An Investigation of Changes in Returns on Peer-to-Peer Lending in Lithuania and Sweden During the COVID-19 Pandemic: Evidence from Wavelet Coherence Analysis

MANTAS BERTULIS, GRIGORIJ ZILINSKIJ

Abstract

FinTech has revolutionised financial services, making them more accessible and efficient. However, the COVID-19 pandemic impacted the FinTech industry, including peer-to-peer lending, in Lithuania and Sweden. This article explores the relationship between the pandemic and changes in peer-to-peer lending returns in both countries. By analysing existing literature, statistical data, and using wavelet coherence analysis, the study aims to understand the influence of COVID-19 on lending in Lithuania and Sweden. The results indicate that the pandemic had a limited impact on Lithuanian peer-to-peer lending, with average interest rates declining over time. Negative correlations between infection cases and lending returns were observed in specific quarters but were only significant in the short term. In contrast, the influence on Swedish peer-to-peer lending was more pronounced. Interest rates initially decreased, but a significant increase occurred in the first quarter of 2022, coinciding with a surge in COVID-19 infections and foreign policies. The negative correlation between cases of infection and lending returns persisted across the short, medium, and long terms alike in Sweden. These findings suggest that the Swedish peer-to-peer lending market was more affected by the economic and policy factors related to the pandemic than that of Lithuania.

Key words

COVID-19; FinTech; Financial technology; Peer-to-peer; Returns; Wavelet coherence analysis.

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Introduction

Nowadays, financial technology (FinTech) is essential when it comes to delivering advances to the financial sector. It helps to improve financial services by boosting their capabilities to make things easier and faster. This innovation in the finance sector is being propelled in part by the Industry 4.0 era. Due to the widespread use of mobile devices and the Internet in modern society, there is a massive global market for digital financial services (Le, 2021). FinTech offers easier access to these services. These innovations have led to the emergence of new markets, where people can invest, send, store, or receive money from each other. Nowadays, people are able to select from a great many offers from various participants in the financial sector, who would happily hold their money for them. However, customers generally seek the most convenient option for their everyday life, which will help them to control, monitor and spend their money. FinTech has made their lives easier, as it has connected FinTech products and services with their desire to have everything in one place – most commonly on their mobile phones. FinTech adapts to the evolution of the financial world, attempting to provide as many financial services as possible in order to attract more customers. Nowadays, the world is faced with the spectre of COVID-19. First discovered in Wuhan, China, it caused a pandemic that spread throughout the world. Most cases were initially found in China, but the virus eventually spread to Europe, the Americas, and ultimately Africa (Roy, 2020). COVID-19 has negatively affected economies and unbalanced human capital processes. An international health crisis that has been declared a threat to global health leads society to worry not only about health, but also about possible economic decline. The measures which were used to combat the pandemic had a negative impact on society, including reduced household consumption, reduced demand, exports, increased unemployment, supply chain disruptions, shrinking stock markets and numerous other economic issues. Additionally, when the government banned domestic and international transportation and logistics routes to limit the spread of the coronavirus, the global supply chain was disrupted (Barua, 2020). Countries faced not only an unstable external environment, but also an unpredictable internal environment. Political decisions were made promptly, in response to the situation and without coordination with the governments of other countries. To stabilise the situation, control the spread of COVID-19 and to avoid greater negative effects on the economy, countries used a variety of tools to fight the pandemic. People and businesses in different countries faced differing quarantine restrictions. Lithuania is one of the countries that applied strict quarantine restrictions aimed at limiting movement and economic activity. This not only caused economic stagnation due to the quarantine period, but also public dissatisfaction with possible human rights violations. Meanwhile Sweden took the opposite step and opted for advisory restrictive measures, which were voluntarily observed in that nation. The object of this research is Lithuanian and Swedish peer-to-peer lending during the COVID-19 pandemic. The aim of the articles is to assess how COVID-19 brought about changes in returns on peer-to-peer lending in Sweden and Lithuania. To properly achieve the goal of the research, the following objectives were set: to analyse the works of other authors on the impact of COVID-19 on FinTech; to describe the use of wavelet coherence analysis to assess the impact of COVID-19 on peer-to-peer lending returns; and to analyse the impact of COVID-19 on the average interest rates for both Lithuanian and Swedish peer-to-peer lending. In this article, scientific literature was analysed to discern the global impact of

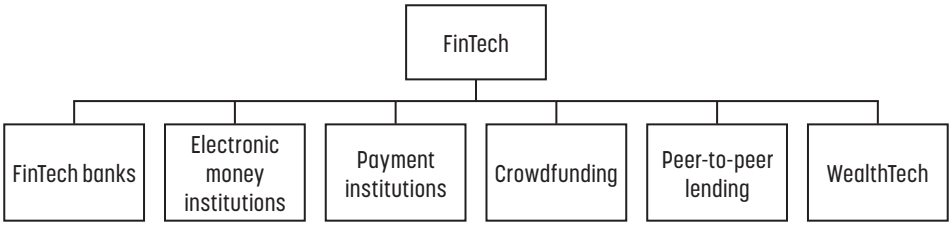
COVID-19 on FinTech; statistical data analysis was used to determine the respective changes in COVID-19 infections and interest rates; and wavelet coherence analysis was used by means of MATLAB to determine the correlation between COVID-19 and changes in peer-to-peer lending returns in various periods.

1. Literature review

1.1. The FinTech ecosystem during COVID-19

Financial innovation, enabled by technology, has the potential to lead to new business models, applications, workflows, or end products that significantly impact financial markets, institutions, and the delivery of financial services (Soloviev, 2018). The emergence of FinTech became particularly important after the 2008 financial crisis, which eroded consumer trust and confidence in traditional service providers. This crisis, coupled with high-profile financial scandals, has fuelled a growing demand in the market for alternative finance. Additionally, the development of new financial products and services that offer greater convenience, efficiency, and inclusiveness at a lower cost has reduced reliance on conventional businesses. The convergence of various technological advancements, such as accessible and affordable infrastructure, maturing technological applications, and streamlined corporate operations, among others, is a significant driving force behind the growth of FinTech (Gelis, 2016). The expanding FinTech market includes licensed companies that offer a wide range of financial services on a global scale. These companies act as financial market participants and provide convenient access to various services such as banking, transactions and payment processing, business lending, personal loans, and virtual brokerage (see Figure 1).

Figure 1. Licensed FinTech companies



Source: He et al., 2017

FinTech market participants with FinTech bank licenses are generally more user-friendly than traditional banks and typically operate through mobile applications without physical branches. These FinTech banks offer people payment and financial services, including credits, deposits, money transfers, and investments. Upon their establishment, FinTech banks have the same requirements as traditional banks to ensure consumer protection (Zveryakov et al., 2019).

Electronic money institutions facilitate easy access to digital wallets, allowing individuals to store money and make transactions at their convenience (He et al., 2017). Payment institutions assist people in conducting day-to-day payment services such as payment transactions, direct debits, credit transfers, cash deposits, cash withdrawals, and payment initiation services (Degerli, 2019).

Crowdfunding connects companies in need of funding with individuals who wish to contribute to their growth and development while seeking potential profits. It facilitates the discovery of companies in need of funds for the implementation of new technologies and serves as an investment

diversification instrument for individuals (Navaretti et al., 2017).

Peer-to-peer lending primarily operates on online platforms and is easily accessible via mobile phones. It connects borrowers in need of personal loans with private individuals seeking to diversify their investment portfolios and generate profits. Peer-to-peer lending regulations enable borrowers to analyse their investments and calculate risks before making any commitments (Bachmann and Funk, 2011).

WealthTech assists individuals in finding user-friendly investment experiences, providing access to stock markets, bond markets, and other financial instruments, including cryptocurrencies. It enables people to find more cost-effective ways to invest in the financial markets (Li, Lu and Hasan, 2020).

1.2. The impact of COVID-19 on the FinTech sector

During the challenging period of the COVID-19 pandemic, many individuals had to carry out their everyday activities from home using the Internet, laptops, and smartphones. The restrictions imposed during 2020 and 2021 resulted in an economic downturn in several nations, particularly in developing countries. However, this period also witnessed a significant rise in digital entrepreneurship activities (Bacq et al., 2020). FinTech, known for providing 24/7 access to efficient and flexible financial services, has been proven to contribute to cost savings, time savings, and economic growth. It is a convenient option that can be accessed from anywhere. While the FinTech sector, like many others, has been impacted by the COVID-19 outbreak, numerous companies are striving to find innovative solutions to sustain their operations. FinTech encompasses more than just financial innovation; it represents inventive ways to improve budget administration through emerging technological trends, such as monetary innovation and mobile financial applications (Nair et al., 2021).

Several studies, including those by Yan et al. (2021), Minhas (2022), Faeni et al. (2021), Mohannad et al. (2021), Naz et al. (2022), Al nawayseh (2020), Tripalupi and Anggahegari (2020), and Tut (2023), have employed quantitative research methods, including structured questionnaire surveys, structural equation modelling (SEM), descriptive analysis and content analysis. These methods were utilised to gather data, examine relationships between variables, conduct in-depth analysis, and derive meaningful insights from the collected data to investigate the impact of COVID-19 on the FinTech sector in their respective countries. For example, in Bangladesh, Yan et al. (2021) identified the variables that influence users' intentions to utilise mobile financial services (MFS) platforms. Their findings indicated that COVID-19 had a significant impact on the growth of MFS usage in Bangladesh. Similarly, Minhas (2022) found that in India, a considerable percentage of respondents reported increased usage of digital payments during the pandemic, with a significant proportion solely relying on digital payments instead of cash. Faeni et al. (2021) observed that social distancing guidelines and the adoption of technology in Indonesia had a positive impact on the economy by slowing the spread of the pandemic and increasing organisational productivity. The COVID-19 pandemic also accelerated the adoption of FinTech platforms for payments in Indonesia, with a rise in mobile banking transactions, mobile agents, and mobile banking accounts. Furthermore, Mohannad et al. (2021) found that people believe that switching to electronic and contactless payment methods can help reduce the spread of COVID-19 by avoiding direct physical contact with cash.

In the Middle East and North Africa (MENA) region, Naz et al. (2022) highlighted the need for technological advancements

to foster an advanced economy and bridge the gap between individuals and digital platforms. To facilitate the growth of the FinTech industry in the region, regulators must prioritise cybersecurity and digital infrastructure. Cross-sector and cross-border collaborations are also essential to the thriving FinTech ecosystem. Notably, the UAE's blockchain innovations have been the predominant presence in the MENA region, accounting for 50% of all transactions with the federal government. The Kuwait International Bank (KIB) has also introduced additional FinTech products, such as an Interactive Voice Response (IVR) portal, opening up more avenues for economic prosperity. In Jordan, Al nawayseh (2020) found that customers' intention to use FinTech applications is influenced by their awareness of the benefits, social impact, and level of trust associated with these services. However, during the COVID-19 pandemic, customers' perceptions of risks had a greater impact on their trust in the service than did their intention to use FinTech applications. Tripalupi and Anggahegari (2020) examined the effects of the pandemic on Indonesia's FinTech sector, revealing a decline in productivity due to altered operational patterns, increased market risk, decreased consumer demand, and increased operational risk. However, certain segments, such as online shopping platforms and FinTech loans and payments, experienced growth during this period.

Tut (2023) analysed the adoption of FinTech during the COVID-19 pandemic in Kenya, finding that favourable regulatory actions by the government, particularly in mobile banking, aided the growth of FinTech usage for payments and digital services while mitigating the adverse economic effects of the pandemic. This research suggests that investments in FinTech can act as a buffer against extreme events such as the COVID-19 pandemic, with implications for developing and emerging markets, including African nations. Fu and Mishra (2022) conducted a qualitative research study on the impact of COVID-19 on worldwide FinTech app downloads, discovering a significant increase in financial app downloads during the pandemic influenced by factors such as the spread of COVID-19, government measures to control the spread thereof, and economic shocks experienced during the crisis. Vasenska et al. (2021) used a mixed research method involving questionnaires and the programming language Python to examine the impact of COVID-19 on Bulgaria's FinTech sector. Their findings indicated that while many respondents were not aware of FinTech to any significant extent before the pandemic, some individuals began using FinTech services during the outbreak. However, a significant proportion of respondents still had no plans to adopt FinTech services due to a lack of information.

Based on the findings from these studies conducted in various countries, the decision was made to evaluate the impact of COVID-19 on the FinTech sectors of Lithuania and Sweden using wavelet coherence analysis. Lithuania was chosen as it is the authors' native country, while Sweden's softer restrictions during the pandemic make it an interesting case to examine. Wavelet coherence analysis was chosen as the methodology for this study due to its ability to examine the impact of COVID-19 infections on peer-to-peer lending by analysing the frequency structure over time. This analysis allows us to understand the relationship between infection cases and lending returns in both countries in a comprehensive manner.

2. Methodology

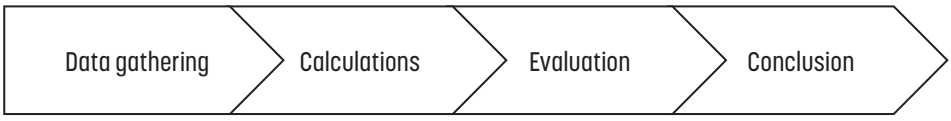
In this article, Lithuania and Sweden, both of which are in northern Europe, have been chosen as the objects of analysis. At the beginning of the COVID-19 pandemic, the Swedish government introduced relatively lenient control measures to fight the spread

of the virus. Conversely, the Lithuanian government implemented strict control measures. This stark difference in approach is the main reason behind the choice of both countries for analysis. The decision was made to focus on peer-to-peer lending returns as they are easier to track compared to other FinTech service providers due to the global interchange of their services and financial products. Additionally, Lithuania and Sweden differ significantly in terms of population size. To understand the general trend of infections and how it relates to the population, the chosen measure was the percentage of infected residents in relation to the total population of each country.

In this article, wavelet coherence analysis is used to examine how COVID-19 affected peer-to-peer lending in Lithuania and Sweden. This method was selected as it enables a greater understanding of the impact of COVID-19 infections on peer-to-peer lending through analysing the frequency structure over time. This analysis will help us determine how COVID-19 infections affect peer-to-peer lending in both countries. The wavelet coherence analysis method is more suitable for this topic than other authors' methods mentioned above because wavelet coherence analysis is particularly suitable for studying time-series data, which is relevant when examining changes in returns over time. It allows for the identification of relationships and co-movements between variables across different time periods and frequency bands. This is especially important when studying the impact of COVID-19, as the effects may vary over time. Wavelet coherence analysis enables the detection of frequency-specific relationships between variables. This means it can capture relationships that exist at specific frequencies or time scales, which may be missed by other methods. In the context of peer-to-peer lending returns, this can provide insights into how different frequencies or time periods are affected by the pandemic and related control measures. Wavelet coherence analysis allows for the dynamic analysis of relationships between variables, as it can capture changes in relationships over time. This is valuable when investigating the impact of COVID-19 on peer-to-peer lending returns, as the effects may evolve and fluctuate throughout the pandemic. This led to the hypothesis that the impact of COVID-19 on peer-to-peer lending returns differs between Lithuania and Sweden.

In order to perform wavelet coherence analysis and assess the impact of COVID-19 on peer-to-peer lending returns in Lithuania and Sweden, data on COVID-19 infection cases in both countries, as well as the interest rates of peer-to-peer lending platforms, was collected. Our investigation draws on data published on the websites of the World Health Organization (WHO), Statistics Sweden, the Bank of Lithuania, and the Official Statistics Portal. The data used in the study spans from 1 April 2020 to 31 December 2022. Although the COVID-19 outbreak in Lithuania and Sweden began in March 2020, some data were inaccurate or unavailable until the end of October. Therefore, this period was chosen to ensure the optimal calculations for studying the impact of COVID-19 on peer-to-peer lending returns in both countries. Our research was conducted in four steps (see Figure 2).

Figure 2. Four-step research

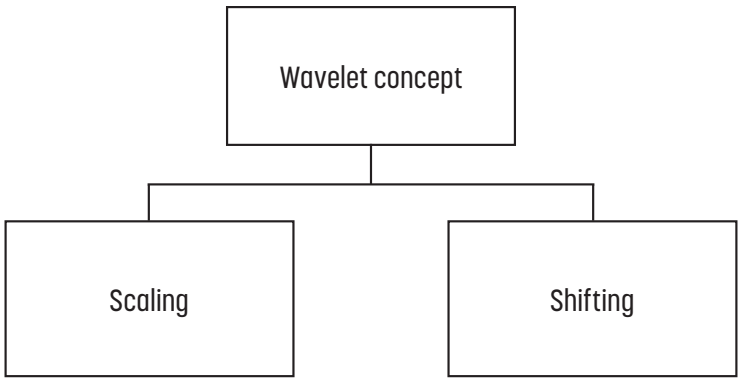


Source: compiled by the authors

As mentioned earlier, data on COVID-19 infections was collected from the World Health Organization (WHO) website. In the second step, calculations were performed using the MATLAB programme. The third step involved evaluating the results obtained, followed by drawing conclusions in the final step.

To examine the impact of COVID-19 on peer-to-peer lending in the respective countries, the research employed wavelet coherence analysis. This allows for the examination of signals in terms of both time and frequency. It involves transforming the signals into images using wavelets, which exhibit fluctuations and zero values and come in various sizes and shapes. Wavelets are characterised by their limited duration (Kristoufek, 2015) (see Figure 3).

Figure 3. Wavelet concept



Source: Addison, 2017

Wavelet scaling, which allows one to describe the process of signal stretching or compression in time, is expressed by the following formula (Addison, 2017):

$$\psi\left(\frac{t}{s}\right) s > 0 \qquad (1)$$

where: ψ – original wavelet; s – is the scaling factor of the wave; t – period of time.

The scaling factor of the wave is positive and indicates the extent to which the wave scaling of the signal changes over time. Wave scaling is inversely proportional to frequency (see Table 1).

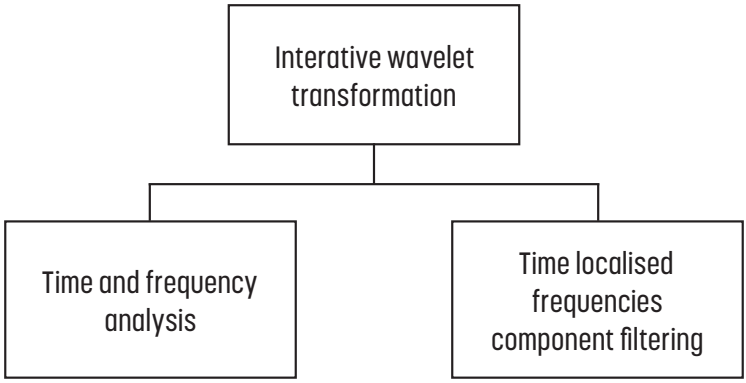
Table 1. Wave scaling features

Type	Feature
Low wavelet scaling and high frequency	S > 1
High wavelet scaling and low frequency	0 < S < 1

Source: Addison, 2017

Wavelet shifting refers to the movement or stagnation of wavelets from their initial position within a signal. The wave motion should align with the characteristics of the signal (Addison, 2017). To assess the impact, we will employ an iterative wavelet transform method (see Figure 4).

Figure 4. Iterative wavelet transformation features



Source: Addison, 2017

This method makes it possible to determine the time and frequency characteristics of the signal. The wavelet transformation enables one to examine the dependence of the signal on wave scaling over time. By utilising wavelet scaling, this transformation reveals the instantaneous frequency, which assists in generating a frequency-time image of the signal (Sadowsky, 1996). When initiating the analysis, attention should be paid to the initial wavelet, also known as the mother wavelet, or analysing wave. The initial wavelet is represented by the following formula:

$$\psi(\mathrm{t}) = (1 - t^2)e^{-t^2/2} \qquad (2)$$

From this wavelet, dilated and translated wavelets may be derived for use in the transformation. To explore the wave power spectrum, which indicates the strength of the impact of the COVID-19 pandemic on peer-to-peer lending in the respective countries, a recurrent wavelet transformation function was employed as expressed by the following formulas (Si & Zeleke, 2005):

$$W_x(\mathrm{t},\mathrm{s}) = \int_{-\infty}^{\infty} x(t)\psi^*_{\tau,s}(t)dt \qquad (3)$$

where: W_x – wavelet transformation function; ψ^* – complex version of the original wavelet.

The time series of x(t) is discrete, so t is assigned as 1. The recurrent wavelet transform is expressed by the following formula:

$$W_x(\mathrm{t},\mathrm{s}) = \sum_{t=1}^{N} x(t)\psi^*_{\tau,s}(t) \qquad (4)$$

An iterative time series helps to transform the original residual series x(t) into another representation by separating time t and frequency s. From these formulas, the wavelet power spectrum formula, which measures the variance of the time series each time the wavelet scale changes, is derived. All measurements will be made according to the initial wavelet. The place where the wavelet power spectrum is formed is called a scalogram (Phillips and Gorse, 2018). The wavelet power spectrum for time and frequency is expressed by the following formula:

$$WPS(t,s) = |W_x(\mathrm{t},\mathrm{s})|^2 \qquad (5)$$

where: *WPS* – wavelet power spectrum.

A power spectrum measures the dispersion at each period and frequency relative to the wavelet. To find the average dispersion in frequency corresponding to the scaling, we will use the average dispersion, which is expressed by the following formula (Addison, 2017):

$$E(s) = \frac{1}{N}\sum_{t=1}^{N}|W_x(t,s)|^2 \qquad (6)$$

where: *E(s)* – average dispersion.

E(s) highlights the dominant frequency in the x(t) time series. To analyse the simple cause-and-effect relationships in the time series, we will use the wavelet transform coherence, which is expressed by the following formula (E(s) represents the average dispersion from wavelet coherence analysis) (Si & Zeleke, 2005):

$$R^2(t,s) = \frac{\left|S(s^{-1}W_{xy}(t,s))\right|^2}{S(s^{-1}|W_x(t,s)|^2)S(s^{-1}|W_x(t,s)|^2)} \qquad (7)$$

where: R^2 – wavelet transform coherence.

The wavelet transform coherence will reveal the connection between signals in the x and y time and frequency domains. The average correlation over time and at each frequency is expressed in the following formula (R^2 represents the coherence from wavelet coherence analysis) (Goodell & Goutte, 2020):

$$AC(s) = \frac{1}{N}\sum_{T=1}^{N} R^2(t,s) \qquad (8)$$

where: *AC*(*s*) – average correlation.

To study the connection, we will use a more complex initial wavelet, which is expressed in the following formula (Goodell & Goutte, 2020):

$$\psi(t) = e^{-\frac{1}{4}}e^{iw_0 t}e^{-\frac{t^2}{2}} \qquad (9)$$

This initial wavelet will provide a good balance between time and frequency when searching for a connection.

The coherence ranges from 0 to 1, and it is classified as low, medium, or high based on the coherence coefficient falling within the ranges $0 \le x \le 0.3$, $0.3 < x \le 0.7$, and $0.7 < x \le 1$. By utilising the previously mentioned formulas, the MATLAB programme generates a scalogram, visually presenting the relationship between selected variables during specific periods. In the generated image, the arrows demonstrate the interdependence of the investigated variables, with right- or left-pointing arrows indicating in-phase or anti-phase time series and positive or negative correlations. Upward-pointing arrows indicate that the X variable leads the Y variable, while downward-pointing arrows indicate that the Y variable leads the X variable. The dashed white bar indicates potential inaccuracies in the results. The X-axis represents the volume of the analysed study (from the second quarter of 2020 to the fourth quarter of 2022) in the figures, while the Y-axis represents the periods covering the entire duration of the study. R2 and AC(s) play a crucial role in the images, where R2 demonstrates the correlation between variables, and AC(s) shows the correlation between signals in time and frequency. AC(s) highlights the area where coherence exists between x and y.

3. Research results and discussion

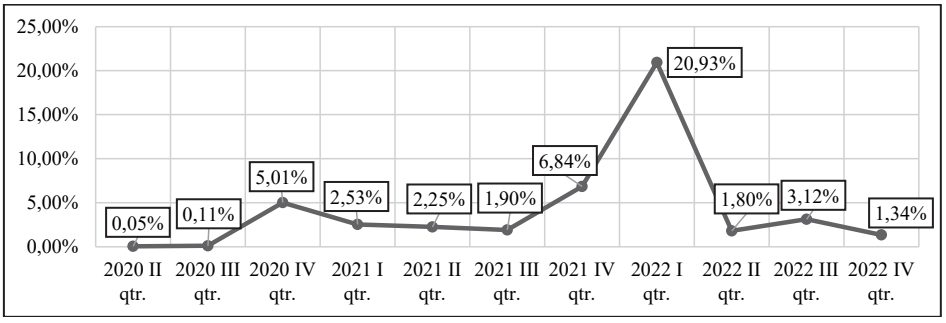
3.1. The Impact of COVID-19 on Peer-to-Peer Lending Returns: A Comparative Analysis of Lithuania and Sweden

The COVID-19 pandemic has had far-reaching effects on various sectors of

the economy, including the financial industry. As people adapted to the challenges posed by the pandemic, there has been an increased adoption of digital financial services and innovative solutions, such as peer-to-peer lending. This chapter explores the relationship between COVID-19 infection cases and the returns of peer-to-peer lending platforms in Lithuania and Sweden. By analysing the fluctuations in infection rates and average interest rates over a specific period, we aim to uncover any potential correlations between these factors. Additionally, we compare the strength and duration of the correlations in both countries. The findings shed light on the impact of the pandemic on the peer-to-peer lending sector and contribute to our understanding of the interplay between outbreaks of infectious disease and the financial markets.

The infection rate in Lithuania was relatively low in the second quarter of 2020, at 0.05%. It increased significantly in the third quarter of 2020, reaching 0.11%, and subsequently surged in the fourth quarter of 2020, reaching 5.01%, which was the highest observed during that year. In the first quarter of 2021, the infection rate decreased slightly to 2.53%. The second and third quarters of 2021 saw a further decline in the infection rate, with values of 2.25% and 1.90% respectively. The infection rate then increased significantly in the fourth quarter of 2021, reaching 6.84%, the highest value since the fourth quarter of 2020. The first quarter of 2022 witnessed a dramatic rise in infection cases, with a rate of 20.93%, which was the highest recorded in the analysed period. The infection rate dropped significantly in the second quarter of 2022, with a value of 1.80%. The third and fourth quarters of 2022 saw a moderate increase in the infection rate, reaching 3.12% and 1.34% respectively. In conclusion, the number of cases of infection in Lithuania exhibited significant fluctuations over the period in question. The highest infection rate observed was 20.93% in the first quarter of 2022, while the lowest was 0.05% in the second quarter of 2020. The average infection rate across all the reported quarters was approximately 4.23% (see Figure 5).

Figure 5. COVID-19 cases in Lithuania as a percentage of the total population

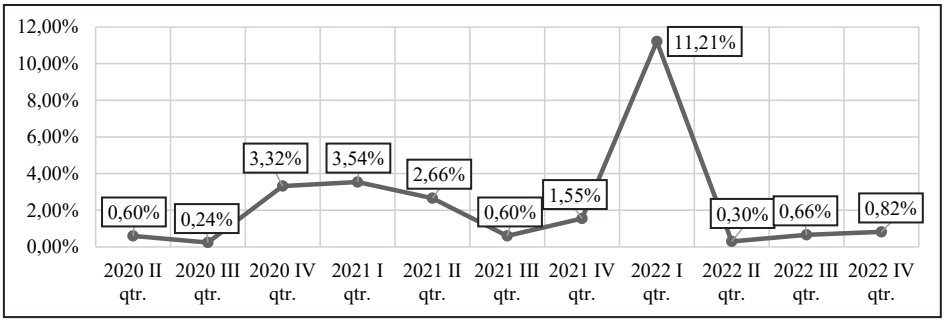


Source: WHO & Official Statistics Portal, 2023

The infection rate in Sweden was relatively low in the second quarter of 2020, at 0.60%. It decreased further in the third quarter of 2020, reaching 0.24%. The infection rate increased significantly in the fourth quarter of 2020, with a value of 3.32%. In the first quarter of 2021, the infection rate remained high at 3.54%. The second quarter of 2021 saw a slight decline in the infection rate to 2.66%, while the third quarter of 2021 saw a significant decrease to 0.60%. The infection rate then increased again in the

fourth quarter of 2021, reaching 1.55%. The first quarter of 2022 witnessed a substantial rise in infection cases, with a rate of 11.21%, which was the highest recorded in the analysed period. The infection rate dropped significantly in the second quarter of 2022, with a value of 0.30%, before increasing slightly to 0.66% in the third quarter of 2022. The fourth quarter of 2022 saw a further increase in the infection rate to 0.82%. In conclusion, the number of COVID-19 cases in Sweden fluctuated over the course of the research period. The highest infection rate observed was 11.21% in the first quarter of 2022, while the lowest was 0.24% in the third quarter of 2020. The average infection rate across all the reported quarters was approximately 2.15% (see Figure 6).

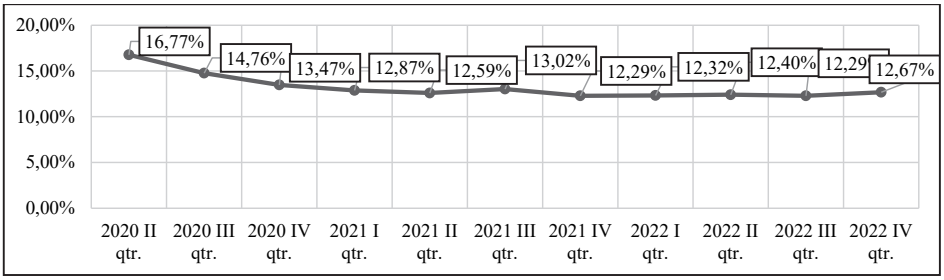
Figure 6. COVID-19 cases in Sweden as a percentage of the total population



Source: WHO & Statistics Sweden, 2023

The average interest rate in Lithuania in the second quarter of 2020 was 16.77%. It decreased in the third and fourth quarters of 2020, reaching 14.76% and 13.47% respectively, and continued to decline in the first and second quarters of 2021, with values of 12.87% and 12.59% respectively. The third quarter of 2021 saw a slight increase in the average interest rate to 13.02%, while in the fourth quarter of 2021, the average interest rate decreased to 12.29%. The average interest rates in the first and second quarters of 2022 remained relatively stable at 12.32% and 12.40% respectively. The average interest rate in the third quarter of 2022 matched the rate observed in the fourth quarter of 2021, standing at 12.29%. The final quarter of 2022 saw a slight increase in the average interest rate to 12.67%. In conclusion, the average interest rates of peer-to-peer lending in Lithuania showed some fluctuations over the analysed period. The highest average interest rate observed was 16.77% in the second quarter of 2020, while the lowest was 12.29%, recorded in both the fourth quarter of 2021 and the third quarter of 2022. The overall average interest rate across all the reported quarters was approximately 13.01% (see Figure 7).

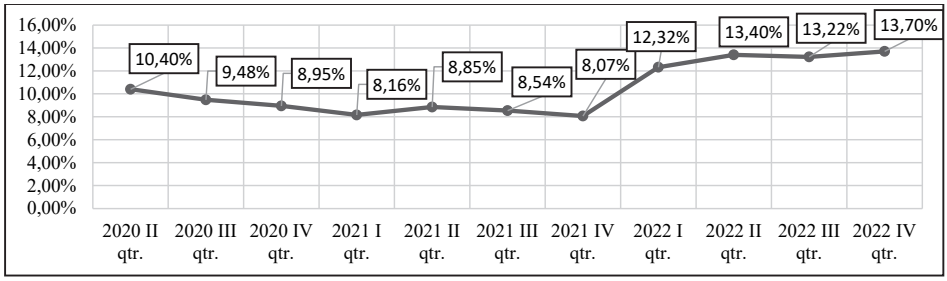
Figure 7. Average interest rates of peer-to-peer lending in Lithuania



Source: Bank of Lithuania, 2023

The average interest rate in Sweden in the second quarter of 2020 was 10.40%. It decreased in the third and fourth quarters of 2020, reaching 9.48% and 8.95% respectively, and continued to decline in the first quarter of 2021, with a value of 8.16%. In the second and third quarters of 2021, there was a slight increase in the average interest rate to 8.85% and 8.54% respectively. The average interest rate further decreased in the fourth quarter of 2021, reaching 8.07%. The first quarter of 2022 witnessed a significant rise in the average interest rate to 12.32%, and the second and third quarters of 2022 saw further increases in the average interest rate, reaching 13.40% and 13.22% respectively. The average interest rate in the fourth quarter of 2022 reached its highest point at 13.70%. In summary, the average interest rates of peer-to-peer lending in Sweden exhibited fluctuations over the analysed period. The highest average interest rate observed was 13.70% in the fourth quarter of 2022, while the lowest was 8.07% in the fourth quarter of 2021. The overall average interest rate across all the reported quarters was approximately 10.69% (see Figure 8).

Figure 8. Average interest rates of peer-to-peer lending in Sweden

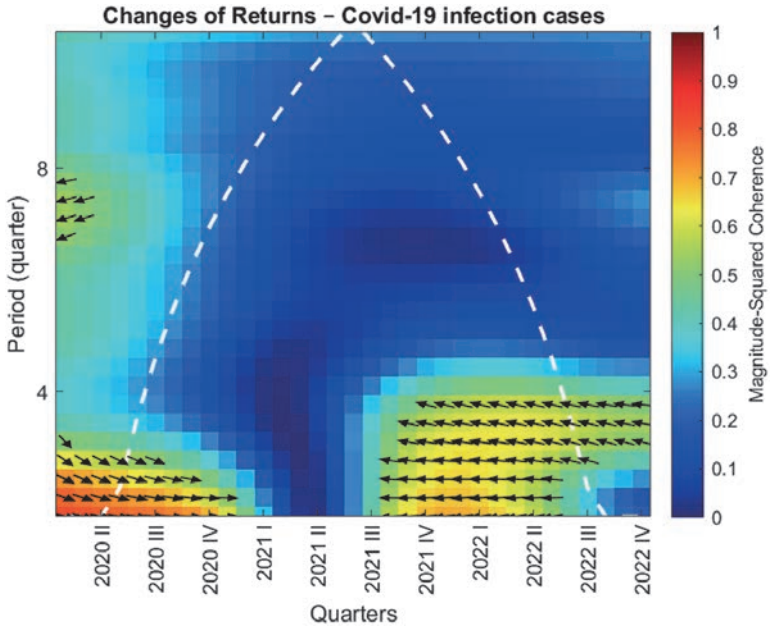


Source: Statistics Sweden, 2023

The average interest rates of peer-to-peer lending in Sweden displayed notable fluctuations between 2020 and 2022. In the second quarter of 2020, the average interest rate stood at a relatively high 10.4%, which then saw a gradual decline in subsequent quarters. By the first quarter of 2021, it had decreased to 8.16%. However, the trend took a different direction from early 2022 onwards, with interest rates steadily rising. In the first quarter of 2022, there was a noticeable spike, jumping to 12.32%,

followed by further increases in the second, third, and fourth quarters of 2022, reaching a peak of 13.7%. This significant uptick in interest rates suggests a shift in the P2P lending landscape in Sweden towards higher borrowing costs for borrowers during this period (see Figure 9).

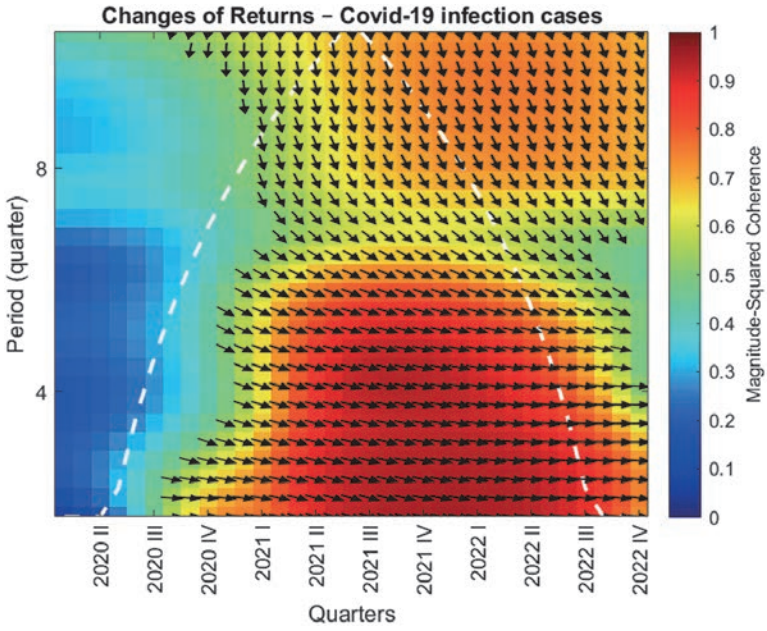
Figure 9. Connection between changes in return on peer-to-peer lending and COVID-19 cases in Lithuania



Source: own elaboration

During the period in question, in the long term (between eight and 12 quarters) a strong correlation between Swedish COVID-19 cases and changes in returns on peer-to-peer lending was visible from the fourth quarter of 2020 to the fourth quarter of 2022. The correlation from the fourth quarter of 2020 to the second quarter of 2021 reached a value of -0.5, and from the third quarter of 2021 to the fourth quarter of 2022 it became stronger, reaching a ratio of -0.7 points. There is clear evidence for the existence of correlation in both periods. In the medium term (between four and eight quarters) a strong connection was visible from the first quarter of 2021 to the third quarter of 2022, at a level of -0.9 points. In the short term (from one to four quarters), it is possible to note that a connection can be seen in the fourth quarter of 2020 lasting until the fourth quarter of 2022. The strength of the connection as of the fourth quarter of 2020 was measured at -0.7 before strengthening to 0.8 in the first and second quarters of 2021. From the third quarter of 2021 to the fourth quarter of 2022 the connection was stronger still, reaching a ratio of -1, enabling us to state that correlation between changes in returns and the number of COVID cases was extremely high in the short term. According to the indicators, it can be said that during all three periods, the incidence of infection had an influence on changes in returns, with especially high correlation during the short and medium term (see Figure 10).

Figure 10. Connection between changes in return on peer-to-peer lending and COVID-19 cases in Sweden



Source: compiled by the authors

The correlation between COVID-19 cases and the changes in returns on peer-to-peer lending is visible for both Lithuania and Sweden. However, the correlation between COVID-19 and Lithuanian peer-to-peer lending is visible only in the short term, while such correlation is visible in all three periods in the Swedish context. In conclusion, Lithuanian peer-to-peer lending was less influenced by COVID-19 than Swedish peer-to-peer lending, where we can see that correlation is visible in all three periods.

Other authors conducted analyses providing an overview of the impact of COVID-19 on the FinTech sector, drawing on studies conducted in various countries. This highlights the accelerated adoption of FinTech services during the pandemic and the positive effects on economic growth. The studies discussed in the text showcase the increased usage of digital payments and mobile financial applications, as well as the role of FinTech in providing cost savings, time savings, and convenience. The findings suggest that the COVID-19 outbreak has acted as a catalyst for the growth of the FinTech sector, with people embracing innovative financial solutions in response to the limitations imposed by the pandemic. This article focuses specifically on the impact of COVID-19 on peer-to-peer lending returns in Lithuania and Sweden. It employs wavelet coherence analysis to examine the relationship between COVID-19 infection cases and lending returns over a specific period. The analysis reveals a correlation between the two variables in both countries, although the strength and duration of the correlation differ. In Lithuania, the correlation is primarily observed in the short term, while in Sweden, it persists across all three analysed periods.

Conclusions

In conclusion, theoretical analysis and studies conducted in various countries have revealed that the COVID-19 pandemic has

had a significant impact on the FinTech sectors. Countries such as Bangladesh, India, Indonesia, the Middle East and North Africa region, Jordan, Kenya, and Bulgaria have experienced the accelerated adoption of digital financial services because of the pandemic. The need for remote and contactless transactions during lockdowns and social distancing measures has driven the increased usage of mobile banking and digital payments.

The findings also indicate that the impact of COVID-19 on the FinTech sector varies across countries. While some countries experienced the increased usage and adoption of FinTech services, others faced challenges related to altered operational patterns, decreased consumer demand, and increased market and operational risks. Factors such as government regulations, cybersecurity, digital infrastructure, trust, awareness, and perception of risks play a crucial role in shaping the FinTech landscape during the pandemic.

In conclusion, using wavelet coherence analysis was an effective method of evaluating the impact of COVID-19 on peer-to-peer lending returns in Lithuania and Sweden. This method has advantages over other approaches, as it can identify frequency-specific relationships and capture changes in relationships over time. By applying wavelet coherence analysis, the researchers were able to visually demonstrate the interdependence and correlations between cases of infection and lending returns during specific periods. Overall, this analysis provides a deeper understanding of how the pandemic affected the peer-to-peer lending sector in these two countries.

In Lithuania, the average interest rates of peer-to-peer lending exhibited a decreasing trend throughout the analysed period. However, the correlation between COVID-19 cases and lending returns was only significant in the short term, with a high negative correlation observed during specific quarters of 2020, 2021, and 2022. Overall, the influence of COVID-19 on Lithuanian peer-to-peer lending was relatively limited. On the other hand, in Sweden, the average interest rates of peer-to-peer lending initially showed a decreasing trend but experienced a significant increase in the first quarter of 2022. This spike in interest rates can be attributed to a surge in COVID-19 infections and countries' foreign policies during that period. The correlation between COVID-19 infections and lending returns in Sweden was evident in all three periods analysed (the short, medium, and long term). In particular, the correlation was strong and negative, indicating a higher influence of COVID-19 on Swedish peer-to-peer lending compared to Lithuania. Therefore, it can be concluded that Swedish peer-to-peer lending was more strongly impacted by COVID-19 than Lithuanian peer-to-peer lending, as evidenced by the longer duration and stronger correlation between infection cases and lending returns in Sweden. These findings suggest that economic and policy factors related to the pandemic had a more pronounced effect on the Swedish peer-to-peer lending market.

In conclusion, the impact of COVID-19 on peer-to-peer lending returns differs between Lithuania and Sweden. In Lithuania, the correlation between infection cases and lending returns is primarily observed in the short term, while in Sweden, the correlation persists across all three analysed periods (the short, medium, and long term). This suggests that peer-to-peer lending was more influenced by the COVID-19 pandemic in Sweden than in Lithuania.

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