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FACTORS OF DEMAND FOR CENTRAL BANK DIGITAL CURRENCY: EVIDENCE FROM SWEDEN AND SWITZERLAND

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Abstract

The article determines factors affecting the demand for Central Bank Digital Currency (CBDC) introduction. The research paper identifies these key parameters to be similar to those contributing to cash demand. Moreover, a comparative analysis between Sweden and Switzerland is presented based on these factors to highlight differences in national economies, which play a significant role in the subsequent demand for CBDC. The timeframe of this analysis is mainly based on the period of the recent COVID-19 pandemic, which brought with itself a global economic crisis. These difficult macroeconomic conditions emphasize the characteristics of national economies that may be evidence of the need of CBDC issuance.

Keywords: Central Bank Digital Curreny, Monetary Policy, Demand, Money Supply, Money Market

1. Introduction

Trends and recent developments in the financial sector and economy in general have created opportunities for incorporating and utilizing open innovations in society's daily life. Many of these technologies are being used for specific purposes, but these concepts can be expanded and broadened to the benefit of people's general well-being.

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Among these innovations are cryptocurrencies, which are directly related to block chain – a revolutionary technological invention of data storage and subsequent its expansion, exceptional due to its traits of safety and security, being virtually uncheckable [1]. Block chain has gained a lot of interest especially in recent years, with ambitious projects and programs attempting to effectively use this innovation in many different industries, but, above all else, in the financial sector.

However, another side of cryptocurrencies has also been given its fair share of attention, and that is the concept of digital currencies. Bitcoin is much more than an example of the successful utilization of block chain, also illustrating the demand for virtual or, more accurately, digital forms of money that can be used in transactions.

One of the big questions arising from this concept is the consequences of introducing a new form of money which would be digital currency. Currently, reserves and cash are distinguished as common forms of money, and digital currency would accompany them further on. The incorporation of such money would require centralized control and legislature in order to operate and function properly, as well as reach universal use by a nation's public. This presumes that digital currency must unconditionally serve as a store of value, medium of exchange and unit of account.

This leads to the logical conclusion that digital currency should be maintained by the state's Central bank, thus being Central Bank Digital Currency (CBDC) [2]. Recent research on CBDC shows that their introduction can have both benefits and significant risks associated with this financial open innovation. Since the discussion is potentially about significant systematic changes in the structure of the banking and financial sectors, as well as payment systems, any miscalculation can have major negative consequences. This motivates countries to be more cautious and wary of any decisions made on the topic and leads to the development of specific projects of researching the use of CBDC and its effects in controlled experimental environments.

In order for a country to introduce CBDC into circulation, it must first make important decisions which will play a consequential role on the nation's future. These questions relate to every citizen, thus amplifying the significance of this open innovation. The topics include but are not exclusive to discussions on whether the state should abolish all cash in the country, the methods of incorporating CBDC on the scale of a nation, creating the infrastructure needed for digital money to be effectively used in any point in the country, and helping society adapt to these dramatic changes [3].

Considering this, many countries have already begun researching the idea of CBDC and examined the prospects of incorporating them on a state-level. Moreover, they have developed projects and plans to analyze this open large-scale innovation. However, the degree to which each individual country requires a new form of digital money varies, and every state decides its most valuable and needed features from a specific set that has been researched before.

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2. Background

The work of Barrdear and Kumhof [4] gives an accurate definition of CBDC, which has been used in other consequential researches on the topic. The article describes it as “a central bank granting universal, electronic, 24x7, national-currency-denominated and interest-bearing access to its balance sheet”. This benchmark interpretation of CBDC involves many key points which will be developed upon further in the study. However, this very same study proposes that CBDC needs further development to before incorporation in order to be socially beneficial. This article examines the prospects of demand for CBDC in developed countries and researches the consequences of introducing this open innovation.

As mentioned in previous studies [5], digital currency itself is not necessarily an innovation. It is important for casual readers to understand that electronic money is and has been used for a long time now.. The innovation consists of new and improved ways that electronic money is recorded and exchanged. Moreover, the idea of Central Bank Digital Currency creates reformed dynamics between the general public and the Central Bank, in which citizens could potentially hold deposits directly in the Central bank itself.

The idea of the Central Bank participating in commercial activities is not unheard of in historical context. The effects of of these actions have been studied [6] and researched, with the conclusions of studies potentially being more important now with the prospect of CBDC introduction in some countries. The role of central banks may change, and it is critical to evaluate how the economy may adapt to these new circumstances.

The dynamic between clients and the central bank is largely dependent on the specific type of CBDC that is incorporated. As stated above, benchmark CBDC have been proposed by Engert and Fung (2017) [7] that are similar to cash and share many characteristics with the liquid asset. However, as this study examines CBDC projects and proposals of countries, it is necessary to distinguish, firstly, account and token based CBDC.

Token based CBDC is most similar to cash [8]. At the same time, the execution of these token CBDC transactions from a technical point of view is drastically different from trade with cash that society is used to. As many studies highlight however, the current stage of development of distributed ledger technology (DLT) is not sufficient enough to be able to provide the needed uninterrupted operations. Regarding this, centralized systems and technological solutions are examined as a more efficient alternative. Considering all of this, the proposed drawback of token CBDC is relatively compensated by increased opportunities when using this form of currency – transactions, which are not unlike cash, can be executed remotely, without the need to, for example, meet in person.

As for account based CBDC, the familiar concept of transactions between commercial bank depositors is employed. The exception in this case is the discussed factor of the accounts being held specifically with the central bank. The reinvented dynamic of the Central Bank’s role in the economy would be similar to the practices of today [9].

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Moreover, this assumes more centralized regulation and control from the perspective of the Central Bank, as it be would in possession of a master-ledger on the millions of accounts.

It has already been noted that the introduction of CBDC in general requires significant developments in the underlying infrastructure. This is related with the decisions that countries have made regarding the type of CBDC that would be emphasized in their research. Token-based CBDC operating on DLT, particularly, would be the most intense power-consuming form that could be incorporated. These peculiarities will be further reviewed in the current section. Other types of CBDC, such as wholesale and retail characteristics have also been researched in papers, being distinguished by variants of accessility [10].

The introduction of CBDC has a long list of benefits for the economy, the country's central bank and the entire banking system. The main benefits are worth highlighting [11]:

- Enabling the Central Bank to provide units of money to any unit of the economy in an affordable and secure way;

- Increasing the sustainability of retail transactions;

- Increased control over illegal transactions and shadow business;

- Strengthening monetary policy, expressed in the ability to overcome the zero lower bound of the central bank rate because ZLB apply to the central bank. Also, regulation of the central bank rate could be another tool of monetary policy;

- Increasing the financial stability of the whole banking system by reducing the importance of the banking system in the money creation process.

In the absence of global experience with the introduction of digital currencies in retail and wholesale trade, it is difficult to speculate on approaches to controlling digital currency, because creating an optimal system for its operation is only half of the project; it is still necessary to understand how to manage such a form of money.

The scientific literature describes the approach of Kumhof and Noun [12]. In 2018, they described the principles according to which they believe such a system should exist:

1. The CBDC pays the regulating interest rate;
2. Reserves and digital currency are not convertible into each other;
3. The conversion of deposits in CBDC is not guaranteed;
4. The central bank issues digital currency only against secure bonds, such as government bonds.

The study looks at the demand for digital currencies in countries where the central bank has already published a report on the prerequisites for the introduction of digital currencies.

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Table 1.Project status of CBDC research in key countries [13].

Government	Potential uses of CBDC	The role of central bank in turnover	Project status
Sweden	Retail trade	Settlement through the central bank	Piloting
South Korea	Retail trade	Under discussion	Piloting
Canada	Wholesale (retail trade in discussion)	Under discussion	Research
Switzerland	Wholesale under discussion	Under discussion	Research

In October 2020, the Central Bank of the Russian Federation published a report on the digital rouble, which is in the research phase. According to the report, between 2016 and 2020, the share of electronic payments in the total share of payments increased from 39% to 70%. The growth has been significantly influenced by the creation of the necessary infrastructure in retail to enable e-payments. This growth shows that regardless of the existence of a country's own dominant electronic payment system, there is an increasing demand for electronic payments in a few countries at different stages of economic development.

According to the Riksbank report on the e-krona project, Sweden is moving towards becoming a cashless society. The report outlines the following prerequisites for this process:

1. Demographic. Based on the global trend, for the most part young consumers prefer the cashless form of payment. After a while, the current younger generation will replace the older generation, which will dramatically reduce the demand for cash payments.
2. New technologies and innovations. In recent years, electronic payments have become an alternative form of payment in areas where no such alternative existed before (e.g., in the marketplace). However, the electronic form of payment is much faster and more convenient, which is gradually replacing cash.
3. The emergence of new consumption channels. In recent years electronic services that allow purchasing goods and services from the comfort of one's own home, which is even safer because of the pandemic, have come to the fore more and more frequently. Such services are becoming more convenient and accessible year by year in all parts of the country.

If Sweden manages to legally reach a stage where merchants are not obliged to accept cash, it will become the first cashless country in the world.

Based on the Riksbank report, it is not difficult to highlight the Central Bank's own position on the project. The researchers are fully convinced that the project should be treated with

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caution because even the design of the e-krona could have a decisive impact on the fate of this massive project. The e-krona must bear its own costs, and the position of the Riksbank should not be too much of an imposition on the digital currency on the public.

The Swedish Central Bank estimates that demand for e-krona will be limited and regulated because the digital currency is expected to be used for small payments. And in that case, the impact of the central bank on monetary policy will not be enormous, even existing business models and processes are not likely to be affected much.

In discussing the need for digital currencies [14-17], the question arises as to the scope of their application. The countries discussed above plan to use digital currency for retail and wholesale trade. However, there is a successful global project called Project Ubin that has tested cross-border payments using distributed ledger technology. The project involved the central banks of Canada and Singapore, as well as major international banks and information technology corporations such as IBM and Microsoft.

At the end of the fifth phase of the project, the prototype block chain-based payment network will continue to serve as a test network for facilitating cooperation with other central banks to continue the development of a payment system for cross-border payments.

"Project Ubin shows first and foremost that the future is already here and if there is a block chain-based electronic payment system for cross-border payments, then a single nation's central bank can also set the stage for the introduction of a CBDC.

However, the prospect of the introduction of CSDC and the partial or complete abolition of cash may not be so favorable, which is why not all countries have a high share of electronic payments. Consider Switzerland, which, contrary to global trends, uses one of the largest banknotes of 1,000 CHF (equal to €880 or $1,007). The Swiss Central Bank claims that banknotes of this denomination are used by citizens to save or make large purchases.

According to the Swiss Payment Monitor 2019 [18], among the Swiss population for 2019, 18% prefer to use cash only (75% of purchases are made with coins and banknotes). Debit cards are preferred by 28% of Swiss people, credit cards are indispensable for 12%. At the same time, 42% prefer to use all payment methods and do not priorities any of them.

A study was also carried out on paying behavior according to the amount of the purchase. The results showed that a large proportion of purchases made with cash are small purchases (CHF 5 to 20). In the category of purchases up to CHF 5, banknotes and coins are used 70% of the time, but if the purchase amount reaches CHF 20, cash will be used 57% of the time. For larger purchases (up to 50-500 francs), the share of cash payments drops to 40-9% respectively. However, even the use of cash on a purchase worth 500 francs in 9 cases out of 100 indicates the culture and habits of the Swiss to use cash.

The culture and payment preferences of this country can be compared with Sweden, where e-payments are increasingly replacing cash every year. To evaluate the benefits

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of CBDC introduction and its demand, the first step would be to research the theoretical effects of this digital currency on a nation's economy. Moreover, decisions made by countries that have shown interest in the idea of CBDC are reviewed and aggregated. The study examines the main factors associated with this open innovation in several countries with the intent to review and illustrate the benefits to an economy.

The demand for CBDC introduction is dependent on whether the public requires currency that coincides the positives of cash and electronic payments [19]. The study reviews conducted research as well as the ongoing CBDC projects in several countries. Data on the necessity of CBDC is also presented and analyzed in the research paper with the main advantages of form of money. The main state that is given the most attention is Sweden with a popular and universal application for electronic money along with a peculiar situation with cash.

In accordance with the provided country-specific information, numerous factors affecting the demand for CBDC can be determined. As outlined in many reports, the viability of CBDC introduction is, as expected, firstly related to the demand for cash in a state [20]. The demand for cash, consequentially, is reliant on many macroeconomic parameters. The study of Shirai, S. and Sugandi (2019) presented an econometric model and uses a generic equation for the analysis of cash demand in many national economies [21]. This model is optimal for the study, as it presents factors affecting cash demand in a country. This, subsequently, will be reflected in the underlying demand for CBDC. Specifically, though, the equation below shows the ratio of cash in circulation to the nominal GDP of the national economy:

$$CASH_{i,t} = \alpha + \beta_1 INTEREST_{i,t} + \beta_2 AGE_{i,t} + \beta_3 CRISIS_{i,t} + \varepsilon_{i,t}$$

The central bank key rate, which will be one of the most important factors when analyzing CBDC demand, is presented as an independent variable INTEREST. CRISIS on the other hand presents is a dummy variable dependant on the recessions of 2000 and 2008. Subsequently, it adopts the values of either 1 or 0. AGE is a percentage parameter, just as INTEREST. It is an age-related factor and is synonymous with log(LIFE). The indices of *i* and *t* in the model refer to the country in the analysis of the aforementioned article and the time index respectively [22].

Considering these determined factors and the research in other studies, it can be concluded that the key rate and liquidity play a vital and critical role in the demand for cash. Of course, as with Sweden, for example, the situation is peculiar regarding these indicators. With respect to them, the question of liquidity in the conditions of the COVID-19-influenced global crisis will be analyzed in the research, along with the key rate in the countries.

3. Data and Methods

The idea of a "cashless society" is one that some mostly developed countries have been gradually nearing. The use of cash as a means of payment has been declining in states such as Canada and Sweden. However, recent research by Engert and Fung (2018) [23]

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determines the problems of a cashless society, citing trouble regarding maintenance of operational reliability and the contestability in retail payments, among others. Moreover, the study examined cashless society where people and banks voluntarily choose not to use cash, thus making the central bank decide not to provide bank notes. This may vary from projects of CBDC introduction, which may impose a cashless regime, though this has not been popular amongst the plans of central banks.

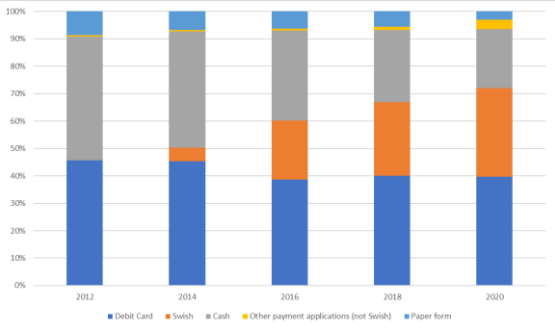

Figure 1. Means of payment by correspondence in the last 30 days in Sweden

Some of the largest financial institutions in Sweden have developed the mobile payment application Swish launched in 2012. As seen by the Figure, the project has been successful in attracting enough users to have people use Swish more often than cash by 2018. Transactions through Swish are, as stated in the research of Jakobsson (2017) [24], similar to cash in the characteristics of the payment method. Thus, the payment application potentially poses as a substitute for bank notes and coins, at least between individuals, along with further development of payments between individuals and businesses. These trends in Sweden are introducing the discussion of digital currencies completely replacing cash in a number of countries.

The M0 money supply in Sweden had been decreasing for the latter half of the 2000s and the majority of the 2010s. It is important to understand that this money aggregate displays the amount of cash in the hands of the public in Sweden. This, paired with the increasing volume of broad money in the country, emphasizes the decreasing demand for cash.

The topic of security and safety is also popular in discussion when addressing electronic money and CBDC specifically. Cash is difficult and expensive to counterfeit. Despite this, Sweden had seen an influx in counterfeit bank notes in 2019 (Figure 3). Simultaneously, Swish has been used for money laundering, with the result of withdrawing cash bank notes. However, the risks of card fraud are low. This emphasizes the need for new infrastructure to accompany CBDC as a new form of money, as well as realize the potential of block chain innovations with distributed ledger technology (DLT).

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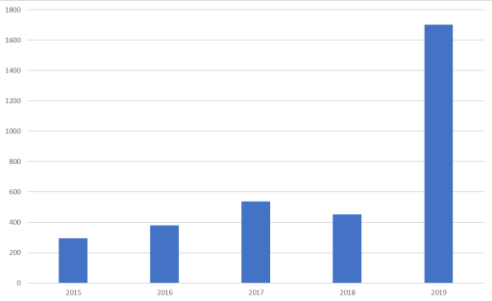

Figure 2. Counterfeit bank notes in Sweden

The study mainly focuses on the national economies of Switzerland and Sweden, as they are both among the most interesting regarding the topic in question. The main indicators that are examined are subsequently linked with monetary policy in the states, as this aspect of the economy is largely responsible for the demand for cash and, subsequently, the demand for CBDC. To be more precise, the key rates in the countries are presented in order to evaluate the policy taken by the governing bodies. Furthermore, detailed analysis of the money supply and money aggregates are studied in order to understand the main tools for executing transactions in countries.

Many previous studies also presented data on the size of banknotes of cash as an instrument of evaluating the demand for cash. Moreover, they reserve to analyze the ratio of cash or broad money to the country's GDP. This study's novelty is the decision to emphasize the ratio of cash to broad money instead of GDP, as it more accurately depicts the changes and preferences among the population regarding payment methods and savings [25-26].

Due to the concept of CBDC being relatively new and the absence of empirical historical data, it is difficult to give a relevant model for the demand for the innovative form of money [27-29]. However, this study presents examples that allow to conclude the need for CBDC introduction. This demand is evaluated using existing macroeconomic indicators and monetary policy. Another novelty of the study is the use of the most recent economic crisis in order to better understand the tendencies of different national economies, consequentially allowing to make better and more accurate conclusions on the demand for CBDC.

To start with, the key rate is the first parameter that is analyzed in the study. In this case, it is important to review the effective-lower bound regarding Switzerland and Sweden. Reaching the effective-lower bound, as stated in the previous section, denies the Central Bank the ability of lowering the lending interest rate in the events of an economic recession. Thus, it has to reserve to other monetary policy instruments to stimulate the economy, such as quantitative easing and others. In the case of the two selected countries, it is not difficult to assess the level of the key rate: they are both negative, and the Swiss National Bank and the Riksbank did not lower the lending rate during the crisis caused by the global COVID-19 pandemic.

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Furthermore, regarding the age of both countries, it can be stated that the population of both states can be characterized as aging. This subsequently leads to increased cash demand. The repercussions of these developments are presented in the next section.

Finally, addressing the crisis-factor is key in understanding the population sentiment towards cash and, consequentially, the demand for it. As has been established, the development of an economic recession traditionally leads to an increase in the demand for assets with high liquidity. Cash is among the assets with the highest liquidity. Thus, under the events of the COVID-19 pandemic, an increase in cash-demand should be observed in accordance with this hypothesis. If increased levels of cash are not observed in the economy, conclusions on the low demand for cash and underlying high level of demand for CBDC can be produced.

In accordance with the presented information, the main object of analysis is the ratio of M0/M3 in Sweden and Switzerland. The indicator is used in a comparative analysis to highlight the differences between the states' macroeconomic characteristics.

3. Analysis and Results

As noted in previous sections, the factor to consider is the Central Bank key lending rate in Switzerland and Sweden, which are presented in the figures below. Whilst this indicator is fairly similar between the two states, they still have substantial differences that need consideration when addressing the demand for CBDC. Firstly, the Riksbank rate stopped being negative on January 8th 2020. Despite the value being below zero for most of the previous decade, the Central Bank began gradually increasing the key rate from -0.50 beginning in January of 2019. It is noteworthy that the last decision came at a fairly peculiar time: just months before the global spread of COVID-19, which lead to a recession.

However, as in Switzerland, Sweden opted not to decrease the key lending rate in response to the pandemic. In the case of the Swiss National Bank, it can be expected that a lower value of the indicator would be counter-productive, hinting at the possibility of Switzerland reaching the effective-lower bound. This, as has been established in the review of past literature, can be aided by the introduction of CBDC. With these theories in mind, it may seem that both countries can achieve wide use of CBDC. But it is important to consider that the central bank key rate is not the only factor playing a key role in determining CBDC demand.

Figure 3. Schweizerische National bank key rate, March 2009 to March 2021

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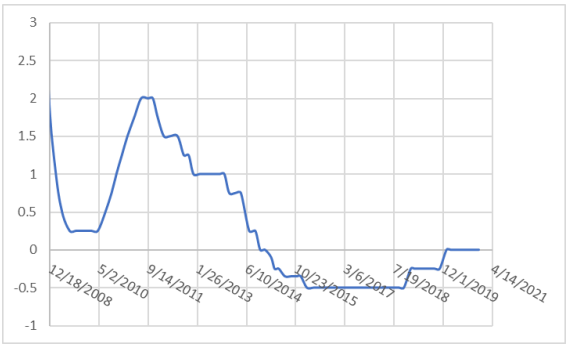

Figure 4. Riks bank rate, March 2009 to March 2021

Another factor that deserves in-depth examination is the overall supply of cash money in national economies in order to better understand the dynamics of demand in the countries. With accordance with the third section of the article, the ratio of M0/M3 should not be underestimated in the process of understanding the overall sentiment of the population regarding cash money. And it is here when the largest differences between the Swiss and Swedish national economies begin to become apparent.

Not only should the supply of cash be examined – to be more specific, the share of cash in the broader money supply – but it is vital to research this indicator for the correct period of time. In the case of this study, the ratio is investigated for the period leading up to and during the COVID-19 pandemic. The events of a crisis, which are apparent in the case of the recent economic downturn caused by the disease, traditionally lead to an increase in the demand for cash, as it is regarded as the asset with the highest liquidity. Moreover, during the recent recession the demand for liquidity was, perhaps, even more intense than usual, as many companies faced employment and payment problems due to the peculiar circumstances of a global pandemic. Many corporations were left to continue to pay off their debts under the conditions of absent demand. In order to comply with the rules of loan agreements, companies began searching for high-liquidity assets. This, obviously, is and was when cash money became among the most valuable assets that a business could be in possession of.

According to this, the study presents the ratio of M0/M3 in Sweden and Switzerland from December 2019 until March 2021. This period of time best encapsulates the behavior of economic agents in the conditions of a global pandemic. The axis on the left is for Sweden, whilst the one on the right – Switzerland. Firstly, before addressing the dynamics of the indicator for both countries, it is important to highlight the fundamental difference in the share of cash money in the broader money supply in the countries. These two states have completely varying attitudes towards cash. And whilst one continues to utilize this tradition of paying for smaller amounts of money with cash, the other prefers exclusive national systems of executing electronic payments. As a result, in the case of Sweden the coefficient is less than 2%, and in Switzerland it is over 50% for the entirety of selected time period. This difference is drastic and only increases during the COVID-19 pandemic.

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The dynamics of the coefficient also offer a significant contribution to the study's body of work. In the case of Switzerland – a country with already high demand for cash highlighted by a large share of cash in the money supply – the share of cash increases during the COVID-19 pandemic. Overall, from December 2019 to March 2021 the indicator of M0 to broad money increased from 54,20% to 63,15%. These results are to be expected, as the population's sentiment towards cash is fundamentally positive and the added effects of a liquidity crisis began to stimulate the demand for cash further.

In juxtaposition to this, however, the situation in Sweden is completely different. The trend of a decreasing share of cash in the money supply continued despite the COVID-19 pandemic. The general population opted not to hold cash during the trying times. Speaking analytically, this may also be linked with the response of the country's government to the pandemic, which can be characterized as being easier, lighter, and less restricting relative to the measures taken by other European coutrnies. That being said, the data shows that even in the conditions of a crisis – a leading factor in evaluating cash demand, the Swedish population still gives preference to other forms of money. These ideas support the thoughts that Sweden is among the few countries which could benefit from the introduction of CBDC the most.

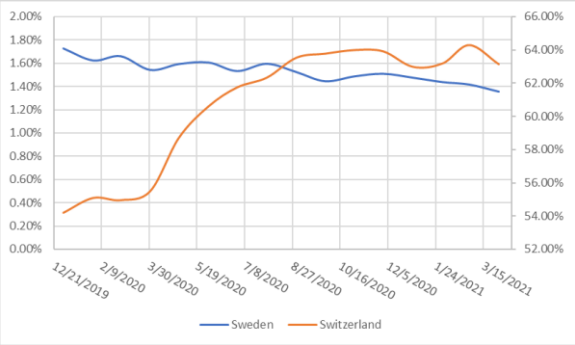

Figure 5. M0/M3 ratio in Sweden and Switzerland during the COVID-19 pandemic

In the second quarter of 2020 – the most challenging period of the crisis – Sweden and Switzerland reported drawbacks in GDP of 8.6% and 8.2% respectively. It is not surprising that the year is characterized by an economic drawback in most countries. The macroeconomic effects of the pandemic were felt from all stages of production, distribution and consumption.

In order to give better perspective on the state of cash demand in these two countries, the figure below presents the dynamics of the coefficient in 5 developed countries: Sweden, USA, Japan, Switzerland, and South Korea. Evidently, among these five countries three had serious changes to the structure of the money supply: Sweden, Switzerland and USA. It is noteworthy that cash in the latter country increase by 50% to just under 30% of the overall money supply. Sweden, however, is the only country to have the share of cash decline. This is considering that Japan and South Korea are also invested in the research of introducing CBDC: the demand for the innovation is, perhaps, not as strong in the Scandinavian state.

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Let us return to the hypothesis that there is a high demand for cash in a country if during a crisis (declining GDP growth), the ratio M0 to M3 increases, i.e., the population needs liquid assets. Two European countries (Sweden and Switzerland) are examined in detail in the study. The main macroeconomic indicators of these countries are similar [30]-[36].

In Switzerland, the key rate of the central bank is -0.75% (no sign of a further decrease suggests that the effective lower bound has been reached). The state has a population of 8.61 million. The GDP is equal to 703 million USD. The inflation rate is 0.3%, which can rather be described as deflation.

Sweden's GDP at the same time is at $531 million and the key rate has also reached the effective lower bound where it is no longer feasible to lower it further, at 0%. However, the population is equal to 10.33 million. The inflation rate in Sweden is 2.2%

The above figures confirm that these countries are quite comparable, however an analysis of the cash demand shows that in the case of Switzerland the hypothesis is confirmed while Sweden shows quite the opposite.

In Switzerland, the demand for cash is quite high in any phase of the economic cycle, and in times of crisis the demand for liquid assets increases, which is logical. However, there are also factors such as consumption habits and culture of Swiss people, who are comfortable with using cash, and a non-working bank terminal is not an obstacle to make a payment, because there are always cash in the wallet. Sweden, on the other hand, has a completely different situation.

Sweden, as it turned out earlier, a country comparable to Switzerland in economic development and key macroeconomic indicators, refutes the hypothesis of increased demand for cash during the crisis. In recent years, according to the analysis, the ratio of M0 to M3 has been falling, indicating that cash in circulation is declining, and electronic payments are coming to the fore. Also, during the crisis there is no frenzy of demand for cash in Sweden. At the same time, the M0 to M3 ratio is rising in all developed countries during the same period. This may indicate a high level of public confidence in the banking system and an established habit of making non-cash payments. Such an environment indicates that in the mind of the people the liquidity of deposit money is very high and there is no point in panicking during a crisis by cashing out all the money.

In addition to the attitude of the population towards such an environment, the huge role of government regulators is also worth noting. If the share of M0 does not grow during the crisis, this confirms the high level of reliability of the state apparatus, which is trusted by citizens. And this in turn brings Sweden to the finish line in the process of becoming a cashless society.

5. Conclusion

The current article examined the factors of CBDC demand on a model of cash demand with evidence from two developed countries, which have begun to research the topic of CBDC introduction. The demand for CBDC, as it can be concluded, is similar to cash – key factors affecting it are fundamentally the same. For example, the key rate plays an

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important role in defining cash demand. And in this case, if the key rate is negative, demand for cash increases. Simultaneously, countries with these values of the Central Bank lending rate are often among those, which could benefit the most from the inclusion of CBDC as a new form of money and legal tender due to the policy of the effective-lower bound, which significantly restricts monetary policy from being able to stimulate the economy in the events of a new crisis.

In fact, this very situation may be observed in Sweden and Switzerland: both countries were unable to aid their national economies by lowering the key rate due to the key rate being already low. With CBDC as mentioned in studies, the ELB may be broken.

The novelty of the article is based on the research of cash-related factors not based on the relation of M0 to GDP, but to broader money aggregates. This, for example, shows that in Switzerland the general population preferred to close their banking deposits and hold onto cash. Subsequently, the increase of cash in the country came not from the Swiss National Bank issuing more money, but from the population's demand for high-liquid assets. This brings the paper to another aspect of the research's novelty: the article is first to give a comprehensive analysis of the different behavior of economic agents in the latest unique economic recession, which came to be due to the spread of the COVID-19 virus globally.

The article concludes that some developed countries have peculiarities making the issuance of CBDC more optimal in the conditions of the national economy. The existence of practically opposite examples of the population's sentiment towards cash through Sweden and Switzerland emphasizes the need to better research the topic of CBDC innovations before launching corresponding projects. Moreover, the absence of empirical data restricts research from being able to conduct more in-depth analysis on the effects of CBDC issuance. However, the theoretical base for the open innovation, as well as the contrast of these thoughts with real-world facts through the example of developed countries, make it possible better understand the viability of the introduction of such a new form of money.

Future research should be based on the developing aspects regarding CBDC: such as new reports from Central Banks of different countries, as well as should model the demand for CBDC with the intent of being able to methodically evaluate the countries that would benefit from CBDC the most.

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