THE IMPACT OF BLOCKCHAIN ON INTERBANK AND CROSS BORDER PAYMENTS

by

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LIST OF ABBREVIATIONS

KYC Know Your Customer

AML Anti-Money Laundering

DEFI Decentralized Finance

NFT Non-Fungible Token

USDT Tether (Stablecoin)

USDC USD Coin (Stablecoin)

ARIMA Autoregressive Integrated Moving Average

ML Machine Learning

B2B Business-to-Business

C2B Consumer-to-Business

B2C Business -to- Consumer

C2C Consumer-to- Consumer

FX Foreign Exchange

FIAT Traditional government-issued currency (e.g., USD, EUR)

DAPP Decentralized Application

CHAPTER 1. INTRODUCTION

Globalization has opened new opportunities for people: ordering goods from the most remote corners of the world, working for companies on other continents, and maintaining ties with friends and relatives globally. At the same time, this interconnectedness has increased the need for fast, cheap, and reliable international payments, yet these often remain unattainable due to the limitations of traditional financial systems. International payments will reach $290 trillion by 2030, with approximately $12 trillion containing consumers in transactions (B2C, C2B, C2C) (Convera Fintech 2025+ Report). This rapid growth shows how urgent it is to fix the problems in international payment systems. Current payment methods remain slow and inefficient, making it difficult for both people and businesses to send money across borders.

Modern financial technology products, such as Wise, Revolut and others that we will discuss later, already offer innovative solutions that significantly simplify international payments. These services reduce fees and speed up of transaction processing and make the user experience more convenient. Despite these advances, such services have limitations. These fintech services still depend on traditional banks, which can cause delays and extra fees, especially when sending money to less common countries. As more people use international payments, these services may be hard to handle the growing number of transactions (Convera Fintech 2025+ Report). To solve these challenges, the adoption of advanced technologies like blockchain is crucial, and it may represent the next major step in the evolution of the financial system. Unfortunately, many people perceive blockchain only as a means for investment and trading. However, this technology has much broader potential. Due to its decentralization, blockchain provides transparency, reliability and faster transaction processing.

This study aims to analyze the impact of blockchain technology soon, up to 2030. It explores how this technology can reduce the costs of international transactions and make them more accessible. The answer seems obvious: the average cost of a blockchain transaction is just a few cents, compared to near 6.65% (C2C) for traditional systems (World Bank Remittance). However, cryptocurrency is not yet a universally accepted payment method. Therefore, it is important to examine the entire transaction cycle: from converting fiat currencies to cryptocurrency, transferring funds via blockchain and converting them back to fiat currency in another country.

In 2021-2022, venture capitalists invested more than $32 billion in the blockchain and crypto industry (Crypto & Blockchain Venture Capital – 2024). Although the volume of investments dropped to $8 billion in 2023, 2024 has shown a resumption of growth, which is likely to continue in 2025. This indicates strong confidence among major investors in the future of blockchain technology.

Despite all prospects, blockchain is not without disadvantages. One significant issue - volatility, was partially solved through the introduction of stablecoins. The most popular examples include USDT, USDC, and EURC, the euro equivalent. However, the market for these currencies remains highly fragmented. Several challenges still prevent cryptocurrency from becoming a universally accepted means of payment. Key obstacles include:

1. Lack of coverage for all stages of a transaction (verification, guarantees, and final settlement).
2. Non-interchangeability of stablecoins across different blockchains. While Bridge tools attempt to solve this, they can't offer a comprehensive solution due to additional barriers.
3. Liquidity issues, which prevent large businesses from fully utilizing stablecoins, particularly when purchasing large sums due to fragmented assets across various blockchains.

4. Security and regulation create another significant issue. Although blockchain ensures transparency in transactions, the anonymity of address holders complicates identification, creating challenges for regulatory oversight.

The main goal of this study is to show blockchain's potential and inspire fintech companies and investors to enhance this technology, but also show its limitations, and introduce innovations that could change the financial industry. It is important to note the difficulty of conducting such studies for two main reasons. First, despite the significant advances the crypto industry has made, it is still young. Bitcoin emerged only in 2009, stablecoins appeared in 2014, and gained widespread popularity in 2017 (Artemis Datashare). Second, while blockchain provides a fully open transaction history, the data volumes are extremely large. For example, the Ethereum network processes over 1.28 million transactions daily, generating more than 250GB of data per year (Artemis Datashare).

Despite these difficulties, we obtained interesting results that could be useful for several groups. Our findings provide valuable insights for venture investors to identify promising blockchain investments and compatible projects. The research also offers important market insights for fintech and blockchain startups planning their future development. Furthermore, both consumers and businesses can benefit from understanding how blockchain could improve international payments, allowing early companies to gain a competitive advantage in the evolving financial market.

CHAPTER 2. INDUSTRY OVERVIEW AND RELATED STUDIES

2.1. CROSS-BORDER PAYMENTS MARKET

To better understand the scale of the international payments industry, it is necessary to understand its structure, challenges and opportunities in greater depth. This sector is a key in ensuring globalization by facilitating international trade, supporting economic ties between countries and creating financial integration. With the advent of digitalization, the international payments market has experienced a surge in growth, providing access to financial services even in the world's most remote regions.

The international payments market was worth $190 trillion in 2023, and it has a complex structure, which can be divided into two main segments (Convera Fintech 2025+):

1. **Wholesale** (Other banks and investors, Institutional investors, Hedge funds and trading companies, Governments and Central Banks) - provides global liquidity, risk management and large-scale foreign exchange transactions, prioritizing efficiency and cost reduction.
2. **Retail** (B2B, C2B, C2C, B2C) - includes money transfers between consumers and businesses. Among these, consumer transactions often incur the highest fees due to complex processing requirements and intermediary involvement.

Table 1. The distribution of the market volume by segments, 2023, Trillions USD

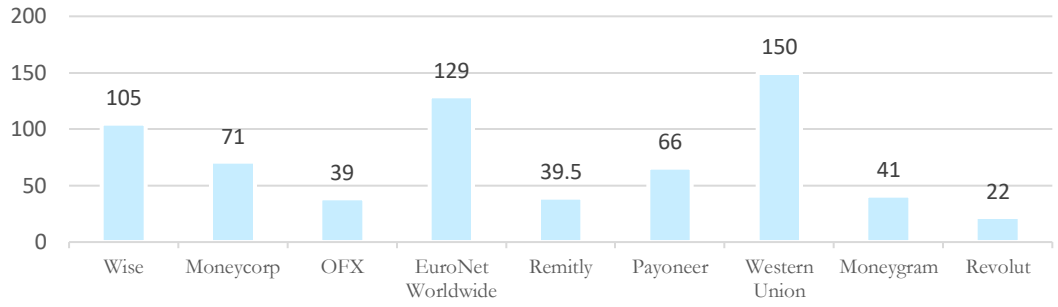
Wholesale	145.6	76.7%	C2B	3.1	1.6%
B2B	37.6	19.8%	C2C	1.8	0.95%
B2C	1.7	0.9%			

Source: own calculations based on Convera Fintech 2025+ Report

Fintech companies are a major force that forms the international market, using innovative technologies and their global reach. The chart below highlights the transaction volumes

of fintech players like Western Union, Wise, Payoneer, and others, showing their dominance in specific regions (Companies 2023 Annual Reports).

Figure 1. The distribution of the market volume by Fintech companies, 2023, Billions USD



Source: own presentation based on companies 2023 Annual Reports

B2B transactions charge minimal fees and require limited intervention. At the same time, high commissions for C2C and C2B create significant barriers for consumers, especially in countries with limited banking access, which requires special attention for the improvement of these segments. By 2023, the total volume of high-fee transactions reached $6.6 trillion (Convera Fintech 2025+ Report).

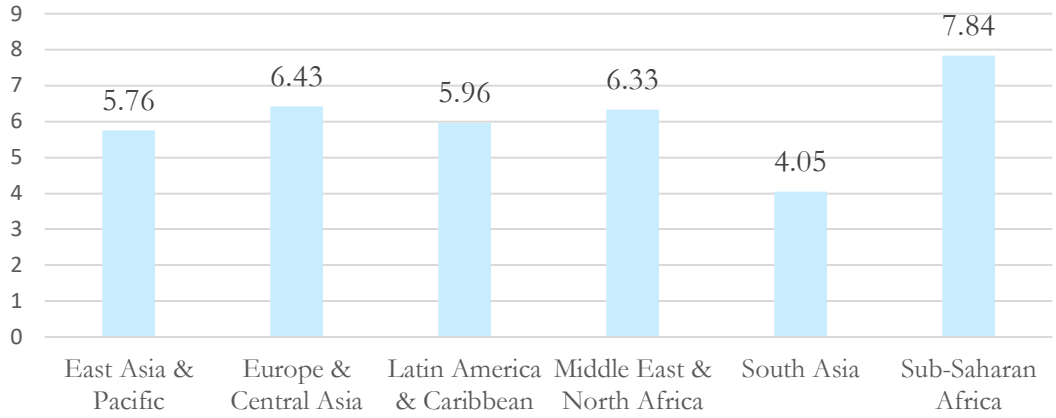
Table 2. Transaction Fees by Segment, 2023, %

B2B	0.10%	C2B	3.50%
B2C	1.50%	C2C	6.00%

Source: own presentation based on Convera Fintech 2025+ Report

The cost of international transactions can vary greatly by region, making it a key factor in understanding economic conditions worldwide. The table below shows the average cost of sending $200, illustrating the gap between countries with advanced banking infrastructure and those with limited access to financial services (World Bank Remittance Prices Worldwide Report, 2022).

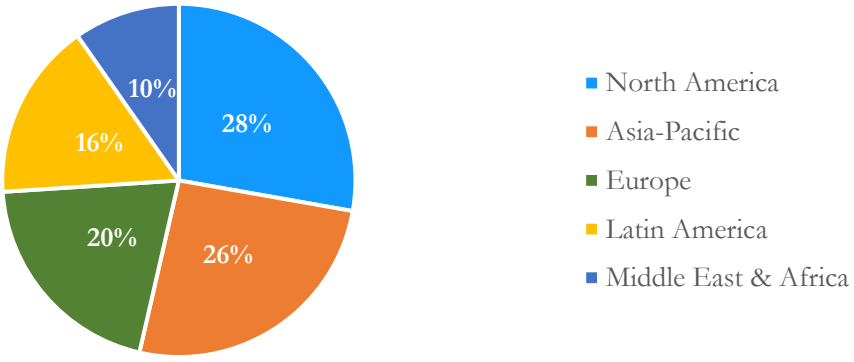
Figure 2. Average fees by region for C2C transfer, 2022, %



Source: own presentation based on the World Bank Remittance Prices Worldwide Report

Africa faces the highest international transaction fees due to large limitations in banking infrastructure. There are technologies, like MobileMoney that has been introduced to solve this problem. MobileMoney approach allows mobile operators to function as banks, which significantly improves the accessibility of financial services to the local population. Millions of people have received access to previously unavailable transfer services through MobileMoney. However, its availability is limited to certain countries, and high fees remain a concern. Despite its high population, Africa has the smallest share of global international transaction revenues. At the same time, other regions share the market almost equally (*Figure 3*)

Figure 3. The distribution of the market volume by regions, 2023, %



Source: own calculations based on Convera Fintech 2025+ Report

Since 2000, the international payments market has grown at an average annual rate of 5.5% based on data from Convera Fintech 2025+ Report. While the COVID-19 pandemic temporarily reduced this growth to 4.2%, it is expected that by 2030 the market will reach even greater scale and become even more significant for the global economy. In the next parts of this study, will be analyzed the potential development of this market in details. However, the implementation of the latest technological innovations is important to increase efficiency. Such innovations can reduce transaction costs and improve service quality for end users.

2.2. BLOCKCHAIN AND CRYPTOCURRENCIES

Blockchain technology offers new ways for improving international payments. Today, there are a few most popular blockchains (Coingecko data). They vary significantly in their technical approaches, capabilities, and target markets. Each blockchain has unique features, making them suitable for diverse financial and business applications (*Table 3*).

The first and most well-known blockchain is Bitcoin. While historically important, Bitcoin faces challenges such as high fees, slow transaction times, and support for only one currency. A group of EVM-Compatible Blockchains (Ethereum, Polygon, Avalanche, Binance Smart Chain) have solved scalability issues by providing faster transactions and reducing fees. They also support smart contracts, which greatly expands their functionality. And blockchains like Solana, Ripple, Stellar use alternative consensus mechanisms that process transactions faster and cheaper. Ripple targets financial institutions, while Stellar is designed to support transactions in regions with limited banking access.

Table 3. Four blockchains comparison, 2024

Blockchain	Transactions per Day	Avg Time per Transaction	Avg Fee ($)	Daily Volume (B$)
Bitcoin	350,000	10-15 min	10	10
Ethereum	1,200,000	15-30 sec	2	25
Solana	5,000,000	< 1 sec	< 0.01	8
Ripple	1,500,000	3-5 sec	< 0.01	5

Source: own calculations based on blockchains data and Artemis Datashare

New-generation blockchains outperform Bitcoin in critical areas such as transaction speed, fees, and scalability. These features make them better suited for international payments, particularly where fast processing of large transaction volumes is essential.

Stablecoins are cryptocurrencies that have a stable value connected to another asset. Most often fiat currencies such as USD or EUR, but stablecoins can also be connected to commodities like gold, oil or others. Stablecoins are stable, so they become an ideal tool for international payments, reducing the risks associated with cryptocurrency volatility.

As mentioned earlier, stablecoins can exist on different blockchains, making them a universal tool for international financial transactions. Different regions around the world prefer specific blockchains and stablecoins (*Table 4*). There are two mechanisms promote their transfer between networks:

Bridges enable the movement of assets between blockchains through the process of locking coins on one network and release their equivalent on another. This can be compared to the interbank transfer system in traditional finance, which allows transfer funds between different banks and institutions.

Swaps, allows one cryptocurrency to be exchanged to another (e.g. USDT to USDC) within one or more blockchain networks. This mechanism provides liquidity for users and allows them to quickly adapt to market changes.

Table 4. Popularity of blockchains and stablecoins by regions, 2024

Region	Popular Blockchain	Popular Stablecoin
North America	Ethereum	USDC
Europe	Ethereum	USDT
Asia-Pacific	Solana	USDT
Latin America	Tron	USDC
Africa	Polygon	USDT

Source: own research based on data from on/Off ramps providers

Blockchain technology is actively integrating into traditional financial systems. A large companies like Visa, Mastercard, PayPal are using stablecoins right now. Visa collaborates with Circle, the issuer of USDC and EURC, to integrate stablecoins into their global payment infrastructure. This partnership allows to make blockchain-based transactions between businesses. Similarly, Mastercard has partnership with cryptocurrency exchange Gemini to launch a credit card that rewards users in cryptocurrency, promoting digital asset adoption in traditional finance. PayPal has also used blockchain by introducing its own stablecoin PYUSD, for payments and transfers across a global merchant network, further integrating cryptocurrencies into everyday transactions. And finally, Stripe has bought crypto unicorn Bridge for $1 billion to implement stablecoin solutions in its payment systems, focusing on North America and Europe regions.

Even traditional financial institutions like Swift have successfully demonstrated how blockchain can facilitate the movement of tokenized assets between different blockchains (Swift Press Release Research, 2023)

The industry of blockchain-compatible projects remains young and not yet fully formed, with high volatility, fluctuating market sentiment, and dependence on cryptocurrency value contributing to instability. However, major fintech players, have spent decades modernizing the financial sector and are heavily investing in blockchain development. They recognize the importance of blockchain for the future of finance. Their ongoing

efforts to implement blockchain innovations highlight the technology's potential to transform the global economy and underscore its growing necessity.

2.3. DISCUSSION OF RELATED STUDIES

The use of blockchain for international payments has been a topic of discussion since the introduction of Bitcoin. As a result, a significant body of research exists, offering perspectives that range from supportive to highly critical regarding the potential and development of this technology. Below, we explore several key studies in greater detail.

In the study, Xian Zhuo, Felix Irresberger, and Denefa Bostandzic (2023) analyze the benefits of blockchain technologies, using the example of African countries. Due to the complexities of the banking system and the limitations of local currencies, a significant part of the population of these countries does not have access to quality financial services. The study analyzes the Stellar network, which has created mechanisms for issuing stablecoins connected to local currencies. These stablecoins are used on the network for international payments, providing a larger population with access to global financial services.

The authors also highlight the importance of complying with Know Your Customer (KYC) and Anti-Money Laundering (AML) procedures. These are important components for integrating blockchain into fintech and traditional banking systems. This aspect of their study is very interesting and deserves a separate detailed consideration.

Castle Island Ventures, Brevan Howard Digital, and Visa (2024) discuss various aspects of stablecoin adoption, including transaction volume analysis, risks, challenges, and future trends. To avoid repetition, this section focuses on aspects that have not been previously mentioned.

First, it is worth paying attention to their study of stablecoin adoption in the countries of Brazil, Turkey, Nigeria, India, and Indonesia. Survey results indicate that a significant proportion of respondents use cryptocurrency for international payments. Among these countries, Nigeria exhibits the highest level of stablecoin adoption. The reasons for this phenomenon will be discussed in detail in the following chapters.

Another important observation is the problem of cryptodollarization, which has the potential to weaken local currencies. This happens when stablecoins connected to the currency of another country (like USD), begin to be very used for payments and storage of savings, displacing the local currency. This situation is dangerous to economic stability, as national currencies lose their role as the main means of payment, which can lead to a loss of control over monetary policy by the central bank. This is especially relevant for countries with a high level of cryptocurrency use, such as Ukraine. In such conditions, it is necessary to develop effective regulatory mechanisms to minimize risks to the economy and ensure a balanced introduction of innovative financial instruments.

In the study "Silicon Valley Bank bankruptcy and Stablecoins stability", the authors analyze the impact of the bankruptcy of Silicon Valley Bank (SVB) on the stability of stablecoins. In March 2023, the bankruptcy of SVB caused a panic due to the freezing of $3.3 billion in USDC reserves, which caused a temporary loss of its peg to the dollar. The results showed a significant effect of dependence between stablecoins. The study demonstrates how instability in the traditional financial system affects digital assets. The authors highlight the importance of considering the relationship between centralized and decentralized finance to minimize risks. This study is very useful for understanding the extent to which stablecoins and other crypto assets depend on the situation in the financial world, and therefore are not independent instruments.

Another great study "Some Simple Economics of Stablecoins" states that in order to realize the potential of stablecoins, it is important to create transparent reserves and implement regulatory standards that guarantee financial stability and consumer

protection. The authors suggest providing stablecoins with reserves of high-quality assets, such as government bonds or deposits with central banks, which minimizes liquidity risks. It is also important to establish transparent standards for reporting reserves, providing for the regular publication of independent audit reports. In addition, it is necessary to introduce regulatory requirements for the minimum level of reserve coverage to maintain stability even in periods of financial turmoil. These are very important points, without the implementation of which it is impossible to fully integrate stablecoins into the financial system.

Many other studies focus on comparing blockchain with traditional methods or analyzing ways to integrate this technology into the financial system. This study, however, tries to quantify the positive impact of blockchain adoption. Providing data-driven evidence is crucial for convincing investors, governments, and global organizations of the technology's advantages. Increased interest and investment will further accelerate the development and integration of blockchain, allowing more people and companies to take advantage of its potential.

CHAPTER 3. METHODOLOGY

To identify the impact of blockchain implementation on reducing the cost of fees in international payments, the study will consist of three main parts. In the first one, a large volume of blockchain transactions will be categorized into four groups: payments, investments, trading, and inorganic. This step will provide precise data on the number and volume of transactions specifically used for payments.

The second part involves forecasting changes in the volume of blockchain transactions by 2030. For this purpose, time series analysis is used to identify future trends and potential growth in transaction numbers. In the final part, the data collected will be compared with information on traditional international payment methods. By calculating transaction fees, the study will quantify the potential cost savings achieved through the usage of blockchain technologies in international financial transactions.

3.1 TRANSACTION CLASSIFICATION: PAYMENT, INVESTMENT, TRADING, AND INORGANIC

The Ethereum network processes over 1.28 million transactions per day, a most of them are inorganic (Visa Onchain Analysis). Organic transactions are initiated by humans, while inorganic transactions are executed by automated scripts. To achieve the goal of classifying transactions, machine learning methods were employed to categorize them into four groups: payment, investment, trading, and inorganic. This approach provides detection of patterns, which are difficult to assess using traditional statistical methods.

The following algorithms were selected for transaction classification: Random Forest Classifier, Logistic Regression, and Gradient Boosting. Random Forest Classifier showed

the best results as it is an ensemble method that combines multiple decision trees. It is resistant to noise and imbalanced data distribution, which are typical characteristics of blockchain datasets.

Since classified data for training models is not available in open sources, 1% of transactions were selected for algorithmic or semi-automatic labeling (5,016,082). Based on this data, several categories were defined:

- Investors: Wallets showing "passive" behavior, holding assets for long periods without outgoing transactions.
- Traders: Wallets actively interacting with exchanges, conducting repeated transactions, and using swap services.
- Payment Transactions: Transfers directed to addresses verified as payment gateways or trading platforms. And paymens to another address with the same behaviour.
- Inorganic: Many transactions, often of low volume or internal transactions initiated by smart contracts.

For further processing, text data (e.g. "from", "to", "token_address") were converted into numeric features. The labeled dataset was then divided into training (75%) and testing (25%) subsets to validate the models. This is a general approach to validate ML models (Data Science Wizards, 2022).

The performance of the models was evaluated using the metrics of accuracy, recall, and F1-measure. The accuracy of the model indicates the proportion of correctly classified transactions among the total number (*Equation 1*). Recall measures the model's ability to correctly identify all transactions of a specific category, such as payment transactions (*Equation 2*). The F1-measure, as a weighted average of accuracy and completeness, allows us to assess the balance between missed transactions and false positive classifications

(*Equation 3)*. All metrics are measured with values from 0 to 1, indicating the accuracy of the model.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN} \qquad (1)$$

$$Recall = \frac{TP}{TP + FN} \qquad (2)$$

$$Precision = \frac{TP}{TP + FP}\ , \qquad F1 = 2 * \frac{Precision * Recall}{Precision + Recall} \qquad (3)$$

where:

- TP - True positives, the number of times the model correctly classified a transaction into a payment class
- TN - True negative, the number of times the model correctly classified a transaction into a non-payment class
- FP - False positive, the number of times the model incorrectly classified a transaction into a payment class
- FN - False negative, the number of times the model incorrectly classified a transaction into a non-payment class

After the model is trained, it is saved that allows it to be restored later or used on other devices and is applied to the entire dataset of transactions in parts (batch processing), since the size of the transactions is too large for single-pass processing. The classified data was saved for further analyses, including estimating the proportion of payment transactions within the overall transaction volume.

3.2 FORECAST OF STABLECOIN TRANSACTION VOLUMES BY 2030

This section uses a time series approach to analyze and predict the daily volume of stablecoin transfers across all networks. After evaluating several models (SARIMA, ARIMA, ETS), the ARIMA model with parameters *(p, d, q) = (4, 1, 2)* was identified as the most optimal. These parameters were determined using the automated auto_arima search method, which analyzes the input series and selects the best values for *p, d, q*, and *P, D, Q* (for SARIMA) based on AIC/BIC criteria.

Historical data on stablecoin transaction volumes form the basis of the time series analysis. The data is first examined for gaps, which are filled using the neighbor value method. Due to the large dataset, anomalies are detected and corrected using the interquartile range (IQR) method. Anomalous values are defined as:

Volume < Q1 - 1.5 × IQR or Volume > Q3 + 1.5 × IQR and are replaced with adjacent values to ensure the accuracy of the analysis.

For the ARIMA model to function effectively, the time series must be stationary. Stationarity is tested using the Augmented Dickey-Fuller (ADF) test, which evaluates the following hypotheses:

- H0: The series contains a unit root (non-stationary).
- H1: The series is stationary.

If the *p-value* $\leq$ *0.05*, the series is considered stationary. In cases of non-stationarity, differencing is applied, incorporated into the ARIMA model through the parameter d = *1*. The other two selected parameters *(p=4, q=2)* indicate the use of 4 autoregressive lags and 2 moving average parameters to effectively describe the data.

The ARIMA model is trained on a part of the dataset, while a subset is used as test data to validate forecasting accuracy. The model's performance is evaluated using Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) metrics.

3.3 COMPARATIVE ANALYSIS OF BLOCKCHAIN TRANSACTIONS AND TRADITIONAL INTERNATIONAL PAYMENTS

Having the projected volumes of stablecoin transactions by 2030, as well as understanding the share of payment transactions, we can compare this data with information on the international payments market in traditional financial systems. This area is well studied and analyzed in many studies, which makes it possible to determine the share occupied by blockchain transactions in the field of international payments. By comparing data from 2024 and 2030, we expect to observe an increase in blockchain adoption, signifying greater trust and implementation of this technology in financial transactions. The rate of adoption is expected to follow an S-curve pattern, typical for transformative financial technologies. The share of blockchain transactions in total payments is calculated using equation (4).

$$Share_{\,blockchain\%} = \frac{Volume_{\,blockchain}}{Volume_{\,blockchain} - Volume_{\,traditional}} * 100 \qquad (4)$$

where:

- $Share_{\,blockchain\%}$ - Percentage of blockchain transactions in total transaction volume.
- $Volume_{\,blockchain}$ - Volume of blockchain payments (USD).
- $Volume_{\,traditional}$ - Volume of traditional payments (USD).

Particular attention is paid to the comparison of transaction fees. As mentioned earlier, blockchain transactions are not limited to network usage fees. It is necessary to comprehensively compare transaction costs in different regions of the world to understand which of them will benefit the most from the implementation of blockchain. The total transaction fee is calculated using equation (5).

$$Fee_{AB\%} = Fee^{A}{}_{Onramp\%} + Fee_{blockchain\$} + Fee^{B}{}_{Offramp\%} \qquad (5)$$

where:

- $Fee_{AB\%}$ - Total fee for transferring funds from country A to country B (percentage of the transfer amount).
- $Fee^{A}{}_{Onramp\%}$ - Fee to deposit fiat into the blockchain in country A (%).
- $Fee_{blockchain\$}$ - Fee for using the blockchain network (% Percentage of the average transaction amount).
- $Fee^{B}{}_{Offramp\%}$ - Fee to withdraw fiat from the blockchain in country B (%)

A key part of the analysis is estimating fee savings due to using blockchain for transactions through 2030. These savings are calculated using equation (6):

$$Total_{Savings} = \sum_{y=2024}^{2030} (AvgFee_{traditional\%} - AvgFee_{blockchain\%}) * Volume^{y}_{blockchain} \qquad (6)$$

where:

- $Total\_Savings$ - Total savings over the analyzed years.
- $AvgFee_{traditional\%}$ - Average fee in traditional payment networks (%).
- $AvgFee_{blockchain\%}$ - Average fee for blockchain transactions (%).
- $Volume^{y}_{blockchain}$ - Blockchain transaction volume in year y (USD).
- y - Year (from 2024 to 2030).

This analysis evaluates the benefits of using blockchain technologies in financial systems, since evaluating implementation costs is highly complex and requires a separate study to examine these aspects in detail. By reducing transaction fees, blockchain offers a more efficient alternative to traditional methods. And provides a basis for evaluating their potential for further development in international payments.

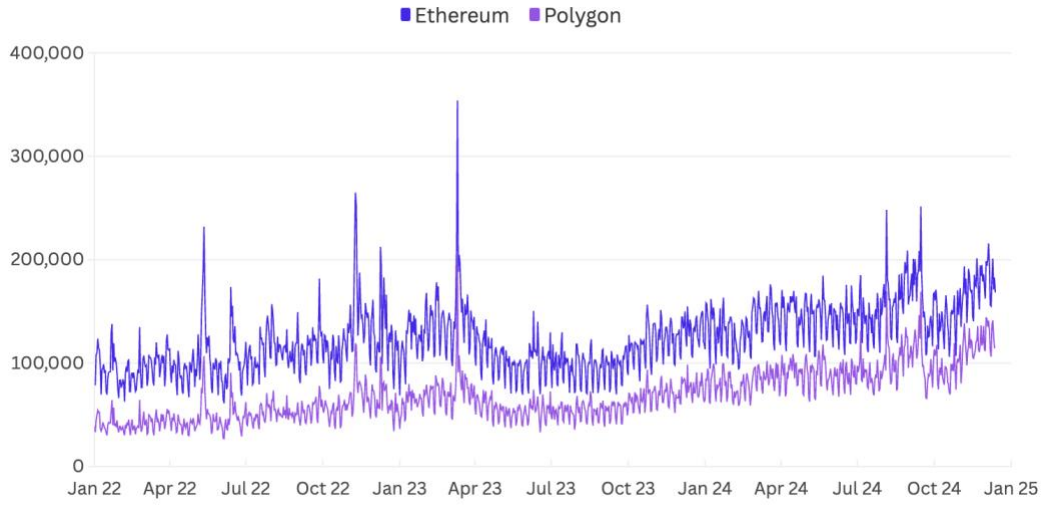
CHAPTER 4. DATA

This study is based on data gathered from various sources, including the Ethereum blockchain, blockchain data accelerators such as Artemis and Arkham, and reports from fintech companies (Wise. Money Without, 2023 Annual Report and Accounts & Moneycorp. Global presence local understanding, Annual Report and Accounts & OFX. Annual Report 2023 & Euronet Worldwide. A Network of Enablement & Remitly Reports Fourth Quarter and Full Year 2023 Results & Payoneer Reports Fourth Quarter and Full Year Financial & Revolut. Annual Report 2023 Bigger, better, faster, stronger)

4.1 BLOCKCHAIN DATA

Data from different blockchains have similar patterns. For instance, the number of transactions on the Ethereum and Polygon networks shows comparable trends; however, Ethereum processes an average of 30% more transactions (Artemis Datashare). This higher transaction volume on Ethereum can be attributed to its first-mover advantage in smart contracts and its extensive ecosystem of decentralized applications (DApps). Additionally, while both networks demonstrate cyclical patterns in daily transaction counts, Ethereum tends to show more pronounced peaks. This volatility in the number of transactions on the network is associated with important events in the crypto industry, such as NFT launches or a strong increase or declines in the value of cryptocurrencies. Which we will discuss in more detail below.

Figure 4. Number of Daily Blockchain Transactions on Ethereum and Polygon, 2022 - 2024



Source: own presentation based on Artemis Datashare

Due to limited resources for analyzing multiple blockchains, this study focuses on the Ethereum network. A total of 50,160,827 transactions for USDT and USDC were collected and stored in JSON format with fields:

- **tokenInfo.address** – the stablecoin address
- **from** – the transaction sender's address
- **to** – the transaction recipient's address
- **value** – the transfer amount, Wei[1]

Most of blockchain explorers only provide access to transactions for the last 30–40 minutes. Services such as Infura offer a convenient API for working with the blockchain, but the number of free queries is limited (Infura Pricing). The most obvious solution is to launch own node[2], which provides direct access to the blockchain. Running an

[1] Wei is the smallest unit of ETH and POL, where 1 ETH or 1 POL equals 10^{18} Wei, used for accurate transaction calculations.

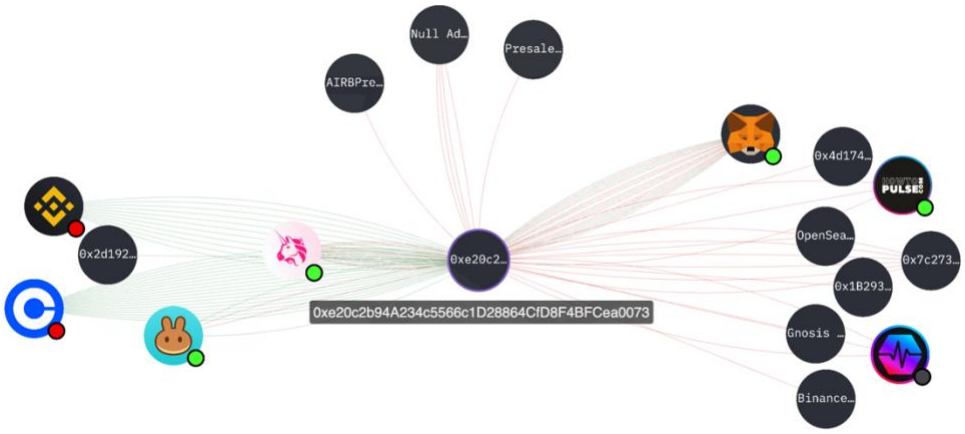
[2] A blockchain node is a computer that is a part of a blockchain network and provides access to work with it.

Ethereum node on a dedicated server in combination with the ethers or web3 libraries provides an efficient tool for working with the blockchain.

Since blockchain transactions contain a limited amount of data, resources that analyze blockchain addresses and associate them with specific services are used to obtain additional information about the transaction (Arkham Intelligence).

Using the Arkham Intelligence API, which supports SQL queries, we created lists of addresses of crypto exchanges (13240), swap services (175), mixers (15) and popular payment systems (140), such as PayPal, were obtained. In addition, the service allows to analyze interactions between addresses and determine their connections. This functionality will be useful for training data classification algorithms on which we will then train a machine learning model.

Figure 5. A visual representation of one blockchain address's interactions with others, Arkham Intelligence

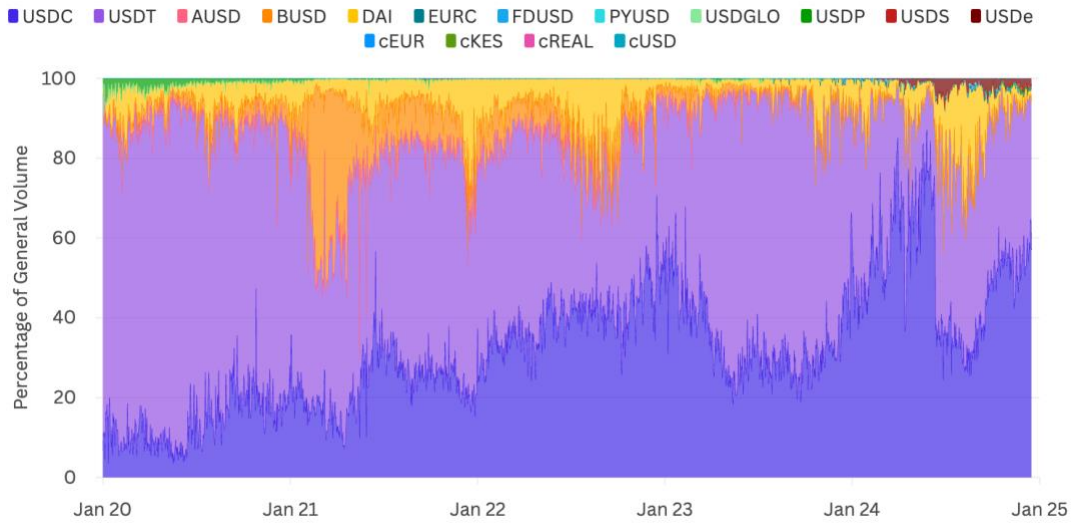


Source: Arkham Intelligence Visualizer

The next important part is data on the volume of stablecoin transfers (Transfer Volume) across different networks. Obtaining this data through direct blockchain analysis is resource-intensive, but it can be found publicly available on various blockchain accelerators. In our case, we use Artemis service data, which are grouped by days for the period 2020-2024. The data structure includes:

- Date – the date of the transaction
- General Volume – the overall transaction volume
- Volumes by stablecoin – including AUSD, BUSD, DAI, EURC, FDUSD, PYUSD, USDC, USDT, and others

Figure 6. The distribution of transfer volume across stablecoins (USDT, USDC, others), 2020-2024, %



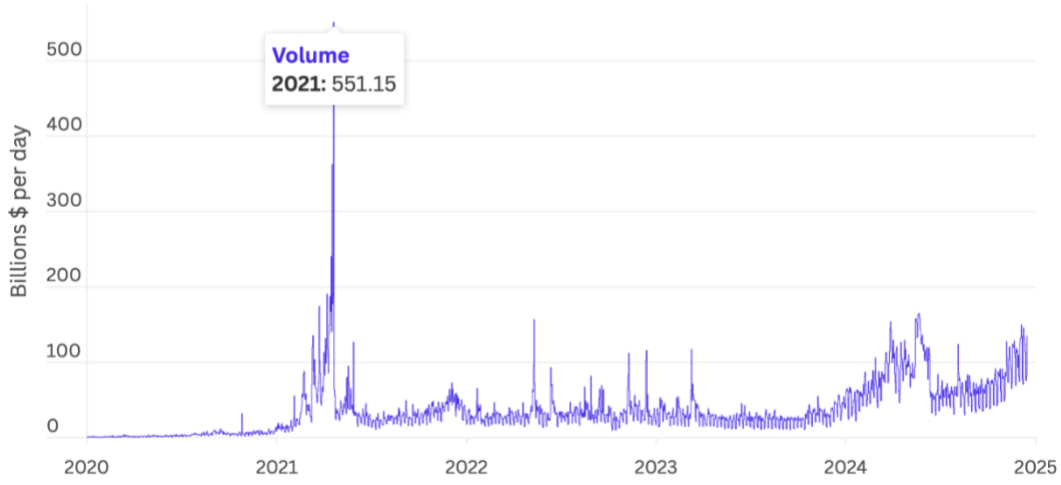
Source: own presentation based on Artemis data

As can be seen from the graph, the main volume is made up of only two stablecoins – USDT and USDC, which together form about 90% of the total volume of all stablecoins. These assets will be the basis for our analysis.

A detailed overview of the total volume of stablecoin transfers shows significant fluctuations within individual days. These fluctuations are often associated with events in the crypto world, such as sharp changes in the value of Bitcoin or the release of new cryptocurrencies, the sale of NFTs.

For example, on April 21, 2021, the total transaction volume spiked to $551 billion, coinciding with a sharp drop in Bitcoin's price. On this day, investors actively transferred their funds to stablecoins, driving the increase in volume.

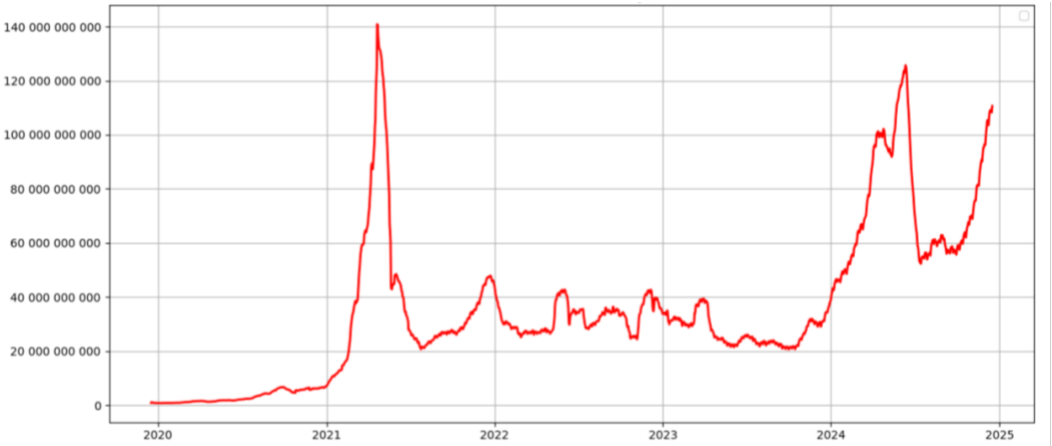
Figure 7. Daily transfer volume of stablecoins in all blockchains, 2020-2024, Billions USD



Source: own presentation based on Artemis data

For further work with this data, it is necessary to eliminate noise, since such spikes caused by unpredictable events can negatively affect the quality of forecasts. By using a moving average with a window of 30 days, we obtained smoothed data that clearly reflects the overall growing trend.

Figure 8. Transfer volume of stablecoins smoothed using a 30-day rolling average, 2020-2024, USD



Source: own presentation based on Artemis data

Blockchain fees are independent of transaction amounts, instead fluctuating based on network load and the main cryptocurrency's value. The fee data, summarized daily from 2022 to 2024, includes:

- **Volume Ethereum** – total daily transaction volume on Ethereum
- **Volume Polygon** – total daily transaction volume on Polygon
- **Count Ethereum** – number of daily transactions on Ethereum
- **Count Polygon** – number of daily transactions on Polygon
- **Ethereum Txn Fee (USD)** – average transaction fee in USD on Ethereum
- **Polygon Txn Fee (USD)** – average transaction fee in USD on Polygon

On Ethereum, the average fee was $7.14, which is significantly higher than on Polygon, where it was only $0.013. However, on Ethereum, the median is $4.77, which is below the average due to the algorithm change on the Ethereum network in 2020 and a significant decrease in the cost of transaction fees. On Polygon, the median and mode are both $0.01, indicating consistently low transaction costs (*Table 5*).

Table 5. Descriptive statistics of Ethereum and Polygon blockchain fees, 2022-2024

Ethereum Txn Fee (USD)		Polygon Txn Fee (USD)	
Mean	7.1	Mean	0.013
Standard Error	0.2	Standard Error	0.000
Median	4.8	Median	0.01
Mode	3.47	Mode	0.01
Standard Deviation	7.3	Standard Deviation	0.014
Sample Variance	53.3	Sample Variance	0.0002
Kurtosis	9.4	Kurtosis	105.5
Range	51.65	Range	0.23
Minimum	0.56	Minimum	0
Maximum	52.21	Maximum	0.23
Sum	7753	Sum	14.53
Count	1086	Count	1086

Source: own calculations based on data from Polygon Scan and Etherscan[3]

Ethereum fees show a higher standard deviation ($7.30) compared to Polygon ($0.0138), indicating greater variability. Ethereum's kurtosis value (9.45) indicates a peaked fee distribution, while Polygon's kurtosis (105.49) reflects extreme low values.

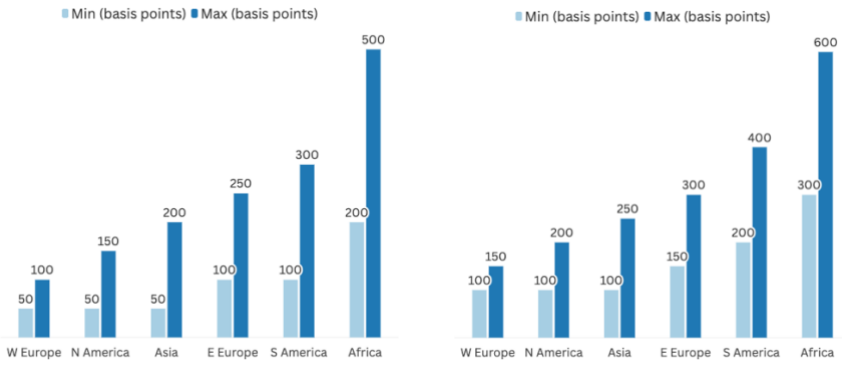
Despite the high popularity of Ethereum due to its ecosystem, high fees can limit its use for micropayments. Instead, Polygon offers cost-effective transactions with fees around $0.01, making it more suitable for smaller transfers. As a result, transaction fees will be excluded from further calculations in this study.

[3] Polygon Scan and Etherscan are services to track and analyze blockchain transactions and addresses.

4.2 ON-RAMP AND OFF-RAMP FEES

Most of the services that provide on-ramp and off-ramp services are focused on B2B cooperation with fintech institutions, so their fees are usually not disclosed publicly. On-ramp is the process of converting fiat money into cryptocurrency, while off-ramp is the process of converting cryptocurrency back into fiat. Most providers offer both services in a region, but sometimes there may only be one. We communicated with the companies Bridge, Noah, Koywe, Unlimit, Wind, Kotanipay, Hercle and summarized the data obtained by regions of the world. The data obtained shows that the lowest fees are observed in North America and Europe. In Africa, fees can reach 500 basis points (bps) for on-ramp and 600 bps for off-ramp, which emphasizes the limited access of the population to financial services in this region.

Figure 9. On/Off-ramp providers fees range by region, 2024, Basis Points



Note: Left: Fees (min, max) for depositing fiat onto the blockchain, by region, 2024, Basis Points
Right: Fees (min, max) for withdrawing from the blockchain to fiat, by region, 2024, Basis Points.
Source: own research based on data collected from On/Off-ramp providers

The full cost of an international transaction consists of:

- **On-ramp fee** in the sender's country.
- **Blockchain transaction fee**, which is about 0.01 USD for polygon and can be excluded from calculations.

- **Off-ramp fee** in the recipient's country.

Calculated the fees based on the data in *Figure 9*, we took the minimum values in basis points for on-ramp in the sender's country and the minimum values in basis points for off-ramp in the recipient's country. Converting their sum into percentages, we obtain the total transaction fee between these countries. As noted earlier, we ignore the blockchain fee, assuming that the transaction will be made on the Polygon blockchain, where the cost is only $0.01.

Table 6. Percentage of fees to transfer funds from one region to another, 2024, %

To/ From	North America	South America	Europe	Europe Eastern	Africa	Asia
North America		2.5%	1.5%	2.0%	3.5%	1.5%
South America	2.0%		2.0%	2.5%	4.0%	2.0%
Europe	1.5%	2.5%		2.0%	3.5%	1.5%
Europe Eastern	2.0%	3.0%	2.0%		4.0%	2.0%
Africa	3.0%	4.0%	3.0%	3.5%		3.0%
Asia	1.5%	2.5%	1.5%	2.0%	3.5%	

Source: own research based on data from On/Off ramps providers

4.3 INTERNATIONAL TRANSACTION MARKET DATA

Data on the international payments market has been sourced from Convera Fintech 2025+ Report. This report includes a detailed study of international transactions for 2023 and provides forecasts up to 2030. In 2023, the total value of the international payments market reached $190 trillion (*Table 1*).

The Wholesale segment holds the largest share, with a volume of $146 trillion. However, this segment is excluded from further calculations due to minimal or non-existent

transaction fees. This category primarily involves large institutions and governments that rely on traditional payment methods (Convera Fintech 2025+ Report).

A similar situation exists for the B2B segment, valued at $37.6 trillion. Although the transaction volume is substantial, businesses in this segment incur fees averaging just 0.1%, making it less relevant for analysis focusing on high fees (Convera Fintech 2025+ Report).

The most notable segment is consumer transactions, with a total value of $6.6 trillion. This segment has the highest average fees, around 6% per transaction. The average transaction value for consumer transactions is 3.6%, based on their volume. (*Table 2*).

Estimated that the consumer cross-border payments segment will grow by 80% by 2030, reaching $12.1 trillion (Convera Fintech 2025+ Report). These estimates indicate a significant expansion of the cross-border payments market.

CHAPTER 5. RESULTS

5.1 TRANSACTION CLASSIFICATION: PAYMENT, INVESTMENT, TRADING, AND INORGANIC FOR 2024

To apply the classification algorithm, a training dataset was created by randomly selecting 10% (5,016,082 transactions) from the entire set of 50,160,827 transactions. These transactions were labeled using scripts to categorize them into four groups: payment, investment, trading, and inorganic. The 2024 data revealed the following distribution:

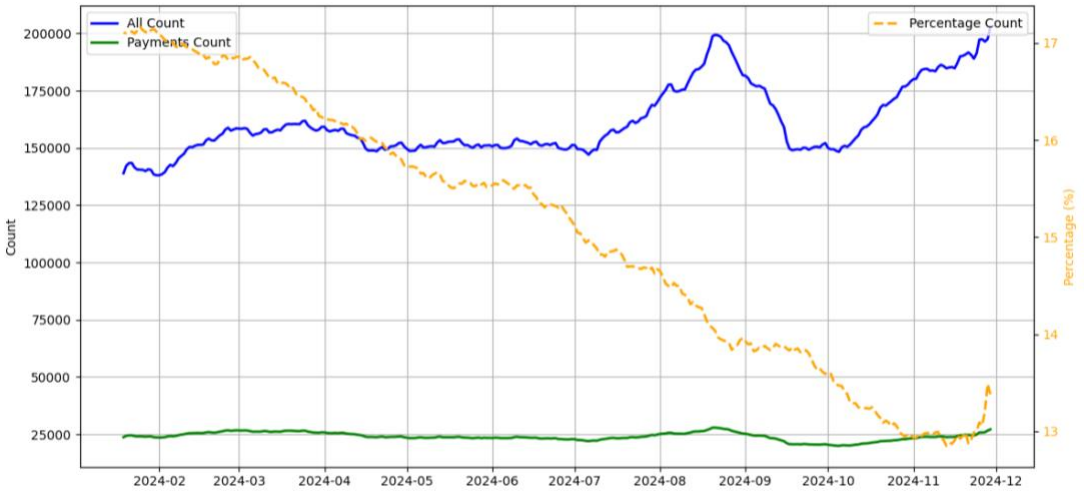
- 11% — payment transactions.
- 23% — investment and trading.
- 66% — inorganic transactions.

At first, the high percentage of inorganic transactions may seem unexpected. However, a study by Visa Onchain Analytics (2024) indicated that 75–90% of all blockchain transactions during 2024 over the past year fell into this category. This aligns with our findings, making the large share of inorganic transactions in the sample logical.

Given the challenges of analyzing these four categories independently, the study combined investment, trading, and inorganic transactions into a single category labeled "non-payment." We tested the model on 25% of the test data and obtained an accuracy of 61.7%. The moderate accuracy rate is primarily due to the limited information available for each transaction (e.g., sender and recipient transaction histories, or the transaction volumes they handle). Incorporating such data could enhance algorithm results but would require substantial computing resources.

Having classified the entire volume of transactions, the algorithm marked 7,591,224 transactions as payment (i.e. approximately 15% of the total). At the same time, during 2024, their share decreased from 17% at the beginning to 13.5% at the end. This decline was largely driven by increased activity in investment and trading transactions, driven by rising cryptocurrency values and the arrival of new participants.

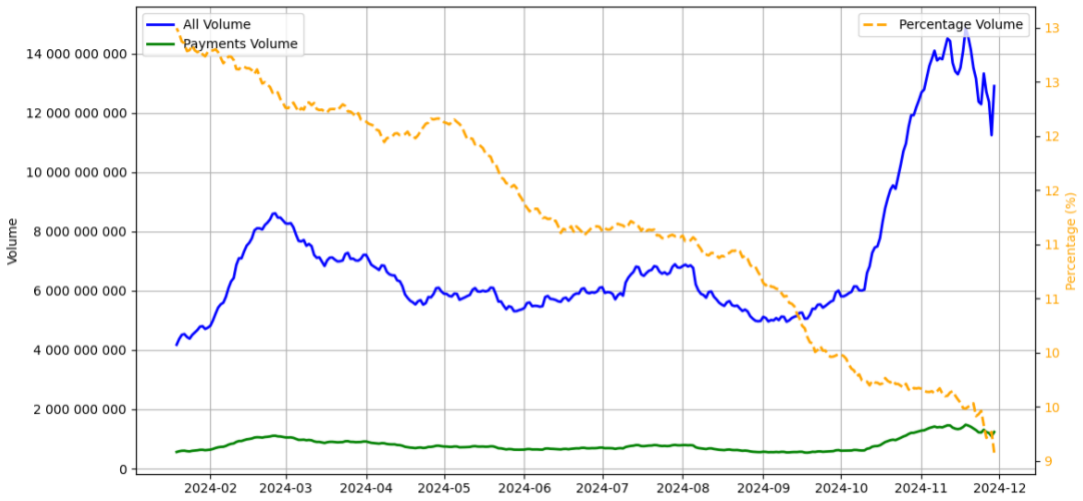
Figure 10. Daily Distribution of Payment and Non-Payment Transactions Counts, 2024



Source: own calculations based on blockchain data

In addition to the number, it is important to analyze the Transfer Volume (total volume of transfers). At the beginning of 2024, payment transactions represented approximately 13% of the total Transfer Volume, but by the end of the year, this dropped to just 9%. This indicates that the average value of a payment transaction is greatly lower than the average value of investment and trading transactions. As a result, although payment transactions accounted for about 15% of the total transaction count, their share of the Transfer Volume was considerably smaller.

Figure 11. Daily Distribution of Payment and Non-Payment Transactions Volumes, 2024, USD



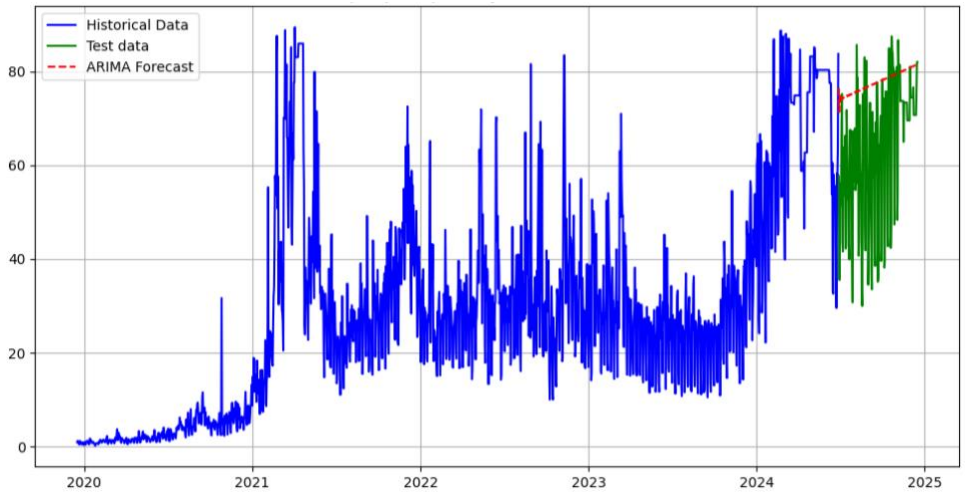
Source: own calculations based on blockchain data

By the end of the year, the Transfer Volume of payment transactions decreased significantly, while non-payment transactions (investment, trading, and inorganic) became more dominant. On average, payment transactions in stablecoins in 2024 accounted for about 11% of Transfer Volume and accounted for 15% of their total number.

5.2 FORECAST OF STABLECOIN TRANSACTION VOLUMES BY 2030

After analyzing the real data for 2024, the next step was to forecast the dynamics of stablecoin transactions by 2030. To evaluate the time series model, the dataset was split into training and test subsets. Although the model did not account for all short-term fluctuations, it accurately captured the overall trend.

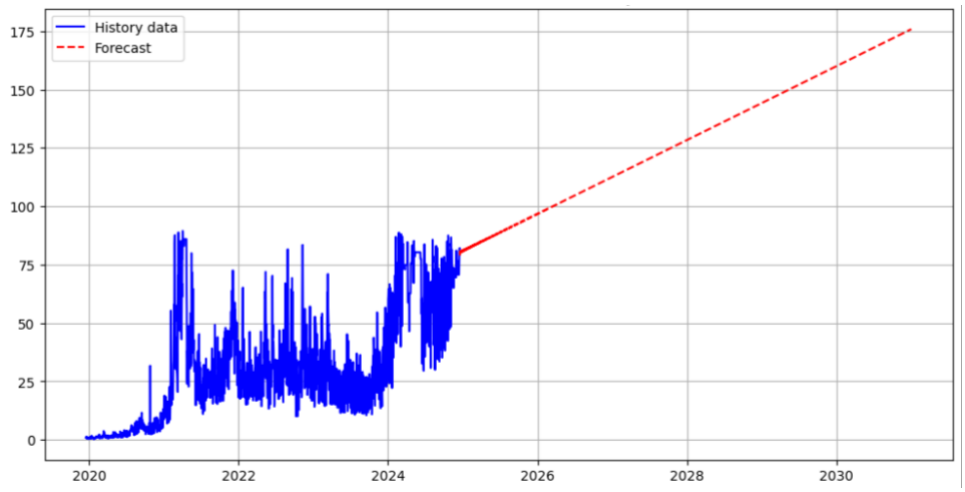
Figure 12. Training Forecast Results for Stablecoin Transaction Volumes, 2020–2024, Billions USD



Source: own forecasting based on Artemis data

According to the forecast, the volume of stablecoin transactions, which stood at $75 billion at the end of 2024, could increase to $175 billion by the end of 2030. This means an increase of 2.3 times in six years.

Figure 13. Forecast Results for Stablecoin Transaction Volumes, 2020-2030, Billions USD



Source: own forecasting based on Artemis data

Summing up the Transfer Volume separately for each year, we get the following results. In 2023, the total volume of stablecoin transactions was $10.1 trillion, of which 11% ($1.2 trillion) of payment transactions. For comparison, the total market for international consumer payments was valued at $6.6 trillion, meaning stablecoins accounted for 14% of this segment.

Table 7. Result of Forecasting and Payment Volume compared to Traditional Volume, 2023-2030

Year	Stablecoins Volume Forecast (T$)	Payment category Volume (T$)	Traditional Volume (T$)	Blockchain compared to traditional (%)
2023	$10.17	$1.12	$6.60	14%
2024	$27.10	$2.98	$7.20	29%
2025	$31.94	$3.51	$7.80	31%
2026	$38.04	$4.18	$8.50	33%
2027	$44.14	$4.86	$9.20	35%
2028	$50.39	$5.54	$9.90	36%
2029	$56.37	$6.20	$10.80	36%
2030	$62.47	$6.87	$12.10	36%

Source: own calculations based on blockchain data and Convera Fintech 2025+ Report

According to the forecasting, the total volume of stablecoin transactions could reach $62.5 trillion by 2030, with $6.9 trillion to payment transactions. During the same period, the traditional international payment market is expected to grow to $12.1 trillion, increasing the share of stablecoins in this segment to 36% (Convera Fintech 2025+ Report). This indicates that payment transactions in stablecoins will experience higher growth than traditional transfers, highlighting their increasing influence on the global payment system.

5.3 CALCULATING SAVINGS ON FEES USING STABLECOIN TRANSACTIONS

The average fee for an international transaction involving consumers in 2023 was 3.6% and was calculated based on transactions with consumer fees by volume. Stablecoin transactions reduced this rate to 2.5%, based on the calculation of average stablecoin transaction fees by region. This results in an average saving of approximately 1.1% per transaction.

Considering the forecast volume of stablecoins usage as a means of payment, the annual fee savings were calculated for the period 2025–2030 (*Table 8*). These savings are range from $39 billion in 2025 to $76 billion in 2030. Over the six-year period, total savings could exceed $342.85 billion.

Table 8. Result of calculation of Fee Savings, 2023-2030, Billions USD

Year	Payment category Volume (T$)	Fee Savings (B$)
2025	$3.51	38.65
2026	$4.18	46.03
2027	$4.86	53.41
2028	$5.54	60.97
2029	$6.20	68.20
2030	$6.87	75.59
	Total Fee Savings 2025-2030	$342.85

Source: own calculations

Thus, the significant reduction in transaction fees underscores one of the most compelling reasons for the rapid adoption of stablecoins. This represents significant financial benefits for businesses and consumers around the world.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

Opinions about the future of blockchain technology in the financial system vary widely, ranging from complete dismissal to excessive optimism. Some propose abandoning traditional financial systems in favor of blockchain, replacing conventional services with DeFi, using smart contracts instead of standard contracts, and preserving ownership rights as NFTs. However, reality is far more complex. The banking system and fintech, like living organisms, are evolving rapidly. Better approaches and technologies gradually replace outdated ones; some ideas fail the test of time, while others revolutionize our lives.

This process is gradual. This study describes the first stage of blockchain integration into the banking system. We can already see how blockchain works with other methods, opening new opportunities, but remaining only a small part of the global financial system. In the future, modern banking approaches may become vestige and blockchain might emerge as the cornerstone of this transformation - or perhaps it will not. Only time will tell.

The goal of this study was to highlight the potential integration of blockchain into international payment systems and its capability to reduce transaction costs. Forecasts suggest that blockchain could save businesses and consumers $342.85 billion in fees for 6 years, between 2025 and 2030. These estimates assume that each transaction starts and ends with fiat currency. If the process were optimized to maintain funds in stablecoins, the potential savings could be even greater.

A reduction in transaction fees could have multiplicative effects throughout the global economy. Lower transaction costs could stimulate increased international trade, especially benefiting end consumers that high international transfer fees have most impacted. This could lead to greater market participation from previously underrated

regions and business segments, potentially helping economic growth beyond the direct fee savings.

Moreover, our projected shift from 14% to 36% blockchain-based international payments by 2030 represents more than just cost savings - it signals a fundamental transformation in global payment infrastructure. This rapid adoption rate indicates that blockchain technology is moving from the early adoption phase to mainstream acceptance. Blockchain is gradually becoming an essential part of the global financial system.

This research could benefit investors by helping them better understand blockchain's prospects in the financial sector, potentially encouraging investment in this domain. It also provides value to startups, by identifying new opportunities, such as stablecoin applications, already recommended by Y Combinator as a perspective area to build startup (Y Combinator. Requests for Startups, Winter 2025).

Although blockchain remains a young and emerging sector, significant infrastructure already supports its development. For example, the stablecoin map from Artemis illustrates the substantial progress made (*Appendix 1*). At Borderless, we are contributing by implementing the Global Transfer Protocol, to solve one of the major challenges discussed earlier: uniting different networks, stablecoins, and on- and off-ramp providers worldwide into a single cohesive network.

This study touched upon the topic of regulation and monitoring of blockchain transactions, which is not a negative aspect for expanding the use of blockchain. Regulation is a vast topic deserving of a separate study, which could examine existing challenges, mechanisms, and solutions, as well as the cryptocurrency policies of the new White House administration and President Trump's statements about transforming the USA into a global crypto capital.

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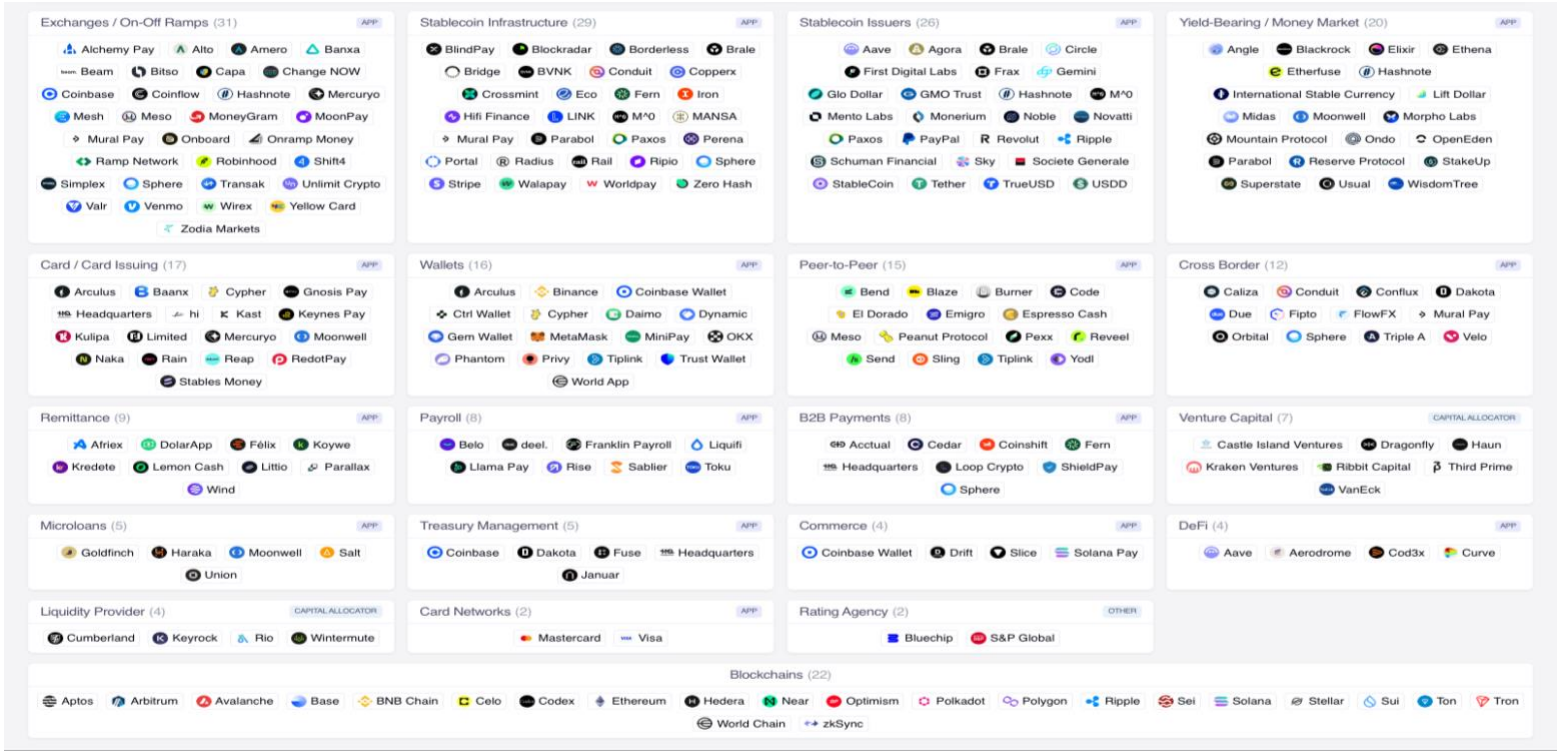
APPENDIX

Appendix 1

List of companies building onchain solutions



Source: Artemis Stablecoins Map