



Article

Perceptions of Cryptocurrencies and Modern Money before and after the COVID-19 Pandemic in Poland and Germany

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Abstract: Research background: Despite the fact that the issue of private, decentralized digital money (cryptocurrencies) is already quite extensively described in the literature dedicated to the financial system, especially its periphery, there is a deficiency in terms of research on the opinions of participants in the financial system, based on trust in money and its widespread acceptance. International comparative studies are lacking, particularly those conducted before and after the COVID-19 virus pandemic. The pandemic showed that people had significantly changed their willingness to use different forms of money. Being isolated at home and avoiding direct contact with others, people started to use digital money more frequently. Purpose of the article: In response to the identified research gap, this study reports research results on the perception of cryptocurrencies by young financial market participants. It attempts to provide answers to the following research questions: (1) Has the COVID-19 pandemic and the lockdown of economies caused changes at the international level in perceptions and attitudes toward the traditional monetary system and cryptocurrencies? (2) Has the COVID-19 pandemic changed perceptions of cryptocurrencies as a potential alternative to current fiat money? Methods: To evaluate respondents' opinions, a survey in the form of a questionnaire was conducted. The respondent groups in 2019/2020 were $N = 171$ (Germany = 143 and Poland = 128), while in 2021, $N = 157$ (Germany = 95 and Poland = 62). For analytical purposes, statistical analysis using the Z ratio test was used to capture the characteristics of the response distributions and the relationships between them. These two moments in time allowed us to determine whether there were significant changes between opinions before and after COVID-19. Findings & value added: The study's results showed that while there are significant differences in perceptions of the traditional monetary system and cryptocurrencies due to a variety of factors, the COVID-19 pandemic and the shutdown of economies did not cause statistically significant differences in this regard.

Keywords: cryptocurrency; fiat money; financial system; trust in the financial system

JEL Classification: E42; E52; G41



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1. Introduction

The global financial crisis, which takes the symbolic date of 15 September 2008 as its beginning, initiated many changes and catalysed new trends in global finance. These included multifaceted changes of a fundamental nature, both institutional and regulatory, changes in perception of currencies and in the level of confidence in the global financial system based on a two-tier banking model of which modern fiat money is an emanation. One of the consequences of this crisis was the emergence of completely new and hitherto unknown currency: the first global, private and completely decentralized digital currency—bitcoin. With bitcoin and its growing popularity and spectacularly rising valuation, newer and newer varieties of cryptocurrencies began to

appear, which now number a dizzying 23,000 (for comparison, there are 162 national currencies) and the current capitalization of the entire crypto market is valued at over USD 1 trillion. Cryptocurrencies and their functioning in global financial markets raise several important questions and concerns, primarily related to the future of the modern financial system, money and its further evolution.

The phenomenon of cryptocurrencies still requires systematic and in-depth academic research, as private, decentralized digital money (cryptocurrencies) has already entered the mainstream and has become part of the conservative financial world. Academic studies dedicated to the bitcoin environment and the cryptocurrency universe are plentiful. They mainly focus on describing the phenomenon itself and the technology behind it, blockchain, the profitability of investments in cryptocurrencies, their use in hedging and the systemic and investment risks themselves.

However, there is a lack of comparative research of an international nature relating both to the cryptocurrency environment and its relationship with contemporary fiat money and the financial system based on a two-tier banking system. In particular, there is a paucity of research studies comparing pre- and post-COVID-19 virus pandemic situation to allow any comparative analysis. The pandemic showed that people had changed their preferences and willingness to use different forms of money. Being isolated at home and avoiding direct contact with others, they started to use digital money more frequently. In response to the identified research gap, this study refers to the research results on the perception of cryptocurrencies by young financial market participants. It attempts to answer the following research questions: (1) Has the COVID-19 pandemic and the lockdown of economies caused changes at the international level in perceptions and attitudes towards the traditional monetary system and cryptocurrencies? (2) Has the COVID-19 pandemic changed perceptions of cryptocurrencies as a potential alternative to current fiat money?

2. Cryptocurrencies as a New Phenomenon in the Global Financial System

Cryptocurrencies have already become an almost universal phenomenon in global finance. The exponential growth in both the popularity and valuation of the entire cryptocurrency market manifests itself, among other things, in the steady increase in the number of digital currencies, of which there are already almost 23,000, which, compared to 162 national currencies, means that there are more than 140 digital currencies per national currency. The relatively large market capitalization of digital currencies is also significant, at present exceeding USD 1.2 trillion (March 2023) and in the past (November 2021) even reaching USD 1.6 trillion. On the one hand, this may indicate a certain potential of this market (Kyriazis 2019) and its ever-growing importance in the hitherto generally conservative financial world. Looking at this phenomenon from another angle, however, one can conclude that it may also be linked to a decline in trust of centralized financial markets, system regulators, and current supervisory institutions. At the same time, these processes are combined with the phenomenon of the so-called “anchoring” of inflationary fears in the economy and their logical consequence, the desire of savings (capital) holders to escape from the real negative interest rates present in almost all leading economies of the world, which have been systematically causing the erosion of savings of the “middle class” worldwide for many years.

It seems that in the current difficult situation in which the global economy finds itself in the post-pandemic era, with systemic tensions resulting from changes in the functioning of the global order and international trade, and because of the war in Ukraine, which has been ongoing since the end of February 2022, the search for answers to questions about the future of the world and its financial systems, which is an important (if not the most important) part of it, has become even more urgent. In fact, there are scholarly studies on cryptocurrencies in the context of the evolution of money and its future (Bitros et al. 2020), the fulfilment of the function of money by cryptocurrencies (mainly bitcoin) and their legitimacy (Baur et al. 2018a, 2018b; Dyhrberg 2016; Klein et al. 2018), the applicability and degree of efficiency of hedging with cryptocurrencies in comparison to gold and to

assets considered “safe havens” (Corbet et al. 2018, 2020), their fluctuations during the COVID-19 pandemic (Conlon and McGee 2020; Yousaf et al. 2020), and the reaction of cryptocurrency markets to the monetary policy of the US central bank Federal Reserve Board (FED) (Akyildirim et al. 2020) and geopolitical risks (Aysan et al. 2019).

Studies have investigated the possibility of making above-average profits in a very short period of time (so-called day-trading) in the cryptocurrency market and its level of efficiency (Kyriazis 2019; Stosic et al. 2018; Almudhaf 2018; Ciaian et al. 2016), and present the mutual correlation with the stock market (Conrad et al. 2020; Jiang et al. 2021; Tiwari et al. 2019; Corbet et al. 2018; Salisu et al. 2019). Some articles also describe the cryptocurrency market as a speculative bubble (Geuder et al. 2019) or as a vehicle for money laundering, drug trafficking and terrorist financing (Choo 2015). Some scholarly works on cryptocurrencies also present ways of acquiring them—so-called mining, by analogy with the acquisition of gold (Eyal and Sirer 2018). There are also studies treating the ever-increasing attractiveness of stablecoin investments (Let et al. 2023).

Wholly private digital money is noted in studies devoted to comprehensive considerations conducted on the evolution of money and the stability of the financial system and its future architecture (Allen and Bryant 2019). However, it seems that the universe of cryptocurrencies still requires systematic and in-depth research. First and foremost, there is a lack of studies based on research of market participants in the financial system which treat users—actual and potential—as relevant actors in the functioning of the financial system, which is always based on the widespread acceptance of and trust in the money. In particular, there is a lack of comparative and international studies, especially those conducted in parallel in several countries by the same research team or research consortium (Khan et al. 2020; Maciejasz-Świątkiewicz and Poskart 2020). There are also (and perhaps especially) no international comparative studies showing how the COVID-19 pandemic changed the perception and status of modern fiat money and cryptocurrencies.

3. Survey Methodology and Characteristics of the Survey Sample

The pilot study was carried out in Poland and Germany and is part of a larger and broader study of an international nature. The questionnaire used in the study consisted of 26 questions related to virtual money issues and five questions of a demographic nature. The survey was conducted in December 2019 and January 2020 with 281 respondents—143 from Germany and 128 from Poland. Another survey following the coronavirus pandemic was conducted in April 2021 and involved 95 people from Germany and 62 from Poland. In both cases, they were economics and finance students. This group of respondents was chosen for several reasons. Firstly, it is believed that young people are more open to the uptake of new and innovative technologies and, thus, more willing to use virtual money. Secondly, economics and finance students should be more predisposed than other groups to use new forms of money. Thirdly, they were assumed to be a group with some experience and knowledge in finance, who would thus more easily understand the questions asked in the survey.

The respondent groups (2019/20 survey) were similar in terms of size (Germany, $N = 143$ and Poland, $N = 128$). The structure of respondents by place of residence shows that respondents from Poland mostly come from small towns and villages. The age structure for both countries shows that most respondents were relatively young (16–18 years—2.22%, 19–24 years—85.93%) or slightly older (25–30 years—10.37%). This structure is the result of the methodological assumptions made for the research. Analysis by gender shows that 59.19% were women, 39.71% were men, and 3 people did not indicate any answer (1.1%), but the Polish group included more women (77.17%) than the German group.

For the second survey, conducted after the pandemic in April 2021, 157 people took part, including 95 respondents from Germany and 62 from Poland. The structure of respondents here was similar to the earlier survey. The majority were women, 60.81%, and men, 31.19%. The majority of respondents, 78.54%, were young people aged 19–24, 7% were aged 16–18, and a similar proportion (6.53%) were aged 25–30.

The questions posed at the beginning of the comparison of the surveys in question were:

Q1: Did the COVID-19 pandemic and the lockdown of economies cause changes at the international level in perceptions and attitudes towards the traditional monetary system and cryptocurrencies?

Q2: Did the COVID-19 pandemic change perceptions of cryptocurrencies as an alternative to current fiat money?

The main hypotheses regarding the above questions are as follows:

H1: *The COVID-19 pandemic and the lockdown of economies have caused changes at the international level in perceptions and attitudes towards the traditional (modern) monetary system and cryptocurrencies.*

H2: *The COVID-19 pandemic has changed perceptions of cryptocurrencies as a potential alternative to current fiat money.*

The following specific hypotheses were posed in the statistical section:

HS1—No changes were observed in the characteristics within the Polish (PL) group before and after the COVID-19 pandemic.

HS2—No changes were observed in the characteristics within the German (D) group before and after the COVID-19 pandemic.

HS3—The observed characteristics were the same within both groups (PL + D) before the COVID-19 pandemic.

HS4—The observed characteristics were the same within both groups (PL + D) after the COVID-19 pandemic.

Statistical analysis was performed using the Z proportion test to confirm the hypotheses. The standard error of the difference between two proportions is calculated from Equation (1):

$$\sigma_{\pi_1 - \pi_2} = \sqrt{\bar{p}(1 - \bar{p}) \left(\frac{1}{n_1} + \frac{1}{n_2} \right)} \quad (1)$$

$$\bar{p} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} \quad (2)$$

where $\sigma_{\pi_1 - \pi_2}$: standard error of the difference between the proportions in the first and second sample, $(\pi_1 - \pi_2)$: expected difference between the proportions in the first and second sample, p_1, p_2 : proportions in the first and second sample, n_1, n_2 : size of the first and second sample.

The critical value was calculated as in Equation (3). The significance level was taken as 5%, indicating the confidence level of 95%.

$$(\pi_1 - \pi_2) + Z_\alpha \sigma_{\pi_1 - \pi_2} \quad (3)$$

Z_α is determined from the normal distribution table, and the probability of obtaining a difference between the proportions from the sample is calculated from Equation (4):

$$Z = \frac{|(p_1 - p_2) - (\pi_1 - \pi_2)|}{\sigma_{\pi_1 - \pi_2}} \quad (4)$$

The Z significance test is one of the basic statistical tools used for data analysis. Its use in this article is justified by several key factors.

Firstly, using the Z-test is appropriate when the data are normally distributed and the sample is large enough to apply the central limit theorem. Thus, the Z-test allows us to assess whether differences between two groups of subjects (in this case, the Polish and German groups) are statistically significant. This provides an opportunity to check whether the observed differences are due to random fluctuations or whether they are

actually related to the variables under study—in this case, the impact of the COVID-19 pandemic on perceptions of financial systems.

Secondly, the Z-test is particularly useful when comparing the averages of two independent groups. In the study, different aspects of trust in financial systems (crypto and banking systems) were measured before and after the pandemic in Poland and Germany. These groups were independent, and the sample is large enough that the Z-test is an appropriate tool to compare their averages. Because the Z-test requires independent samples, we were able to use it in the research, as the participants in the 2019 survey were different from those in 2021. Surveys in these two periods were done independently of each other.

Finally, the Z-test is simple to interpret, which is important for many readers to understand the results. In this article, the Z-test allows a clear and specific statement of whether the hypotheses are confirmed or rejected.

4. Analysis of the Survey Results

A selection of questions was analysed that were almost identical in wording in both the 2019 and 2021 questionnaires. The first such question was, “What is your level of confidence in the traditional financial system based on money issued by the central bank?”. An analysis of the responses to this question is shown in Figure 1.

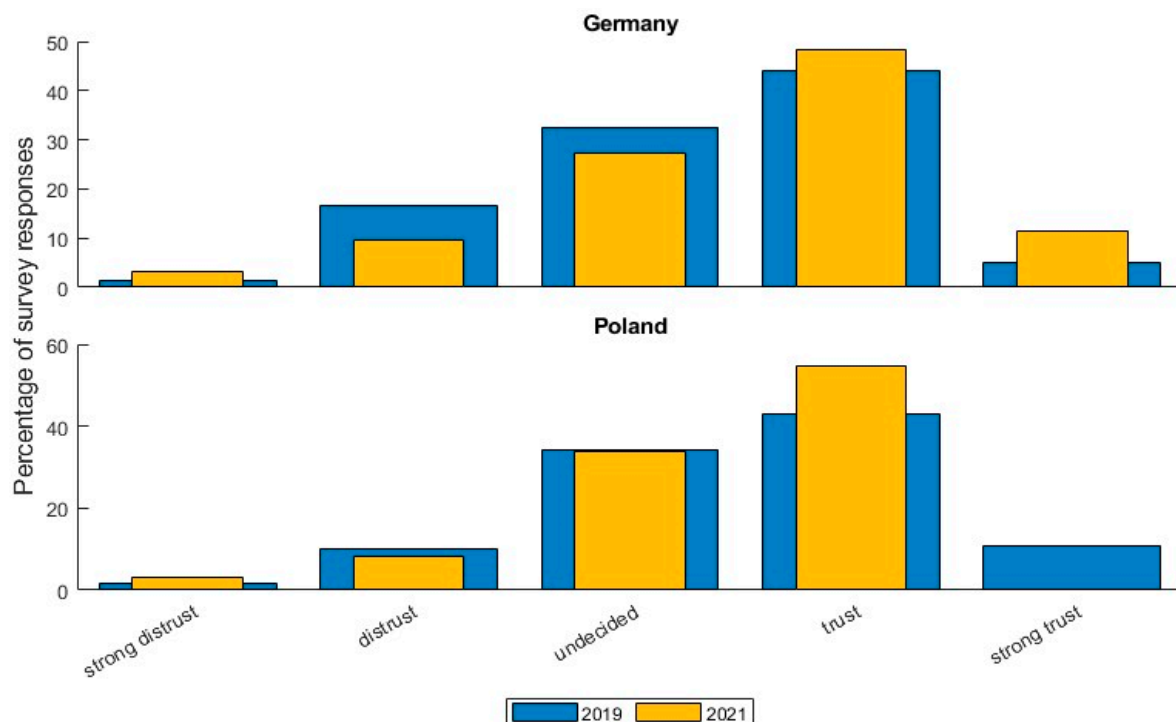


Figure 1. Respondents’ answers to the question: What is your level of confidence in the traditional financial system based on money issued by the central bank?

In the case of this question, an increase in the level of “trust” in the so-called traditional money (and monetary system) can be seen in both countries, the highest in Poland by 11.9 p.p., and lower in Germany, by 4.2 p.p. Interestingly, in the area of “very strong trust” in the system, there was a significant polarization of opinions: in Germany, the number of respondents who strongly trusted the system increased (up 6.5 p.p.), while respondents from Poland did not share this optimism and showed a decrease by 10.9 p.p. (Table 1). This change is statistically significant, as confirmed by the Z-significance test, which is presented in Table 2. This phenomenon can be explained by the fact that Germany, as the most powerful economy not only in the Eurozone but also in the entire EU (the world’s fourth economy), can be considered by respondents to be relatively immune to external

turbulence—much more than the economy of Poland. Poland is a country of much smaller size and economic importance, a country at the so-called ‘acquisitive stage’, without its own value-creation chains, plugged into the German economic system. Interestingly, the number of responses indicating ‘no confidence’ decreased in both countries, most notably in Germany (by 7.2 p.p.) followed by Poland (by 2.1 p.p.).

Table 1. Magnitudes of change for individual responses. Comparison is between pre- and post-pandemic nationality groups. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	‘Strong Distrust’	‘Distrust’	‘Undecided’	‘Trust’	‘Strong Trust’
PL	1.7	−2.1	−0.5	11.9	−10.9
DE	1.7	−7.2	−5.2	4.2	6.5

Table 2. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no basis for rejecting the hypothesis.

Question A: What Is Your Level of Confidence in the Traditional Financial System Based on Money Issued by the Central Bank?					
	‘Strong Distrust’	‘Distrust’	‘Undecided’	‘Trust’	‘Strong Trust’
HS1	0	0	0	0	1
HS2	0	0	0	0	0
HS3	0	0	0	0	0
HS4	0	0	0	0	1

A summary of the statistical analysis results indicates the significance of certain observations.

HS1: The analysis did not provide a basis for rejecting the hypothesis that there was no change in the observed characteristics within the Polish group before and after the COVID-19 pandemic. All categories (‘strong distrust’, ‘distrust’, ‘undecided’, ‘trust’, ‘strong trust’) do not indicate significant changes, except for the last one (‘strong trust’), where the hypothesis was rejected. This means there were significant changes in trust in the financial system among those showing strong trust.

HS2: In the case of the German group, the analysis did not give grounds to reject the hypothesis that the observed characteristics did not change. This means that the level of trust in the financial system was similar across all categories both before and after the COVID-19 pandemic.

HS3: Based on the available data, there were no grounds to reject the hypothesis that the observed characteristics were the same in both groups before the COVID-19 pandemic. Thus, no significant differences were observed between Poland and Germany during this period.

HS4: After the COVID-19 pandemic, the situation changed slightly. The hypothesis that the characteristics were the same in both groups was rejected for the category ‘strong trust’. This means that people with strong trust in the financial system in Poland and Germany differed in their responses after the pandemic.

In summary, these data suggest that the COVID-19 pandemic had little impact on the level of trust in the traditional financial system in Poland and Germany. There was a significant change only among those showing strong trust in the system, particularly in Poland.

Analysing the obtained results, it is noticeable that there is no major change in the Polish conditions, as the number of people declaring firm trust and confidence in the financial system increased by only 1 p.p. There was a shift from the group of ‘strong trust’

to ‘trust’. However, the number of those who do not trust the system decreased in favour of those who definitely do not (a difference of 0.4 p.p.). The number of undecideds remained at almost the same level. The situation is different in German conditions. Here, there is a noticeable increase in trust in the system (more than 10 p.p. in total), with a decrease in declarations of distrust (down 5.5 p.p.) and in the number of undecided persons (down 5.2 p.p.).

A possible explanation for this phenomenon is the positive public perception resulting from the impact of the monetary policies of both countries, in which so-called crisis shields were activated, directing a flow of new money directly into the economy to stabilize the markets, which may have resulted in a significant increase in confidence in the financial system as a whole. The functioning of society under lockdowns was associated with a significant reduction in certain expenditures, e.g., transport and communications, eating/going out, clothing, etc., increasing households’ net disposable income. In addition, the low interest rate encouraged people to take out cheap loans at the time. For some people, this may have had the short-term effect of creating a positive perception of the state of the economy, the actions of the state, central banks and the financial system, resulting in increased confidence in it, but only to a certain extent (inflationary fears). Indeed, it is worth noting that in 2021, none of the respondents from Poland declared full confidence in the financial system.

Another question in both surveys was: How do you perceive contemporary (traditional) money issued by central banks and the commercial banking system? When answering this question, several choices could be ticked. The distribution of answers given by Polish and German respondents is shown in Figure 2.

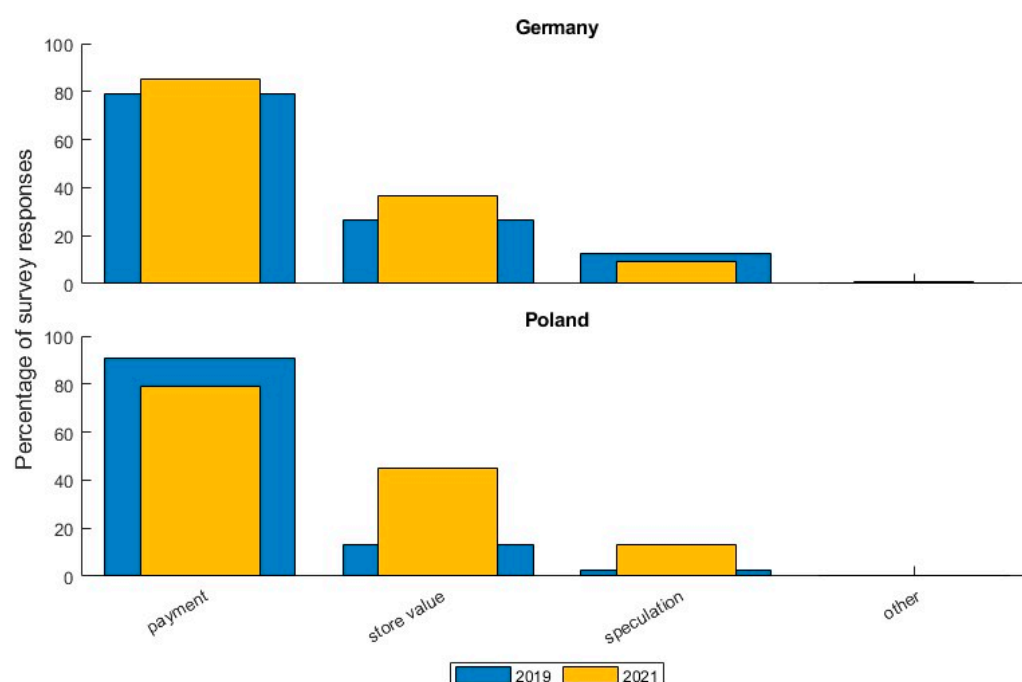


Figure 2. Respondents’ answers to the question: How do you regard traditional money issued by the central bank?

Figure 2 shows that before the pandemic, there were significant differences between the two countries in the perception of the function of money, which is confirmed by the result of the Z-significance test as a result of the aftermath of the pandemic, there were major changes in this regard, particularly evident among Polish respondents (H1).

Analysing Figure 2, it can be seen that among respondents from Germany, the importance of the “means of payment” function increased by 31.9 p.p. compared to respondents from Poland in 2021 (Tables 3 and 4). This can be explained by significant changes in payment habits during the pandemic and lockdown, manifested, among other things, by

a shift away from cash to electronic and online payments. This was a result of media reports that cash transmits viruses. Among respondents from Poland, on the other hand, an increase in the importance of money as a “store of value” is more evident, which can be explained by the fact that a wide stream of new money flowed into the economy from the so-called “crisis shields”. In contrast, due to widely growing fears about the future, the circulation rate of money was not yet high and inflation in the economy was still at an acceptable and moderate level. The population, faced with a hitherto unknown threat and uncertainty about how long it would last, was more likely to give up meeting current needs and accumulate cash for an unspecified time and circumstances. Poles, having learned from the experience of a centrally planned economy, are more sensitive to economic uncertainty, so their reaction is stronger. Among Germans, on the other hand, a redirection of financial resources from investment activities (speculation) to current payments and the function of hoarding is evident.

Table 3. Magnitudes of change for individual responses. Comparison applies to nationality groups before and after the pandemic. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	Payment	Store of Value	Speculation	Other
PL	−11.6	31.9	10.6	0.0
DE	6.0	10.2	−3.1	1.1

Table 4. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no basis for rejecting the hypothesis.

Question B: How Do You Treat Traditional Money Issued by a Central Bank?				
	Payment	Store of Value	Speculation	Other
HS1	1	1	1	0
HS2	0	0	0	0
HS3	1	1	1	0
HS4	0	0	0	0

In 2021, compared to 2019, modern money appears more frequently among respondents from Poland than from Germany as a ‘tool of speculation’—an increase of 10.6 p.p., which would be in line with new trends corresponding to the observed increase in, among other things, the number of new brokerage accounts, the fruit of individual investors’ interest in investments on financial markets, including the stock exchange and listed financial instruments, as well as alternative investments, such as in cryptocurrencies. This resulted from the negative real interest rate prevailing in the economy, combined with increasing inflationary pressure and abnormally low interest rates on bank deposits. This was particularly evident in the Polish market, which, as a rule, is more prone to risk exposure in the financial investment sphere than the more conservative German market.

Equally interesting are the results of the statistical Z significance test.

HS1: In the Polish group, for each of the first three categories (‘payment’, ‘store of value’, ‘speculation’), the hypothesis that there was no change in the observed characteristics before and after the COVID-19 pandemic was rejected. Thus, there were significant changes in the treatment of money issued by the central bank in Poland. The hypothesis was not rejected only for the category ‘other’, meaning no significant changes were observed for this group.

HS2: For the German group, the analysis did not give grounds to reject the hypothesis that the observed characteristics in each category did not change. This suggests that the COVID-19 pandemic did not significantly affect the treatment of money issued by the central bank in Germany.

HS3: Before the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the first three categories ('payment', 'store of value', 'speculation'). This suggests that, before the pandemic, there were significant differences between Poland and Germany in the treatment of money issued by the central bank. For the category 'other', no significant differences were observed.

HS4: After the COVID-19 pandemic, the analysis did not provide a basis to reject the hypothesis that both groups' observed characteristics were the same. This suggests that no significant differences were observed between Poland and Germany after the pandemic in the treatment of money issued by the central bank.

In summary, the data suggest that the COVID-19 pandemic has affected how Poles treat money issued by the central bank. These changes were not apparent in the German group. Moreover, differences between Poland and Germany before the pandemic appear to have disappeared after the pandemic. Given these results, it may be crucial to understand what caused these changes and how they may affect future attitudes towards central bank-issued money.

The next question analysed was, "Which currencies issued by central banks do you trust the most?". Analysing the answers to this question, it is apparent that the euro dominates as the modern currency most trusted by respondents in both cases. This was the case in Germany (a country in the EUR area and its largest financial and economic beneficiary) and Poland (Figure 3). Second place in this ranking is the US dollar (USD)—the currency of the largest economy in the world, which is at the same time the world's reserve currency, while in third place (in the case of respondents from Germany) is the Swiss franc (CHF), which is the currency of a country commonly regarded as a "safe haven". In the case of Polish respondents, the British pound (GBP) plays this role. Within the two years between the surveys there were some changes caused primarily by exogenous factors, namely the COVID-19 pandemic and its consequences, including lockdowns of global economies and printing of empty money by central banks as anti-crisis shields.

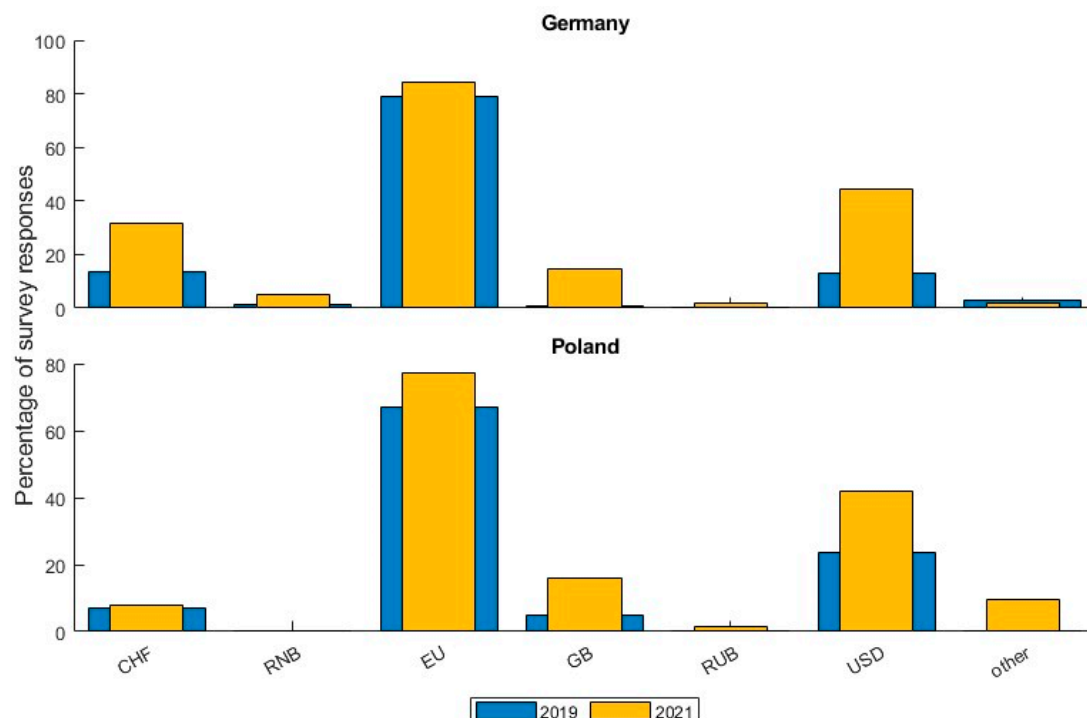


Figure 3. Respondents' answers to the question: Which currencies issued by central banks do you trust the most?

The situation has somewhat changed the perception of the so-called global reserve currencies (USD, EUR, GBP, CHF), as can be seen both in Figure 4 and Tables 5 and 6. In

2021 (Table 5) there was a clear increase in confidence in the US dollar (USD), particularly evident among respondents from Germany: H2 (Table 6)—an increase of as much as 31.3 p.p. and somewhat weaker among Polish respondents: H1—by 18.3 p.p. In second place (interestingly, only among German respondents) was the Swiss franc (CHF)—up 17.9 p.p. (H4) and in third place was the British pound (GBP)—up 14 p.p. (Germany) and 11.4 p.p. (Poland). This increase in confidence in the CHF among German respondents can also be explained by the fact that the economy of Switzerland, which borders Germany to the south, is considered to be very stable and has shown exceptional resilience in the face of pandemic crises, lockdowns and, compared to the surveyed countries, has also avoided significant inflation.

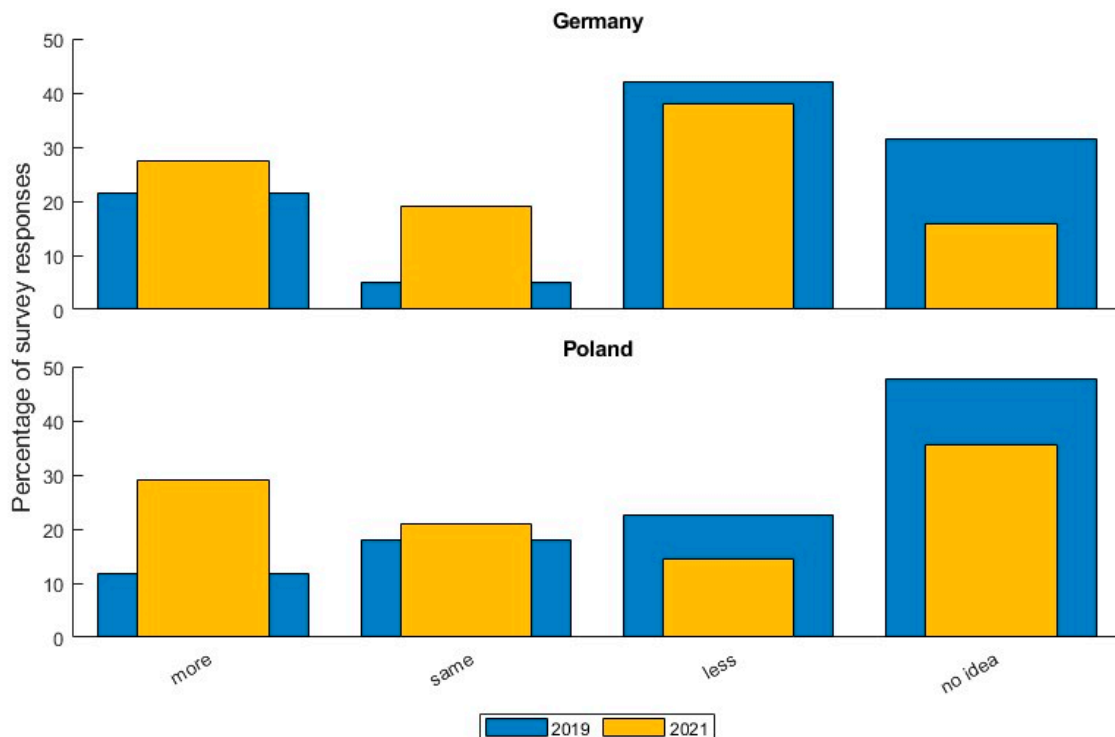


Figure 4. Respondents' answers to the question about their views on the value of cryptocurrencies relative to modern fiat currencies. The figure shows the percentage of respondents' answers to the question. The responses included: more, same, less, no idea.

Table 5. Percentages (magnitude) of decreases/increases for individual responses. Comparison is between pre- and post-pandemic nationality groups. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	CHF	RMB *	EU	GBP	RUB *	USD	Other
PL	1.0	0.0	10.5	11.4	1.6	18.3	9.7
DE	17.9	3.8	5.1	14.0	2.1	31.3	−0.8

* RMB—renminbi, RUB—rubel.

The validity of these considerations is also confirmed by the results of the Z-significance test for individual currencies presented in Table 7, which allow us to interpret whether significant changes in confidence in central bank-issued currencies were observed among respondents from Poland and Germany, both before and after the COVID-19 pandemic. A '1' indicates the need to reject a hypothesis, while a '0' indicates no grounds for rejection. Interpretation of the results for each hypothesis are as follows:

Table 6. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no basis for rejecting the hypothesis.

	Question C: Which Currencies Issued by Central Banks Do You Trust Most?						
	CHF	RMB	EU	GBP	RUB	USD	Other
HS1	0	0	0	1	0	1	1
HS2	1	0	0	1	0	1	0
HS3	0	0	1	1	0	1	0
HS4	1	0	0	0	0	0	1

Table 7. Percentages (magnitude) of decreases/increases for individual responses. Comparison is between pre- and post-pandemic nationality groups. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	More	Same	Less	No Idea
PL	17.3	3.0	−8.1	−12.2
DE	5.9	13.9	−4.2	−15.6

HS1: No basis for rejecting the hypothesis for CHF, RMB, EU and RUB, meaning that no significant change in confidence in these currencies was observed. The hypothesis is rejected for GBP, USD and ‘other’, indicating that there have been significant changes in confidence in these currencies.

HS2: The hypothesis is rejected for CHF, GBP and USD, indicating that significant changes in confidence in these currencies were observed after the pandemic. There is no basis for rejecting the hypothesis for RMB, EU, RUB and ‘other’, indicating that no significant changes in confidence in these currencies were observed.

HS3: The hypothesis is rejected only for the EU, indicating that differences in confidence in the euro were observed between Poland and Germany before the pandemic. There are no grounds to reject the hypothesis for CHF, RMB, GBP, RUB and USD, indicating no differences in confidence in these currencies between the two countries before the pandemic.

HS4: The hypothesis is rejected for CHF and ‘other’, indicating differences in confidence in these currencies between Poland and Germany after the pandemic. There are no grounds to reject the hypothesis for RMB, EU, GBP, RUB and USD, indicating no significant differences in confidence in these currencies between the two countries after the pandemic.

In summary, the results of the Z-test indicate that the COVID-19 pandemic affected changes in confidence in certain currencies issued by central banks. Specifically, for Polish respondents, the changes concern GBP, USD and ‘other’, and for German respondents, CHF, GBP and USD. After the pandemic, differences in confidence in CHF and ‘other’ between Poland and Germany became statistically significant.

The next question analysed was intended to show how respondents valued the worth of cryptocurrencies compared to modern fiat currencies. The responses from both countries varied (Figure 4, Tables 7 and 8). Still, most respondents from Germany believed (both before and during the pandemic) that cryptocurrencies were worth less than modern currencies. The second group (apart from the undecided), comprising more than 20% of German respondents in 2019, thought cryptocurrencies were worth more, while Polish respondents thought that they were worth the same. Interestingly, these opinions changed during the 2021 pandemic. Although the opinion of the ‘superiority’ of modern (traditional) money prevailed in both groups, the percentage of those convinced of this decreased by 8.1 p.p. in Poland and 4.2 p.p. in Germany (Table 8). Interestingly, there was an increase in those convinced of the superior value of crypto compared to traditional currencies—highest in Poland by 17.3 p.p., (H1) and significantly lower in Germany by 5.9 p.p. In contrast, the

belief that cryptocurrencies are worth the same increased among German respondents—up 13.9 p.p. (H2). On the other hand, the percentage of undecided respondents decreased significantly, in both groups, by 15.6 p.p. in Germany and 12.2 p.p. in Poland (H3, H4). This may indicate that external factors (pandemic, lockdowns, rising inflation, negative real interest rates) increased their interest in alternative forms of investments in cryptocurrencies, to protect the purchasing power of money or to make money in the future from projected increases.

Table 8. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no basis for rejecting the hypothesis.

	Question D: What Is Your Opinion? Cryptocurrencies Are Worth ... Compared to Modern Currencies?			
	More	Same	Less	No Idea
HS1	1	0	0	0
HS2	0	1	0	1
HS3	1	1	1	1
HS4	0	0	1	1

The results of the Z significance test confirm these observations, as follows.

HS1: For the Polish group, the hypothesis that there was no change in observed characteristics before and after the COVID-19 pandemic was rejected for the currencies GBP (British pound), USD (US dollar) and ‘other’. Thus, there were significant changes in confidence in these currencies in Poland. The hypothesis was not rejected for the remaining currencies (CHF, RMB, EU, RUB), suggesting no significant changes.

HS2: For the German group, the hypothesis was rejected for CHF (Swiss franc), GBP and USD, suggesting significant changes in confidence in these currencies. The hypothesis was not rejected for the remaining currencies (RMB, EU, RUB, ‘other’), indicating that no significant changes were observed.

HS3: Before the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the EU (euro), GBP and USD. This suggests that, prior to the pandemic, Poland and Germany had significant differences in confidence in these currencies. No significant differences were observed for the other currencies (CHF, RMB, RUB, ‘other’).

HS4: After the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for CHF and ‘other’. This suggests that significant differences were observed in confidence in these currencies between Poland and Germany after the pandemic. No significant differences were observed for the remaining currencies (RMB, EU, GBP, RUB, USD).

In summary, the data suggest that the COVID-19 pandemic affected confidence in some of the currencies issued by central banks in Poland and Germany. In Poland, significant changes were observed in confidence in the British pound, the US dollar and other currencies. In Germany, changes were observed in confidence in the Swiss franc, the British pound and the US dollar. Therefore, the instability of the external environment leads respondents to seek a so-called ‘safe haven’, which may be the strong and stable currencies of other economies.

Another question asked respondents about their views on the value of cryptocurrencies relative to modern fiat currencies.

Analysing the results of the Z-significance test for each of the four hypotheses, several interesting conclusions can be drawn.

HS1: For the Polish group, the hypothesis that there was no change in observed characteristics before and after the COVID-19 pandemic was rejected for the ‘more’ category. This

means that in Poland, there was a significant change in the opinion that cryptocurrencies are worth more than traditional currencies. No significant changes were observed for the other categories ('same', 'less', 'don't know').

HS2: The hypothesis was rejected for the 'same' and 'don't know' categories for the German group. This suggests that in Germany, there were significant changes in the opinion that cryptocurrencies are worth the same as traditional currencies, and a number of respondents had no opinion. No significant changes were observed for the other categories ('more', 'less').

HS3: Before the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected in all categories. This suggests that, before the pandemic, there were significant differences between Poland and Germany in opinions on the value of cryptocurrencies compared to traditional currencies.

HS4: After the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the 'less' and 'don't know' categories. This suggests that after the pandemic, significant differences were observed between Poland and Germany in the opinion that cryptocurrencies are worth less than traditional currencies and in the number of people with no opinion. No significant differences were observed for the other categories ('more', 'same').

Even more interesting conclusions are provided by an analysis of the answers to the question "Do you think that cryptocurrencies have the potential to substitute money?" regarding the potential of cryptocurrencies as a substitute for traditional fiat money. Respondents' answers and changes in the perception level are shown in Figure 5 and Tables 9 and 10. In 2019, i.e., before the pandemic, lockdowns and inflation explosion, the vast majority of respondents marked the answer "no" or "no idea" (Figure 5, Tables 9 and 10), while in 2021, these proportions changed significantly, most evident among respondents from Poland, where the number of sceptics decreased by as much as 29.1 p.p. (H1), while the number of those answering positively increased by 11.3 pp. Among the answers given by German respondents, an identical trend can be found, except that the dynamics of change were somewhat smaller—the number of sceptics decreased by 21.7 p.p. (H2), while those who answered positively increased by 11.3 p.p. (H2).

Table 9. Percentages (magnitude) of decreases/increases for individual responses. Comparison is between pre- and post-pandemic nationality groups. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	Yes	No	Perhaps	No Idea
PL	11.3	−29.1	24.2	−6.4
DE	7.4	−21.7	27.4	−13.0

Table 10. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no basis for rejecting the hypothesis.

	Question E: Do You Think that Cryptocurrencies Have the Potential to Substitute Money?			
	Yes	No	Perhaps	No Idea
HS1	0	1	1	0
HS2	0	1	1	1
HS3	0	0	0	0
HS4	0	1	0	1

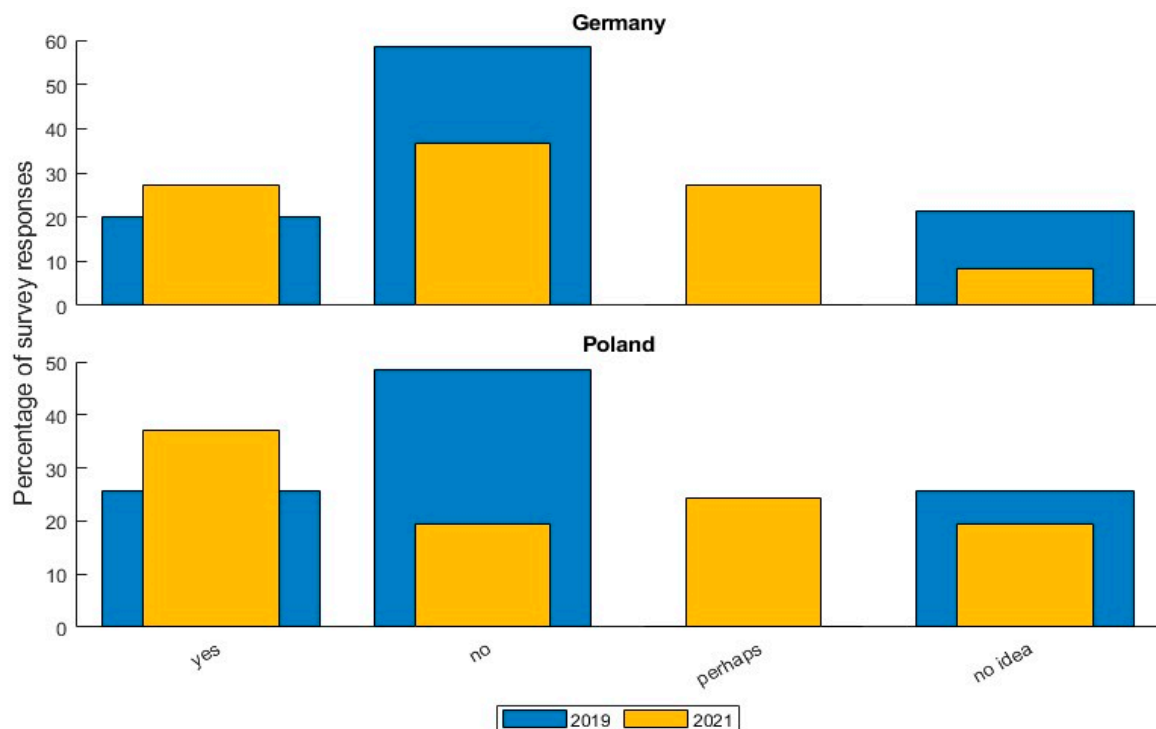


Figure 5. Respondents' answers to the question: Do you think that cryptocurrencies have the potential to substitute money? The figure shows the percentage of respondents' answers to the question. The responses included: yes, no, perhaps, no idea.

In summary, the COVID-19 pandemic had an impact on opinions about the value of cryptocurrencies compared to traditional currencies. These changes were different for Poland and Germany, and the differences between these countries, which were apparent before the pandemic, appear to persist after the pandemic.

Thus, the results reflect the extraordinary events in recent world history (the pandemic and the lockdowns) that the beginning of 2020 brought. Their consequences (economic and social) for both the economies of the respondent countries and the global economy have somehow changed the perception of modern money, the vision of its future and the attitude towards cryptocurrencies—from less conservative to more open to the potential changes that the future may bring.

The following question, "Please compare the inflation risk of currencies issued by central banks and cryptocurrencies. Do you think the inflation risk of cryptocurrencies is . . .," asked respondents for their opinions on the inflation risk of modern currencies and cryptocurrencies. Comparing the distribution of the answers given in 2019 and 2021 shows that there have been major changes here as well (Figure 6, Tables 11 and 12). Thus, most respondents in Germany (around 35%) before the pandemic believed that the inflation risk for cryptocurrencies was much higher than for traditional currencies, and around 30% believed it was the same. In Poland, the proportions were slightly different: around 38% thought the risk was the same, and around 28% thought it was higher. The events of 2020–2021 changed the perception of this problem. Polish and German respondents indeed thought that the risk of inflation in the cryptocurrency environment was similar (in Poland, around 28% and in Germany, around 20%), but there were far fewer such responses. Some respondents in both groups changed their opinion (H1, H2), claiming that this risk is much lower (Tables 11 and 12)—about 25% in Poland (an increase of 18.7 p.p.) and 22% in Germany (an increase of 18 p.p.). Meanwhile, there were very few such responses before the pandemic—less than 5%. In Germany, there was a decrease in those who said the risk was higher (−13.3 p.p.), while in Poland, there was a greater change of −19.3 p.p. (H4).

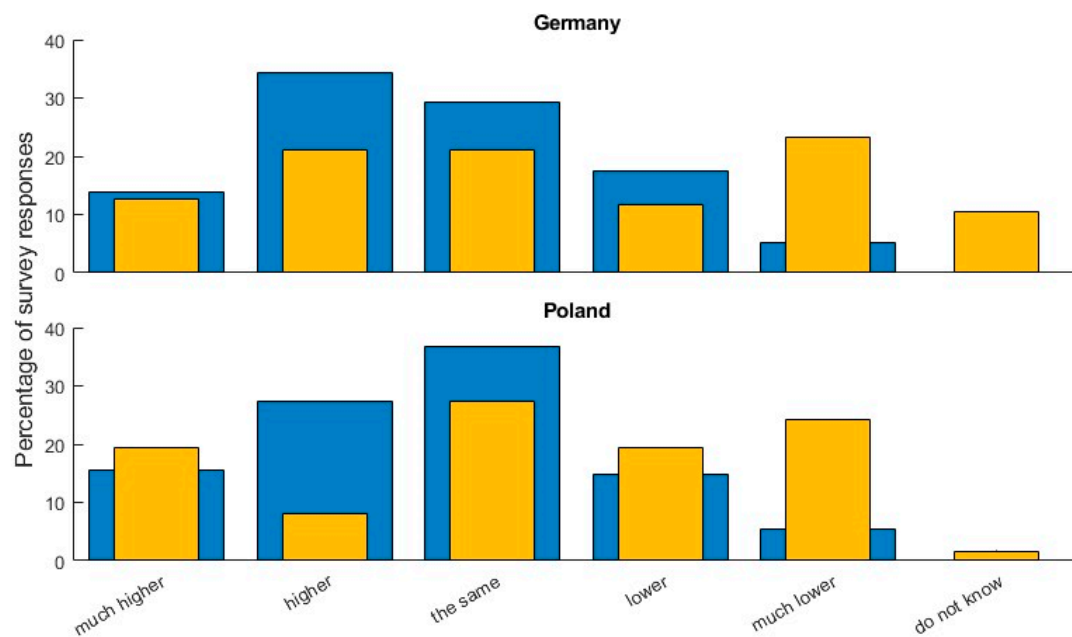


Figure 6. Respondents' answers to the question: Do you think the inflation risk of cryptocurrencies is ...? The figure shows the percentage of respondents' answers to the question. The responses included: much higher, higher, the same, lower, much lower, do not know.

Table 11. Percentages (magnitude) of decreases/increases for individual responses. Comparison is between pre- and post-pandemic nationality groups. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	Much Higher	Higher	The Same	Lower	Much Lower	Do Not Know
PL	3.7	−19.3	−9.3	4.5	18.7	1.6
DE	−1.2	−13.3	−8.1	−5.9	18.0	10.5

Table 12. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no basis for rejecting the hypothesis.

Question F: Please Compare the Inflation Risk of Currencies Issued by Central Banks and Cryptocurrencies. Do You Think the Inflation Risk of Cryptocurrencies Is ...?						
	Much Higher	Higher	The Same	Lower	Much Lower	Do Not Know
HS1	0	1	0	0	1	0
HS2	0	1	0	0	1	1
HS3	0	0	0	0	0	0
HS4	0	1	0	0	0	1

The analysis of the results for each of the four hypotheses is as follows:

HS1: For the Polish group, the hypothesis that there was no change in observed characteristics before and after the COVID-19 pandemic was rejected for the 'no' and 'maybe' categories. This suggests that there has been a significant change in Polish opinion, namely that cryptocurrencies do not have the potential to replace traditional currency and that they could replace traditional currency. No significant changes were observed for the other categories ('yes', 'don't know').

HS2: The hypothesis for the 'no', 'maybe' and 'don't know' categories for the German group was rejected. This suggests that in Germany, there were significant changes in the opinion that cryptocurrencies do not have the potential to replace traditional currency,

could replace traditional currency, and in the number of people with no opinion. No significant changes were observed for the 'yes' category.

HS3: Before the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was not rejected for either category. This suggests that, before the pandemic, there were no significant differences between Poland and Germany in opinions on the potential of cryptocurrencies to replace traditional currencies.

HS4: After the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the 'no' and 'don't know' categories. This suggests that after the pandemic, significant differences were observed between Poland and Germany in the opinion that cryptocurrencies do not have the potential to replace traditional currency, and several people had no opinion. No significant differences were observed for the other categories ('yes', 'maybe').

In summary, the COVID-19 pandemic impacted opinions on the potential of cryptocurrencies to replace traditional currencies. The changes were different for Poland and Germany, and the differences between these countries, which were invisible before the pandemic, appear to have become significant after the pandemic.

Thus, a significant polarization of the distribution of responses can be seen, which allows us to conclude that the events of the pandemic period changed the perception of the vulnerability of modern money to inflation and also changed attitudes towards the cryptocurrency environment.

The analysis of the results for each of the four hypotheses is as follows:

HS1: For the Polish group, the hypothesis that there was no change in observed characteristics before and after the COVID-19 pandemic was rejected for the 'higher' and 'much lower' categories. This suggests that there has been a significant change in the Polish view that the inflation risk of cryptocurrencies is higher and significantly lower than for central bank-issued currencies. No significant changes were observed for the other categories ('much higher', 'same', 'lower', 'don't know').

HS2: For the German group, the hypothesis was rejected for the categories 'higher', 'much lower' and 'don't know'. This suggests that in Germany, there were significant changes in the opinion that the inflation risk of cryptocurrencies is higher, much lower than for central bank-issued currencies, and in the number of people with no opinion. No significant changes were observed for the other categories ('much higher', 'same', 'lower').

HS3: Before the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was not rejected for either category. This suggests that, before the pandemic, Poland and Germany had no significant differences in their opinion of the inflation risk of cryptocurrencies compared to currencies issued by central banks.

HS4: After the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the 'higher' and 'don't know' categories. This suggests that, after the pandemic, significant differences were observed between Poland and Germany in the opinion that the inflation risk of cryptocurrencies is higher than for currencies issued by central banks and in the number of people with no opinion. No significant differences were observed for the other categories ('much higher', 'same', 'lower', 'much lower').

In summary, the COVID-19 pandemic impacted opinions on how the inflation risk of cryptocurrencies compares to the inflation risk of currencies issued by central banks. These changes were different for Poland and Germany.

Another question posed to respondents was about their level of confidence in currencies. The structure of the answers given to the question "Which currency is, in your opinion, the most trustworthy?" is shown in Figure 7.

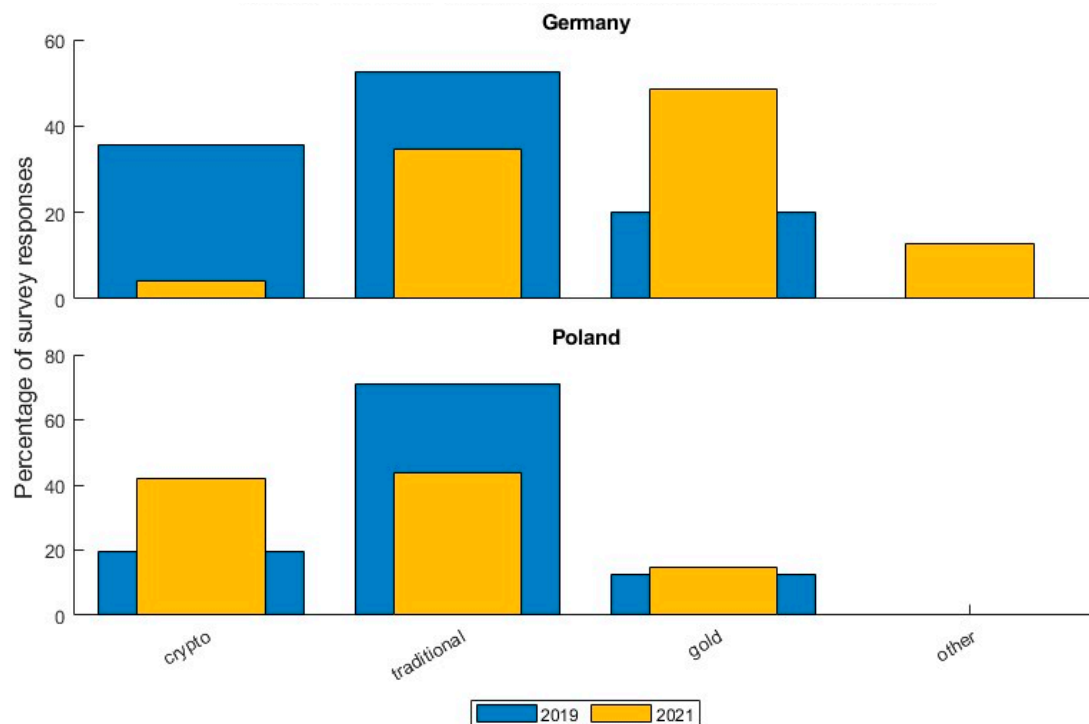


Figure 7. Respondents' answers to the question: Which currency is, in your opinion, the most trustworthy?

From the answers given to the question on the most trustworthy currency according to Polish and German respondents, some changes can be observed between 2019 (before the pandemic) and 2021 (Figure 7, Tables 13 and 14). The analyses show that cryptocurrencies and modern money (fiat) lost trust with respondents from Germany who were in favour of money based on the gold standard. As many as 31.34 p.p. fewer respondents consider cryptocurrencies the most trustworthy, while only 17.85 p.p. have less trust in fiat money. More than 28 p.p. of respondents increased their trust in gold-standard money. This large drop in confidence levels in the cryptocurrency market as a whole was most likely because, with the onset of the global pandemic and the lockdowns of most of the world's major economies, cryptocurrencies, contrary to widespread expectations, failed to live up to expectations, i.e., they did not record the previously expected (and almost certain) spectacular increase in value. Rather, they showed a sideways trend, with increases in the crypto market only appearing towards the end of the pandemic 2020.

Table 13. Percentages (magnitude) of decreases/increases for individual responses. Comparison is between pre- and post-pandemic nationality groups. PL: Poland; DE: Germany.

$\Delta = 2021-2019$	Crypto	Traditional	Gold	Other
PL	22.4	−27.5	2.0	0.0
DE	−31.3	−17.9	28.4	12.6

In a German society accustomed to a stable financial environment in the face of rising inflation, reaching 3.1% at the time of the survey (for the whole of 2020, it was only 0.5%), cryptocurrencies proved to be an inadequate means of tesaurization (storing value). That is to say, contrary to the earlier expectations of many enthusiasts (investors), the crypto market, in the opinion of respondents from Germany at the time, proved to be a poor alternative to modern fiat money, based only on trust in the issuer and in the financial system.

Table 14. Summary of the results of the statistical significance analysis of the accepted hypotheses, where 1 indicates that the hypothesis should be rejected, and 0 indicates no grounds to reject the hypothesis.

	Question G: Which Currency Is, in Your Opinion, the Most Trustworthy?			
	Crypto	Traditional	Gold	Other
HS1	1	1	0	0
HS2	1	1	1	1
HS3	1	1	0	0
HS4	1	0	1	1

Among respondents from Poland, the answers to the analysed question were distributed quite differently. Trust in cryptocurrencies increased by 22.4 p.p., while trust in fiat money decreased by 27.54 p.p. Confidence in money based on the gold standard increased by only 2.01 p.p. This peculiar dissimilarity is most likely due to the more positive attitude of Polish respondents towards the cryptocurrency phenomenon. This can be explained by the fact that Polish respondents are less risk-averse, less conservative than German respondents, and more open to new trends in the financial world. The much higher level of inflation in the Polish economy than in Germany, reaching 5.1% in 2021, could have an impact on the so-called anchoring of inflationary expectations, i.e., fears of further price increases in the economy, for which the crypto market seemed to be a long-term alternative.

Statistical tests show statistically significant differences ($H = 1$) in German respondents' confidence in each type of currency before and after the pandemic. In contrast, the change in confidence in Poles was not significant only for gold ($H = 0$), while there were differences for the others. That is, the COVID-19 pandemic and the lockdown economies introduced by the governments did not only change the already relatively low level of trust in gold-based money in respondents from Poland, unlike in the case of German respondents.

The analysis of the results for each of the four hypotheses provides very interesting conclusions:

HS1: For the Polish group, the hypothesis that there was no change in observed characteristics before and after the COVID-19 pandemic was rejected for the 'cryptocurrency' and 'traditional' categories. This suggests significant changes in the level of trust in cryptocurrencies and traditional currency. No significant changes were observed for the other categories ('gold', 'other').

HS2: For the German group, the hypothesis was rejected for all categories ('cryptocurrency', 'traditional', 'gold', 'other'). This suggests significant changes in the level of trust in all types of currencies in Germany.

HS3: Before the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the 'cryptocurrency' and 'traditional' categories. This suggests that, before the pandemic, there were significant differences between Poland and Germany in levels of trust in cryptocurrencies and traditional currency.

HS4: After the COVID-19 pandemic, the hypothesis that the observed characteristics were the same in both groups was rejected for the categories 'cryptocurrency', 'gold', and 'other'. This suggests that significant differences were observed between Poland and Germany in the level of trust in cryptocurrencies, gold and other forms of currency after the pandemic. No significant differences were observed for the 'traditional' category.

In summary, the COVID-19 pandemic impacted the confidence level in different types of currency in Poland and Germany. There were significant differences between these countries before the pandemic, which increased further after the pandemic.

5. Summary

This paper presents the results of a survey conducted in Poland and Germany in 2019 and 2021. The research aimed to determine the changes in the perception of modern fiat money, the financial system and cryptocurrencies that occurred as a result of the COVID-19 pandemic and lockdowns of the world's economies.

The results show that in both countries, there was an increase in confidence in the traditional financial system based on money issued by the central bank and the commercial banking system. Germans showed a higher confidence level in the modern financial system than Poles, which may be due to Germany's stronger economy than that of Poland. Poles attach more importance to money as a means of hoarding (tesaurization), while Germans divert their financial resources from investment activities rather than current payments. An analysis of the respondents' answers to the question of trust in currencies issued by central banks allows the conclusion that the euro is the most trusted currency, followed by the US dollar. The Swiss franc (in Germany) and the British pound (in Poland) are also prominent. The results obtained made it possible to answer the first research question and confirm the hypothesis that the COVID-19 pandemic and the closure of economies caused changes at the international level in perceptions and attitudes towards the traditional (modern) monetary system and cryptocurrencies.

It is noteworthy that, despite the increased confidence in the traditional financial system, the pandemic has also accelerated the development of financial technologies, including cryptocurrencies. In the surveys, it is clear that interest in this form of money has increased in both countries, although much more so in Poland than in Germany. Polish respondents also showed a greater understanding of cryptocurrencies and willingness to use them than German respondents. The pandemic has also affected how people use banking services and handle money. The use of online banking, as well as cashless payments, has increased in Poland and Germany. The pandemic has also accelerated the development of digital technologies, particularly in the financial sector, which may further impact the way financial services are used. Thus, the results made it possible to answer the second question and confirm the hypothesis that the COVID-19 pandemic changed the perception of cryptocurrencies as a potential alternative to current fiat money. Summarizing the considerations in this paper, it is clear that there have been some changes in the two years between the surveys, mainly due to the COVID-19 pandemic and the associated lockdowns of global economies. The conclusions of the analysis are not only relevant to the financial and investment sectors. Changes in perceptions of money and financial systems can influence decisions in the sphere of savings and investment and, thus, the future behaviour of financial markets. The COVID-19 pandemic has shown that the financial sector is vulnerable to external influences and may need to adapt quickly to an increasingly volatile environment.

The paper highlights the pandemic's role in accelerating the adoption of financial technologies, including online banking and cashless payments, in both countries. This finding is critical for understanding the rapid digital transformation in the financial sector.

The study underscores the financial sector's vulnerability to external shocks like the pandemic, emphasizing the need for adaptability and resilience in financial systems. This insight is vital for developing strategies to enhance financial stability in volatile environments. By identifying changes in public perception and behaviour, the research lays the groundwork for further studies on the long-term impacts of the pandemic on financial systems and trust. It calls for ongoing, in-depth research to understand these dynamics fully.

This issue still requires systematic and in-depth research to capture the changes in the sphere of money, the financial system and the social trust (acceptance) necessary for it to work.

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