

## Financial Innovations' Risk Management

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**Abstract.** The effect of the implementation of financial innovations is largely determined by a correct assessment of the risks associated with them. The increased level of uncertainty in the markets of innovative financial instruments is determined by the imperfection of legislation, the absence of the existing system of self-regulation, as well as exposure to the influence of external factors: the conditions of global markets, central bank policies and international financial institutions. The result of trading innovative financial instruments depends on the ability to determine trends in market participants' behavior. This article is devoted to the study of financial innovation risk management methods based on the analysis of cryptocurrency market indicators.

### 1. Introduction

The effect of the implementation of financial innovations is largely determined by the correct assessment of risks associated with them. New financial instruments, like any other assets, are potentially capable of bringing both profits and losses. However, the lack absence of data, which allow to highlight the previously arisen tendencies and extrapolate them for the future, requires making a choice of solution with the utmost care. It should be noted that the use of innovative assets may entail a number of consequences that go beyond the scope of finance.

Lucky speculators who earned on the wave of popularity of bitcoin, it is worth remembering the first experiences with the use of virtual currencies, which for a number of reasons have ended less successfully. For example, DigiCash, the cryptographic digital currency that appeared in 1990, was based on technologies that are still used to encrypt digital transactions. It ceased to exist in 1998 due to irreconcilable contradictions between the initial clients who insisted on keeping the anonymity of money transactions and the largest European partner banks of the settlement system, which demanded Identification of account holders. Another company-a pioneer in the field of electronic payments, the owner of patents for a secure system of Internet payments-Internetcash.com, which originated in 1999, lasted quite a short period, until 2001, did not survive in business against the backdrop of the collapse of Dotcom [1].

## 2. Relevance, scientific significance of the issue

Obviously, the difficulties of forecasting the effects of financial innovations are caused by the presence of unexpected consequences of their realization caused by imperfection of legislation, absence of the established system of self-regulation, and also susceptibility Influence of environmental factors: the state of global markets, the policies of central banks and international financial institutions. Consequently, the assessment of the appropriateness of investment requires a thorough study of all aspects of the project: legal, social, economic and environmental.

Obviously, the risk analysis of financial innovations should start with the definition of the legal status of the project. Possible contradictions may be already on the surface: the essence of cryptocurrency as an instrument of anonymous calculations and the requirements of legislation and international treaties on the prevention of money laundering.

Bitcoin became the first and most famous cryptocurrency-decentralized transferable digital asset, used as a means of exchange, based on the technology of the distributed Registry Distributed Ledger Technology (DLT), in particular, Blockchain. Ten years of existence of Bitcoin have revealed the main risks of its use. Thus, the concern of central banks causes anonymity of calculations- it's the reverse side of the lack of regulation and centralized management. The problem of energy intensity of computer computations to support the functioning of cryptocurrency has already become a subject of research of ecologists: during the period of cryptocurrency boom from the beginning of 2016 to the first half of 2018, this sphere contributed to the release of Atmosphere from 3 to 13 million tonnes of carbon dioxide, which is roughly equivalent to the results of use of 1 mln. of cars [2].

Many researchers believe that cryptocurrency itself, the technology underlying it, derivative instruments generated by it (for example, ICO-Initial coin offering, primary placement of coins (tokens)-a way to raise funds by issuing cryptocurrency) are, in fact, fraudulent. In particular, Nuriel Roubini (Nouriel Roubini), one of the few economists who predicted the financial crisis of 2008, thinks so. Speaking in the U.S. Senate at the end of 2018, he called cryptocurrency the parent of all frauds and bubbles («Crypto is the mother or father of all scams and bubbles»), and the technology of blockchain- excessively untwisted and least useful technology in human history («Blockchain is the most over-hyped — and least useful — technology in human history») [3].

Indeed, cryptocurrency fever was accompanied by numerous frauds. Statistics in the Wall Street Journal in May 2018 may be an illustration to the report by N. Roubini. In the analysis of 1450 cases of primary placement of coins 271 ICO (18.7%) turned out to be suspicious, were accompanied by plagiarism in investment documents, promises of guaranteed payments and representation of false project executing teams [4].

Deceptive fundraising tactics can be accompanied by manipulation of the cryptocurrency market: for example, artificial inflating of low-rated coin quotes with aggressive advertising and their rapid sale at maximum price levels - strategy «pump and dump» (pumping and dumping, blowing the bubble). In the world of traditional investments, organizing coordinated asset purchases to artificially inflate their prices is illegal, but in the field of cryptocurrencies such fraud remains common [5].

It should be noted that the turnover of new instruments in the crypto-currency market, in particular, IEOs - Initial Exchange offers and STOs, Security Token offers, - forms of investment in blockchain projects, which appeared in 2017-2018, is accompanied by stricter control on the part of exchanges and regulators.

Nevertheless, the decisions of buyers of innovative tools may be irrational, generated by the general excitement. So, the story of the dogecoin joke coin, created at the end of 2013 as a «fun, light-hearted cryptocurrency», is a vivid example of an unexpected outcome of speculative games. Unexpectedly for the founders in early January 2018, dogecoin became for one day a financial asset with a market capitalization of \$1.7 billion [6].

Jackson Palmer, one of the founders of dogecoin, who left the team in 2015, was seriously concerned about this situation, considering it a manifestation of a serious overheating of the cryptocurrency market. He said: «I think this says a lot about the state of the cryptocurrency space,

because cryptocurrency which has not released software updates for more than 2 years, has a market capitalization of \$1 billion» [7].

Kevin Werbach, a professor at the University of Pennsylvania's Wharton School noted that cryptocurrency is almost an ideal tool for fraud, because of the combination of trustful customers and low barriers for fraudsters as well as the fact that the money flow poured into this market before the administration and self-government bodies appeared on it [8].

Cryptocurrencies, above all, became the subject of speculation, many managed to make a fortune, cashing the income received in this market, while others, underestimating the risks associated with such games, lost money. Kenneth Rogoff, a professor of economics at Harvard University, believes that cryptocurrencies are like «lottery tickets that can pay off in the future». At the same time, Rogoff noted: «Regulators are gradually realizing the fact that they cannot tolerate large, expensive transaction technologies that contribute to tax evasion and criminal activity» [9].

Indeed, this area has already attracted the attention of regulators: in the United States the Securities and Exchange Commission (SEC) began to actively oppose fraudulent ICOs, applying stock market rules to them. In particular, in November 2018, the SEC announced that two cryptocurrency companies, Airfox and Paragon Coin Inc., would pay \$250,000 in fines for lack of registration of the ICO as securities [10].

### 3. Formulation of the problem

However, cryptocurrency trading is constantly expanding. For example, the largest American bank J.P. Morgan Chase in February 2019 announced the creation of its own digital currency JPM Coin, which will be used for instant payments between customers [11].

Experience shows that interest in cryptocurrencies, in particular, in Bitcoin, is the highest, firstly, in countries with developed financial markets, in particular, in the United States, and secondly, where the share of electronic payments in the settlement system is large (Japan and Sweden), and thirdly, in countries with high rates of inflation (Venezuela and Argentina).

The reasons for the popularity of cryptocurrency can be very different: from the desire to make money on speculative trading, to attempts to smooth out the negative effects of hyperinflation. Accordingly, the attitude of the Central Banks to them can range from setting various restrictions in use to attempts to introduce their own cryptocurrencies (El Petro in Venezuela, E-Krona in Sweden and Sovereign in the Marshall Islands).

Despite the serious fluctuations in quotations, bitcoins have a lot of adherents who hope that in time it will become the world currency. So, Apple co-founder Steve Wozniak believes that bitcoin is «pure digital gold», «defined mathematically» without the influence of humans and management companies [12].

It should be noted that skeptics, in particular, Kenneth Rogoff, note that bitcoin cannot be «digital gold»: unlike real gold, cryptocurrency has no alternative use. Cryptocurrencies can be valuable as long as enough people perceive them as new gold, however, «the price bubbles surrounding initially useless assets should eventually burst» [9].

Thus, assessing the possibility of using financial innovations, in particular cryptocurrencies, it is necessary to accurately determine the status of this tool, which will subsequently affect the choice of risk management methods associated with it.

It is obvious that financial innovations meet both supporters and opponents like any innovation. Undoubtedly, the arguments of both deserve attention. The balanced approach of Aswath Damodaran, a professor at the Professor of Finance at the Stern School of Business at NYU, is undeniably interesting. In his blog, he disagrees with both the fiercest critics of bitcoin and his strongest supporters. He does not believe that bitcoin is a scam, but he does not believe that «cryptocurrencies now or ever become an asset class, or that these currencies can change fundamental truths about risk, investment and management» [13].

Aswath Damodaran formulated a number of theses that can be used in managing the risks associated with the use of cryptocurrencies. Unlike traditional financial assets, a cryptocurrency can

only be traded based on assumptions about how its price will behave in the next period. The goal of the speculative game is to guess in which direction the price will move, to win it is necessary to be «right more often than not right with respect to the direction of price movement and exit before the wind changes». The price of cryptocurrencies «is determined by supply and demand, which, in turn, depend on mood and momentum» while news and rumors will change the mood of market players, affecting the current price. It is necessary to have time to «measure market sentiment or momentum changes earlier than the rest of the market». The main tools for price analysis can be technical indicators, price charts and consideration of the psychology of market participants. In addition, relatively small volumes of cryptocurrency trading allow you to simply manipulate this market.

Ultimately, Aswath Damodaran considers cryptocurrency trading as a form of gambling: «If you have good trading instincts, you have to play a pricing game ... this is a game in which you can win millions or lose millions based on your impulses» [13].

Thus, in the process of managing the risks associated with cryptocurrencies, special attention should be paid to the analysis of the main trends of this market.

#### **4. Practical relevance, suggestions and research results**

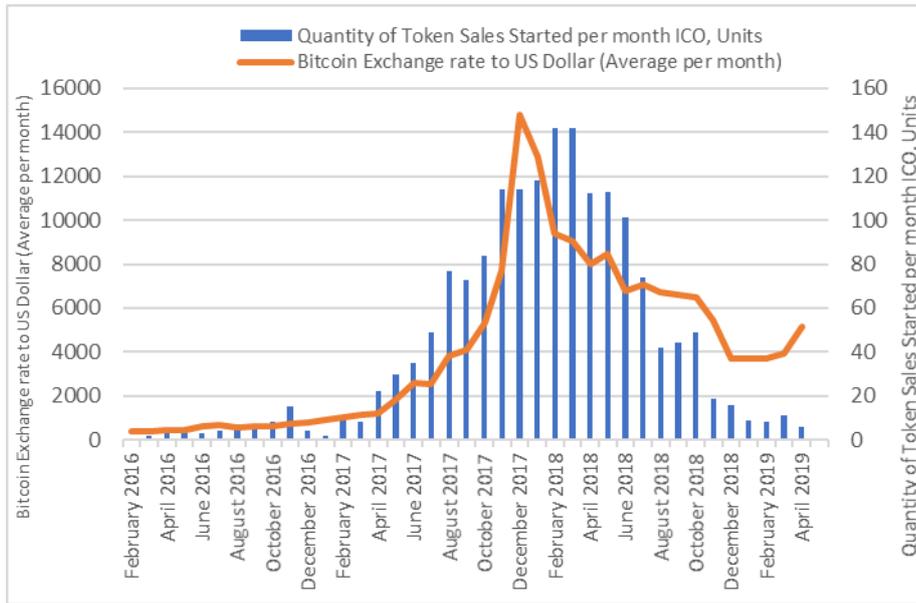
According to the statistics of the site [www.coinschedule.com](http://www.coinschedule.com), only 24% of the 7910 ICOs, IEOs, STOs presented on the site are executed, and only 4% of them are subsequently traded in the cryptocurrency markets [14]. Obviously, the probability of earning income in the cryptocurrency market is close to the probability of winning the lottery.

Nevertheless, attempts are already being made to predict the dynamics of the Bitcoin exchange rate on the basis of the instruments used in the financial markets - fundamental and technical analysis. At the same time, the researchers note that its course is influenced by events, both related to the cryptocurrency itself, for example, hacker attacks, and macroeconomic instability, which increases the attractiveness of alternative assets [15].

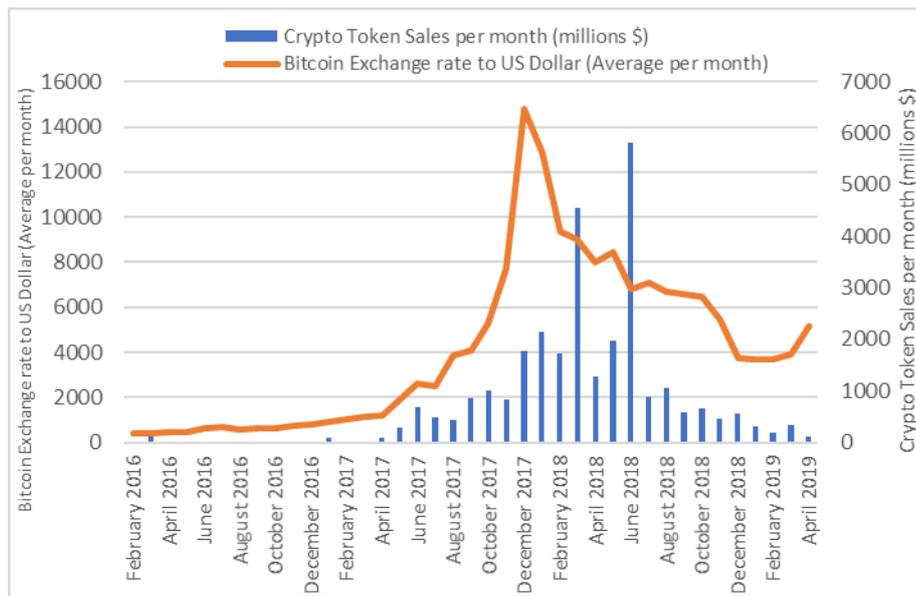
In turn, the dynamics of the bitcoin rate can be viewed as an indicator of the state of the cryptocurrency market, due to the fact that it is still the first most popular cryptocurrency to this day. The behavior of investors and speculators in this emerging market will be largely determined by the dynamics of the Bitcoin rate. Figures 1 and 2 show the relationship between the dynamics of the average monthly rate of Bitcoin to the US dollar, the number of tokens and the amount of funds attracted with their help.

The number of placements of tokens per month can be considered as the main indicator of the activity of market participants (Figure 1); the graph reflects the direct connection of the indicator with the average monthly rate of Bitcoin.

This indicator reflects the expectations of the participants-sellers of this market: the growth of the cryptocurrency exchange rate stimulates market participants to more actively exit with the offer of tokens. In figure 1, you can see that the number of token offerings repeats the dynamics of the Bitcoin exchange rate with some lag: in most cases, participants in this market make decisions, assessing the trends of the Bitcoin exchange rate.



**Figure 1.** Dynamics of Bitcoin Exchange rate to US Dollar and Quantity of Token Sales Started per month [Figure constructed by the authors on the site database <https://www.coinschedule.com>].



**Figure 2.** Dynamics of Bitcoin Exchange rate to US Dollar and Crypto Token Sales per month [Figure constructed by the authors on the site database <https://www.coinschedule.com>].

The relationship of the average monthly rate of Bitcoin with the amount of funds raised during the sale of tokens in Figure 2 does not look so clear. Obviously, the amount of funds raised through the cryptocurrency market is a more inert indicator than the number of tokens placements.

To confirm or disprove the hypothesis about the existence of a link between the bitcoin rate, the number of placements of tokens and the amount of funds raised with their help, we can use the tools of correlation and regression analysis. The initial data for the analysis after preliminary standardization are presented in Table 1.

**Table 1.** Normalized source data [compiled by the authors on the site database <https://www.coinschedule.com>].

Period	Quantity of Token Sales Started per month A	Crypto Token Sales per month, Amount B	per Bitcoin Exchange rate to US Dollar (Average per month) C
February 2016	0,023	0,000	0,098
March 2016	0,046	0,243	0,101
April 2016	0,093	0,000	0,105
May 2016	0,093	0,000	0,112
June 2016	0,069	0,000	0,154
July 2016	0,093	0,000	0,160
August 2016	0,162	0,000	0,140
September 2016	0,162	0,000	0,147
October 2016	0,185	0,000	0,156
November 2016	0,347	0,029	0,176
December 2016	0,093	0,000	0,199
January 2017	0,046	0,109	0,220
February 2017	0,255	0,000	0,256
March 2017	0,185	0,000	0,274
April 2017	0,510	0,109	0,293
May 2017	0,695	0,385	0,455
June 2017	0,811	0,894	0,636
July 2017	1,135	0,655	0,610
August 2017	1,783	0,568	0,932
September 2017	1,691	1,155	0,992
October 2017	1,945	1,327	1,288
November 2017	2,640	1,098	1,880
December 2017	2,640	2,365	3,600
January 2018	2,733	2,868	3,129
February 2018	3,289	2,284	2,278
March 2018	3,289	6,049	2,192
April 2018	2,594	1,686	1,949
May 2018	2,617	2,640	2,053
June 2018	2,339	7,742	1,649
July 2018	1,714	1,157	1,724
August 2018	0,973	1,408	1,628
September 2018	1,019	0,762	1,604
October 2018	1,135	0,862	1,578
November 2018	0,440	0,607	1,318
December 2018	0,371	0,731	0,906

January 2019	0,208	0,402	0,900
February 2019	0,185	0,255	0,896
March 2019	0,255	0,463	0,958
April 2019	0,139	0,149	1,253

Let's assess the closeness of the connection between the Bitcoin rate and the factors chosen as indicators of the sentiments of the market participants in cryptocurrencies (See Table 2).

**Table 2.** Correlation matrix [compiled by the authors on the basis of Table 1].

	A	B	C
A	1		
B	0,741515	1	
C	0,847853	0,633796	1

Correlation analysis confirmed the existence of a direct relationship between the bitcoin rate and the considered indicators, however, the relationship between Bitcoin quotes and the number of token allocations is closer. Construction of regression models describing the relationship between Quantity of Token Sales Started per month, Crypto Token Sales per month, Amount and Bitcoin Exchange rate to US Dollar (Average per month) confirm the findings of correlation analysis. Thus, the relationship between Quantity of Token Sales Started per month (Y) and Bitcoin Exchange rate to US Dollar (Average per month) (X) is described by the regression equation:

$$y = 1,0049x - 0,00491 \quad (1)$$

The coefficient of determination was 0.7189, therefore, 71.89% of the variance is explained by the factor Bitcoin Exchange Rate to US Dollar (Average per month). Obviously, the hypothesis about the presence of a relationship between the number of placements of tokens and the rate of bitcoin can be accepted.

The relationship between the amount of resources attracted by placing tokens (Crypto Token Sales per month (Y)) and the dynamics of Bitcoin Exchange rate to US Dollar (Average per month) (X) is less noticeable. The regression equation is as follows:

$$y = 1,1413x - 0,1413 \quad (2)$$

Only 40.16% of the variance of the dependent attribute is determined by the influence of the dynamics of the Bitcoin rate, i.e. in this model, 59.84% is the fraction of unexplained variance in the variance of the dependent variable. Obviously, the amount of resources attracted by means of the allocation of tokens weakly depends on the variation of the Bitcoin rate. Therefore, the hypothesis about the relationship of these indicators is not confirmed.

Thus, assessing the prospects of the cryptocurrency market, it is necessary to take into account the identified dependence of the number of tokens placed on the dynamics of the Bitcoin exchange rate. Obviously, the number of token placements can be considered as one of the indicators of the assessment of the behavior of cryptocurrency market participants, and the connection of this indicator with the bitcoin exchange rate allows to predict their future behavior.

## 5. Conclusions

The risks that accompany the use of innovative financial instruments are usually greater than those associated with traditional financial assets. The increased level of risk is caused by the greater uncertainty of such markets, the lack of sufficiently long time series, allowing for a more accurate identification of the trend. The development of innovative tools is always ahead of the pace of adaptation of their regulatory system, which often does not allow timely suppression of fraud and manipulation. Obviously, a participant in the market of innovative financial instruments should have a

clear idea of what the objects of sale and sale are, and what kind of risks are accompanied by their turnover.

In these circumstances, the approach of such recognized experts in the field of asset valuation, such as A. Damodaran, who views the cryptocurrency trade as speculation, is justified. Obviously, the gain in the «game of pricing» depends on the ability to determine trends in the behavior of other market participants.

In the course of this study, a relationship between the number of token offerings and the dynamics of the average monthly Bitcoin exchange rate was revealed. This dependence can be used to assess the changes in supply in the cryptocurrency market, which allows us to consider the indicator of the number of token offerings as an indicator of the mood of participants in this market.

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