

How Anonymity & The Dark Web Affect Pricing of Cryptocurrency

By: Neal Koch

Table

Introduction	3
Tor	3
Crypto	4
The Dark Web	9
How Anonymity & The Dark Web Affect Pricing of Cryptocurrency	11
Anonymity	11
Illegal Sales on the Dark Web	19
Regulations and Government Interference	22
Conclusion	24

Introduction

In recent history, we have witnessed the phenomenon, known as “cryptocurrency” take the world by storm. Adding a new facet to our economy and our ever increasingly online lives. This new wave of technology has created a way for drug dealers and other criminals to operate in the shadows of the online world and stay out of the range of law enforcement. These cryptocurrencies have been created with a level of anonymity with which modern society has yet to fully grasp. The dark web has continuously created more specific cryptocurrencies for their benefit which has kept law enforcement in a constant state of catching up to these criminals. With these factors, more people have accessed the dark web and have the ability to get cryptocurrencies. Many will access the dark web for opportunities to make money or buy illicit items. The trio of TOR, the dark web, and cryptocurrencies do a superb job of retaining anonymity that law enforcement officials are having a very difficult time keeping up and trying to regulate these activities. Cryptocurrencies have been particularly difficult for the government to get a hold on.

TOR aka The Onion Router

The dark web is a corner of the internet not many of us know or understand. The dark web is a part of the internet that is hidden and created to be inaccessible to the normal browser tools you would find on your computer or laptop such as google, bing, firefox, or internet explorer. To enter the dark web you must download what is called the TOR browser bundle. The

Onion Router, or TOR for short, is the only way to access the dark web. The TOR browser makes the online user indistinguishable from any other TOR user in the eyes of law enforcement or any other kind of hackers. As Bruce Schneier explains “The very feature that makes TOR a powerful anonymity service, and the fact that all Tor users look alike on the internet, makes it easy to differentiate Tor users from other web users. On the other hand, the anonymity provided by Tor makes it impossible for the NSA to know who the user is.”¹ Schneier is describing the “fingerprint” left by a TOR user. While the individual may be impossible to identify a TOR user looks completely different from a normal user so the law enforcement can tell which “fingerprint” is from a TOR browser. Schneier goes on to discuss how the NSA is beginning to be able to attack and stop TOR users involved in illegal activity. But the nature of the constantly evolving internet causes these tactics to become outdated.



Figure 1. The fingerprint on the left is not unlike any normal user on the internet it has distinct features that make it particular to a singular person. The one on the right would be similar to the fingerprint left by a TOR user. Has no

¹ Schneier, Bruce. "Attacking Tor: how the NSA targets users' online anonymity." *The Guardian* 4 (2013).

distinct features which makes it impossible to tell them apart but it is possible to tell who is a TOR user and who isn't.

Cryptocurrencies

Cryptocurrencies started out as a proxy system for online users to transfer money without a way for it to be traced back to them. This is why most 'coins' start off having a very low monetary value. Original owners of bitcoin and other forms of online currencies were not trying to make a profit. They were not looking at it as an investment. It was viewed as a service. Then cryptocurrency entered a phase of investor lust. It was skyrocketing in value and was picked up by many hedge funds and investors as an investment while they try to make a profit. This was not its original purpose. One of the amazing aspects of cryptocurrencies is that the internet is constantly making more of them. The buyers and sellers of drugs and other illegal items on the internet have consistently created more and different cryptocurrencies for their purposes. Many cryptocurrencies values are not inflating the way Bitcoin and other big name currencies are but some have been much more volatile. This is because of how competitive the marketplace of illegal goods and services are, users carry such a risk that they have to use the best form, which often means the most recent form, of anonymity at all times.

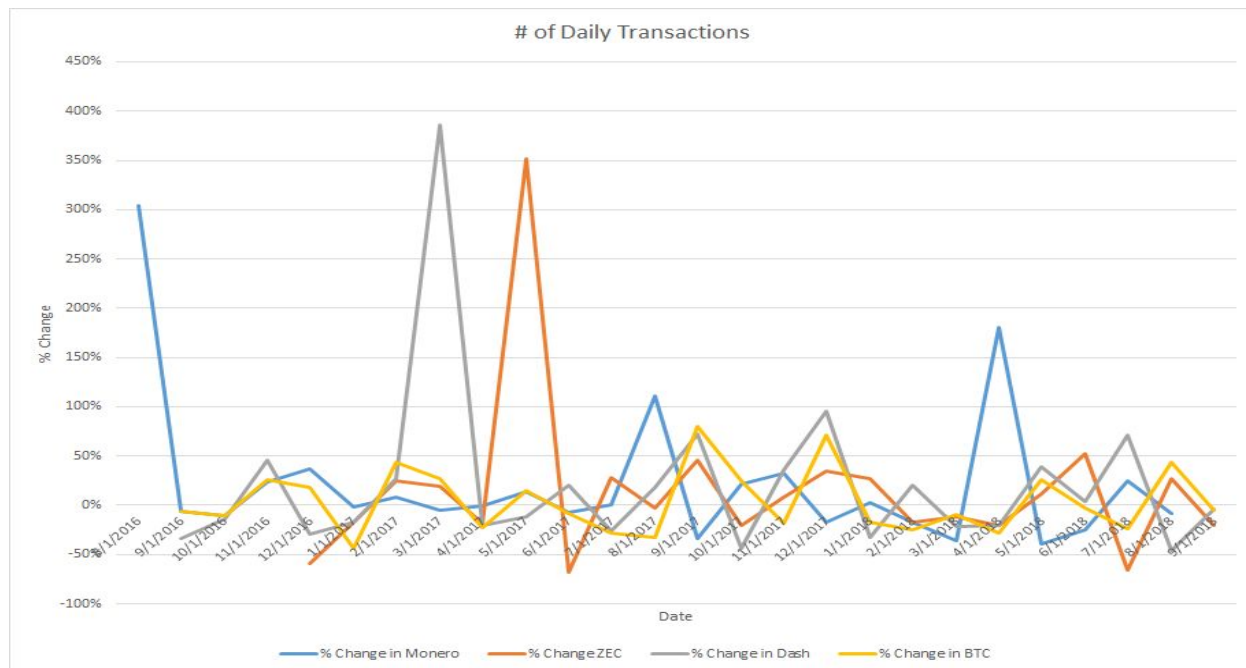


Figure 2. Illustration of the percent change in the average daily transactions month to month for 3 anonymous cryptocurrencies, Monero, Zcash and Dash with Bitcoin as a constant example since it is the most mainstream.

The anonymous based coins are significantly more volatile in the amount they are used. This is because they are constantly evolving and implementing new features to please the dark web and make them more attractive to be used by people who need to stay anonymous. One of the upticks was for Dash (grey) one possible reason for this was that Dash had eclipsed the ‘Petahash’ barrier. This means it was much easier to mine and create one of these coins rather than buy it from someone else. “Hash rate can be defined as the speed at which a given mining machine operates. Crypto mining involves finding blocks through complex computations. The blocks are like mathematical puzzles.” Jordan Tuwiner describes in detail what the ‘Hash rate’ is and how it applies to mining “The mining machine has to make thousands or even millions of

guesses per second to find the right answers to solve the block.”² What appears to have happened was that dark web users began mining the coin and creating it. Therefore taking out one step that could get them caught, exchanging other cryptocurrency for Dash, and trading the newly created dash for products or services. As an example Bitcoin passed the same barrier and saw nothing close to this kind of uptick in 2013.

The cryptocurrency market is constantly changing and evolving. The crypto market place sees each cryptocurrency act as an independent firm.³ These coins change and evolve due to what is best for that particular coin and the people who use it. I will discuss Navcoin later in this paper. I go on to talk about a new mechanic their coin offers called Navtech polymorph. I will go into detail what that exactly is on pages 13-14. But, Navcoin saw itself an opportunity to jump into the forefront of money laundering and illegal trade business and they took it. These coins are essential businesses run by the programmer's who created them and hold the most coins. If a business was to see an opportunity to jump in and take market share they would. That is exactly what happens with these coins. On top of this new coins are created everyday with very specific codes that make them different and useful for certain tasks.

Cryptocurrencies like Bitcoin use blockchain technology to their advantage which has garnered a lot of attention. Christian Cachin gives an overview of Blockchain in *Architecture of the Hyperledger Blockchain Fabric* “In a ‘permissionless’ blockchain such as the one underlying the Bitcoin cryptocurrency, anyone can operate a node and participate through spending CPU

² Tuwiner , Jordan. “What Is Hash Rate?” *21+ Ways to Buy Bitcoins Online 2018 (Trusted Exchanges)*, 30 June 2018, www.buybitcoinworldwide.com/mining/hash-rate/.

³ Gandal, Neil, and Hanna Halaburda. "Can we predict the winner in a market with network effects? Competition in cryptocurrency market." *Games* 7.3 (2016): 16.

cycles and demonstrating a ‘proof-of-work.’”⁴ Blockchain works as the community holding each other accountable. Every transaction is logged on computers all over the world to form one, completely accurate transaction history. It is impossible to change the “blocks” without every other computer viewing the chain seeing this happening. This does not mean it is impossible to steal cryptocurrencies. Using proxy systems a thief can steal cryptocurrencies and the chain would see it but it would be impossible to tell where they have gone. It is not foolproof but it is an amazing technology that is in its infancy and has created the surge of cryptocurrencies being made and the consumer confidence that has risen the value of said cryptocurrencies. Anonymous Cryptocurrencies have taken the blockchain idea and created their own anonymous private blockchains in which the user is hidden but the transaction is not. See page 8-9 for more on this topic.

Monero is another perfect example of specification. Bitcoin was created as a decentralized currency with a blockchain that was open to the public for reasons of insurance. One could look back and provide proof that they gave another user Bitcoin. Monero was created for anonymity.⁵ The creators realized Bitcoin was a good idea however it needed some added layers of privacy and Monero was born. Monero is almost completely anonymous to outside users. Similar to Navcoin but has more layers of added protection.

Growing Specification is important because it has been leaning towards the dark web and criminal side of change and innovation. There has been much more innovation on the side of anonymity rather than the side of open public blockchains. This indicates the market is favoring

⁴ Cachin, Christian. "Architecture of the Hyperledger blockchain fabric." *Workshop on Distributed Cryptocurrencies and Consensus Ledgers*. 2016.

⁵ Möser, Malte, et al. "An empirical analysis of traceability in the monero blockchain." *Proceedings on Privacy Enhancing Technologies* 2018.3 (2018): 143-163.

anonymity to open blockchains. That is not to be surprising as “Anonymity is important for the possibility of democracy. Anonymity provides space for people to think and voice opinions that are against the grain.”⁶ Eric Jardine discusses this in his piece *The Dark Web Dilemma: Tor, Anonymity and Online Policing*. He goes on to state how the dark web is constantly changing because there is a market for illegal products such as drugs weapons and illegal pornography. Jardine also expresses how there are chat rooms on the dark web dedicated to ‘activism’ along with other forms of social protest that people want to keep anonymous.⁷

The Dark Web

The Dark Web is a place on the internet where only the most tech savvy users can enter. As stated above you need a TOR browser to enter and partake in the Dark web. This section of the internet was created mainly for the purpose of buying and selling illegal items. This paper will be focusing the sale of drugs in particular, but everything from people to classified government documents and information are sold on the dark web. This has produced a solid marketplace and demand for these anonymous coins. Jamie Bartlett interviewed a top tier computer hacker who they called “Amir” and he had a lot to say about Bitcoin and the dark web as a whole. “Amir shouts ‘Bitcoins are a political project’” Amir continues ““The government is just one big bunch of gangsters! You can’t placate gangsters! Right now it’s us who have the initiative. And we are not going to give it back.”” The article goes on to say “For people like

⁶ Jardine, Eric. "The Dark Web dilemma: Tor, anonymity and online policing." *Global Commission on Internet Governance Paper Series* 21 (2015).

⁷ Jardine, Eric. "The Dark Web dilemma: Tor, anonymity and online policing." *Global Commission on Internet Governance Paper Series* 21 (2015).

Amir, Bitcoins are the front line in a bigger battle over the right to anonymity and freedom online.”⁸ Amir wanted cryptocurrencies to stay in control of the internet and dark web users. Now it seems as if they have lost control and bigger industries and investors now have control over the value of Bitcoin and subsequently drained its value. This is one of the reasons why the dark web has continued to create different currencies which have not been touched by hedge funds and other investors. Alexia Maddox and Monica J Barrett agree with “Amir” as they discuss activism in the dark web community in their paper *Constructive activism in the dark web: cryptomarkets and illicit drugs in the digital ‘demimonde’*. They conducted “Ethnographic exploration” into people who buy and sell drugs on the dark web. They found that not only did the dark web’s anonymity attract drug dealers but it also attracted political activists. The anonymity of the dark web brought people who wanted to have conversations without fear of persecution. Alongside drug trafficking and other horrible things, there are deep political conversation and activism occurring on the dark web. This article illustrates how a tech savvy generation looking for new ways to communicate and express themselves without fear of government intervention may turn to the dark web as a way to express themselves.

In recent years governments have taken an even closer look into the dark web because of increased terrorist activity. They use the anonymous nature of the dark web to communicate with other terrorists around the globe. Terrorists have been online since the early 1990’s but it wasn’t until recently that they have moved into the dark web. After the attacks in Paris in 2015 Islamic propaganda and claims of victory in the attack popped up all over the dark web.⁹ Not only are Terrorists communicating through the dark web they are also recruiting. As in recent years it is

⁸ Bartlett, Jamie. *The Dark Net: inside the Digital Underworld*. b Melville House, 2016.

⁹ Weimann, Gabriel. "Terrorist migration to the dark web." *Perspectives on Terrorism* 10.3 (2016).

growing harder to enter the US from abroad they are using videos and messages trying to recruit US citizens to join their cause.¹⁰ This is another example of how the Dark web is changing and evolving. It is evolving for the worse and governments need to keep up as it is becoming more and more specified. This quote from the conclusion of *The Tor Dark Net* sums up this growing specification well “It is technically possible to block Tor, although it is likely that the Tor Project will deploy countermeasures resulting in the endeavour descending into a cat-and-mouse game of “circumvent-and-censor.” In any case, Tor does not provide the absolute impunity that is often attributed to it.”¹¹

The fluidity of the Dark Web is an interesting factor to take into account when we look towards the crypto coins that are being used in this sector of the internet. These sites come and go very quickly and these sites vary in the coins that they accept so the market share for these coins is constantly changing. This is one explanation for the graph illustrated in Figure 2. “Our research also finds that drugs platforms exit and get closed down for different reasons. As the online drugs markets have emerged and grown rapidly, they have attracted attention from both the media and law enforcement agencies.” Stephen Machin and V Bhaskar discuss this fluidity in this online space in their piece *Dark web: The economics of online drugs markets*, they go onto say “As a result, some have been seized and shut down. Others have undertaken exit scams and run off with the money they were holding (in Bitcoins often running into millions of pounds). Thus, the market has become characterised by platform (and seller) entry and exit. It is interesting to consider whether this has had a deterrent effect on potential buyers and sellers.” They later in the paper state how this has not deterred these buyers or sellers. “Despite high

¹⁰ Weimann, Gabriel. "Terrorist migration to the dark web." *Perspectives on Terrorism* 10.3 (2016).

¹¹ Owen, Gareth, and Nick Savage. "The Tor dark net." (2015).

turnover of the platforms that host the buyers and sellers of drugs, the online drugs market seems resilient.”¹² Even if these dark web sites steal money or get shut down and the sellers lose money or product it is still a far greater risk selling drugs in person as that can land the seller in a long prison term. This is why through the rise and fall of the cryptocurrency market the dark web market has remained unchanged because it is still far more preferable for buyers and sellers.

Anonymity

There are several coins that have a focus on anonymity and the list is ever growing but the main ones that will be the focus of this paper are Monero, Dash, PIVX, Zcash and Navcoin. All of these coins have specific hardware that makes them anonymous. The updates and creation of new hardware to these cryptocurrencies is what causes the fluctuations in price and usage. To the public Bitcoin is the most volatile cryptocurrency, this sentiment is wrong, the anonymous crypto coins are far more volatile. It is important to understand who is creating these coins, and why they are being created. Jeff Kauflin hits on this in his article in Forbes by stating “They’re not financial planners or investors—they’re developers and engineers.”¹³ These are people who for the most part are only concerned with the mechanics of the coin online and not about the financial ripple effects they create. That is pivotal as these coins become more and more influential and are worth increasingly high amounts of money. This is evident in ICO’s which are exactly like IPO’s but instead of stocks they are with cryptocurrencies. The heads of these coins,

¹² Bhaskar, V., Robin Linacre, and Stephen Machin. "Dark web: The economics of online drugs markets." *LSE Business Review Blog* (2017).

¹³ Kauflin, Jeff. "Where Did The Money Go? Inside the Big Crypto ICOs of 2017." *Forbes*, Forbes Magazine, 1 Nov. 2018, www.forbes.com/sites/jeffkauflin/2018/10/29/where-did-the-money-go-inside-the-big-crypto-icos-of-2017/#1c8ed4d7261b.

more times than not, are engineers and developers with no background in running a company or asset management. Then, they get capital as the coin is ready to be purchased and often times they are stuck with the money. Often times they are not sure how to manage it properly and will run their coin into the ground.

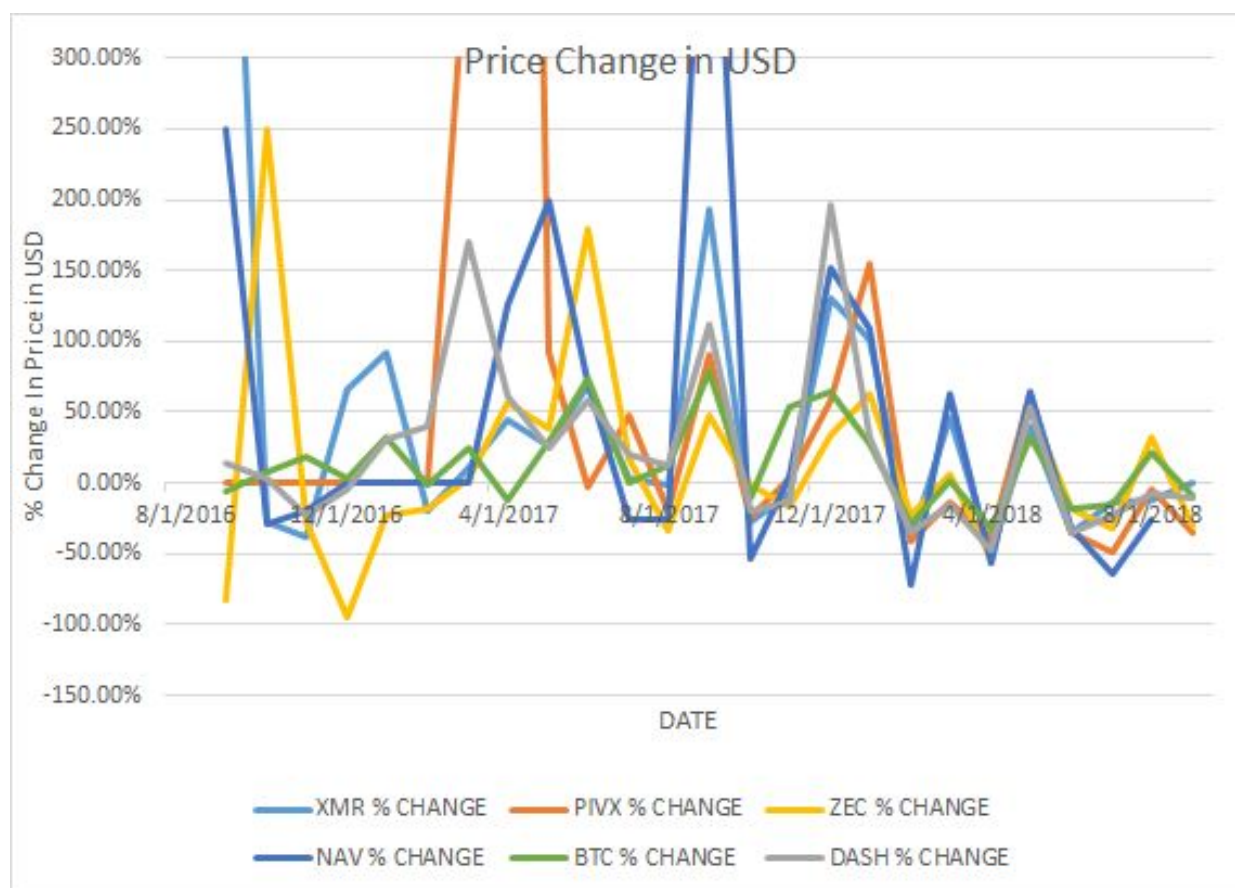


Figure 3. Graphically illustrates the percent change in price from month to month. Bitcoin (Green) is the constant as it is mainstream and not anonymous. It is capped at 300% change because XMR (Monero), NAV (Navcoin) and PIVX shot up so much that it skewed the entire graph and the smaller movements were not visible.

An interesting point on this graph is in August of 2017 right before Nav's big jump in price. They had just implemented Navtech polymorph which enhanced Navcoin's ability to be used on the dark web. It operates on two blockchains. While Bitcoin's blockchain public

Navcoin's is not, it is private and encrypted so its anonymous. Hypothetically if I want to buy illegal drugs on the Dark Web I go onto a website and would try and find a users who is selling what I want. I find 'Mr.X' and 'Mr.X' has a price of \$3000 for the product I want. Bitcoin is the easiest cryptocurrency to exchange for cash or to buy legitimate items with so most likely Mr.X would prefer it to be in Bitcoin however that is very very traceable. What Navtech polymorph does is it will operate on two seperate blockchains. Navcoin's own private one and Bitcoins public one. I would put in the the amount of bitcoin that is equal to the asking price and it would transfer it to Navcoin so the blockchain that everybody can see just saw I traded Bitcoin for Navcoin. Then the navcoin transfers to 'Mr.X' and he can redeem it seconds later therefore getting very close to if not the exact agreed upon price. The interpersonal transaction is hidden in the private blockchain of Navcoin therefore making it impossible to trace. What makes this special is the speed at the transactions take place. Usually a transaction with Bitcoin could take half an hour or 15 mins but in this field the price can change very drastically in minutes so one would lose value if they went to redeem it back in half an hour once it is able to happen at seconds it is much more efficient. But when they implemented that their price went thru the roof illustrating that the dark web draw of it really affected the price.

Cryptocurrencies have been particularly difficult for the government to get a hold on. Omri Y Marian's piece talks about how would be tax evaders are now leaving foreign governments and old ways of tax evasion for cryptocurrencies. Marian discovered the relationship between the ever constricting tax laws with the rise of value and popularity of cryptocurrencies. The article goes on to speak on how governments are slowly starting to look into the issue bet have yet to realize how large the potential problem could be with a young

generation who is incredibly tech savvy and the law enforcement cracking down on the old ways of evading taxes. If this goes unchecked it could result in huge losses in tax revenue for countries around the world. In another article focusing on cryptocurrencies ¹⁴Neil Gandal and Hannah Halaburda look at how network effects affect competition among the different cryptocurrencies. They look at the exchange rate between the different cryptocurrencies and the situations they are used. They found that network effects play a large role among the different kinds of cryptocurrencies. Gandal and Halaburda go on to state that since they all have different values and are constantly interacting with each other they create competition between each other and they act as independent firms.¹⁵ As a result these cryptocurrencies will be constantly getting better for their individual tasks. In their article the pair discusses how different cryptocurrencies are starting to be suited for different tasks and are becoming specialized. If this is the case then the competition in the niche markets of each area of the dark web will produce the best cryptocurrencies for each scenario. This is one of the reasons why law enforcement is always playing catch up to these cryptocurrencies. The competition between them forces these online currencies to change and evolve and become better, and if they cant a new cryptocurrency will be created that can evolve and be better which we have seen. The dark web is constantly creating new types of cryptocurrencies while they aren't as valuable as bitcoin or other large profile cryptos they are becoming specialized. This fact puts law enforcement at a severe disadvantage and is one of the reasons why cryptocurrencies have been able to stay one step ahead of law enforcement.

¹⁴ Marian, Omri Y., Are Cryptocurrencies 'Super' Tax Havens? (October 1, 2013). 112 Michigan Law Review First Impressions 38 (2013).

¹⁵ Gandal, Neil, and Hanna Halaburda. "Can we predict the winner in a market with network effects? Competition in cryptocurrency market." *Games* 7.3 (2016): 16.

As cyrcptocureecnies have been taking steps to remain anonymous and ahead of law enforcement the dark web has been following suite and doing the same. Julia Buxton and Tim Bingham write about the rise of dark web drug markets and the challenges traditional law enforcement face in trying to keep up with the sophistication of the trading abilities of the dark web. They look at the timeline of illicit trade on the internet and how slow law enforcement and government have been historically to stop and fight it. The pair concludes that these hidden drug markets are due to have an exponential increase in traffic and sales due to multiple factors. One of which being the new generation that has grown up with computers and who are technology superior to their predecessors.¹⁶ Another reason would be the ease of security tools to protect your identity online. Lastly, and most importantly, the international demand for illegal drugs. The pair agree, unless law enforcement and governments take serious action to deter dark web use, the increasing knowledge gap between the generations paired with the rapidly increasing demand for drugs around the world will result in a massive boom for the dark web and drug trading industry.

Privacy and anonymity are becoming more important in our ever-increasingly digital world. For many people, even those with nothing to hide, privacy is becoming a massive issue. Alessandro Acquisti, Curtis Taylor, and Liad Wagman tackle this topic in their work titled *The Economics of Privacy*. The group states “The ascent of the so-called web 2.0 (Blogs, social media and online social networks) has rendered individuals no longer mere consumers of information but public producers of often highly personal data.”¹⁷ It is apparent that everyday

¹⁶ Buxton, Julia, and Tim Bingham. "The rise and challenge of dark net drug markets." *Policy Brief 7* (2015).

¹⁷ Acquisti, Alessandro, et al. "The Economics of Privacy." *Journal of Economic Literature*, 2016, www.aeaweb.org/articles?id=10.1257%2Fjel.54.2.442.

citizens are now more than ever worried about their privacy. Cryptocurrencies allow for these people to have an outlet for their money that cannot be traced. Not only are people with nefarious intentions willing to pay a premium for privacy, more and more ordinary people are willing to as well. The three go on to say “The protection and disclosure of personal data are likely to generate trade-offs with tangible economic dimensions.”¹⁸ In recent years a market for big data and datasets of the public's information has been created and is booming. These large companies have been sharing user data with each other in exchange for other data or goods they desire. In a piece written by Alexis Madrigal, she discusses the market for big data from the public. “Microsoft’s search engine, Bing, got Facebook users’ friends, whether or not the users agreed to grant that access. Netflix and Spotify got access to users’ messages. Amazon got names and contact information. And, of course, Facebook got things in return. The *Times* states that Facebook used data from other companies, including Amazon, in its ‘People You May Know’ feature, which has long attracted attention for its mysterious suggestions.”¹⁹ While all this sharing make for a more user friendly experience many people were not thrilled at the idea that these companies were treating their personal information like trading cards. This has led to a rise, in the public’s eyes, in the importance of anonymity.

¹⁸ Acquisti, Alessandro, et al. “The Economics of Privacy.” *Journal of Economic Literature*, 2016, www.aeaweb.org/articles?id=10.1257%2Fjel.54.2.442

¹⁹ Madrigal, Alexis C. “Facebook Didn't Sell Your Data; It Gave It Away.” *The Atlantic*, Atlantic Media Company, 20 Dec. 2018, www.theatlantic.com/technology/archive/2018/12/facebooks-failures-and-also-its-problems-leaking-data/578599/.

Illegal Sales

What the Dark web is infamous for is the sale of illegal goods. The tool that is used by the dark web to transfer value is cryptocurrency. There have been countless sites set up for these trades from Silk Road to the Hidden Wiki. It is incredibly hard to obtain numbers of pure sales from these sites as it is mainly anonymous for the buyer and sellers protection. Christian Janze writes that we can tell that these coins are in fact being used for illegal transactions. "Specifically, our findings suggest that both transactions within the Bitcoin blockchain as well as the usage of transaction obfuscation services can be related to previous sales on darknet markets."²⁰ It is exponentially harder to find the amount that is being traded. One metric that is obtainable however is the number and classification of shutdown sites on the dark web.

²⁰ Janze, Christian. "Are cryptocurrencies criminals best friends? Examining the co-evolution of bitcoin and darknet markets." (2017).

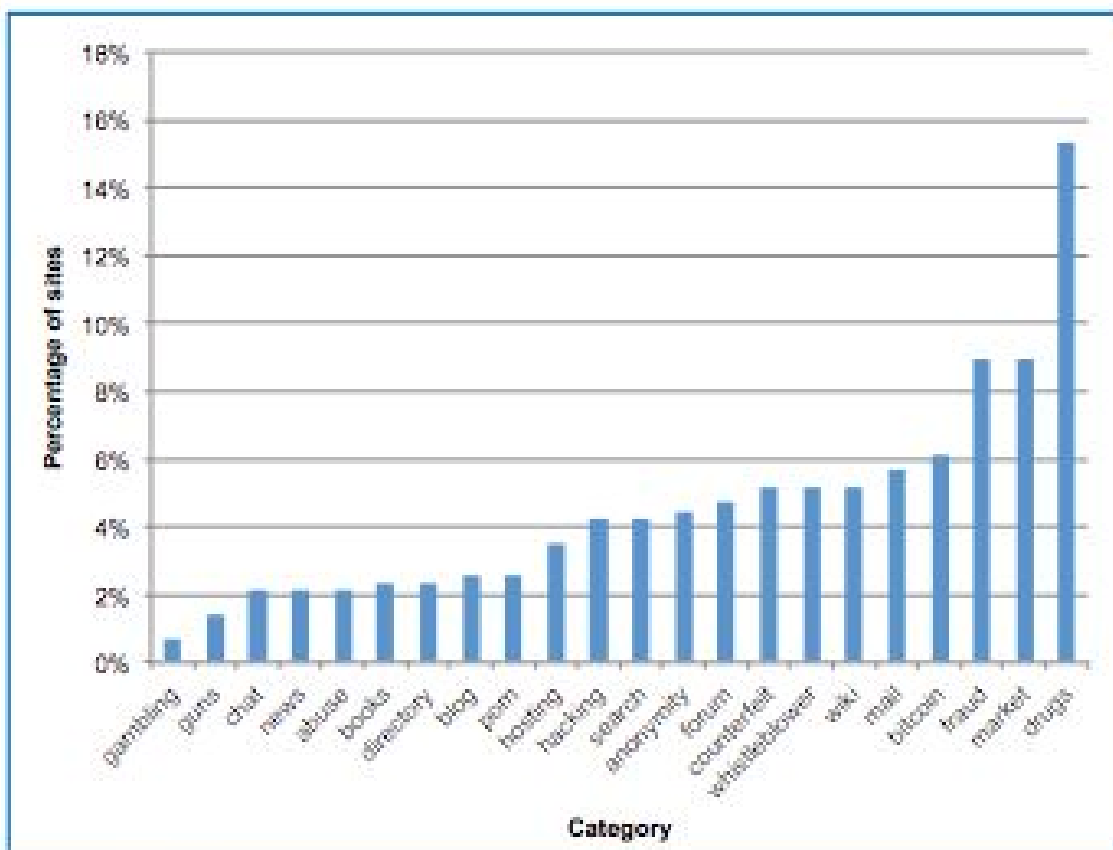
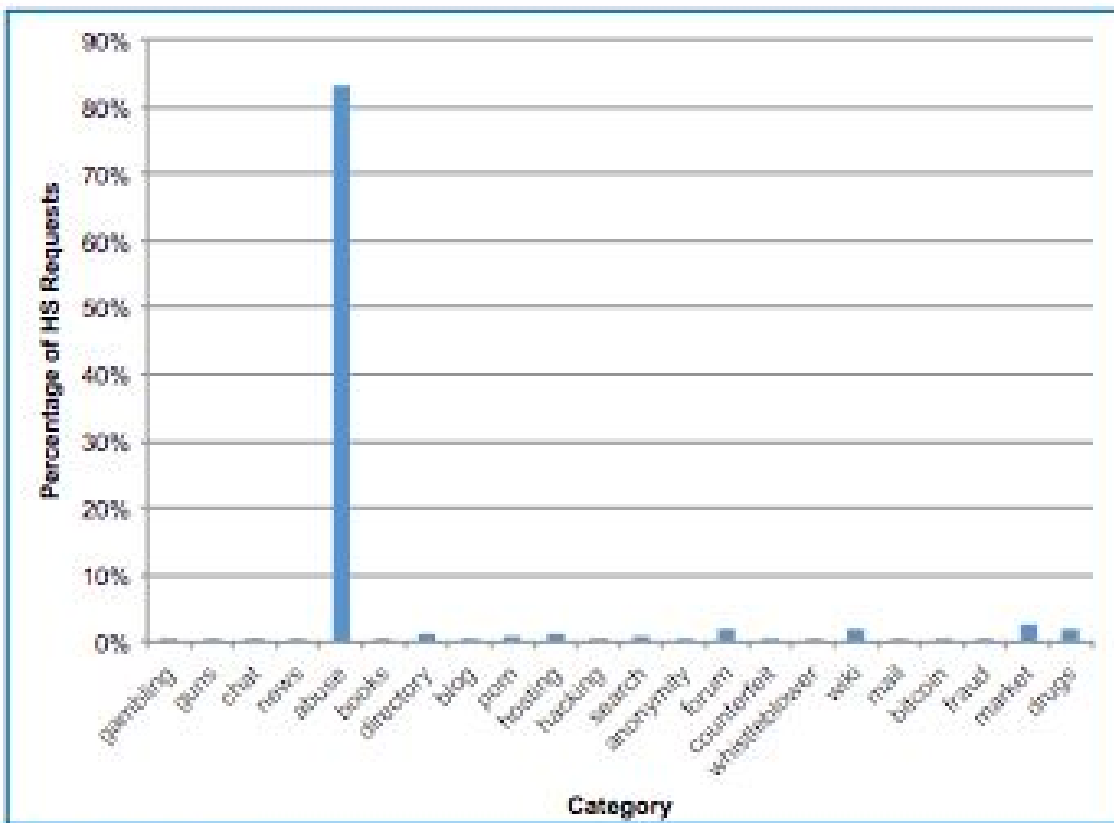


Figure 4: Taken from *The Tor Dark Net* (2015) written by Gareth Owen and Nick Savage. This graph divides all the found sites on the dark web and divides them into categories then illustrates the percentage of each category compared to the others. Drugs is the biggest category with a little over 15% of the dark web being sites where you buy drugs.²¹

As you can see from Figure 4 above, drug dealing sites control the market share of websites on the dark web. However Figure 5 will paint a different, much more disturbing, picture.

²¹ Owen, Gareth, and Nick Savage. "The Tor dark net." (2015).



Source: Authors.

Figure 5: Also taken from *The Tor Dark Net* (2015) written by Gareth Owen and Nick Savage. This illustrates the percent of the HS requests for each category compared to each other. This illustrates what people are looking for when they enter the Dark web.²²

HS requests are the Dark Web equivalent of Google searches for the normal internet. While Figure 4 shows us that there are more Drug dealing sites than any other category on the dark web, the overwhelming holder of the dark web market share is the abuse category. The Abuse category is full of illegal child pornography and other disgusting acts of violence towards others. While it is assumed that the dark web is mainly used for distribution of drugs or terroristic ideas and videos, in actuality it is far worse. The pair of Owen and Savage went on and

²² Owen, Gareth, and Nick Savage. "The Tor dark net." (2015).

broke down the numbers in their paper. Over the span of twelve days one Child Abuse site named ‘Censored’ had 168,152 search results a day. Totalling over two million search requests for the site in less than two weeks. In comparison the most infamous dark web site to the public, named ‘Silk Road’ had 8,067 search results per day for eleven days. Totalling 88,737 search results in eleven days. Both sites have since been shut down.²³ While it is unclear which cryptocurrency was being used to pay for these videos it is more than likely Navcoin or Monero as they are nearly exclusively used for drug transactions for their level of anonymity.

Regulation and Government Interference

There is precedent when it comes to governments not allowing a foreign currency to enter the market. For example Cambodia, in 2017, tried to eliminate the US Dollar from circulation in their economy. “‘If we don’t have our own currency, can we call it our own country?’ CNRP spokesman Yim Sovann”²⁴. Likewise, Syria in 2013 also tried to ban all foreign currency but mainly the US dollar in business deals.²⁵ While these are mainly tangible and physical forms of currency, the same goes for Bitcoin and cryptocurrency. However not many countries have tried to ban Bitcoin (12 in total Algeria, Bangladesh, Bolivia, Ecuador, Iceland, Indonesia, Kyrgyzstan, Macedonia, Nepal, Russia, Thailand, and Vietnam and restricted in three others China, India, and Jordan). This may be for several reasons, being that it is online meaning that it

²³ Owen, Gareth, and Nick Savage. "The Tor dark net." (2015).

²⁴ O’Byrne, Brendan. “Economists Assail Opposition Proposal to Ditch US Dollars.” *The Cambodia Daily*, 15 June 2017, www.cambodiadaily.com/news/economists-assail-opposition-proposal-to-ditch-us-dollars-131307/.

²⁵ Barnard, Anne. “Syria Bans Use of Foreign Currencies for Business Deals.” *The New York Times*, The New York Times, 19 Oct. 2018, www.nytimes.com/2013/08/05/world/middleeast/syria-bans-use-of-foreign-currencies-for-business-deals.html.

is harder to crack down on, or that countries don't see it as much of a threat as the world Standard of the US Dollar. It could just as well be strictly political reasons, they don't see cryptocurrency as another country's interference in their economy as some would see the US Dollar.

This by no means indicates that it's impossible to ban Bitcoin and other cryptocurrencies. Joshua R. Hendrickson and William J Luther discuss a formula and a way to ban Bitcoin in countries across the Globe. "A ban on bitcoin is a policy in which the government not only refuses to accept bitcoin in transactions, but also punishes any individual it detects using bitcoin. In other words, there are two elements to a ban: a transactions policy and a punishment policy."²⁶ Through strict punishments, governments can sway the average citizen to value their freedom more than using this electronic currency. However this doesn't take into account the users using cryptocurrency for criminal purposes. If these people get caught committing crimes they will most likely get jail time, so they will better their odds at not getting caught by risking a little more jail time. This is where governments run into trouble. Yes they want to stop the usage of a volatile currency because they stand at risk of losing money in exchanges. But mainly, they want to stop criminal activity and cryptocurrency is being used as a device to expedite the criminal process. It is possible to sway the average citizen to stop using cryptocurrency, it is a lot harder to stop criminals with laws and punishments since they already are breaking the laws in the first place. The only way governments can get a grasp on cryptocurrency is to stay as close to one step ahead as they can get. But as previously stated the dark web and cryptocurrency is ever evolving so it will prove to be a very challenging task over the coming years.

²⁶ Hendrickson, Joshua R, and William J Luther. "Banning Bitcoin." *Journal of Economic Behavior & Organization*, North-Holland, 11 July 2017, www.sciencedirect.com/science/article/pii/S0167268117301798#bbib0100.

Conclusion

Cryptocurrency and the dark web co-exist and depend on one another. While in recent history the financial market has seen an opportunity to invest and profit from cryptocurrency, the main purpose was and will be to facilitate transactions on the dark web. Janze understands the codependency and discusses it in his paper “From a theoretical perspective, our study provides first empirical evidence on the co-evolution of Bitcoin and darknet markets as two emergent phenomena in information systems research.”²⁷ These two have grown and changed alongside one another. As time has gone on there has been a hyper focus on anonymity. While many think it is bulletproof anonymity Owen and Savage beg to differ. “There is a misunderstanding of how Tor works and some nations have attempted naive approaches that have, predictably, failed. There are many effective approaches to blocking Tor and the problem of building a truly censorship-resistant network is presently an open one.”²⁸ As technology advances we will see how the market increasingly favors anonymity. Anonymity and the Dark Web directly affect the pricing of cryptocurrency. I believe as this field grows and attracts more attention we will be able to get a better look into this mysterious market.

²⁷ Janze, Christian. "Are cryptocurrencies criminals best friends? Examining the co-evolution of bitcoin and darknet markets." (2017).

²⁸ Owen, Gareth, and Nick Savage. "The Tor dark net." (2015).

Works Cited

- Acquisti, Alessandro, et al. "The Economics of Privacy." *Journal of Economic Literature*, 2016, www.aeaweb.org/articles?id=10.1257%2Fjel.54.2.442.
- Afilipoaie, Alois, and Patrick Shortis. "From dealer to doorstep—how drugs are sold on the dark net." *Global Drug Policy Observatory Situation Analysis*. 2015.
- Barnard, Anne. "Syria Bans Use of Foreign Currencies for Business Deals." *The New York Times*, The New York Times, 19 Oct. 2018, www.nytimes.com/2013/08/05/world/middleeast/syria-bans-use-of-foreign-currencies-for-business-deals.html.
- Bartlett, Jamie. *The Dark Net: inside the Digital Underworld*. b Melville House, 2016.
- Bhaskar, V., Robin Linacre, and Stephen Machin. "Dark web: The economics of online drugs markets." *LSE Business Review Blog* (2017).
- Böhme, Rainer, et al. "Bitcoin: Economics, Technology, and Governance." *The Journal of Economic Perspectives*, vol. 29, no. 2, 2015, pp. 213–238
- Buntinx, JP. "6 Best Performing Currencies of Q1 2017." *The Merkle*, themerkle.com/6-best-performing-currencies-of-q1-2017/.
- Buxton, Julia, and Tim Bingham. "The rise and challenge of dark net drug markets." *Policy Brief 7* (2015).
- Cachin, Christian. "Architecture of the Hyperledger blockchain fabric." *Workshop on Distributed Cryptocurrencies and Consensus Ledgers*. 2016.
- Dierksmeier, Claus, and Peter Seele. "Cryptocurrencies and business ethics." *Journal of Business Ethics* (2016): 1-14.
- Gandal, Neil, and Hanna Halaburda. "Can we predict the winner in a market with network effects? Competition in cryptocurrency market." *Games* 7.3 (2016): 16.
- Greenberg, Andy. "Monero, the Drug Dealer's Cryptocurrency of Choice, Is on Fire." *Wired*, Conde Nast, 3 June 2017, www.wired.com/2017/01/monero-drug-dealers-cryptocurrency-choice-fire/.
- Halaburda, Hanna and Gandal, Neil, Competition in the Cryptocurrency Market (September 30, 2014). NET Institute Working Paper No. 14-17

- Hayes, Adam, What Factors Give Cryptocurrencies Their Value: An Empirical Analysis (March 16, 2015)
- Hayes, Adam S. "Cryptocurrency value formation: An empirical study leading to a cost of production model for valuing bitcoin." *Telematics and Informatics* (2016).
- Hendrickson, Joshua R, and William J Luther. "Banning Bitcoin." *Journal of Economic Behavior & Organization*, North-Holland, 11 July 2017, www.sciencedirect.com/science/article/pii/S0167268117301798#bbib0100.
- Janze, Christian. "Are cryptocurrencies criminals best friends? Examining the co-evolution of bitcoin and darknet markets." (2017).
- Jardine, Eric, The Dark Web Dilemma: Tor, Anonymity and Online Policing (September 30, 2015). Global Commission on Internet Governance Paper Series, No. 21.
- Kauflin, Jeff. "Where Did The Money Go? Inside the Big Crypto ICOs of 2017." *Forbes*, Forbes Magazine, 1 Nov. 2018, www.forbes.com/sites/jeffkauflin/2018/10/29/where-did-the-money-go-inside-the-big-crypto-icos-of-2017/#1c8ed4d7261b.
- Lewis, John. "Bitesize: The Very Volatile Value of Cryptocurrencies." *Bank Underground*, 23 Aug. 2017, .
- Maddox, Alexia, et al. "Constructive activism in the dark web: cryptomarkets and illicit drugs in the digital 'demimonde'." *Information, Communication & Society* 19.1 (2016): 111-126.
- Madrigal, Alexis C. "Facebook Didn't Sell Your Data; It Gave It Away." *The Atlantic*, Atlantic Media Company, 20 Dec. 2018, www.theatlantic.com/technology/archive/2018/12/facebooks-failures-and-also-its-problems-leaking-data/578599/.
- Marian, Omri Y., Are Cryptocurrencies 'Super' Tax Havens? (October 1, 2013). 112 Michigan Law Review First Impressions 38 (2013).
- Möser, Malte, et al. "An empirical analysis of traceability in the monero blockchain." *Proceedings on Privacy Enhancing Technologies* 2018.3 (2018): 143-163.
- O'Byrne, Brendan. "Economists Assail Opposition Proposal to Ditch US Dollars." *The Cambodia Daily*, 15 June 2017, www.cambodiadaily.com/news/economists-assail-opposition-proposal-to-ditch-us-dollars-131307/.

Owen, Gareth, and Nick Savage. "The Tor dark net." (2015).

Schneier, Bruce. "Attacking Tor: how the NSA targets users' online anonymity." *The Guardian* 4 (2013).

Tuwiner , Jordan. "What Is Hash Rate?" *21+ Ways to Buy Bitcoins Online 2018 (Trusted Exchanges)*, 30 June 2018, www.buybitcoinworldwide.com/mining/hash-rate/.

Weimann, Gabriel. "Terrorist migration to the dark web." *Perspectives on Terrorism* 10.3 (2016).

Wright, Aaron and De Filippi, Primavera, *Decentralized Blockchain Technology and the Rise of Lex Cryptographia* (March 10, 2015).