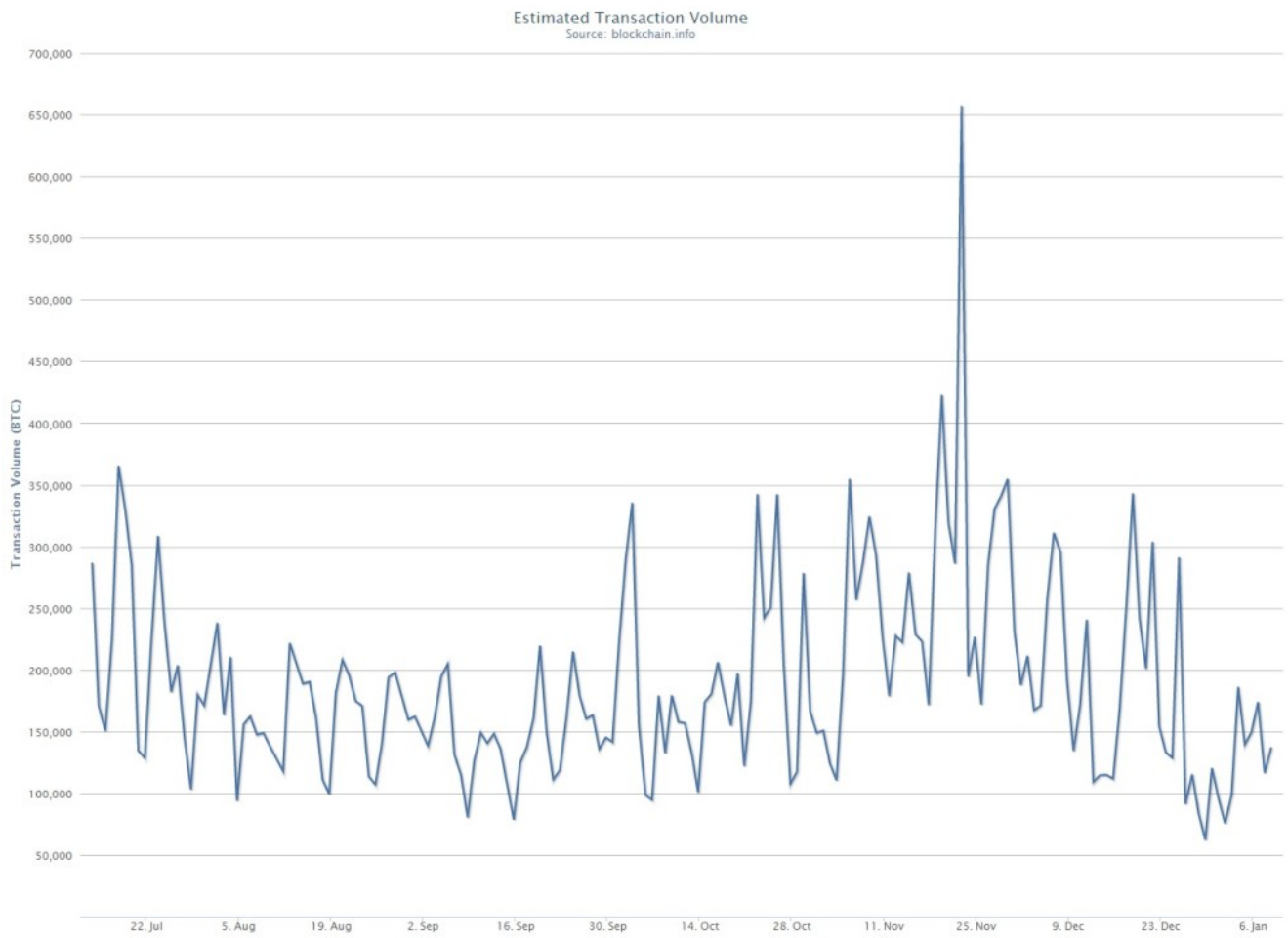
Value as a medium of exchange

To assess bitcoin's potential value as a medium of exchange, we will look to existing fiat money flows and supplies, and ask what total value of all bitcoin is necessary to support various fractions of that economic activity. We do this as a starting point for rational, data-driven determination of bitcoin's fair value, and will leave it to the individual reader to decide whether our underlying assumptions and reference points are sensible.

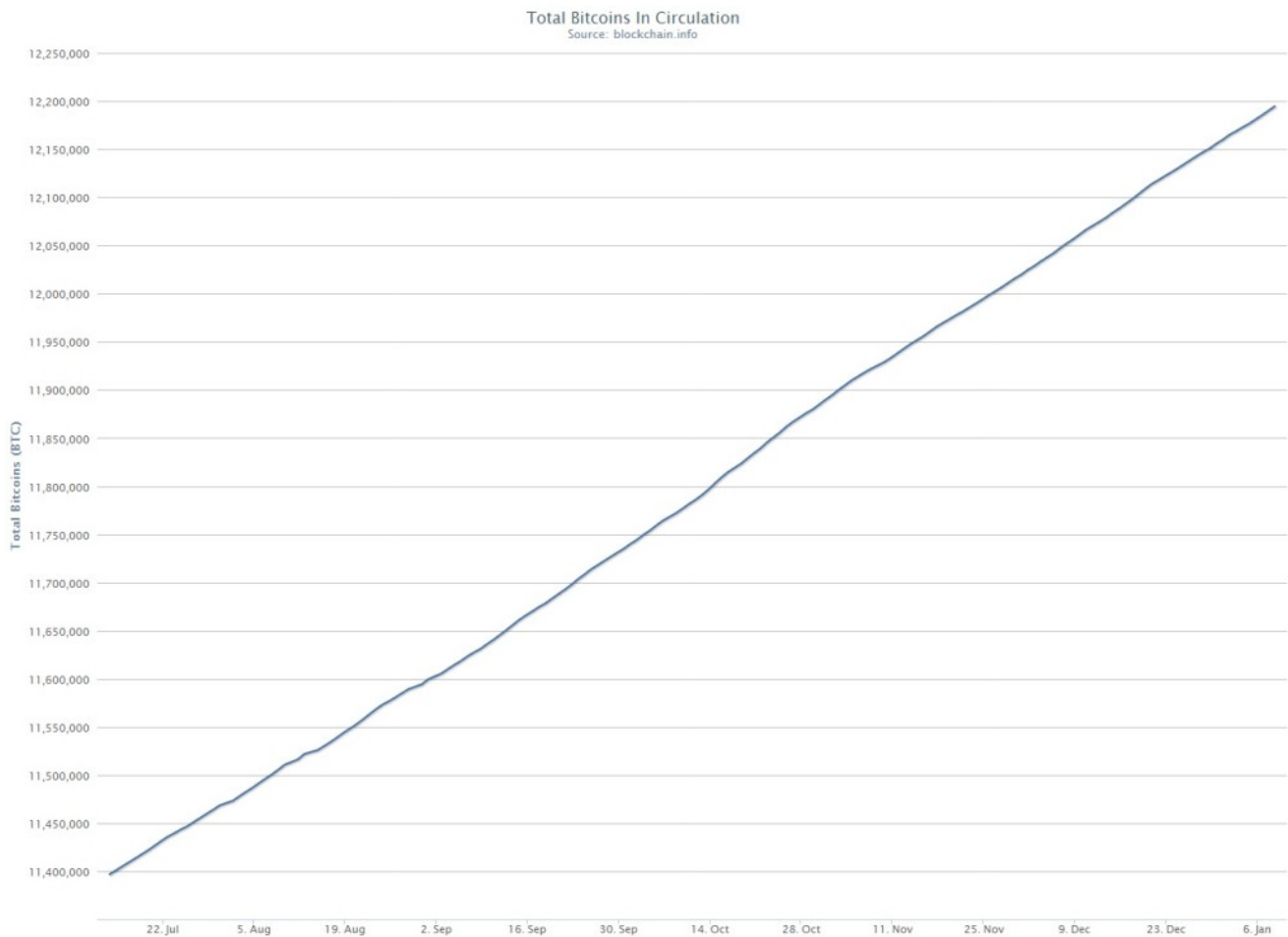
Economic Activity, Money Supply, and Velocity

To determine the supply of money necessary to sustain a certain amount of economic activity, we must look at how quickly that money changes hands. This concept of [monetary velocity](#) is a key value for modern economies. Let's look at velocity in the bitcoin ecosystem.

We can see from [blockchain data](#) that average daily transaction volume for bitcoin over the last 6 months is roughly 200,000BTC:



while total supply of bitcoin averaged ~10,000,000BTC over the same period:



That yields an annual velocity of roughly 7.3*. This is much higher than the [monetary velocity of dollars](#), which averages under 2.0. In our view, this seems a natural consequence of bitcoin being a far more frictionless medium of exchange compared to fiat money such as Dollars or Euros. Since bitcoin requires no third-party settlement intermediary, it's simply easier and cheaper to send/receive; thus, one would indeed expect it to move around the economy more quickly than other currencies.

The other side of the equation when determining value of a single unit of something is supply. Due to the algorithmic nature of bitcoin, we know the supply exactly; there are currently 12,151,075 bitcoins in circulation as of this writing (see chart above, or visit blockchain.info/charts for real-time data). Additionally, we know that there will never be more than 21,000,000 bitcoins ever issued. We will use this latter supply figure in value calculations below.

* Money Velocity, V , is defined as: $V = T / M$, where T is the aggregate value of all transactions over a given period, and M is the avg total money supply over that same period. In our discussion, $T = (200,000 * 365) = 73,000,000$, and $M = 10,000,000$. Thus, $V = 7.3$.

Bitcoin as 10% of remittance market

In contrast to Mr. Woo's comparative equity/enterprise-value analysis, we think it's more relevant to analyze bitcoin's potential share of the remittance market as a currency, not as a single corporation/equity. The equity comparison Mr. Woo undertakes is ultimately vague and difficult to justify since bitcoin is not a company. Luckily, since bitcoin is used as a medium-of-exchange (ie,

currency), we can look directly at existing demand for currency and determine what value bitcoin must have in order to satisfy various slices of that demand. Using such methodology, the calculation is simple:

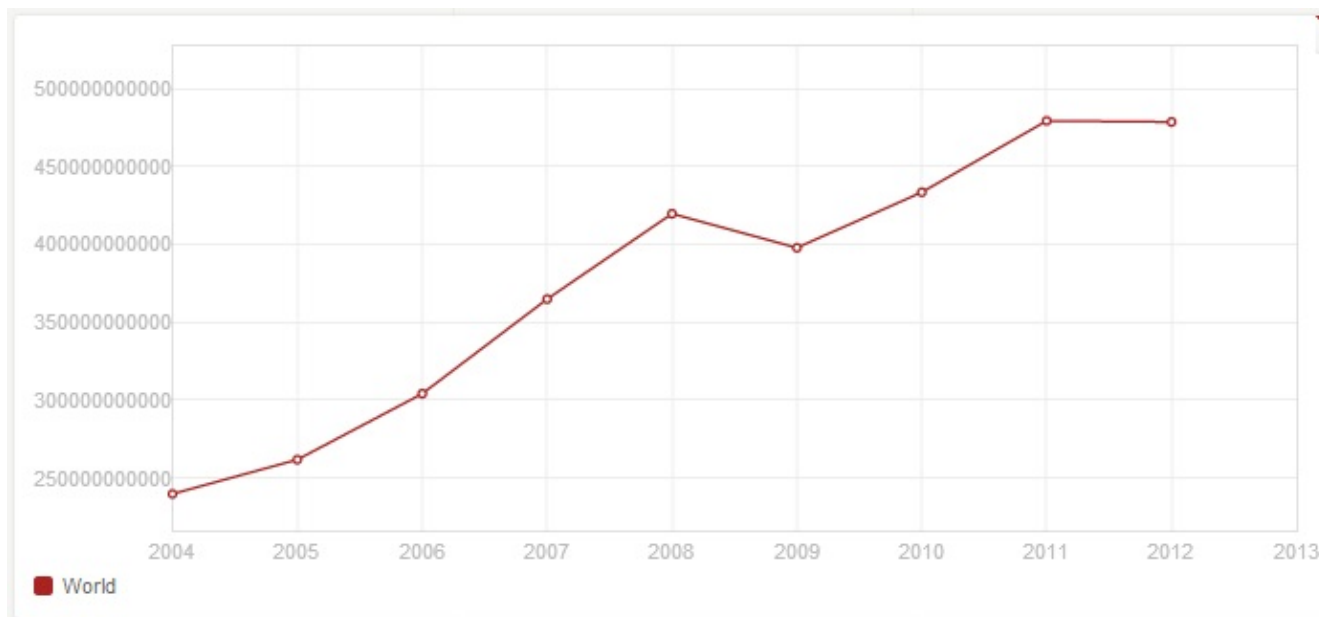


Chart source: [World Bank](#)

Global remittances in 2012 totaled \$478 Billion according to the above World Bank [data](#). If bitcoin accounted for 10% of that activity, the equivalent of \$47.8B worth of bitcoin would need to be transacted. Using our monetary velocity of 7.3 from above, the supply of bitcoin would need to be $\$47.8B / 7.3 = \$6.55B$.

Table 1. Bitcoin Money Supply Summary 1

| Domain | Domain Penetration | Supply Required |
|-------------------|--------------------|-----------------|
| Remittance Market | 10% | \$6.55B |

In our view, it seems reasonable that bitcoin eventually becomes widely used in the remittance market due to its frictionless, borderless, and near-zero fee properties. For these reasons, we see 10% of this market as a conservative reference point.

Bitcoin as 10% of "black-market" transactions

Total black market transactions have an [estimated annual value of \\$1829B](#). 10% comes to \$182.9B, yielding a total necessary supply of bitcoin, at our money-velocity of 7.3, to cover this economic activity of \$25.05B.

Table 2. Bitcoin Money Supply Summary 2

| Domain | Domain Penetration | Supply Required |
|---------------------------|--------------------|-----------------|
| Remittance Market | 10% | \$6.55B |
| Black Market Transactions | 10% | \$25.05B |
| | Total: | \$31.60B |

Like Mr. Woo, we offer no opinion on whether or not bitcoin is suited to black-market transactions, but merely provide the above analysis as a reference point for potential data-driven valuation discussion.

Bitcoin as comparable to one medium-sized nation

We'll (subjectively) use a GDP of \$200B as the definition of "medium" for our purposes here. That roughly corresponds to the [GDP of countries](#) such as Algeria, Peru, Kazakhstan, and the Czech Republic.

| Rank | Country/Region | GDP (Millions of \$US) |
|------|-----------------------------------|------------------------|
| ◆ | <i>World</i> | ◆ 72,689,734 ◆ |
| 1 | United States | 16,244,600 |
| 2 | China | 8,358,400 |
| 3 | Japan | 5,960,180 |
| 4 | Germany | 3,425,956 |
| 5 | France | 2,611,221 |
| 6 | United Kingdom | 2,417,600 |
| 7 | Brazil | 2,254,109 |
| 8 | Russia | 2,029,812 |
| 9 | Italy | 2,013,392 |
| 10 | India | 1,875,213 |
| 46 | Algeria | 207,021 |
| 47 | Peru | 204,681 |
| 48 | Kazakhstan | 202,656 |
| 49 | Czech Republic | 196,446 |
| 50 | Qatar | 192,402 |
| 51 | Kuwait | 183,219 |
| 52 | Ukraine | 176,309 |
| 53 | New Zealand | 171,256 |
| 54 | Romania | 169,396 |
| 55 | Vietnam | 155,820 |
| 103 | Estonia | 22,376 |
| 104 | Uganda | 21,736 |
| 105 | Zambia | 21,490 |
| 106 | Afghanistan | 20,364 |
| 107 | Congo, Democratic Republic of the | 18,823 |
| 108 | Honduras | 18,564 |
| 109 | Nepal | 18,029 |
| 110 | Bosnia and Herzegovina | 17,319 |
| 111 | Brunei | 16,954 |
| 112 | Georgia | 15,830 |

For comparison, as can be seen in the above chart, the GDPs of France, the UK, Brazil, and Russia are all more than 10 times higher, and the GDPs of Estonia, Uganda, Zambia, and Afghanistan are all 10 times lower.

Once again using our velocity of 7.3, we calculate that a money supply of \$27.4B worth of bitcoin would be required to support \$200B in economic activity; ie, the equivalent of a single "medium" sized country.

Table 3. Bitcoin Money Supply Summary 3

| Domain | Domain Penetration | Supply Required |
|-----------------------------|--------------------|-----------------|
| Remittance Market | 10% | \$6.55B |
| Black Market Transactions | 10% | \$25.05B |
| M2 of "Medium" Size Country | 1 Country | \$27.4B |
| | Total: | \$59.0B |

Bitcoin as 10% of global eCommerce

Total eCommerce can be approximated as the sum of Business-to-Consumer (B2C) and Business-t-Business transaction volume. B2C is somewhat readily tracked; [estimates for 2013](#) are about \$1.3T. B2B figures are more difficult to reliably determine, but some studies ([pdf](#)) suggest B2B eCommerce volume is more than double B2C volume.

In our analysis, we'll assume equal volume for B2C and B2B transactions, yielding total eCommerce volume of ~\$2.6T for 2013. To support 10% of that economic activity in bitcoin, the total supply of bitcoin would need to be \$35.61B

Table 4. Bitcoin Money Supply Summary 4

| Domain | Domain Penetration | Supply Required |
|-----------------------------|--------------------|-----------------|
| Remittance Market | 10% | \$6.55B |
| Black Market Transactions | 10% | \$25.05B |
| M2 of "Medium" Size Country | 1 Country | \$27.4B |
| Global eCommerce | 10% | \$35.61B |
| | Total: | \$94.61B |

Bottom-Line: Estimated total value for bitcoin as medium of exchange = \$94.61B

As the astute reader will note, the above figures are not necessarily fully additive, but we approximate to provide a reasonable upper-bound on bitcoin's medium-of-exchange value if bitcoin garners 10% of the markets noted above plus the general economic equivalent of one medium-sized country.

Value as a store of value

We further agree with Mr. Woo that bitcoin as a store of value most closely resembles precious metals (specifically gold) and cash balances since it generates no interest or dividends in and of itself, and is credibly scarce. We will treat each separately:

Bitcoin as 10% of gold's store-of-value demand

Here we will diverge from Mr. Woo, and instead look at bitcoin garnering 10% of gold's investment demand. While Mr. Woo instead looks at silver, arguing that bitcoin's volatility makes it inappropriate as a gold substitute, we note that we're evaluating potential success-cases and medium/long-run possibilities. As bitcoin gains further adoption and liquidity, its volatility will lessen. Thus, for the purposes of this valuation-grounding exercise, we believe it's both fair and interesting to look at bitcoin's value if it were to achieve 10% of gold's investment demand.

What's the total value of gold as an investment? It's estimated that 50% of gold is used as jewelry and about 10% in industrial processes, leaving 40% of gold consumption for investment purposes.

With ~174,000 tons having been mined, that yields a total above-ground investment-gold supply of \$2.7 trillion.

Ten-percent of total investment gold is \$270B.

Table 5. Bitcoin Money Supply Summary 5

| Domain | Domain Penetration | Supply Required |
|-----------------|--------------------|-----------------|
| Investment Gold | 10% | \$270B |

Bitcoin as 1% of "offshore accounts"

A headline-grabbing [research paper](#) from 2012 estimates that the world's high-net-worth individuals have hidden between \$21T and \$32T in untaxed "offshore accounts". While it's difficult to know much about the nature of this money or validity of the analysis, it's worth noting that bitcoin could

eventually be seen as a potential vehicle for discretely storing liquid wealth.

Bitcoin is extremely confiscation-resistant, and essentially impossible to block from a flow-perspective. It is not anonymous, but its pseudo-anonymous/user-defined-anonymity properties seem likely to hold privacy advantages relative to traditional money flows. With the recent precedent of the Cyprus bail-ins, Portugal's pension seizure, and the IMF's musings on global wealth confiscation, we believe the world's wealthy may come to look toward bitcoin as a safe-haven for a small percentage of their non-public holdings.

Using the \$21T lower-bound from the above report, we see that 1% of such wealth amounts to \$210B.

Table 6. Bitcoin Money Supply Summary 6

| Domain | Domain Penetration | Supply Required |
|-------------------------|--------------------|-----------------|
| Investment Gold | 10% | \$270B |
| HNW "Offshore" Holdings | 1% | \$210B |
| | Total: | \$480B |

Bottom-Line: \$480B in potential store-of-value demand if bitcoin captures small fractions of existing store-of-value assets.

Final Tally

When we add our estimated market capitalization of bitcoin if it captures 10% of common medium-of-exchange uses to our estimate if it captures up to 10% of store-of-value uses, we arrive at a total market-cap of ~\$574.6B.

Table 7. Bitcoin Money Supply Summary 7

| Domain | Domain Penetration | Supply Required |
|-----------------------------|--------------------|-----------------|
| Remittance Market | 10% | \$6.55B |
| Black Market Transactions | 10% | \$25.05B |
| M2 of "Medium" Size Country | 1 Country | \$27.4B |
| Global eCommerce | 10% | \$35.61B |
| Investment Gold | 10% | \$270B |
| HNW "Offshore" Holdings | 1% | \$210B |
| | Total: | \$574.61B |

At full-issuance of 21,000,000 bitcoins, each bitcoin's fair-value would therefore be \$27,381.

Conclusion

Our analysis determines that one bitcoin must be worth \$27,381 in order to support 10% of common medium-of-exchange economic activity, plus well under 10% of existing common store-of-value demand. Whether bitcoin will achieve on the order of 10% market-share for those activities is another analysis entirely; one that is far more subjective, and requires a framework for evaluating both micro and macro economic dynamics, viral technology adoption, network effects, and other domains that are beyond the scope of our analysis.

That said, the following conclusions can be drawn from our analysis above:

- 1) If bitcoin achieves close to 10% market-share of the above uses, it is undervalued by more than an order of magnitude today.
- 2) The bitcoin market is either inefficient, or is assigning a probability of less than 5% for bitcoin to achieve the success-scenarios outlined herein.

Is Bitcoin a bubble?

The answer to this question depends entirely on how much bitcoin adoption, both as a medium of exchange and a store of value, grows in the future. From our analysis, it's clear that there is significant upside if bitcoin does continue to gain market-share.

To arrive at a fair value for today, one must determine the probability that the above 10% market-share "success scenarios" will occur. If we say there's a 10% of this success itself, then a simple analysis (ie, ignoring discount rates and duration), puts a fair value of one bitcoin at $(0.10)(\$27381) = \mathbf{\$2,738}$ today.
