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Suslenko V.*Master,**Faculty of Economics,**Taras Shevchenko National University, Kyiv, Ukraine;**e-mail: vladimirmetnew@gmail.com; ORCID ID: 0000-0002-6074-5034***Zatonatska T.***Doctor of Economic Sciences, Professor,**Faculty of Economics,**Taras Shevchenko National University, Kyiv, Ukraine;**e-mail: tzatonat@ukr.net; ORCID ID: 0000-0001-9197-0560***Dluhopolskyi O.***Doctor of Economic Sciences, Professor,**Faculty of Economics and Management,**West Ukrainian National University, Ternopil, Ukraine;**Higher School of Economics and Innovation (WSEI), Lublin, Poland;**e-mail: dluhopolsky77@gmail.com; ORCID ID: 0000-0002-2040-8762***Kuznyetsova A.***Doctor of Economic Sciences, Professor,**Rector,**Banking University, Ukraine;**e-mail: angelkuzn@gmail.com; ORCID ID: 0000-0003-3590-7625*

USE OF CRYPTOCURRENCIES BITCOIN AND ETHEREUM IN THE FIELD OF E-COMMERCE: CASE STUDY OF UKRAINE

Abstract. The article examines integration of cryptocurrencies as electronic payment systems in e-commerce enterprises. Practical usage of Ethereum and Bitcoin cryptocurrencies as electronic payment systems, as well as factors that may affect their functionality are studied. Coinbase Commerce and Bitpay, as market leaders in cryptocurrency payment providers, were analyzed to compare integration issues and commission analysis with traditional payment systems LiqPay, PayPal. It is determined that the factors influencing the integration of cryptocurrencies in the enterprise include the field in which this enterprise is operating, instability of the national currency, development of information technology. It has been proven that e-commerce companies specializing on selling consumer goods could use hybrid cryptocurrency payments in Bitcoin in 50% of transactions and Ethereum in 65% of transactions in the studied timeframe to reduce the cost of the transaction compared to the LiqPay system.

Key words: electronic payment systems, cryptocurrency, e-commerce, transactions.

JEL Classification D2, C50, G23, G41

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Сусленко В. В.*магістр,**економічний факультет,**Київський національний університет імені Тараса Шевченка, Київ, Україна;**e-mail: vladimirmetnew@gmail.com; ORCID ID: 0000-0002-6074-5034***Затонацька Т. Г.***доктор економічних наук, професор,**економічний факультет,**Київський національний університет імені Тараса Шевченка, Київ, Україна;**e-mail: tzatonat@ukr.net; ORCID ID: 0000-0001-9197-0560*

Длугопольський О. В.
 доктор економічних наук, професор,
 факультет економіки та управління,
 Західноукраїнський національний університет, Тернопіль, Україна;
 Вища школа економіки і інновацій (WSEI), Люблін, Польща;
 e-mail: dlugopolsky77@gmail.com; ORCID ID: 0000-0002-2040-8762

Кузнєцова А. Я.
 доктор економічних наук, професор,
 ректор,
 Університет банківської справи, Україна;
 e-mail: angelkuzn@gmail.com; ORCID ID: 0000-0003-3590-7625

ВИКОРИСТАННЯ КРИПТОВАЛЮТ BITCOIN ТА ETHEREUM У СФЕРІ ЕЛЕКТРОННОЇ КОМЕРЦІЇ: ПРИКЛАД УКРАЇНИ

Анотація. Розглянуто інтеграцію криптовалют як електронних платіжних систем в компаніях електронної комерції. Авторами досліджено практичне використання криптовалют Ethereum та Bitcoin як електронних платіжних систем, а також фактори, що впливають на їх функціональність. Проведений аналіз Coinbase Commerce та Bitra як лідерів ринку постачальників криптовалютних платежів в контексті порівняння з традиційними платіжними системами LiqPay та PayPal. Встановлено, що до факторів, які впливають на інтеграцію криптовалют, можна віднести галузь, в якій працює це підприємство, нестабільність національної валюти, розвиток інформаційних технологій. Доведено, що компанії електронної комерції, які спеціалізуються на продажу споживчих товарів, могли б використовувати гібридні криптовалютні платежі Bitcoin у 50% своїх транзакцій і Ethereum у 65% своїх транзакцій за аналізований період, що б дозволило суттєво знизити вартість останніх порівняно із системою LiqPay.

Ключові слова: електронні платіжні системи, криптовалюта, електронна комерція, транзакції.

Формули: 0; рисунки: 9; таблиці: 2; бібл.: 16.

Introduction. Electronic payment systems are rapidly evolving to meet the demand for electronic funds transfer and demonstrate a set of development trends, such as: the trend towards inclusive access to electronic payment systems, the trend towards information security of the system and the trend towards digitalization of the system through mobile banking. currencies and the development of the use of the Internet as a global e-commerce network.

General problems overview. Cryptocurrencies, as a subject of research on the integration of new payment instruments into global networks, can be considered as an alternative to existing electronic payment systems and listed the characteristics of cryptocurrencies that are unique in relation to traditional electronic payment systems.

The scientific hypothesis includes the following statement, whether cryptocurrencies can find practical use as parts or substitutes for electronic payment systems. This thesis potentially creates an additional link of research questions and tasks, namely: the existing regulatory framework and foreign experience of cryptocurrency regulation; approaches to the integration of cryptocurrency settlements at businesses and their economic efficiency; the main motivators of the transition from traditional payment systems to cryptocurrency payment systems or hybrid use of both payment systems; types and examples of settlements that can be considered rational to perform in cryptocurrency; types and examples of cryptocurrencies that can be used for settlements, etc. If the company leaves the cryptocurrency at the account when it has the opportunity to sell it or settle with counterparties, then this problem should be considered in studies that examine cryptocurrency as an alternative investment or study the preservation of effective currency balance in the company.

Literature review. Currently, cryptocurrencies are adopted both at e-commerce enterprises and enterprises that operate in the real world. Examples of the use of cryptocurrencies for offline

settlements are the recent popularity of cryptocurrencies in Turkey [1], caused by the weakening of the national currency, and the popularity of cryptocurrencies for settlements in Venezuela, caused by hyperinflation of national currency [2]. This indicates the relevance of the use of cryptocurrencies by Ukrainian e-commerce enterprises.

It is worth noting that cryptocurrencies already have some use in electronic payment systems, but this use is not a systemic and stable solution, and mostly resembles the marketing promotions from some companies: promotions from Burger King and Coca Cola with unique gifts for those who use cryptocurrency for settlements.

According to table 1, currently, the world’s largest enterprises using cryptocurrency payments in e-commerce, as of February 2021, use the following cryptocurrency payment providers such as BitPay, Coinbase, Flexa, or create their own integrations with cryptocurrency networks [3; 4; 5]. According to the website of Shopify’s e-commerce platform [6], currently, Shopify allows online stores to receive payments through cryptocurrency processors Coinbase Commerce, BitPay, GoCoin, CoinPayments.net. There are also smaller players in this market that offer cryptocurrency payment gateways to customers, such as CoinGate, Electroneum, Circle Pay.

Thus, given the choice of market leaders, integration complexity, transaction fees, and other required fixed costs, Coinbase Commerce and BitPay platforms can be considered market leaders in this field [7; 8]. Currently, these players allow online stores to integrate through the connection of a software module to a server application. This operation can be done even by a person without significant technical knowledge. This integration creates a cryptocurrency gateway for the enterprise and allows you to accept cryptocurrency payments in cryptocurrencies Bitcoin, Litecoin, Bitcoin Cash, Ethereum, and USD Coin.

Table 1

List of the largest enterprises in the world that use cryptocurrencies to conduct economic activity in global networks

Company	Cryptocurrency payment provider	Date of use
Twitch	Bitpay	2014 – 2019 2020 –till now
Restaurant Brands International Inc.	Cryptobuyer + self-hosted integration	September 2019 (Germany, temporary promotion, self-hosted integration) Since 2020 in Burger King Venezuela (Cryptobuyer)
Overstock.com, Inc.	Coinbase	2014
Coca-Cola Amatil Limited	Centrapay	Temporary promotion
Yum! Brands, Inc.	Cryptobuyer	Integration at Pizza Hut Venezuela
Rakuten, Inc.	Bitnet Technologies	2015 – till now
Whole Foods Market Inc.	Flexa	2019 – till now
PayPal Holdings, Inc.	Self-hosted integration	2020 – till now
Starbucks Corporation	Bakkt	2020 – till now
AT&T	BitPay	2019 – till now
USAA	Coinbase	2015 – till now
The Home Depot, Inc.	Flexa	Planned
Bayerische Motoren Werke AG (BMW)	BitPay	2021 – till now
Microsoft Corporation	Self-hosted integration	2014 – 2016 (XboX Store) 2019 – till now (other MSFT services)

Source: compiled based on [3; 4; 5].

According to the official website, BitPay has a 1% fee for transfers, which can be on both the buyer's side and the seller's side. But BitPay does not provide a functionality of a cryptocurrency exchange and doesn't allow converting a cryptocurrency to a fiat equivalent. In order to convert cryptocurrency to fiat equivalent, an online store using BitPay must transfer cryptocurrency to the exchange, which also costs a network fee.

According to the official Coinbase Commerce website [7], transactions in the Coinbase Commerce network have no fees other than cryptocurrency network fees, but Coinbase has other indirect fees when withdrawing funds in fiat equivalent, such as commissions when buying another cryptocurrency for cryptocurrency, or when converting cryptocurrencies in fiat equivalent (0,5%). Thus, the indirect commission in the Coinbase system is 0,5%. This commission does not take into account the cost of the transaction in the cryptocurrency network, which is dynamic. Therefore, it is advisable to consider Coinbase Commerce as the leader in the field of cryptocurrency settlements due to the advantages of the commission, or rather its absence, as well as the integration with the centralized exchange Coinbase, whose commission is smaller than the transaction fee of BitPay.

It is worth noting that the practical benefits of integrating a cryptocurrency payment system at an enterprise can be expressed through a set of characteristics, the value of which can be subjective for the enterprise. Characteristics that affect the practicality of integration are the availability of hybrid payment systems, quality of integration between ERP and BPM systems and cryptocurrency or hybrid payment systems, and other indicators that may affect the practical benefits of integration. However, given the variety of systems and solutions available, these criteria can be considered insignificant because they depend on specific characteristics of the enterprise and technological solutions that are available for the enterprise's personnel. Thus, the only characteristic that can be considered significant is the size of the fee taken by the electronic payment system. Therefore, this study does not consider the comparative characteristics of electronic payment systems that do not affect the financial benefits of the enterprise.

Currently, different electronic payment systems in different countries set their own commission rates for transactions. Among the traditional electronic payment systems that have a significant impact on the current state of e-commerce in Ukraine and other countries, we can highlight [8; 9]:

- Liqpay, as the leading Ukrainian Internet acquiring system,
- Paypal, as a global electronic money platform system.

Considering that the size of the interchange fee may depend on the bank that issued the card and is regulated in the EU and the USA at the legislative level, it is expedient to use the maximum legally permitted level of the commission (table 2). Currently, the average commission in the United States is considered to be a rate of 2% of the transaction value [10]. In the EU, the amount of the commission is determined by law in accordance with EU Regulation 2015/751, for credit cards – 0,3%, for debit cards – 0,2% [11]. For businesses that use PayPal in the United States to settle with local customers, the commission is 2,9% + 30 cents, when settling with buyers from other countries, the commission is 4,4% + 30 cents [12].

Table 2

List of electronic payment systems and commissions in their network

Electronic payment system	Fee, %
LiqPay	2.75%
PayPal (domestic payment)	2.9% + 30 cents
PayPal (international payment)	4.4% + 30 cents
USA (average fee)	2%
EU (regulated fee)	0.2%
Bitcoin	Dynamic fee, depends on the load of the network
Ethereum	Dynamic fee, depends on the load of the network

Source: compiled based on [9; 10; 11; 12].

Among the cryptocurrencies, potential key players in electronic payment systems may be Bitcoin and Ethereum, they have a dominant position in the cryptocurrency market due to a number of technical and integration characteristics, in addition, the functionality of smart contracts in Ethereum and atomic payments in Bitcoin can meet the demand for different settlements models.

Cryptocurrency transactions have a fixed fee, and the online acquiring systems discussed above determine the fee based on the interest rate. For online stores, as e-commerce companies that can connect more than one payment method for transactions through electronic payment gateways or software modules, it is economically feasible to use a certain method of calculation depending on the size of the transaction and, as a result, e-payment system fees. In other words, the store will use a certain electronic payment system if the amount of fee in this system is smaller than in others. It is worth noting that the Paypal network commission is the highest among all types of commissions based on the percentage of transactions.

Research methodology. The aim of the work is to assess the effectiveness and develop recommendations for the use of cryptocurrency settlements in the field of e-commerce, taking into account the current legal framework of the EU and Ukraine. The following methodological methods were used: scientific abstraction –for the formulation of theoretical generalizations and conclusions regarding the use of cryptocurrencies as an electronic payment system in e-commerce enterprises; analysis and synthesis – for studying the nature of cryptocurrency; economic-statistical analysis – for the distribution of transaction costs and marginal transactions’ amount under LiqPay and Bitcoin.

Research findings. The characteristics of the online store significantly affect the choice of the electronic payment system by the store. If the online store sells products at a relatively low price in large quantities, the store will be forced to pay a fixed fee to the cryptocurrency network for each transaction. This fee is dynamic and may increase depending on the price of the cryptocurrency and the demand for online transfers. According to *Fig. 1*, it is clear that making payments in 2016 is more profitable for the company than making a payment in early 2018, when the average fee paid for a transaction in the bitcoin network reached \$60. Therefore, the choice of the electronic payment system depends on the nature of the online store’s business model, number of goods sold, and size of transactions.

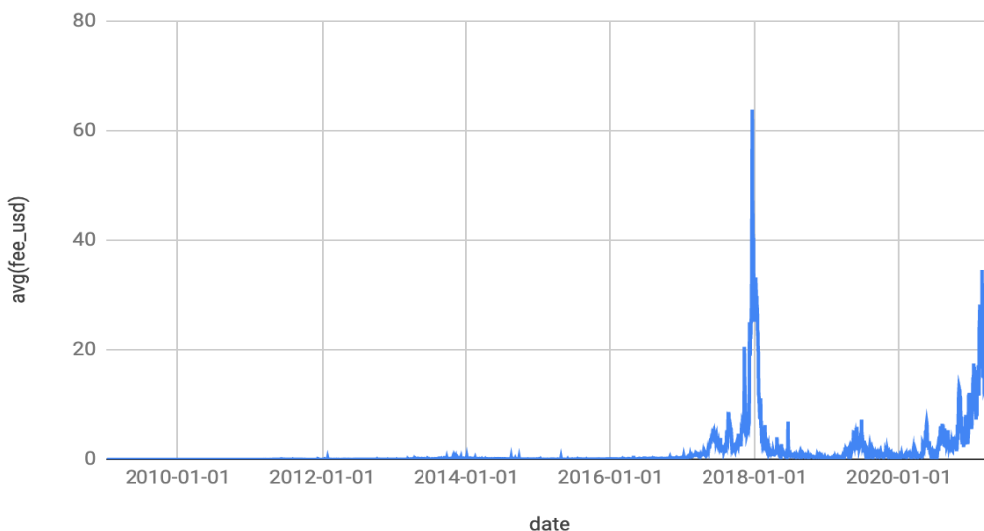


Fig. 1. Average cost of a transaction in the Bitcoin network in US dollars

Source: compiled based on [13].

According to *Fig. 2*, using Bitcoin for settlements for the company in the EU is rational when the transaction cost exceeds a fairly high limit. For example, transactions in early 2018 and spring 2021 must exceed \$30 thousand in order to make it rational to use Bitcoin. This is a significant barrier to the integration of cryptocurrencies as electronic payment systems in the EU.

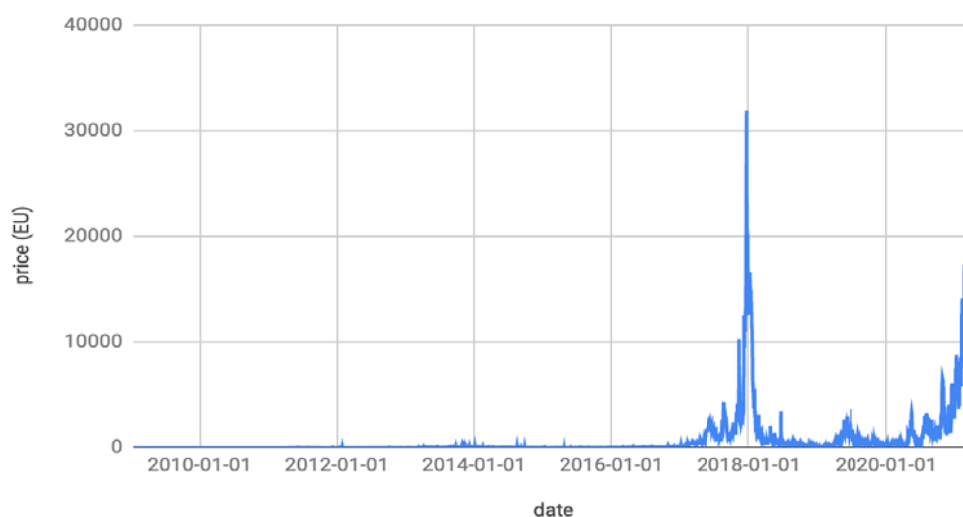


Fig. 2. The size of the transaction in which the use of Bitcoin as a payment system is equivalent to the use of the Internet acquiring system in the EU

Source: compiled based on [13].

Given that Coinbase Commerce is a leading system that does not charge a transaction fee, except for the cryptocurrency network commission, while LiqPay's online acquiring rate is 2,75%, and cryptocurrency payments are widely popular in countries with high inflation, it is worth considering the integration of cryptocurrencies in Ukrainian e-commerce companies that use Internet acquiring. As already mentioned, the characteristics of an enterprise that considers the possibility of using cryptocurrencies as electronic payment systems are then key when choosing an electronic payment system. Currently, LiqPay, as a leader in the Ukrainian market of internet-acquiring services, has a fee of 2,75% for transactions passing through the network [9]. This has created some conflicts in the business community due to the fact that the commission is too high in the opinion of the leaders of the e-commerce sector in Ukraine, for example, the online store Rozetka [14; 15].

It is advisable to consider several potential profiles of online stores that have a different number of sold goods that were sold at a certain price every day. For simplicity, we can assume that transactions are executed evenly on each day of the month, which potentially reduces the impact of possible fluctuations in the value of the commission at different times of the month. It also makes sense not to consider historical cryptocurrency data until 2017 due to a significant difference in the amount of the commission.

Given that the use of hybrid payment systems is currently possible for online stores through the connection of software modules, it is worth considering not only the scenario where cryptocurrency is the only possible calculation option, but also the hybrid scenario when cryptocurrency is used only if making a payment in cryptocurrency is less expensive compared to other internet-acquiring systems. The use of cryptocurrencies in Ukrainian online e-commerce can potentially solve the problem of high commissions, or partially eliminate it for certain types of transactions.

Until 2017 the average fee on the Bitcoin network was stable, but at the beginning of 2018 and 2021, significant increases in commission are easily noticeable (*Fig. 3–4*).

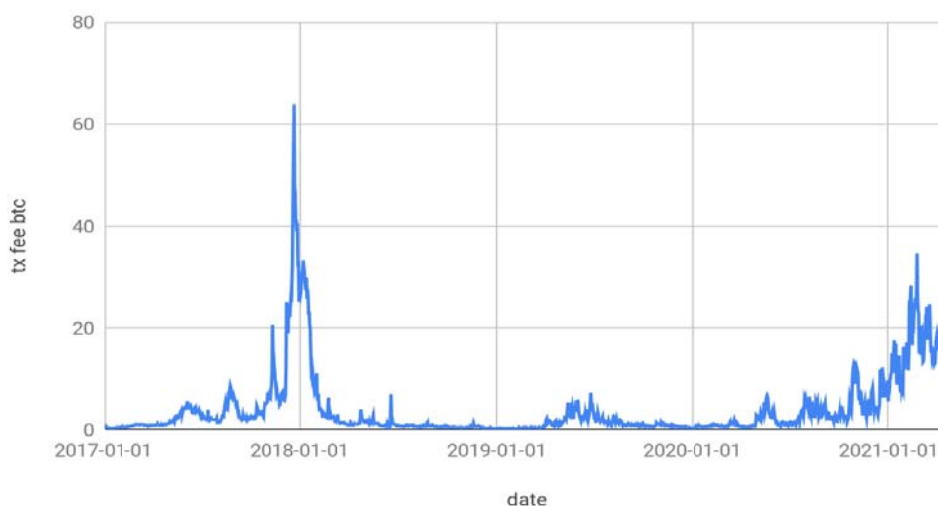


Fig. 3. The marginal cost of the transaction under which the use of LiqPay and Bitcoin leads to the same commission

Source: compiled based on [13].

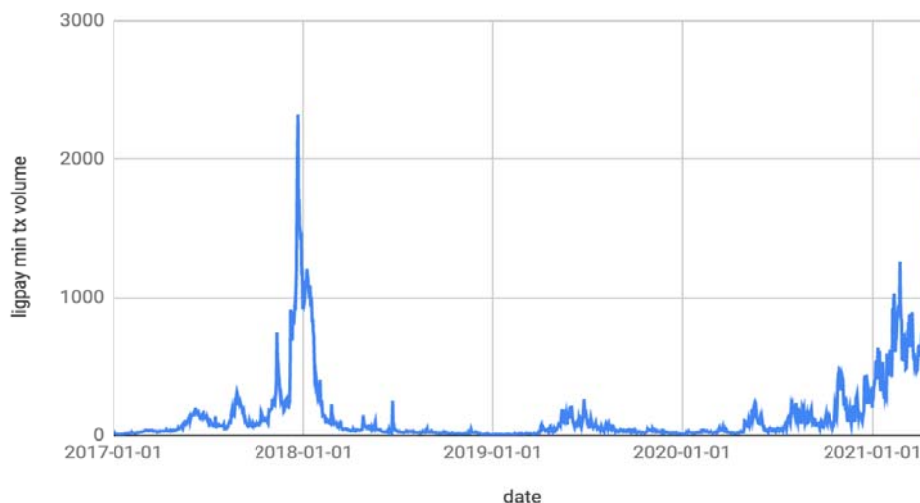


Fig. 4. The cost of the transaction under which the use of LiqPay and Bitcoin leads to the same commission

Source: compiled based on [13].

Thus, it should be noted that more than 25% of transactions account for transactions up to \$25. In the other 25% of cases, using the Bitcoin network is more profitable than using LiqPay for a transaction cost of up to \$50. At the same time, it should be noted that using Bitcoin in more than 30% of cases requires transactions in the range of \$100 to \$500 and above, which of course is not a median transaction for Ukrainian e-commerce (Fig. 5).

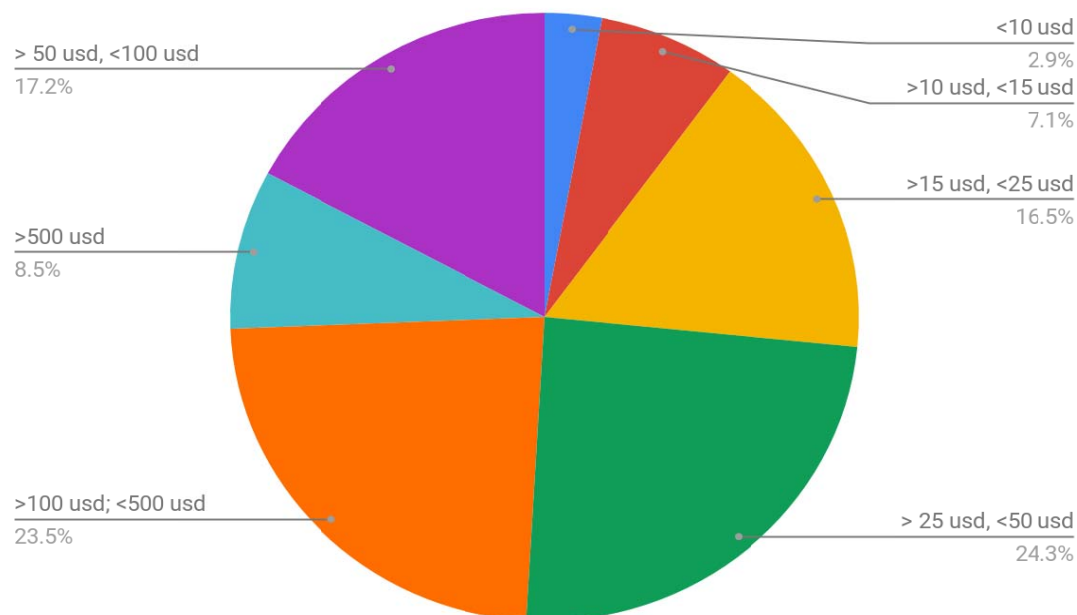


Fig. 5. Distribution of transaction costs (from 2017 to 2021) under LiqPay and Bitcoin fees are the same

Source: authors own elaboration.

A significant problem for the research and analysis of potential benefits for enterprises is the lack of information on the size of transactions and calculations performed by enterprises. Business statistics mostly focus on the use of the terms “average check” or “median value of sold goods”. Due to the fact that the economic benefits of using cryptocurrency payment systems can be assessed by the size of the transaction, and data on purchases and settlements with the company is information that may damage the company’s competitiveness, it is not possible to create an accurate assessment of the economic benefits of cryptocurrency.

According to statistics from OLX [14], which is one of the largest C2C and B2C commerce platforms in Ukraine, Ukrainians most often make online purchases in the following areas: 1) appliances and electronics – the average check is 2190 hryvnias, which is an equivalent to \$78–80; 2) clothing and perfumes – the average check is 860 hryvnias, which is an equivalent to \$30–35. Thus, cryptocurrency payments in Bitcoin cryptocurrency for this platform are more than relevant and could have been used in 50% of transactions from 2017 to save the money spent on transaction fees from online acquiring.

A similar situation can also be seen with Ethereum cryptocurrency in comparison with the electronic payment system Liqpay (Fig. 6–7). Moreover, the use of Ethereum as a settlement currency leads to a significant reduction in the amount of commission and helps to cover more payments passing through the e-commerce platform. Ethereum can be used in more than 65% of transactions to minimize the cost of commission on the Ukrainian e-commerce market, according to OLX and Picodi.com [14].

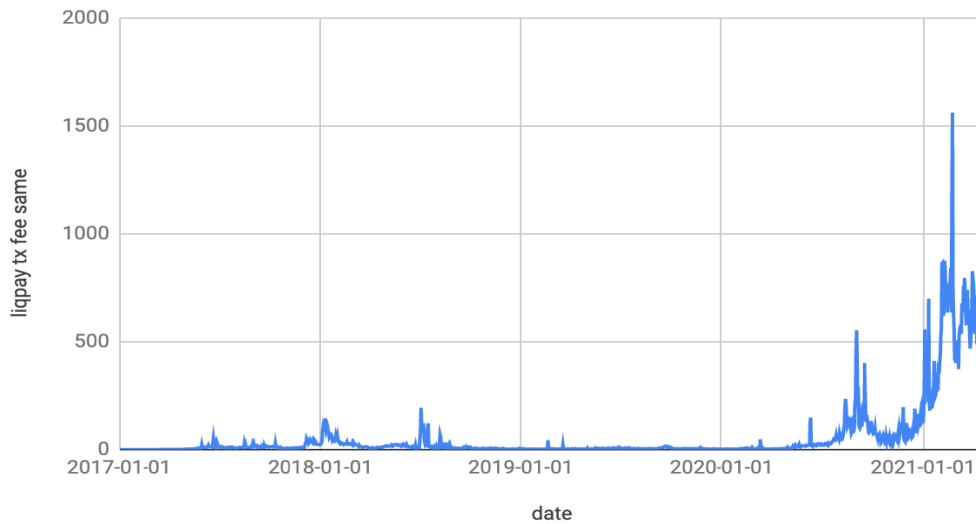


Fig. 6. Marginal amount of the transaction that results in the same transaction fee in LiqPay and Ethereum

Source: compiled based on [13].

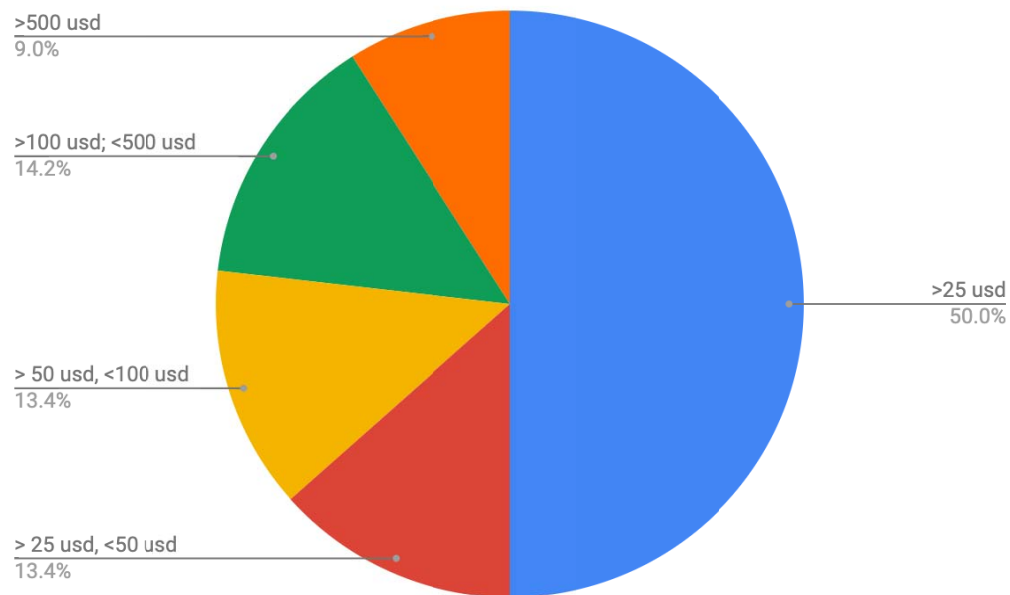


Fig. 7. Distribution of marginal transactions' amount (from 2017 to 2021) under which use of LiqPay and Bitcoin leads to the same commission

Source: authors own elaboration.

However, it should be noted that an accurate estimate requires real data on user transactions received by e-commerce companies, and also depends on the seasonality of purchases, availability of new products on the market, and other factors. However, some guaranteed benefits of cryptocurrency payments can be seen in such a market sector of Ukrainian e-commerce as buying a car on the Internet.

Cars cost more than a few thousand dollars, so the fee of a cryptocurrency network in this sector will be much lower than in Internet acquiring providers and other payment systems. Currently, according to OLX data for 2020, the average price of a car was \$4,700, and there were more than 1.8 million ads on the market.

Assuming that a certain company was selling a car per day during 2020, and it used Internet acquiring from LiqPay to make payments to customers. The LiqPay commission from the sale of a car is \$129,25, for a year the cost of the commission increases to \$47,305.

According to 2020 data, the annual fee on Ethereum and Bitcoin networks would be \$527 and \$1,048, respectively, which is only 0,031% and 0,06% percent of the good’s cost, compared to the 2,75% fee of Liqpay payment system (Fig. 8–9). This indicates a very high advantage of using cryptocurrencies as payment systems for the company that sells goods of this type.

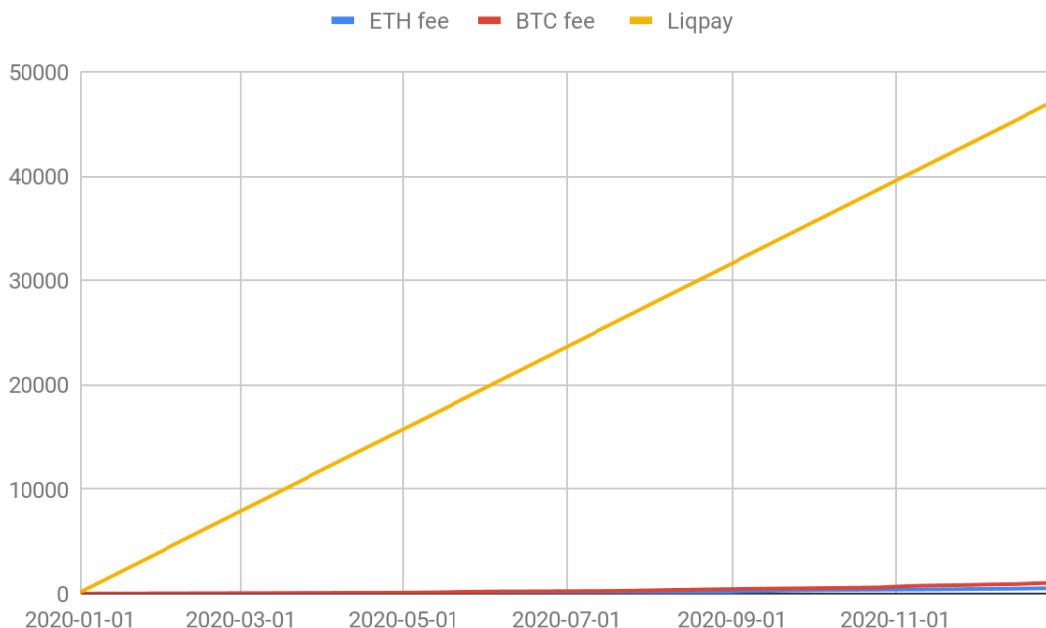


Fig. 8. Cost of Liqpay, Ethereum and Bitcoin fees in 2020 for the abovementioned company
 Source: authors own elaboration.

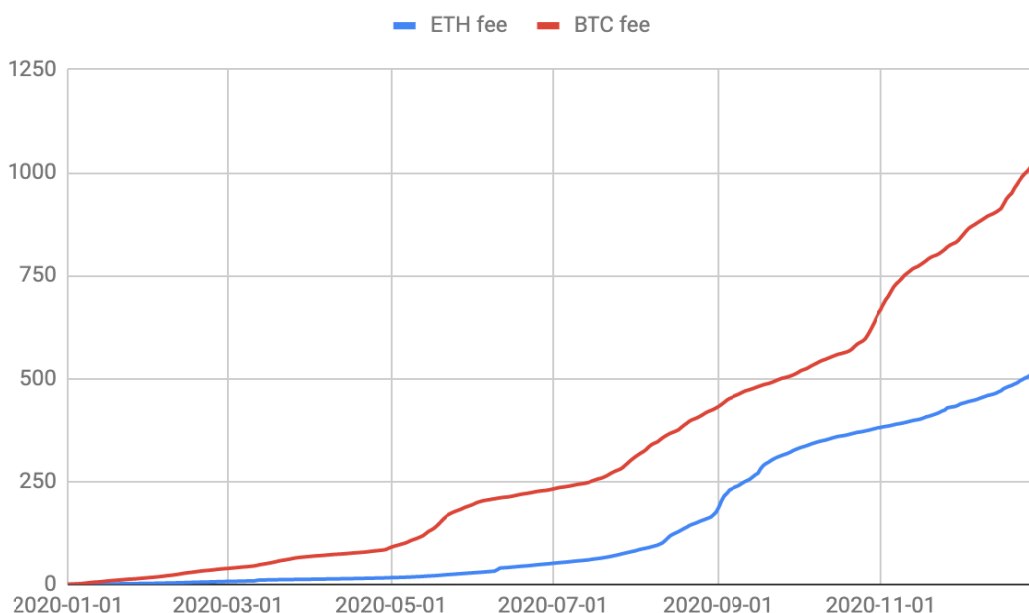


Fig. 9. Annual cost spent on transactions in Ethereum and Bitcoin networks in 2020 for the abovementioned company

Source: authors own elaboration.

Discussion. The study confirms that the applicability of cryptocurrencies as a part of hybrid electronic payments systems in Ukrainian e-commerce systems is significant. In comparison with LiqPay internet-acquiring system charging 2,75% of the transaction amount, usage of Bitcoin and Ethereum for settlements can help to decrease the fee significantly, up to 0,06% of the cost of the item in the. In the context of OLX marketplace statistics and e-businesses focusing on consumer goods, in the reviewed period 25% of the time it was cheaper for enterprises to make a transaction

up to \$25 on Bitcoin network, 25% of the time – up to \$50. For Ethereum this data is even more significant. Half of the time, performing a transaction on Ethereum network was cheaper than through LiqPay.

This study proves that intentions of companies such as BMW and Tesla [15; 16] are based on the fact that the use of cryptocurrency payment systems can significantly reduce the online acquiring fee for both these companies and companies whose goods are worth more than a certain maximum amount, at which the commission of the traditional electronic payment system is equal to the commission of the cryptocurrency payment system. On the scale of the Ukrainian car market, using cryptocurrencies to purchase cars could save up to 2% of the market that would be otherwise spent in fees, which is a quite significant saving.

Conclusions. The paper investigates the usage of cryptocurrencies as electronic payment systems at e-commerce businesses. It is proved that cryptocurrencies show certain differences from electronic payment systems, namely: dynamic transaction prices, dynamic demand for cryptocurrencies, high volatility. The study proved that the use of cryptocurrency payment systems creates significant benefits for the e-commerce sectors of Ukraine. According to the results of the analysis of the use of cryptocurrency settlements at the e-commerce enterprise that sells cars, it was proved that the use of cryptocurrency settlements for enterprises selling high-value goods is appropriate and allows to obtain significant savings on electronic payments. The results of the study can be used by e-commerce companies and for e-payment system developers, as they demonstrate trends and practical benefits of using cryptocurrencies as parts or substitutes of e-payment systems with better security, algorithmization, and lower transaction fees.

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