Predicting Future Cryptocurrency Investment Trends by Conjoint Analysis

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Abstract*— General: Over time, businesses have used different things as money: first, items that could be traded, and later, government-issued currencies like the US dollar and the Euro. Recently, a new type of money called cryptocurrency has appeared. Unlike tradeable goods or traditional money, cryptocurrencies are entirely new. This research looks at what influences people to invest in cryptocurrencies, using a method called conjoint analysis, which studies what people prefer. It found that the most important factors for investors are how profitable cryptocurrencies are, how bookkeeping is managed, and how secure they are—with profitability being the top priority. Surprisingly, anonymity isn't a big concern for most investors, though their preferences for bookkeeping vary. These results help understand what investors want and can guide improvements in cryptocurrency features to match market needs.

Indexed Terms- Bitcoin, cryptocurrency, investment, investor expectations, conjoint analysis.

I. INTRODUCTION

This study examines what factors influence investment decisions involving cryptocurrencies based on conjoint analysis. [1] Prior research had indicated that certain features of an investment differ investment choices among individuals. Relevant features were identified along with their respective levels, and the data was collected using conjoint cards. According to the study, profitability, anonymity, and convenience are the most important factors concerning investment choices.

Cryptocurrencies are digital financial assets traded over the internet, which use cryptography. Bitcoin was the first such currencies and has been trading around the world since 2009. [2] Since its inception, more than 1,500 altcoins have emerged, which include, but are not limited to, Ethereum and Litecoin. Currently a niche market, perhaps someday cryptocurrencies will supplant national currencies. Blockchain technology is used; this is just a system of cryptographically linked records, or blocks.

This research aims to identify features that affect investor decisions about cryptocurrencies, such as profitability, convenience, anonymity, security, and bookkeeping. Conjoint analysis was done for each of the features at different levels to gain deeper insights into investor preferences.

II. LITERATURE REVIEW

2.1. Defining Cryptocurrencies

[3] Some exchange mediums that have been used are trade goods. Now, about a thousand years ago, currency was established, and it has taken the form of exchange in today's world. However, the monetary evolution did not stop with fiat currencies like the US Dollar or Euro. Cryptocurrency is the latest development.

Cryptocurrencies are digital or nonmonetary assets that use strong cryptography and come as a medium of exchange. [4] The creation and all transactions that are about to be performed are controlled and monitored by the network in which they function, hence ensuring safe and regulated flow. Just like Bitcoin, altcoins, alternative currencies depend on blockchain technology. Blockchain is a system where a distributed network of computers agrees on new transactions, hence there is security, anonymity, and data integrity.

Cryptocurrencies are complex systems with many features that remain yet not fully understood. Perhaps the most important feature of such a payment mechanism is decentralization, meaning there is no central authority controlling these digital payments.

[5] Another feature of Bitcoins is immutability, or the inability to change transactions that have been made, and public accessibility. Additionally, cryptocurrencies are not trustless, which means that no party needs to rely on others or central authorities to have the network run smoothly.

2.2. Types of Cryptocurrencies

The first cryptocurrency of its kind, Bitcoin was launched in 2009 and remains the front-runner in the cryptocurrencies market to this day.[6] A peer-to-peer electronic cash system, Bitcoin allows online payments to be sent directly between users without going through a financial institution. Being the first cryptocurrency to use blockchain technology, Bitcoin paved the path for many other cryptocurrencies, which are collectively called altcoins, some of which have survived to date.

It runs on a decentralized open-source network, and although its design has flaws, its disruptive features are what bring people closer to it.[7] Bitcoins are considered the most successful cryptocurrency in history-its total value reached billions of dollars within just two years after launch. After Bitcoin, numerous altcoins entered the market, each offering specific features to attract investors. However, this diversity makes it more difficult for investors to assess the strength of a particular altcoin.

All the other cryptocurrencies than Bitcoin are referred to as "altcoins" or "alternative coins." Even though Bitcoin is the market leader due to its first mover advantage, some altcoins are gradually gaining popularity. By June 2017, the cryptocurrency market had grown steadily with a capitalization of over $100 billion, reflecting its growing importance in the financial world.

[8] Within time, Bitcoin has lost dominance to altcoins. In 2013 to 2014 for instance, Bitcoin's value in the market increased four times as altcoins grew twelve times, it reduced the market of bitcoin from 95% to 84%. By 2018, Bitcoin's market share dropped to about 47.6% as altcoins collectively exceeded 50%. Thus, the trend projects that Bitcoin may not lead the cryptocurrency market soon because altcoins are becoming popular gradually.

The following are the mainstream alternative coins:

Here is a summary of some of the most crucial cryptocurrencies in brief:

- Ethereum: [9] Ethereum is the second most popular cryptocurrency founded by Joseph Lubin. The strongness is that it is going to provide developers with the ability to develop applications running on its network, limitless. Ethereum market value is currently $21 billion and is likely eventually to compete with Bitcoin and is already the second biggest cryptocurrency.
- Ripple (XRP): [10] Ripple is a cryptocurrency combined with a digital payment system that was founded in 2012 by Chris Larsen. The Ripple currency is like Bitcoin. The company is involved in the speed and efficiency needed to make transactions, particularly for the banks. Their market value is over $21 billion; therefore, it becomes the third highest cryptocurrency.
- Bitcoin Cash: [11] Bitcoin Cash is a fork from Bitcoin, and its market capitalization is over $10 billion, making it the fourth largest in the market.
- Stellar: [11] Stellar is a network of connected banks, payment systems, and people to facilitate specific distributed exchanges. It focuses on creating markets based on technology like Ripple's, but with an expansive mission. The market capitalization of Stellar is over $5 billion, hence placing it as the fifth largest cryptocurrency.
- EOS: [12] Like the others, EOS is the blockchain platform for developing decentralized applications. Its market capitalization is more than $5.1 billion and makes it the sixth biggest cryptocurrency.
- Litecoin: [13] Litecoin can be considered a direct competitor to Bitcoin. Instead of using so much power to mine Bitcoin, a normal computer may be used to mine Litecoin. The market value of Litecoin’s is more than $3 billion, thus making Litecoin the seventh-largest cryptocurrency.
- Mint Chip: [14] Mint Chip is a cryptocurrency of the Canadian government and is pegged to Canadian dollars. This makes it rather unique since most cryptocurrencies are decentralized and not supported by any government or central authority.

The differences in their technology, purpose, and market focus make each of these cryptocurrencies unique in the crypto space.

Most of the studies are done over Bitcoin and some others. [15] The system has not been studied (Elbahrawy, Alessandretti, Kandler, Pastor-Satorras, & Baronchelli, 2017). For most of the types of cryptocurrencies there exists no study in literature. Few preliminary studies have been done on Ethereum (Atzei, Bartoletti, & Cimoli, 2017; Aung & Tantidham, 2018.

Buterin, 2014; Corbet, Lucey, & Yarovaya, 2018; Iansiti et al., 2017; Pustišek & Kos, 2018; Wood, 2014) and only a few which concerned with Ripple (Leising & Robinson, 2018; Schwartz, Youngs, & Britto, 2014). These mainly discuss the systems' technical aspects of cryptocurrencies.

2.3. Investing in Cryptocurrencies

Many investors have started to find time to focus on cryptocurrencies, which is another new investment option that many are incorporating into their portfolios.[16] Cryptocurrencies are virtual assets with little regulation from the authority, hence less affected by financial catastrophes. However, despite this aspect attracting more investors, many individuals do not know how cryptocurrencies work or the principles on which they are founded. This ignorance is creating shyness, although interest in cryptocurrency investments is growing. These investments will only grow with knowledge about these currencies.

There are two kinds of people interested in cryptocurrencies, which include miners and traders.

- Miners: require computer algorithms or special machinery to locate new coins. Once they find one, it is added to the blockchain, and they become the first owners of that coin. Moreover, miners may earn some transaction fees once the coin is being used.
- Traders: They buy pre-mined coins. Owners could keep them as an investment or spend them buying goods and services. A trader more often uses online wallets or exchanges. In addition, more people became interested in cryptocurrencies over time and by informing others of their potential.

III. DATA AND METHODOLOGY

This paper is based on an earlier version presented by Komşuoğlu Yılmaz and Boydaş Hazar at the Istanbul Finance Congress in 2018. [17] This paper essentially uses conjoint analysis, which is a statistical technique that helps us understand consumer preferences. Conjoint analysis allows researchers to estimate how important various product features are and predict customer reactions to new products or features.

The steps involved in conjoint analysis are:

1. Decomposition of a product into features (attributes).
2. Identifying the levels of preference of each attribute.

The five attributes of cryptocurrencies covered in this paper include profitability, convenience, anonymity, security, and bookkeeping. After selecting the attributes, there followed the definition of possible levels as indicated in Table 1 below.

Table 1: Attribute and Level

Attribute	Levels				
Profitability	Very high	High	Moderate	Low	Break-even
convenience	Very easy	Easy	Moderate	Difficult	Very difficult
Anonymity	Anonymity	Pseudonymity with difficulty	Pseudonymity	Link ability with difficulty	Link ability
Security	Impossible	High	Moderate	Low	Easy
Bookkeeping	All clear	Manageable	Some confusion	Inadequate standards	Inapplicable

Profitability

[18] In this study, profitability refers to how much an investor wants to earn from their cryptocurrency investment. Profit refers to the actual difference between the price at which an investor bought the cryptocurrency and its current market price. The greater the difference, the higher the profitability of investment. The explanation on attribute “profitability” and its related levels can be seen in Table 2 below:

Table 2: Definition of Attribute “Profitability” and its Levels

Attribute	Levels				
Profitability	Very high: The investor wants returns very high always compared to other investment opportunities. Even a slight drop in earnings will not be tolerated	High: The investor expects high returns compared to other investment possibilities but accepts some losses if the value of the cryptocurrency recovers quickly.	Moderate: The investor expects slightly higher returns compared to other investment possibilities over the period. The value of the cryptocurrency is expected to decline at certain times, but it is expected to recover over some time.	Low: The earnings do not have to beat alternative investments if there is some gain.	Break-Even: The investor does not initially require high earnings. He would be satisfied if he did not lose money.

Convenience

In this study, the term "convenience" here describes the ease of converting regular money (fiat currency) into cryptocurrencies and vice versa. [19] Fiat currency is the medium of exchange issued by or under the authority of a government, such as the US Dollar or Euro. An investor needs to trade his fiat money to sell or buy cryptocurrencies; if he is willing to leave the cryptocurrency market, then he must sell his coins in terms of fiat money. If the investors always need to make these trades, then they also need to easily find places where they can realize this.

The explanation on attribute "convenience" and its related levels can be seen in Table 3 below:

Table 3: Definition of Attribute "Convenience" and its Levels

Attributes	Levels				
convenience	Very easy: The investors can reach online exchange services and confidently trade his fiat currency for digital money.	Easy: It is relatively easy for the investor to do this exchange.	Moderate: Online exchanges are not readily available to the investor due to trust issues and/or difficulties in depositing his fiat money into the exchange's account.	Difficult: The investor finds it difficult to deposit fiat money into the exchange's account.	Very difficult: The investor finds it very difficult to open an account with an exchange.

Anonymity

[20] In this research, the term "anonymity" means to what extent an investor would like his or her cryptocurrency transactions to remain private. Anonymity keeps an investor's real identity segregated from his or her transactions. When an investor's public key relates to transactions but not the investor's real name, it is referred to as pseudonymity. When the investor desires both the real name and transactions to be secret, then anonymity becomes important for the investor. If the real name is not shown, if the investor is fine with the public linking their transactions to their coins, then they are fine with pseudonymity. If the investor is not disturbed by their privacy, then they will not mind if their coins get connected to both the transactions and real-world identity.

The explanation on attribute "anonymity" and its related levels can be seen in Table 4 below:

Table 4: Definition of Attribute "Anonymity" and its Levels

Attribute	Levels				
Anonymity	Anonymity: Full anonymity is very much required by the investor so that his privacy is very important; the cryptocurrencies he holds should not relate to the transaction history of the same and their real identity.	Pseudonymity with Difficulty: Privacy is an important consideration for the investor. He will not wish to reveal the transaction history of his cryptocurrencies to the public. However, he will not mind if the regulatory bodies relate his public key to transactions using high technology.	Pseudonymity: The investor does not mind if the transaction history of his coins is public knowledge if his real-world identity is not revealed.	Link ability with difficulty: The investor is indifferent to the transaction history that may be linked to his realidentity by thosewho have the technology, suchas regulatory bodies of the state.	Link ability: Privacy is not important for the investor. He is indifferent to link ability of his coins both to the related transactions and to his real-world name.

Security

Cryptocurrencies exist and are spent in the virtual world. A prime problem with virtual currency is the risk of hacking, where coins get stolen.[21] If an investor feels confident that the network is safe, along with a feeling that his coins are safe, he will most likely invest more money. Conversely, if he believes the network might get hacked, and he would lose his coins, then hesitation in investing will be towards cryptocurrencies.

The explanation on attribute "security" and its related levels can be seen in Table 5 below:

Table 5: Definition of Attribute "Security" and its Levels

Attribute	Levels				
Security	Impossible: The investor is confident that the network and its protocols cannot be breached, and his coins cannot be stolen.	High: The investor is confident of the network security; however, he accepts that some risks exist related to online exchanges.	Moderate: The investor accepts the security problems of the cyber world. However, he thinks he can overcome this problem by being careful in choosing the services he uses.	Low: This attribute is related to the investor's perception of the difficulty that his coins might be stolen. Since digital money is merely an address in the cyber-world, it is possible to hack or steal it electronically.	Easy: The investor accepts the possibility of his coins to be stolen in the cyber world.

Bookkeeping

The term "bookkeeping" may be used to define the ambiguous rules of accounting and taxation for every cryptocurrency transaction.[22] Since "cryptocurrencies" is a new type of asset, no standard rules of bookkeeping or taxation have been developed yet. Recording the transactions correctly is much more important for businesses. For instance, a company invests in cryptocurrency by converting its "own" money into "new digital money" and needs to record

this transaction and pay taxes once the cryptocurrency's value increases.

Table 6: Definition of Attribute "Bookkeeping" and its Levels

Attribute	Levels				
Bookkeeping	All clear: The investor has knowledge of how to record transactions related to cryptocurrencies. He finds all regulations related to bookkeeping and taxation are clearly defined.	Manageable: The investor is clear which accounting standard applies.	Some confusion: The investor is not clear about all the standards and regulations related to accounting; however, he finds such issues manageable and has a plausible bookkeeping system.	Inadequate standards: The investor is not clear which accounting standard applies. He thinks his bookkeeping is inadequate and troublesome.	Inapplicable: The investor feels that laws and regulations governing cryptocurrency bookkeeping are so unclear and confusing that his bookkeeping system will not satisfy any audit.

Figure 1. methodology for predicting future cryptocurrency investment trends using conjoint analysis

Finding and Discussions

[23] In the present study, an orthogonal design was used to create 25 bundles of options, and they were administered to the participants. The participants picked by convenient sampling were reachable. Because the whole study was based on knowledgeable participants about the concept of cryptocurrencies, only 101 participants were included. Bundles are listed below in Table 7:

Table 7: Conjoint Analysis Bundles

ATTRIBUTES/ BUNDLES	BUNDLE 1	BUNDLE 2	BUNDLE 3	BUNDLE 4	BUNDLE 5
Profitability	Very High	Very High	Very High	Very High	Very High
Convenience	Very Easy	Easy	Moderate	Difficult	Very Difficult
Anonymity	Anonymity	Pseudonymity with difficulty	Pseudonymity	Link ability with difficulty	Link ability
Security	Impossible	Moderate	Easy	High	Low
Bookkeeping	All Clear	Inadequate standards	Manageable	Inapplicable	Some Confusion
ATTRIBUTES/ BUNDLES	**BUNDLE 6**	**BUNDLE 7**	**BUNDLE 8**	**BUNDLE 9**	**BUNDLE 10**
Profitability	High	High	High	High	High
Convenience	Very Easy	Easy	Moderate	Difficult	Very Difficult
Anonymity	Pseudonymity with difficulty	Pseudonymity	Link ability with difficulty	Link ability	Anonymity
Security	High	Low	Impossible	Moderate	Easy
Bookkeeping	Manageable	Inapplicable	Some Confusion	All Clear	Inadequate standards
ATTRIBUTES/ BUNDLES	**BUNDLE 11**	**BUNDLE 12**	**BUNDLE 13**	**BUNDLE 14**	**BUNDLE 15**
Profitability	Moderate	Moderate	Moderate	Moderate	Moderate
Convenience	Very Easy	Easy	Moderate	Difficult	Very Difficult
Anonymity	Pseudonymity	Link ability with difficulty	Link ability	Anonymity	Pseudonymity with difficulty
Security	Moderate	Easy	High	Low	Impossible
Bookkeeping	Some Confusion	All Clear	Inadequate standards	Manageable	Inapplicable
ATTRIBUTES/ BUNDLES	**BUNDLE 16**	**BUNDLE 17**	**BUNDLE 18**	**BUNDLE 19**	**BUNDLE 20**
Profitability	Low	Low	Low	Low	Low
Convenience	Very Easy	Easy	Moderate	Difficult	Very Difficult
Anonymity	Link ability with difficulty	Link ability	Anonymity	Pseudonymity with difficulty	Pseudonymity
Security	Low	Impossible	Moderate	Easy	High
Bookkeeping	Inadequate standards	Manageable	Inapplicable	Some Confusion	All Clear
ATTRIBUTES/ BUNDLES	**BUNDLE 21**	**BUNDLE 22**	**BUNDLE 23**	**BUNDLE 24**	**BUNDLE 25**
Profitability	**Break-Even**	**Break-Even**	**Break-Even**	**Break-Even**	**Break-Even**
Convenience	**Very Easy**	**Easy**	**Moderate**	**Difficult**	**Very Difficult**
Anonymity	**Link ability**	**Anonymity**	**Pseudonymity with difficulty**	**Pseudonymity**	**Link ability with difficulty**
Security	**Easy**	**High**	**Low**	**Impossible**	**Moderate**
Bookkeeping	**Inapplicable**	**Some Confusion**	**All Clear**	**Inadequate standards**	**Manageable**

On the back of the bundles, there was a short questionnaire with five questions about the participant's age, gender, income, whether he is married, and his level of education.

The demographic distribution of the respondents is given in Table 8 below:

Table 8: Demographic Distribution of the Participants

Demographic Variable	Choices	Frequency	Percentage
Gender	Male	74	73.3
	Female	27	26.7
Age	18-24	60	59.4
	25-34	36	35.6
	35-44	4	4
	45-54	1	1
Education	Bachelors	50	49.5
	Masters	49	48.5
	PhD	2	2
Income	0-1500 TL	20	19.80
	1500-4000 TL	65	64.3
	4000-8000 TL	10	9.9
	8000+ TL	6	5.9
Marital Status	Single	71	70.3
	Married	22	21.8
	Not Specified	8	9

Participants ranked 25 cards from best to worst.[24] Their rankings were changed into preference points, ranging from 100 (most preferred) to 0 (least preferred), and analyzed by using Marketing Engineering for Excel-a tool designed specifically for marketing research analysis.

[25] First, the software calculated the participants' "preference partworths" (their preferences for various options). In the table of partworths, the least preferred option for each feature was set to 0 and the sum of the

most preferred options for all features was set to 100. The value of its most preferred option signified the importance of a feature.

[27] The analysis made it clear that profitability was one of the characteristics for the mass of individuals, especially with 61% considering high or very high profitability when deciding to choose which cryptocurrencies to invest in. Bookkeeping and security were ranked second, while convenience and anonymity garnered the lowest rankings.

[29] Based on the preferences calculated, researchers then simulated the current market by creating two product profiles- one for Bitcoin and one for Altcoins. These profiles were based on real features of Bitcoin and various Altcoins in the market.

[30] Bitcoin is the top cryptocurrency by market shares, taking up 48%, while the remainder of 52% is comprised of more than 20,001 altcoins. In the study, it shows that the “Best Option" product will capture 60% of the market shares, which will cause a decrease in Bitcoin's share since it will be considered cannibalization. This suggests that the strongest altcoin will destabilize the status quo Bitcoin enjoys now. A simulated market share for the "Best Option," using Marketing Engineering software, is provided below as Figure 1:

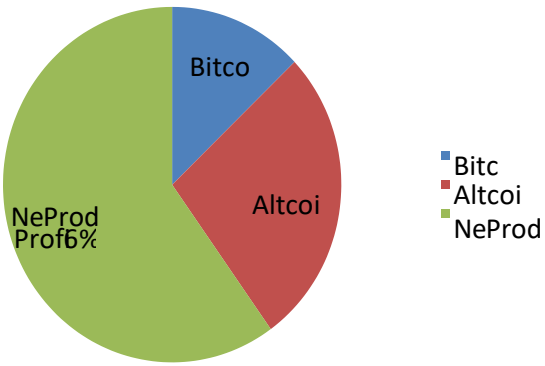

Figure 2: Market Share Simulation for New Product Profile “Best Option”

[33] There are 2075 altcoin types in the market on 29 November 2018 listed on coinmarketmap.com
In this worst case scenario, one new cryptocurrency possesses the least desirable features. Market prediction in such a case varies with a big gap; the market share of the new product was reduced to only 12%.

CONCLUSION

Research and industry practitioners, for nearly 50 years, supported the conjoint method as a useful tool to understand consumer preferences and predict their behavior toward new products (Green & Srinivasan, 1978). Numerous studies have explored from the consumer behavior perspective what influences investor decisions.

With growing importance being placed on cryptocurrencies and new ones entering the market, competition is keen. Competitiveness among cryptocurrencies has increased as the prominent one, Bitcoin, faces stronger competitors. The study thus focuses on determining priority features for new cryptocurrencies to compete favorably in the market.

Investor behavior is determined by the characteristics of investment alternatives. This study uses conjoint analysis to understand how investors make a choice in cryptocurrencies. Five key characteristics, each with five levels, have been chosen as the most critical factors affecting investor behavior. It is the first research study that applies conjoint analysis to ascertain the most critical factors and their levels in investment decisions in cryptocurrencies.

This study has the limitation that the bundles created were hypothetical and might not represent actual sets in real life. Features of coins that investors would most prefer should be targeted for the creation of coins by cryptocurrency developers. Future studies may consider testing these hypothetical bundles in real market share simulations using conjoint analysis.

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