The Impact of Cryptocurrency on Economies

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[Abstract] Cryptocurrency is a new and unique form of money, which is significantly different than other forms of digital money. Some of the differences are decentralized system, lack of the third party, and the scope. In this research paper, many worries surrounding the development of cryptocurrency were summarized into two big parts: money laundering and double spending problem. First, unique characteristics of cryptocurrency that incentivize people to do money laundering were identified. Currently, the value of cryptocurrency is too unpredictable and isn't used widely enough. With such instability, people tend to not launder their money. However, it is expected that such problem might get exaggerated if cryptocurrency gets highly adopted to the global economy. Second, since cryptocurrency is a form of digital money, double spending problem is inevitable. Double spending is an issue unique to digital currencies, in which the same single digital token can be spent more than once, duplicated or falsified. Double spending problem hinders cryptocurrency to be used as an alternative form for fast payment. Many mechanisms and devices are currently being developed to prevent it, such as enhanced observers (ENHOBS). Correlation between the growth of global GDP (GDP of G20) and the growth of economic scale of cryptocurrency was statistically determined. The result showed that they don't have a significant correlation. Lastly, economic impacts of using cryptocurrency were discussed. Three major points were the possible benefits, good and bad impacts, and the implementation of cryptocurrency despite its possible problems.

[keyword] Cryptocurrency, Economic growth, Money Laundering, Double Spending, Blockchain, Financial system, ENHOBS, Investment
Introduction

Cryptocurrency has a completely different form of organization and program compared to the traditional form of currency. By nature, cryptocurrency fluctuates significantly with market. It is dependent on the intensity of demands and the supply. Under this system, citizens became dominant in the economy rather than central government. Although cryptocurrency may seem new and innovative, there was a different type of online currency called ‘digital money’ before. Cryptocurrency is much different than the pre-existing ‘digital money’. The original digital money couldn’t be independent; it was only used to purchase intangible objects online and in mobile. Thus, digital money was dependent on the company that made it and was limited in use. So, usage of digital money online was restricted to certain networks. In addition, it needed a sort of identity verification. To verify, one must bring in a credit card or a photo ID.

Cryptocurrency, on the other hand, has limitless usage and no restriction. Like regular currency, cryptocurrency itself has a value. In another word, cryptocurrency is equal to the original money of merchandise or fiat money. For example, let’s say you are purchasing a gift card. You are only allowed to spend that gift card at the given store. However, cryptocurrency is like a real currency, so you can spend on any store. It is the same concept as foreign exchange transaction. If simply exchanged or approved for use, it can be exchanged without any services.

Another difference is centralization. Digital money has a specific origin (the company), and if the company thinks that someone is using digital money for money laundering or fraud, they can simply cancel or pause the transaction. However, cryptocurrency has no special restrictions.

So, if there was a fraud, it is the responsibility of the trader. One of cryptocurrency’s characteristic is that no third party can be part of the transaction. The DAO hacking incident is a good example of this characteristic. $60,000 dollars were missing from The DAO because hackers programmed an automatic contract code. Although the hackers’ crime was recognized, due to cryptocurrency’s characteristic and its identity, currency owners couldn't do anything.

In short, there are three main differences between digital money and cryptocurrency: centralization, third party intervention, and its value as currency.

Cryptocurrency and Money Laundering

Economic Incentives given to ML by Use of Cryptocurrency.

One of the leading worries behind cryptocurrency is money laundering. In this paragraph, characteristics of cryptocurrency that either promote or deter money laundering were identified.

First is utilization. Currently, cryptocurrency is only used in limited markets. For example, VISA and MASTER are used globally, while Bitcoin, a form of cryptocurrency, has relatively small utilization area. Such small utilization area hinders many people to launder their money.

Second is management. Cryptocurrency’s main representative is the principle users. Such management is paradoxically good news for those who money launder. The absence of centralized government leads to easier and faster way for such fraud. In the current system, each country’s central bank (authorizer) monitors the flow of money; so, the process of money

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laundering gets complicated. Due to the lack of central bank or other organizations, money laundering is much easier through cryptocurrency.

Third is anonymity. During cryptocurrency transaction, asymmetrical code strengthens anonymity. Although a single individual can’t be identified, confirmation and accreditation are much more efficient and effective during transactions. Due to such characteristic, cryptocurrency is appealing to those who want to money launder. However, all cryptocurrency transactions are public so AML (Anti-Money Laundering) could track down such action.

Fourth is instability. Cryptocurrency and fiat money both fluctuate significantly. Such price fluctuation range may become an unpredictable variable for money laundering process and may cause additional cost. Instability in price is a negative factor for those who want to money launder.

Fifth is flexibility. Cryptocurrency can quickly and easily be exchanged globally. Instant currency exchange wasn’t something that was possible for original money laundering process, however, such characteristic became a huge advantage.

Sixth is one way process. Once the transaction is approved, it can’t be cancelled. For normal currency system, if illegal transactions were detected, central bank temporarily deactivates the account for prevention. However, for cryptocurrency there are no ways of cancellation if transaction has been initiated. This makes money laundering process much easier.

Seventh is lack of national limits and accessibility. Cryptocurrency has no national limits and only needs mobile devices for transactions. Because of this advantage, international illegal activities are readily possible. In order to investigate international bank fraud or money laundering using this method, international cooperative investigation is needed. In this case, investigation is extremely hard. Lack of organizations that watch over this program incentivize international frauds.

All these factors participate in money laundering, bank fraud, and other illegal activities. Despite those advantages, the percentage of people who use cryptocurrency for money laundering is relatively low. In long term, if cryptocurrency continues to grow, more illegal activities might arise from the misuses.

So NCA, on September 2016, stated that cryptocurrency has the potential to become a big threat in our society. Thus, the idea of cryptocurrency and its use promote both positive and negative economic motives.

The Impact of Money Laundering on economies

Undermine integrity of financial system

Between 1980 and 1999, Nigeria lost 100 billion dollars due to money laundering, which destroyed their financial system reputation and lost numerous international investments. Money laundering was one of many reasons why Nigeria's financial system reputation hit the bottom. However, it led to a different issue where Nigeria’s financial organization had depended heavily on illegal funds. Many banks including the National Bank, Bank for Credit and Commerce International and Allied Bank were disbanded for such reason.
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Loss of Control of the National Economic Policy

According to John McDowell and Gary Norris's research, current money laundering makes up 2-3% of the world’s GDP.

It can be inferred that money laundering can cause a huge effect in globally economy. With the definition of global GDP as an addition of GDPs of every country, it can be predicted that money laundering covers approximately 1~2% of each nation’s GDP. Because reports of money laundering aren’t accurate, precise GDP size is hard to determine. Also, exchange and interest rate’s measurements are skewed. In conclusion, measurement errors in national account statistics, volatility in exchange, and interest rates across border lead to policy mistakes. Errors in asset structure, due to money launderings, can lead to monetary instability. Inaccurate reports of income cause problems in taxes and redistribution of assets. Also, money launderings cause unproductivity of resources distribution by disturbing assets and market price. Also, money laundering can undermine currency and interest rate. According to “The economic and Social Consequences of Money Laundering” by Paul Freeman, reinvested illegally laundered money can undermine interest rate and exchange rate of that country due to money launderers’ tendency to invest in things that are safe from suspicion rather than beneficial one. To be specific, as money launderers reinvest laundered money on safer things rather than beneficial things, it becomes hard for government to measure flow of capital. This leads to unstable money demand, which leads to unstable interest rate and exchange rate as well.

To explain with IS-LM model, firstly, the inflow of capital through money laundering leads to appreciation of demand for domestic money because money launderers have to exchange laundered money into domestic currency. Due to appreciation of domestic money demand, the price of domestic money relatively rises than other currencies, and exchange rate rises. As exchange rate rises, net export falls since price competitiveness of domestic products declines. So, government spending has to rise in order to balance national account. On the other hand, the outflow of capital through money laundering leads to appreciation of money demand for foreign money. Therefore, price of foreign currency relatively rises than domestic currency, so exchange rate will fall. The decline of exchange rate leads to increase of net export as price competitiveness of domestic product rises. For this situation government spending should be reduced to balance national account. This simple logic cannot be executed since we cannot measure the amount of money laundering. Therefore, money laundering is the obstacle for policy making, and it can even give wrong signal to government who should decide whether they should spend more or not. Moreover, according to the research paper by John McDowell and Gary Norris, the artificial inflow and outflow of capital and investments from one country to another would have weakening effects on the international financial markets due to its integrated nature. Therefore, we can say that money laundering distorts country’s financial system and governments policy making, which can make world financial market unstable.

Kenya can be a good example of distorted economy due to money laundering. According to an article written by Paul Freeman, the real estate prices of Nairobi, capital city of Kenya had soared about 2 to 3 times in the last 5 years. The increase of real estate price is extraordinary because at that time, world real estate prices have dropped sharply due to mortgage bubble bursting. Since Kenya shares border with
Somalia, we can figure out that Somali piracy ransom money had gone to Kenya. Because of money launderers’ reinvested capital, Kenyans lost their home ownership in Nairobi.

**Cryptocurrency and Double Spending**

**Double Spending Induced by Cryptocurrency**

Double spending is a problem that occurs when using digital cash scheme. Same single digital token can be used more than once due to duplication or falsification. Double spending can lead to inflation like inflation caused by counterfeit money (money produced without legal process). Cryptocurrency use proof-of-work system which verifies computation cost or CPU cost or Hashcash to prevent problem of double spending, but it is still incomplete. For example, double spending for Bitcoin Gold occurred on May 2018.

An individual can rewrite or control ledger if he/she controls enough level of computational work being done, and has accounted enough amount of computational work. This type of attack is called 51% attack because the least amount of computational work the attacker should obtain is 51 percent of network's total hashpower. The director of Bitcoin Gold warned about the 51% attack as a malicious miner obtained 51% of total hashpower to temporarily take over control of the ledger in order to steal funds from cryptocurrency exchanges. The cryptocurrency exchanges defended itself by increasing the number of confirmation required because slow transaction is almost perfectly safe from double spending. However, actions were taken after the malicious miner stole about 18.6 million dollars from the exchanges. Also, previously, 1.75 million dollars’ worth verge coins were stolen by a malicious miner, and Japanese cryptocurrency, Monacoin, was attacked by block withholding attack as a miner gained 57% of total hashpower.

**Macroeconomic Impact of Double Spending**

Due to money duplication and creation of new money without legal process, the amount of money circulating in the economy simply increases. Therefore, the amount of currency increases and price level increase, which lead to inflation. (One unit of currency's value is depreciated due to increase of money supply).

Function of money supply: \( \frac{M}{P} = \frac{M}{P}(\text{constant}) \)

Credibility of that currency is decreased. Therefore, the money demand for that currency decreases.

Function of money demand: \( \frac{M}{P} = L(r; Y) \)

Therefore, the equilibrium of money market is when liquidity decrease and interest rate does not change. Therefore, liquidity (real purchasing power of money) decreases.

Moreover, due to increase of money supply, in the IS-LM model, LM curve shifts to the right. Therefore, interest rate falls, which corresponds with the economic intuition that money supply and interest rate have negative relationship. As a result, inflation occurs.

**Slow and Fast Transactions for Bitcoin**

Currently, Bitcoin uses POW (Proof-of-work). Slow payment with transaction confirmation is relatively safe, but fast payment, through transaction reception, is not safe from double spending issues. In the situation where customer C and seller S are making transaction, the most secure way to make payment is to force C
to wait until the transaction is perfectly confirmed on the blockchain. However, what matters is time. The time spent to make confirmation is same as the time spent generating one block. According to “Two Bitcoins at the Price of One? Double-Spending Attacks on Fast Payments in Bitcoin”, the average block generating time was 10 minutes, but the standard deviation was 881.24 seconds. And only 64% of total blocks were generated within 10 minutes. The others required 10 to 40 minutes to be generated. Long waiting period for confirmation and generation of variables being cumbersome and inconvenient lead to issues in most of the transactions.

In order to adopt payments through Bitcoin in our everyday life, quicker confirmation time is detrimental. Installation of fast payment will not require customer to wait until the confirmation is made. Rather, it keeps “receipt” to verify the transaction. And later, the seller can receive the transaction from the network transferring correct amount of Bitcoin from customer to seller. However, this method of transaction is not secure since it does not have any mechanism to prevent double spending. Therefore, it is recommended to use fast payment only if the transaction value is small.

**How Double Spending Occur on Payments Made by Using Cryptocurrency**

Let’s assume a situation where an attacker is buying a good or service from a seller. In order to do double spending through Bitcoins, the attacker creates two transactions at the same time. The first transaction accepts the seller as the recipient of Bitcoin, while the second transaction accepts the attacker as the recipient of Bitcoin. The reason why the attacker sets two transactions is to deceive the seller that the seller is delivering goods and services to the attacker, not knowing the attacker will not pay for it and will even keep the money. The attacker will send both transactions. The first transaction should be transmitted directly to the seller, and to do this, the attacker needs the seller's IP address. And the second transaction should be broadcasted to the rest of the network. Moreover, the seller should receive the first transaction before the second transaction, so that second transaction will be automatically dropped when seller receives it. Lastly, the second transaction should be confirmed in the blockchain in order to successfully achieve double spending. In this progress, two transactions both have probability to be accepted in the network. Therefore, the attacker will put more nodes working on the second transaction to promote probability of the second transaction being accepted in the network.

Also, there is another form of double spending, which is called block withholding attack. In this case, the attacker pools resources to create a block containing the first transaction. And the attacker blocks seller from receiving other blocks that are confirming the second transaction, while he sends the block containing the first transaction. And then, the attacker creates a fork in the blockchain that will be dismissed since no one will extend blocks to this side of the fork. The important fact is that this type of action can be used in both fast and slow payment methods.

**Efforts of Cryptocurrency to Prevent Double Spending**

The countermeasure to prevent double spending problem is being devised by many researchers. A method proposed by John P. Podolanko, Jiang Ming, and
Matthew Wright called “Enhanced Observer” is analyzed. According to “Countering Double-Spend Attacks on Bitcoin Fast-Pay Transactions”, enhanced observers, which is called ENHOBS, is a combination of observers and peer alert system. ENHOBS not only conducts deeper inspections of all transactions, but also, sends alert messages through P2P (Peer to peer) network. When an alert is received and verified, that is, when a threat of double spending is detected, any transactions that match the same inputs are dropped from the network.

Since ENHOBS requires some computation powers to conduct deep inspections to determine whether there is a double spending or not, the research showed that there was an increase in computation power using ENHOBS. Comparing to non-ENHOBS, the average client CPU utilization was about 20 percent point higher with ENHOBS.

However, although ENHOBS needs more resources, it detects double spending significantly faster than non-ENHOBS. The research shows that ENHOBS-only clients detected double spending by 14.3 seconds on average, when client with 1 percent of ENHOBS needed 34.3 seconds and client with 2 percent of ENHOBS needed 20.5 seconds on average to detect double spending. Therefore, rather than operating only ENHOBS, adjusting the proportion of ENHOBS can be an effective solution.

Through ANOVA test, the mean growth of overall economy, represented as real GDP of G20, and growth of cryptocurrency were identified. Also, signs of correlation between the growth of overall economy and economic scale of cryptocurrency were studied using regression analysis. According to the ANOVA test results, the p-value was 0.046246, which is below the significance level of 0.05. Therefore, the null hypothesis was rejected, which means that the mean of level of economic growth and the growth of economic scale of cryptocurrency were not close to each other.

Linear regression analysis stated that the R square is only 0.169911. This means that there is no clear correlation between economic growth and growth of scale of cryptocurrency.

Therefore, it can be concluded that the economic growth of G20 countries and growth of economic scale of cryptocurrency have no meaningful correlation. Even though growth scale of cryptocurrency may affect global GDP in either good or bad ways, the statistical data states that the growth of scale of cryptocurrency and economic growth have significantly influenced each other. The external elements, such as exposure to the public, may have been the sources of error as they significantly influenced the growth of scale of cryptocurrency, rather than growth of real GDP.
2. Possibly Positive Economic Impacts Given by Cryptocurrencies

First of all, cryptocurrencies are relatively safer than other forms of fiat money. As mentioned before, blockchain is extremely hard to change arbitrarily, so cryptocurrency is really hard to counterfeit except for some extraordinary situations like double spending accidents. Thus, it is relatively safer from fraudulences.

Moreover, cryptocurrencies are free from problems that traditionally banks have had. For example, cryptocurrencies are easily accessible compared to many people in developing countries who are unbanked. Since cryptocurrencies, such as Bitcoin, do not need third parties to make transaction and exchange currencies, and people can access their cyber money by simply using their phones. By gathering tremendous amount of possible users, cryptocurrency can increase its user base and increase its own scale to create economies of scale. Furthermore, cryptocurrencies can be used in business in various ways. When the transaction has to occur quickly in response of emergency situations, using cryptocurrency can be an effective solution if security issues like double spending problems are complemented. Also, cryptocurrency can be sent to anywhere, which can be a great advantage for international businesses.

As online market is thriving nowadays, payment using cryptocurrency can be a good option. In fact, many online market companies such as Amazon and Ebay are using digital currency that is similar to Bitcoin. Especially Ebay is using digital currency payment system called Paypal, and it is successfully operating. Lack of third parties in cryptocurrency transactions eliminates or reduces transaction fees.

3. Investing in Cryptocurrency

The economic scale of cryptocurrency market has grown about 19,900% over the last four years. Some people worried about the difference between its market price and its intrinsic value while others invested in cryptocurrency to earn profit from its inflating prices over the last four years.

This section will analyze several research papers and articles to determine if investment in cryptocurrency is truly worth it.

First, according to the research paper written by David Kuo Chuen Lee, Li Guo, Yu Wang, historically, daily return earned by cryptocurrency outperformed traditional asset classes with Litecoin being the highest. Furthermore, according to the correlation analysis, cryptocurrencies have negative correlation with mainstream assets. Therefore, cryptocurrency can be useful in risk-management of assets. It can alleviate the risk from investing mainstream assets. According to the portfolio analysis in the report, investing cryptocurrencies had the highest return while that of the oil was the lowest. Also, the research figured out that if risk-averse investor is willing to take daily volatility above 3 percent, investing 80 percent of his initial wealth is recommended since return of investing cryptocurrencies was the highest.

To sum up, investing cryptocurrency can bring high return, but also high risk as well. The value of cryptocurrency goes to the different direction of the price of mainstream assets such as stocks.
4. Conclusion

There has been an increase in attention for Bitcoin, general form of cryptocurrency, due to its innovative change in currency. Cryptocurrency can override our existing economic system completely. This research paper’s main points were controversies surrounding cryptocurrency and its financial potential. The definition of cryptocurrency, differences between current currency system, negative effects on global economics, and possible solutions to potential problems were discussed throughout this paper. First, it was concluded that cryptocurrency had no significant and meaningful impacts on general economy. Second, negative effects of cryptocurrency on economy by money laundering and double spending standpoint were analyzed. Cryptocurrency provides both positive and negative temptations for those who want to money launder; if cryptocurrency market continues to grow, more incidents of money laundering are bound to happen. Money laundering decreases the economic system and can cause confusions within national policy decisions. Since cryptocurrency is a form of digital currency, double spending problem is inevitable. There needs to be an effective way to prevent double spending problem as immense amount of money were stolen from different cases. Double spending can merely be a small loss of a payment but can also cause inflation on a big scale. It is dangerous because inflation is hard to predict and solve. Active discussions on programs like ENHOBs might lead to a solution. Despite those previous negative effects, cryptocurrency is an innovative form of currency and can possibly bring positive outcomes on our global economy. Thus, it has economic value. Like other innovations, cryptocurrency's potential is yet to be discovered. Many experts believe that it can bring positive economic effects.

Rise of cryptocurrency was both innovative yet dangerous. It has the potential to go in either directions. With its unpredictability, it can’t be concluded that cryptocurrency brings only economic disadvantages. In short, usage of cryptocurrency, either as an economic innovation or medium for illegal activities, truly determines its value and potential.

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References


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