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Central Bank Digital Currencies – Fad or the Future?

A framework for country level assessment of central bank digital currencies.

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Abstract

When should central banks issue their own digital currencies? There is no clear guidance on this issue, neither from theory nor practice. In this thesis we perform a textual analysis of the available literature to identify the most important considerations in evaluating the attractiveness of a central bank digital currency (CBDC). Then we use these to recommend which countries should and should not consider issuing a CBDC.

By the use of textual analysis, we find eight considerations to be the most important. These include cashless societies, financial stability, interest rates, technological development, shadow economy, costs, exchange rate policies and institutional credibility. We establish a framework for country level assessment of the implications of CBDC based on these considerations.

Applying our framework, we find that developing countries should generally not consider issuing a CBDC, while developed countries should. More specifically, we find that countries with weak institutions and low financial stability should not consider issuing a CBDC. The introduction of a CBDC in these countries is relatively unlikely to be accepted by the public and can cause adverse effects on the financial system. In contrast, we recommend countries facing particularly low interest rates or developments towards cashless societies to consider issuance of a CBDC, given that they are not restricted from issuing their own currencies. Generally, our recommendations contradict with the current practice. Today, several developing countries are introducing different types of CBDCs, while developed countries are more cautious in their approach. Developed countries emphasize the need for more research, to avoid introducing a currency that might destabilize the financial system without entailing significant benefits compared to today's systems.

The recommendations to which countries should consider issuing a CBDC are based on both a qualitative and a quantitative approach. We find that the results of both approaches coincide. Based on our findings, we suggest that countries build on our framework in future assessments of CBDC, to ensure that the most important considerations are thoroughly assessed before a digital currency is introduced to the economy.

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We also wish to express our gratitude to Christian Langerfeld, who patiently introduced us to textual analysis, a method that we had no prior knowledge of.

Mona Lisa.

Contents

1. Introduction

"I believe we should consider the possibility to issue digital currency. There may be a role for the state to supply money to the digital economy." (Managing Director of the IMF, Christine Lagarde, 2018, p. 4)

"Digital central bank money for the general public is not necessary to ensure an efficient system for cashless retail. It would deliver scarcely any advantages, but would give rise to incalculable risks with regard to financial stability". (Member of the Governing Board of the Swizz National Bank, Andréa M. Maechler, 2018, p. 7-8)

1.1 Background and Motivation

The thought of central banks issuing their own digital currencies started from the emergence of private cryptocurrencies.[1] The most well-known cryptocurrency is Bitcoin, introduced to the market in 2009 by a group of developers called Nakamoto. Because the emergence of Bitcoin and other cryptocurrencies have caused heated debates, and some have argued them to be disruptive (e.g., Raskin & Yermack, 2016), central banks and policymakers have been forced to assess how they will respond. There have been worries that private cryptocurrencies will replace existing payment systems, which could lead to central banks losing money supply control and thereby its most important tool in maintaining price stability (e.g., Sauer, 2016). Central banks must therefore choose between banning, tolerating and co-opting the innovations. One of the potential responses is central banks issuing their own digital currencies.[2] It is to the research of such a CBDC that we hope to contribute.

Researchers and central banks hold different opinions on whether a CBDC introduction would be beneficial. On the one hand, some researchers argue that we still know too little about digital currencies and blockchains, and that issuing a CBDC might cause significant risks to

[1] Cryptocurrencies is a means of payment based on distributed ledger technology (DLT), a technology in which data is decentralized. See section 2 for further details.

[2] CBDC is different from private cryptocurrencies in two crucial ways. First, a CBDC is backed by a central bank, meaning that the central bank has control of the CBDC. In contrast, private cryptocurrencies are privately issued and not backed. Second, a CBDC does not have to be a cryptocurrency relying on DLT, but could use well-developed technologies.

the financial system (e.g., Raskin & Yermack, 2016). Many central banks share this view, like those of the UK, Germany, Israel and Singapore (Bank of England, 2018; Mallien, 2018; Bank of Israel, 2018; Noonan, 2018). On the other hand, head of the IMF, Christine Lagarde, recently stated that central banks should look seriously at issuing digital currencies (Lagarde, 2018). She argues that a CBDC could increase financial inclusion, serve as a back-up solution if cash was to disappear, ease investigation of money-laundering and terrorist financing and prevent private payment providers from obtaining too much power. Several researchers share the view that introducing a CBDC might be beneficial (e.g., Barrdear & Kumhof, 2016).

Although practice with CBDC is very limited, some central banks have come a long way in researching CBDC, and a few have already issued one. China has launched its own research center to study CBDC, and China's central bank governor states that a CBDC is technologically inevitable (Huillet, 2018; China Daily, 2018). Sweden is among the central banks in highly developed countries that have come the longest in assessing the implementation of a CBDC, with their main reason being a decline in use of cash (Sveriges Riksbank, 2017). In fact, Sweden is planning to start a pilot project of issuing a CBDC next year (Rolfe, 2018). Other countries that also have started or will start pilot projects are The Bahamas and Uruguay, with the motivations being to increase financial inclusion and decrease costs, respectively. The countries that have already issued CBDCs are Ecuador, Marshall Islands, Senegal, Tunisia and Venezuela. The most common reasons for issuing a CBDC among these countries are to increase financial inclusion and to ease international trade. Another country that will issue a CBDC is Iran, with the motivation being to evade sanctions imposed by the U.S. (Fanusie, 2018).

Also, there is very limited literature on CBDC.[3] Most research on the topic has been exploratory or theoretical, and empirical studies of CBDC are rare. As there is both little practice and limited research on the implications of CBDC, it is difficult to know whether the benefits of introducing a CBDC will outweigh the costs and risks. Whether central banks should issue their own digital currencies therefore needs to be further studied. Bank of Israel official, Sigal Ribon, argues that international effort should be formed to study CBDC, as

[3] In the limited literature that exists, there is typically disagreement about the design and the implications of issuing a CBDC. In contrast, there is a broad range of research on Bitcoin (e.g., Yermack, 2015; Ron & Shamir, 2013; Eyal & Sirer, 2018).

much work is being replicated (King, 2018). It is to this international effort we seek to contribute, by answering the following research question:

What are the most important considerations in a central bank's assessment of the implications of CBDC, and which countries should consider issuing a CBDC?

Our contribution to the international effort on CBDC is twofold.[4] First, we use textual analysis to identify which considerations that are generally the most important in assessing the attractiveness of a CBDC. Second, we apply these results to recommend which countries should consider issuing a digital currency.

For our textual analysis we gather all the exploratory and theoretical literature that already exists on CBDC, in addition to relevant news articles and statements from 40 different countries. We take an agnostic approach, and let textual data decide which considerations are the most important. By gathering a comprehensive textual foundation, we hope to provide answers that are representative to a wide range of countries.

The main result of the textual analysis is a list of the most important considerations in assessing the implications of CBDC. We find these to include developments towards cashless societies, financial stability issues, interest rate opportunities, technological development, shadow economy implications, cost efficiencies, exchange rate policies and institutional credibility, in chronological order. The top three considerations stand out as particularly important. First, countries developing towards cashless societies could issue CBDC to ensure the existence of a risk-free legal tender and to maintain resiliency in the payment system. Second, introducing a CBDC could have adverse effects to the financial system, potentially promoting large-scale bank runs and financial crisis. Third, countries could obtain an additional monetary policy tool in the CBDC interest rate, which could allow them to break through the zero-lower bound. In general, we find that the most important considerations are relevant to most countries, and our work can thereby serve as a global framework for primary assessments of CBDC.

[4] To limit the scope of our thesis, we base our recommendations on today's situation, in which no large economy has successfully issued a CBDC. We do not consider legal issues and we limit our studies to CBDC available to the general public. Besides this, we assume that the central banks choose the optimal design for their CBDC.

After identifying these considerations, we ask which countries that should consider issuance of CBDC. We address this question by combining our results from the textual analysis with theory and country data. We gather country specific data on measures relevant to the considerations and utilize this data in two different approaches. In a qualitative approach, we group similar countries together and apply theory to provide recommendations to whether the groups of countries should consider issuing CBDC. In a quantitative approach, we calculate a score for each individual country in our sample representing the attractiveness of issuing a CBDC. We also compare our results with the countries' own conclusions to see whether our recommendations coincide with practice.

An interesting pattern emerges from our analysis. In general, developed countries with low interest rates and low levels of cash in circulation are recommended to consider introducing a CBDC, but in practice they are cautious to do so. In contrast, many of those countries we have recommended not to consider issuance of a CBDC have already issued one. These are typically developing countries with low institutional credibility and low financial stability. The developed countries are often afraid of the potential adverse effects a CBDC might have on their financial systems, or they argue that a CBDC will not improve existing payment systems. Nevertheless, most of these countries are still researching the concept and have not ruled out that a CBDC with an appropriate design might be introduced in the future.

The results from our qualitative and quantitative approach to which countries that should consider CBDC comprise a list of recommendations. In general, we recommend countries with weak institutional credibility to not consider a CBDC, as the currency is relatively unlikely to be adopted by the public in these countries. We also recommend countries with low financial stability to refrain from considering a CBDC, since they are relatively more likely to experience adverse effects to their financial systems. In contrast, we recommend countries developing towards cashless societies to consider issuing CBDC, as it could provide a risk-free legal tender and maintained resiliency if cash disappears. Also, countries facing particularly low interest rates are recommended to consider CBDC, because of the strengthening effect it might have on their monetary policy toolkits. If any of the above-mentioned countries are part of currency unions with laws preventing them from issuing their own currencies, we recommend them to reject the opportunity.

We acknowledge that supplementary studies should be performed in country level assessments, to fully account for country specific conditions. Such conditions might explain the contradictions between our recommendations and practice. However, we provide primary recommendations to which countries should spend resources on considering an introduction of a CBDC, and we highlight which aspects are important to consider in this process. We suggest that introduction of CBDC should not be rushed and must be based on a thorough assessment of the relevant implications, to avoid destabilizing the financial system without obtaining significant benefits.

1.2 Outline

This thesis contains two main parts. The first main part seeks to answer the first element of the research question, namely which considerations that are the most important in assessing the implications of CBDC. Textual analysis is applied to attain an objective measure of the importance of different considerations, before we provide a detailed theoretical explanation of the eight most important considerations. The second main part of the thesis provides answers to the second element of the research question. By gathering and evaluating country data, using both a qualitative and a quantitative approach, we give recommendations to which countries that should and should not consider issuing a CBDC.

More specifically, the thesis starts with an introductory part presenting the concept of CBDC. We define and elaborate on relevant characteristics. For design properties that are considered optional, we briefly explain the alternatives.

In the first main part of the thesis, we then move on to answer the first element of the research question. We present our methodology, particularly the use of textual analysis and term frequencies. Next, we explain each step of the method implementation, before we discuss our results. We test the robustness of the results and discuss country differences and limitations. The first main part ends with a section providing a detailed theoretical presentation of the eight considerations found to be the most important in the first part of the thesis.

In the second main part of the thesis, we apply the results from the first main part to answer the second element of the research question. We begin by explaining how we gather data on

the considerations in our assessment. Next, we describe the implementation of both the qualitative and the quantitative approach to the country level assessment. Thereafter, we first present the results of the qualitative approach, in which countries with similar characteristics are given common recommendations. Then, we present the results of the quantitative approach, comprising country scores representing the attractiveness of issuing a CBDC. The recommendations from both approaches are compared, before we do a comparison of our final recommendations with the central banks' stated opinions on CBDC. In the end, we discuss the robustness of our conclusions to the issuance of foreign CBDC by considering potential domino effects.

2. Definition of Central Bank Digital Currencies

In this part, we introduce the concept of central bank digital currencies. The emergence of private cryptocurrencies has motivated the debate on central banks developing their own digital currencies. Due to the speculative nature of today's cryptocurrencies, interest in CBDC has been provoked by some central banks proposing to issue digital currencies. In this regard, questions have been made as to what a CBDC would look like and what implications it would promote to the financial system and the rest of the economy. To fully grasp the latter, we believe that it is crucial to understand what a CBDC is and how it would be designed.

Although the interest in cryptocurrencies and DLT has fostered a growing range of research on CBDC, there exists no single commonly agreed definition of the term central bank digital currency. This is partly due to the complexity of the issue, touching on a range of different fields, thereby promoting varying focus in the limited research. However, Meaning, Dyson, Barker and Clayton of the Bank of England propose a definition of CBDC as "any electronic, fiat liability of a central bank that can be used to settle payments, or as a store of value" (2018, p. 2). They thereby assume that a CBDC will fulfill the basic functions of money. Further, several characteristics are suggested. These will be elaborated on in the following.

To elaborate on the characteristics of CBDC, we will mainly draw on the framework presented by Meaning et al. (2018). They suggest that the first key characteristic of CBDC, in contrast to existing private cryptocurrencies such as Bitcoin, is that the value of CBDC is backed by the central bank. Further, CBDC is digital, making it different from central bank notes, which is the public's only option to hold a centrally backed asset today. Several other characteristics are presented and considered optional by Meaning et al. (2018), including whether CBDC should be universally accessible, interest bearing and trade at par with other central bank liabilities. In addition, they consider whether CBDC should be a cryptocurrency, and account-based or value-based. Like other research on CBDC, they argue that the choice of these parameters should depend on the purpose for which CBDC is introduced. The suggested characteristics of CBDC are summarized in Table 1.

Characteristic	Central Bank Digital Currency
Liability of the Central Bank	Yes
Electronic	Yes
Universally Accessible	Optional
Interest Bearing	Optional
Trades at par	Optional
Cryptocurrency	Optional
Value- or account-based	Optional

Table 1: Characteristics of CBDC. Framework from Meaning et al. (2018).

Among others, Bech and Garratt (2017) discuss the question of whether CBDC should be universally accessible. They propose that the central bank can choose between issuing a CBDC available to the public only, a retail CBDC, or limit the accessibility of CBDC to interbank use, referred to as wholesale CBDC. Although central banks are currently researching both alternatives, we focus on a CBDC available to the public to limit the scope of our thesis. On the other optional characteristics listed in Table 1, we do not take an active stance on which design the CBDC should have, and we explore all opportunities.

The next design choice is whether CBDC should be interest bearing or not. Barrdear and Kumhof (2016) assume CBDC to be interest bearing, either through the central bank setting the interest rate on CBDC directly or setting the quantity supplied. They argue that the strategy should depend on the objective in mind. Kumhof and Noone (2018) argue that an adjustable interest rate should be a fundamental requirement of an effective CBDC system, to maintain price stability and parity between CBDC and bank deposits. Some of the researchers proposing interest on CBDC refer to the arguments of Friedman (1969), that there should be paid an interest rate equal to the risk-free rate to achieve the goal of optimum supply of money. Regardless, by making CBDC interest bearing, central banks can obtain a new monetary policy tool in the CBDC interest rate, which can potentially be negative (Barrdear & Kumhof, 2016). At the current state, researchers therefore do not consider non-remunerated CBDC as optimal. Nevertheless, Sveriges Rikbank (2017) propose the issuance of a CBDC that does not bear interest. They emphasize, however, that the intended design will allow for the option to introduce interest on the CBDC in the future.

Further, CBDC can be set to trade at par with other central bank liabilities, similarly to exchange of central bank notes for reserves today, or the exchange rate can be flexible or floating. Kimball and Agarwal (2015) argue that a digital currency should trade at a flexible exchange rate to other central bank liabilities, to achieve the objective of breaking the zero-lower bound. In contrast, Meaning et al. (2018) reject the option of introducing a CBDC that does not trade at par, and dismiss this as a solely theoretical possibility. They argue that it would be practically implausible and pose a significant risk to monetary stability to run a system with two distinct fiat currencies circulating simultaneously. Hence, their suggestion is to let the CBDC exchange at 1:1.

Many assume CBDC to be some sort of cryptocurrency, but theoretically it is not required to be so. A CBDC based on distributed ledger technology (DLT), referred to as a central bank cryptocurrency, is only one of the possible options. A distributed ledger is a decentralized database spread across several independent nodes, or computing devices. Transactions are recorded, shared and synchronized across these nodes, all keeping an identical copy of the ledger. This removes the need for a centrally coordinating entity, as each node updates itself independently. Compared to a centralized payment system, the decentralization prevents power from being concentrated at a single person or organization, it makes the computer system more resilient and available and it gives the users more privacy (Böhme, Christin, Edelman & Moore, 2015). If DLT is not applied, the CBDC can utilize existing technologies.

Finally, the implementation of a CBDC system can be either account-based or value-based, referred to by Meaning et al. (2018) as token-based. In general, the account-based system has similarities to today's commercial bank accounts, while the value-based system has similarities to today's cash (Norges Bank, 2018). With the account-based solution, the public can hold funds electronically in CBDC accounts, either directly at the central bank or at other depository institutions (e.g., Bordo & Levin, 2017). Norges Bank (2018) outlines the value-based system as having CBDC stored locally on some sort of payment device, allowing transactions to happen without the intermediation of a third party. Thus, value-based systems include card and mobile phone solutions, in addition to cryptocurrencies stored in wallets. The outlined solutions have distinct strengths and weaknesses within different fields, and the optimal choice of strategy depends on the purpose for issuing a CBDC (Norges Bank, 2018).

3. What Are the Most Important Considerations in Assessing the Implications of CBDC?

In this first main part, we answer the first element of the research question by use of textual analysis. We calculate term frequencies to decide which considerations should form the basis of a central bank's CBDC assessment and elaborate on the considerations found to be the most important. In section 3.1, we introduce textual analysis and our reasons for adopting this method. In section 3.2, we explain every step of the method implementation, leading up to the term frequencies for the considerations, representing their importance. In section 3.3, we discuss our results and test their robustness, before we examine country differences in the results. In section 3.4, we clarify the limitations of our method and results. Finally, in section 3.5, we provide a theoretical presentation of the considerations found to be the most important in this first main part. We seek to understand why these considerations are important and whether they will pose arguments in favor or disfavor of CBDC in our assessment.

3.1 Methodology Textual Analysis

In this section, we explain the methodology of the first main part of the thesis. We introduce textual analysis and explain how this method facilitates the answer of which considerations that are the most important in a central bank's assessment of the implications of CBDC.

To identify which considerations are the most important in this assessment, we perform a textual analysis of the available literature. The goal of this analysis is to create an objective measure of the importance of the different considerations, which allows us to answer the first element of the research question. We take an agnostic approach and let the textual data provide us with this measure. This means that instead of manually reading all the available information about CBDC and deciding which considerations should be given weight in the assessment ourselves, we let the textual analysis provide us with an objective measure by calculating term frequencies. In identifying the most important considerations, we also seek to limit our framework and assessment in the second main part of the thesis.

Textual analysis is a qualitative analysis: it translates text into quantitative measures, which is then used as inputs in economic regressions (e.g., Loughran & McDonald, 2016). This method

is an emerging area within finance and accounting, because it makes it easier to extract useful information from texts and balance sheets. Throughout this part, we explain the steps of the textual analysis in detail. This is important because the transformation of text into quantitative measures entails some imprecision, and transparency is therefore crucial to ensure reliable results (Loughran & McDonald, 2016).

In this thesis, we use *term frequency* to identify the most important considerations regarding the implications of CBDC. Within the field of textual analysis, term frequency is a fundamental measure sometimes used to weigh terms and contents of documents. It measures the frequency in which a specific term, being a word or a phrase, appears in a text. The crucial assumption underlying the term frequency method is that the more frequently a term is mentioned in a document, the more representative it is for the content of the document (Zhang, Wang, Wu & Hu, 2012). We assume that the more frequently a consideration is mentioned in relation to CBDC, the more important it will be in a central bank's assessment. We therefore use the term frequency method to weigh the considerations and to create an objective measure of their importance.

An alternative approach within textual analysis is TF-IDF, which stands for term frequency-inverse document frequency. In addition to the above-mentioned assumption underlying the term frequency method, this method assumes that the more documents in which a term occurs, the less important it will be (Zhang et al., 2012). We find that a simple term frequency measure better fits our objective in weighting the different considerations. Since we aim at providing a general framework built on the most important considerations for all countries assessing CBDC, we do not want to focus on the between-country differences, which would be the case had we used TF-IDF. Instead, we assume that the most important considerations will be mentioned by several countries, and this should not reduce the weight of the consideration, but instead increase the weight. Therefore, we prefer the basic term frequency measure, which assumes that term importance is proportional to how often the term is mentioned.

3.2 Implementation of Textual Analysis

In this section, we explain how textual analysis is implemented to answer the first element of our research question. First, we identify relevant considerations through a literature review,

which provides us with a dictionary for the textual analysis. After having identified which considerations are mentioned in assessments of CBDC, we begin the textual analysis by converting relevant texts into .txt files and reading these files into R Studio. There we perform necessary transformations of the textual data and calculate term frequencies. Finally, we make use of the dictionary and look up all terms that are relevant to the different considerations. By adding their frequencies, we find the weight and importance of each consideration. The steps of the textual analysis will be explained in detail in the rest of this section.

3.2.1 Dictionary of considerations

To facilitate the textual analysis, we find it necessary to create a dictionary containing terms that we can look up to find the importance of the considerations. A dictionary is necessary because we do not want to identify the most frequently mentioned terms in general, but the most frequently mentioned considerations regarding the implications of issuing a CBDC. This difference is crucial, because the most frequently mentioned terms in general are dominated by terms that provide no information about the implications of issuing a CBDC. This is illustrated by the below wordcloud, in which the most frequent terms on the topic of CBDC are plotted with size representing their frequencies. Although some of these terms appear relevant, many of the most frequently mentioned terms provide no relevant information.

Figure 1: Most frequent terms on the topic of CBDC, with size representing frequency. Common English stopwords are excluded.

We create a dictionary by reviewing central bank publications and scientific papers about the implications of CBDC. In total, we find 22 publications by researchers associated with central banks and seven independent scientific papers. When we review these texts, we make notes of any arguments that appear on why or why not a central bank should issue its own digital currency. These notes make up the basis for the dictionary. By identifying the arguments that have been used in assessing CBDC, we get an indication of which terms that are relevant and should be searched for when we perform the textual analysis. The identified considerations with their related arguments are listed in Table 2. We explain the considerations and arguments in detail in section 3.5, where we limit our theoretical presentation to the considerations that are found to be most important in this textual analysis.

Consideration	Argument	Examples of Relevant Terms
Capital Flows	CBDC may increase volatility in capital flows and make it necessary to keep larger reserves in countries with fixed exchange rates. Also it may ease international trade.	Flow, current account, transfer, cross-border, trade, flight, volatility, movement, exchange
Cashless Society	In a cashless society, the public would lack a legal tender and a fully risk-free alternative, the payment systems would be less resilient and seigniorage could decrease.	Cash, cashless, notes, coins, card, payment, withdrawals, transaction, online
Competition in Payment Services	Increased consolidation in payment services sector can be counteracted using CBDC. However, CBDC could reduce incentives for innovation.	Competition, consolidation, monopoly, rivalry, concentration
Costs	Due to high costs of handling cash, CBDC might decrease costs. CBDC could also incur lower fees than bank deposits. However, there are infrastructure costs.	Fee, cost, expense, efficiency, expensive
Data Availability	CBDC might improve data availability to central banks, enhancing policy decision making.	Data, database, surveillance, information, statistics, monitor, knowledge
Exchange Rate Policies	With a fixed exchange rate, CBDC may not improve monetary policy. Could be part of a strategy to de-dollarize economy.	Union, peg, board, fixed, euro, WAEMU, dollarization, CFA, ECB, inflation

Financial Inclusion	CBDC can facilitate more people being integrated in the banking system.	Inclusion, unbanked, account, banking, access, universal
Financial Stability	Potential adverse effects on financial system. Banks become more dependent on wholesale and central bank funding. Risk premiums increase as banks' risk-taking behavior is affected. Increased risk to central bank and augmented lender of last resort role.	Stability, bank run, debt, crisis, regulation, requirement, credit, panic, risk, liquidity, LoLR, wholesale, funding, prudent, incentive, withdrawals
GDP and Consumption	CBDC could lift GDP and consumption due to reduced distortionary taxes and government debt, increased monetary transaction balances which increases liquidity and decreased interest rates which stimulates the economy.	GDP, consumption, debt, tax, distort, efficiency, welfare, wealth, liquidity, synergies
Geography	Large distances and poor infrastructure make access to financial services difficult and costly. CBDC can improve efficiency.	Geography, distance, island, accessible, distribution, transit, infrastructure, transport
Institutional Credibility	Institutions may be strengthened as CBDC may increase credibility. Lack of trust will make it difficult to introduce new currency.	Trust, credibility, confidence, anchor, faith, reliable, public, reputational, institutions, legal, government, independent
Interest Rate	CBDC can provide new monetary policy tool, increase efficiency of transmission and remove or lower ZLB. Opposite if non-remunerated.	Floor, zero lower, bound, negative, interest rate, policy, transmission, tool
IT Security	CBDC might increase IT security if it is decentralized. If IT security is poor, CBDC might be subject to cyber-attacks.	Cyber, security, hack, breach, confidential, privacy, personal, protection
Private Crypto-Currencies	Increasing use of private cryptocurrencies might influence financial stability and effectiveness of monetary policy tools.	Cryptocurrency, bitcoin, ethereum
Shadow Economy	Substituting cash with CBDC could decrease illegal activity, if the CBDC is less anonymous.	Underground, shadow, black, illegal, illicit, launder, fraud, evasion, terror, corrupt, counterfeit, anonym
Shutdowns	CBDC can offer new backup solution. If there is no supply of electricity, CBDC might not help.	Shutdown, backup, resilience, stop, failure, outage, disruption

Size of Economy	Small economies could fear other countries potentially issuing CBDC, as it can then crowd out domestic currency.	Small, open, large, powerful, significant, economy, country, nation, populated, trade
Technological Development	Technological development could threaten monetary policy. Existing technology might make it easier or harder to implement CBDC.	Technology, mobile, mpesa, vipps, klarna, paypal, swish, electronic, modern, develop, contactless, infrastructure, DLT
Unconventional Policy Tools	Use of QE has not been efficient. CBDC can facilitate Helicopter Money, which can be a more efficient tool.	QE, quantitative, easing, unconventional, policy, tool, helicopter, fiscal

Table 2: Considerations, arguments and relevant terms identified in the literature review. These comprise the dictionary for the textual analysis.

3.2.2 Textual foundation

After having identified which considerations and related arguments that are mentioned in the literature on CBDC, we move forward to perform the analysis of our textual foundation. In the textual foundation, we include both the central bank publications and scientific papers from the initial literature review, in addition to web articles we find from research online. All these texts are downloaded and converted into .txt files. In total, there are 22 central bank publications from 14 different countries, in addition to 7 scientific papers and 249 web articles in our textual foundation. The central bank publications and scientific papers are typically long research papers examining many of the implications of CBDC in depth. In contrast, the web articles are typically short news articles including statements from central bankers or other acknowledged economists or politicians on fewer considerations. The web articles are quickly reviewed to verify their relevance and credibility before adding them to our textual foundation. We clarify that these web articles were not part of the initial review process to limit the manual work, and because we assume that the central bank publications and scientific papers cover all the considerations that will be important to most countries.

We choose to include the web articles in our textual foundation for a couple of reasons. First, it allows us to increase our sample of countries from 14 to 40, which we believe is likely to enhance the representativeness of our framework and discussion. This increase in countries is possible because while only 14 countries have official central bank publications on CBDC at the time of our analysis, statements from central bankers or politicians on CBDC have been

reported in another 26 countries. Second, we assume that considerations that provoke much interest in the media should be considered important, as we believe this to reflect what is important to the people. Because we assume this is relevant for central banks' assessments of CBDC, including web articles adds another dimension to our textual foundation. However, we are aware that by including web articles, we might reduce the reliability of our textual data compared to using only central bank publications and scientific papers. We hope to have reduced this effect by mainly including web articles that contain statements from central bankers and politicians. Still, we will validate our results including the web articles in our textual foundation, by comparing the weights of the considerations with the weights using only central bank statements and scientific papers in an otherwise identical analysis. For this comparison, see section 3.3.1. We move forward using the textual foundation including web articles, as we believe this to best facilitate our aim of creating a global framework.

In total, we use texts from 40 countries all over the world on the topic of CBDC. We note that for these 40 countries, there is significant variation in the amount of available texts published in English. Therefore, the number of texts representing each country varies from 1-21 in our final sample. For an overview of the number of texts per country, in addition to the share of text from central bank publications and web articles, we refer to Table A.1 in the appendix. For the countries with few texts, availability is a limitation. For the countries where availability is no concern, we prioritize to gather central bank statements and the most recent web articles. Irrespectively of the number of texts, the texts are merged by country. Thus, all textual data from a specific country is gathered in a common .txt file, and we get 40 .txt files representing the 40 countries in our sample. We choose to merge the texts by country and not keep the central bank publications and web articles separated, because we consider all publications to be equally relevant contributions to our framework. Further, we create one common .txt file for the scientific papers that are not written by researchers of a central bank. Then, all the .txt files are read into R Studio where we perform the term frequency analysis.

3.2.3 Use of bigrams

In our term frequency analysis, we choose to use what is called bigrams to ensure the representativeness of our term frequencies. A bigram is "a pair of consecutive written units such as letters, syllables, or words" (Oxford Dictionaries, n.d.). The rationale for using bigrams

in calculating term frequencies rather than single words, called unigrams, is that many of our considerations are natural bigrams, such as “interest rate” and “financial stability”. In addition, when using bigrams, we obtain the possibility of seeing the context in which an important word is mentioned, before deciding whether to include its frequency in the total frequency of the consideration. For example, developments towards cashless societies is identified as a consideration relevant to CBDC. If we were to use for instance the unigram “cash” when estimating the frequency of this consideration, all situations in which cash is mentioned would be counted, and we would get a too high frequency. “Digital cash” is an example of a bigram included quite often in our texts, which does not necessarily say anything about declining use of cash. By using bigrams, we can sort through all possible bigram combinations, find those that are relevant to the consideration, and add their frequencies to generate the total term frequency for each consideration. Although the approach of using bigrams increases the degree of subjectivity and manual work compared to using unigrams, even a unigram approach would require us to choose the relevant unigrams.

By increasing the representativeness of each consideration’s terms, we also ensure that the relative importance of the different considerations become more correct. There is likely to be differences between the considerations in how often a relevant term is mentioned in the wrong context. For example, we believe that “cash” is more likely to be mentioned in the wrong context than “geography” in our textual foundation. Thus, by using bigrams, we reduce the bias in the relative importance that could otherwise result from differences in how often a relevant term is mentioned in the wrong context.

Having decided to base our textual analysis on bigrams, we initiate the term frequency analysis in R Studio by dividing our textual foundation into such bigrams. Thus, each of the 41 .txt files that we have loaded into R Studio are separated into chunks containing bigrams. This gives us 41 .txt files in which every word in each file is put into one bigram with the word before and one bigram with the word after itself. An overview of the textual foundation and the share of bigrams from central banks, scientific papers and web articles is presented in Table 3. We note that although relatively few texts are central bank publications or scientific papers, they comprise almost 40% of the textual foundation in terms of bigrams.

	TEXTS	BIGRAMS	SHARE OF TOTAL BIGRAMS
CENTRAL BANKS	22	200 370	27.44%
WEB ARTICLES	249	450 729	61.73%
SCIENTIFIC PAPERS	7	79 029	10.82%

Table 3: Number of texts and bigrams for each text category, in addition to share of total bigrams for each text category.

3.2.4 Cleaning and scaling of the bigrams

When splitting our textual foundation into bigrams, we also perform a cleaning of the data. First, all the bigrams are cleaned for punctuation, capitalization, numbers and empty spaces. This leaves us with between 924 and 54 538 bigrams for each country. Second, we remove all bigrams containing a so-called stopword. Stopwords are common words that are deemed irrelevant and therefore programmed to be ignored. We use R's own stopword list for this, which includes stopwords like "and", "if" and "but". By removing stopwords, the number of bigrams is about halved, which reduces the manual effort in the rest of the analysis. We believe that most bigrams including a stopword make little sense, for example "and cash", and they will thereby not be relevant to the frequencies of the considerations.

After having cleaned our lists of bigrams, we perform a scaling of the term frequencies to ensure that all countries are given equal weight in estimating the general importance of the CBDC considerations. We wish to give equal weight to each country to ensure that our framework becomes equally applicable to all countries in our sample. We have already established that there are differences in the textual data availability between the countries. However, in our study, the opinions of all countries are considered equally important contributions. Therefore, we must adjust for the fact that some countries have published more text than others, to ensure that the opinions of countries with much text are not given more weight than those of countries with little text. We assume that if a country has published little text focusing only on one or few of the considerations related to CBDC, these considerations are particularly important to this country. We are aware that by giving equal weight to countries with very little text, which content might not be fully representative neither for the country itself nor for the rest of the sample, there is a possibility that this scaling approach

makes our results less reliable. However, we hope to have reduced this possibility by briefly reviewing all the texts included in our textual foundation. Overall, we find it appropriate for our objective to scale the frequencies, as we believe that this approach best facilitates the creation of a general framework applicable to a wide range of countries.

We will use the example of Sweden and Senegal to explain the scaling and its effects on our results. In the Swedish publications, there is much focus on the development towards a cashless society. Also, the Swedish central bank is among the central banks that have come the furthest in researching the potential introduction of a CBDC. There is therefore much text available from Sweden, in which cash usage is mentioned quite often. In Senegal, there are no central bank publications on CBDC available in English. The texts from Senegal included in our textual foundation are therefore mainly shorter news articles and statements regarding CBDC. We find many of these to focus on CBDC's implications for financial inclusion. In concrete numbers, Sweden mention the bigram "cash usage" 31 times, while the bigram "financial inclusion" is not even mentioned in the Swedish publications. In the Senegalese publications "financial inclusion" is mentioned 14 times, while "cash usage" is mentioned zero times. The total number of cleaned bigrams in Sweden is 6969, while for Senegal it is 2325. Had we simply added the bigram frequencies giving Sweden and Senegal equal weight, we would end up with a ranking of the bigrams in which "cash usage" would be deemed twice as important as "financial inclusion". However, when the absolute frequencies for each bigram is divided by the total number of bigrams per country, we end up with a scaled frequency of "cash usage" in Sweden of 0.44% and a scaled frequency of "financial inclusion" in Senegal of 0.60%. Giving equal weight to both countries when calculating the total frequency of the bigrams, we end up with measures of the bigrams' importance equal to 0.22% for "cash usage" and 0.30% for "financial inclusion".

As explained, we assign equal weights to all countries when we add their bigram frequencies to obtain the overall frequency and importance of each bigram. Thus, we ensure that all countries' opinions are equally important to the overall ranking. Specifically, we assign each country's scaled frequency a weight of 1/41 when adding the frequencies across countries. This implies that the scientific papers are also assigned the same weight as the texts from the 40 countries. The scientific papers comprise seven papers, which contents have similarities to those of the central bank publications allocated to specific countries. Therefore, we find it hard

to argue that the frequencies of the scientific papers should be given different weight than the frequencies of each country.

For every bigram that exist in our textual foundation, we add its scaled frequencies across the countries and scientific papers. The result is a list of all the bigrams in our textual foundation with their total frequency measure. These total frequencies sum to one.

3.2.5 Term frequencies for the CBDC considerations

Based on the list of all the bigrams with their total frequency measure and the dictionary we created during the initial literature review, we move forward to sort out the relevant bigrams for each consideration and add their frequencies. We believe many bigrams to be relevant for each of the considerations we identified in the initial literature review. For example, the consideration of developments towards cashless societies is likely discussed using a wide range of bigrams, not only the bigram "cashless society". Other bigrams, such as "cash usage", "decreasing cash" and "replace cash" are likely also mentioned in this context. Instead of choosing one bigram to represent each consideration and consider the frequency of that bigram to represent the importance of the consideration, we therefore add the frequencies of all bigrams deemed relevant to each consideration. We use Pivot tables in Microsoft Excel to sort out the bigrams that we consider relevant to each consideration. By searching for the word "cash" for example, all bigrams in which cash is included are examined, and we can select the bigrams we believe to be relevant for the consideration. This searching and sorting procedure is based on the dictionary that we made during the initial literature review, in which we noted which arguments that were used in relation to each consideration. The number of relevant bigrams to each consideration varies. Table 4 illustrates some of the bigrams selected as relevant for the term frequency of the cashless society consideration. For the entire table, and the corresponding tables for the other considerations, we refer to tables A.2-A.23 in the appendix.

BIGRAMS	FREQUENCY MEASURE
CASH USAGE	0.0002932
CASH TRANSACTIONS	0.0002777
CASH PAYMENTS	0.0002717
REPLACE CASH	0.0001736
CASH DEMAND	0.0001548
USE CASH	0.0001283
CASH WITHDRAWALS	0.0001066
CASH TRANSACTING	0.0000949
CASH USE	0.0000876

Table 4: Ten most frequent bigrams relevant to the consideration of developments towards cashless societies.

Finally, the frequencies of the relevant bigrams for each consideration are added, and we obtain the consideration's total frequency. Thus, for all the 19 considerations that were identified in the initial literature review, we add the frequencies of all the bigrams that are considered relevant to each consideration and obtain the total frequency, and thereby the importance, of each consideration.

3.3 Results of Textual Analysis

In this section, we present the main results of the textual analysis and use the results to answer the first element of our research question, specifically which considerations that are the most important in a central bank's assessment of the implications of CBDC. We test the robustness of our results, by applying different textual foundations. In addition, we present and discuss some of the country differences that appear in our results.

The outcome of the textual analysis is a frequency measure for each of the considerations identified in the literature review. The results are presented in Figure 2, in which the considerations with the highest frequencies have the largest segments and are at the bottom. The frequencies of the considerations decrease as we move up the column, and the consideration with the lowest frequency is at the top. The column therefore provides a ranking

of the considerations' importance and an indication of which considerations that should be of priority in a general assessment of the implications of CBDC. As is evident from Figure 2, there is significant variation in the importance of the different considerations. This implies that there might be value in limiting our framework to not include all the considerations.

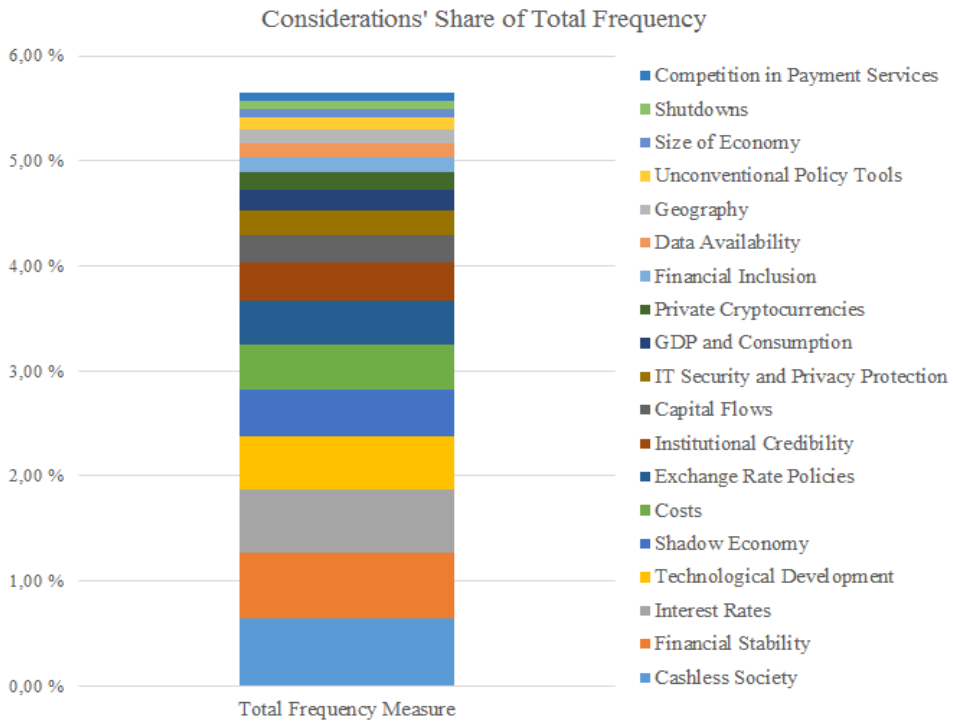

Figure 2: Identified considerations' share of total frequency in textual foundation. The most important considerations are at the bottom.

With our results from the textual analysis, we can answer which considerations that are the most important in a central bank's assessment of the implications of CBDC. From Figure 2, we see that the considerations that appear to be the most important are the following; cashless society, financial stability, interest rates, technological development, shadow economy, costs, exchange rate policies and institutional credibility. Due to the relatively large difference in term frequency between institutional credibility and the next consideration, capital flows, we choose to limit our framework and assessment to these eight considerations. Based on our review of the literature on CBDC, we find it reasonable that these are the most commonly mentioned considerations. By including eight considerations in our framework, we hope to ensure comprehensiveness of our assessment, at the same time as we allow for an in-depth discussion of the considerations that are included.

As seen in Figure 2, there is variation in the importance of the eight considerations included in our framework. There appears to be three considerations that are particularly important according to our analysis: cashless society, financial stability and interest rates. Technological development is found to be somewhat less important than these considerations. Next follow shadow economies, costs, exchange rate policies and institutional credibility.

The textual analysis we have performed in this part of the thesis allows us to create a general framework for future assessments of CBDC that can be applied across nations. For any given country that would like to assess the potential implications of issuing CBDC in that specific country, the eight considerations included in our framework are likely to be important. We suggest that a primary assessment of CBDC starts by examining these considerations, before doing additional analyses of considerations that appear particularly important in that country.

In the following, we will validate and elaborate on our results in two ways. The first subsection compares our results with frequencies based only on central bank publications and scientific papers. The second subsection explores cross-country differences in the rankings and discusses deviations from our general framework.

3.3.1 Robustness to other textual foundations

We would like to validate our results by comparing our frequencies to the corresponding frequencies from textual analyses using other textual foundations. We hope to find that the considerations included in our framework are important irrespectively of the textual foundation.

First, we compare our results with the frequencies of an identical analysis using only central bank publications and scientific papers. If there are significant deviations, this might imply that including web articles in our textual foundation has affected our results. We merge the 22 central bank publications by their 14 respective countries and add these, in addition to the merged file containing the scientific papers, to the new textual foundation. The scaling is performed as in the original analysis, giving the 15 .txt files equal weights. The term frequency analysis provides us with the results presented in the following comparison table, Table 5, in which the original results are labeled A and the new results are labeled B.

Table 5 supports our results from analysis A performed on the original textual foundation. We find that all the eight considerations that are the most important in the original analysis A are among the top eight considerations in analysis B. This implies that the inclusion of web articles in our textual foundation has not affected which considerations that are deemed most important and thereby included in our framework.

RANK B	CONSIDERATION	FREQUENCY B	FREQUENCY A	RANK A
1	**Interest Rates**	1.37%	0.60%	3
2	**Financial Stability**	0.92%	0.62%	2
3	**Cashless Society**	0.92%	0.65%	1
4	**Technological Development**	0.69%	0.51%	4
5	**Shadow Economy**	0.52%	0.44%	5
6	**Costs**	0.45%	0.43%	6
7	**Exchange Rate Policies**	0.33%	0.42%	7
8	**Institutional Credibility**	0.32%	0.37%	8
9	**Unconventional Policy Tools**	0.28%	0.12%	16
10	**Capital Flows**	0.24%	0.26%	9
11	**IT Security and Privacy Protection**	0.23%	0.23%	10
12	**GDP and Consumption**	0.19%	0.19%	11
13	**Geography**	0.16%	0.13%	15
14	**Shutdowns**	0.15%	0.08%	18
15	**Financial Inclusion**	0.12%	0.15%	13
16	**Competition in Payment Services**	0.11%	0.07%	19
17	**Private Cryptocurrencies**	0.07%	0.17%	12
18	**Data Availability**	0.06%	0.13%	14
19	**Size of Economy**	0.05%	0.08%	17

Table 5: Comparison of ranks and frequencies of considerations with (labeled A) and without (labeled B) web articles in the textual foundation.

The exclusion of web articles in our textual foundation has had some effects on the order and relative importance of the different considerations, however. We find that especially the

interest rate consideration and the consideration of unconventional policy tools appear much more important when excluding web articles. Thus, these considerations appear to be more important to central banks and researchers than to the public. It is reasonable that central banks have relatively more focus on monetary policy concerns, because one of the main tasks of central banks is to control business cycles, which can be done using policy rates and unconventional tools. Central banks are therefore likely to go into detail on these topics. Another consideration which relative importance has changed quite much is private cryptocurrencies. Private cryptocurrencies are relatively more important in analysis A, when web articles are included. A likely explanation for this might be that private cryptocurrencies create excitement and interest among the public, which could promote more articles being published on this topic.

Second, we compare our results with the opinion of the literature on CBDC without adjusting for the nationality and length of the publications. One could hypothesize that the literature would capture the most important considerations without us splitting and scaling the texts. To investigate this, we create a common text file including all the central bank publications and scientific papers, and generate frequencies representing the literature as a whole. Thus, we remove any effects of the scaling, in addition to the effect of including web articles. The results are summarized and compared in Table 6.

RANK C	CONSIDERATION	FREQUENCY C	FREQUENCY A	RANK A
1	**Interest Rates**	1.44%	0.60%	3
2	**Cashless Society**	0.92%	0.65%	1
3	**Financial Stability**	0.73%	0.62%	2
4	**Technological Development**	0.52%	0.51%	4
5	**Costs**	0.44%	0.43%	6
6	**Unconventional Policy Tools**	0.36%	0.12%	16
7	**Institutional Credibility**	0.33%	0.37%	8
8	**Shadow Economy**	0.32%	0.44%	5
9	**GDP and Consumption**	0.30%	0.19%	11
10	**Capital Flows**	0.26%	0.26%	9
11	**Exchange Rate Policies**	0.24%	0.42%	7
12	**IT Security and Privacy Protection**	0.21%	0.23%	10
13	**Financial Inclusion**	0.20%	0.15%	13
14	**Geography**	0.14%	0.13%	15
15	**Competition**	0.14%	0.07%	19
16	**Shutdowns**	0.13%	0.08%	18
17	**Private Cryptocurrencies**	0.11%	0.17%	12
18	**Data Availability**	0.07%	0.13%	14
19	**Size of Economy**	0.05%	0.08%	17

Table 6: Comparison of original results (labeled A) with results from analysis C, which represents the literature as a whole.

We find that among the top eight considerations, only one change occurs in terms of which considerations are included when we apply the unscaled literature as our textual foundation. In Table 6, we see that unconventional policy tools appear to be more important in the literature, and this consideration is included among the top eight. Exchange rate policies are not considered as important in the literature and is therefore no longer among the eight most important considerations.

Within the top eight considerations, there are some changes in the weights when we apply the unscaled literature as our textual foundation. The importance of the interest rate consideration increases significantly, making it by far the most important consideration in the literature. The cashless society and financial stability considerations are also relatively more important than other considerations, when comparing the literature to the general results.

We believe that the results of frequency analysis C could be affected by the fact that most of the longer central bank publications and scientific papers are published by highly developed countries such as Canada, the UK, Norway and Sweden. If these countries have focused much on some considerations, the lack of scaling will result in these considerations obtaining higher frequencies in analysis C than in analysis A. In fact, these countries have faced very low interest rate levels in recent years. This has motivated the use of unconventional policy tools and provoked a discussion of the necessity to expand the central bank policy toolkit. We believe this could explain why the considerations of interest rates and unconventional policy tools are more important in the literature than in the general results. Since these countries are not restricted by exchange rate policies limiting their monetary independence, this consideration might appear less important to the literature. These effects could make the frequencies from analysis C less representative in a global context, compared to the frequencies we have obtained in our original analysis A.

Considering the results of the textual analyses performed on other textual foundations in this subsection, we have no reason to question our main findings using the original textual foundation. Thus, the eight most important considerations appear to be robust to changes in the textual foundation, and we can build our general framework on these.

3.3.2 Country differences in rankings

In this subsection, we examine some of the cross-country differences that exist in the ranking of the CBDC considerations. We hope to find that the eight considerations included in our framework are in fact important in most countries. In addition, we want to identify and understand deviations from our general results. Since the objective of our thesis is to create a framework for assessments of CBDC that can be applied across nations, we believe that it is important to discuss deviations from the general ranking. It may be that a general framework built on our top eight considerations is not the best fit for all countries.

To understand how representative our general framework would be for a given country, we study the count of framework considerations among the top eight considerations for the individual countries. Summary statistics for this are presented in Table 7. We find that we can expect five framework considerations to be among the top eight considerations in a given country. This indicates that many of the considerations we have included in our framework are in fact considered particularly important in most countries. It therefore seems as if our framework can provide a good starting point for country level assessments of CBDC.

Framework Considerations in Top Eight by Country	
Mean	4.775
Median	5
Maximum	7
Minimum	2

Table 7: Summary statistics of the count of framework considerations in the top eight considerations per country.

Despite our framework considerations generally providing an adequate fit to most countries, there are some differences among the countries in the relative importance of the considerations and therefore also the representativeness of our framework. In Table 7, we see that the minimum count is 2, meaning that at least one country only has two of the eight framework considerations in its own top eight considerations. We find that this applies to Senegal. The maximum value is seven, which applies to the US. Evidently, there are some country differences in which considerations that are the most important.

We want to explore whether these differences are related to the countries' income level, as we believe there might be variation in the considerations' relative importance between developed countries and developing countries. This assumption is motivated by the fact that most countries that have introduced or plan to introduce some sort of CBDC are less developed countries, while central banks in more advanced economies are cautious in their approach to CBDC. This difference in approach could be due to dissimilar focus and perceptions of the relative importance of the considerations related to CBDC.

The relative importance of the considerations in high-income and lower-income countries is illustrated in Figure 3. We have applied the World Bank's country classification by income to our sample of countries, in which the high-income class includes 28 of our countries, while 12 countries are classified as lower-income countries. We find that there are in fact differences in the focus of these countries. Generally, the weights of the considerations in high-income countries are more in line with the general results than the weights of the lower-income countries. This is likely a consequence of us assigning equal weight to all countries' opinions and having more developed than developing countries in our sample. However, it might suggest that our framework will be a better fit for developed countries than developing countries. Thus, we should expect developing countries' opinions to deviate more from the recommendations based on our general framework than those of developed countries.

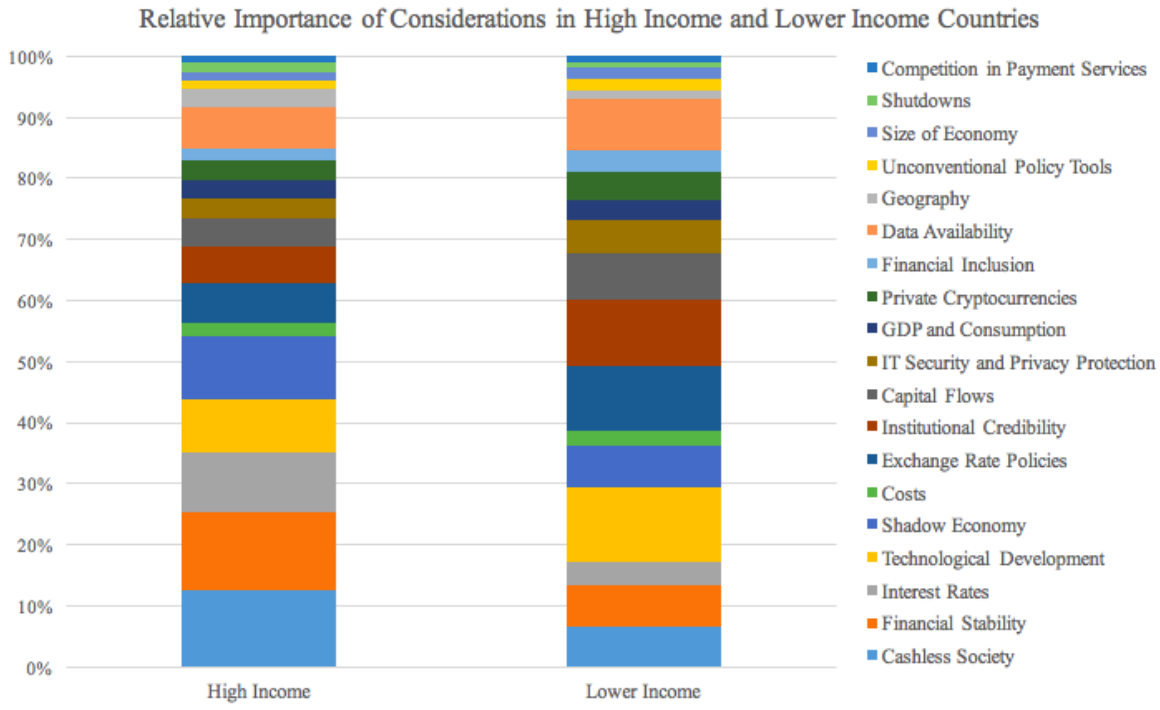

Figure 3: Relative importance of the CBDC considerations in high-income and lower-income countries. The considerations are in order of importance according to analysis A, the general results for all countries.

Considering the relative importance of the CBDC considerations in high- and lower-income countries, we find that the weight assigned to the various considerations differ. High-income countries generally assign more weight to cashless society, financial stability and interest rate considerations. It appears reasonable that high-income countries are more focused on the

interest rate possibilities of CBDC, as these countries generally have faced lower interest rates and more limited monetary policy space in recent years. The countries that experience a decline in the use of cash are typically also high-income countries. In addition, we find that shadow economy concerns are more important in high-income countries than lower-income countries. This difference is harder to explain. Lower-income countries are relatively more focused on technological development and institutional credibility. This might suggest that developing countries are more interested in the new technologies and the opportunities they entail and might be more affected by the hype caused by the new technological innovations. Further, the relatively large focus on institutional credibility could be explained by the relatively less developed institutions in these countries, which might pose as an obstacle to the success of issuing a CBDC. Financial stability is relatively less important in lower-income countries, which might suggest that the potential adverse effects of issuing CBDC have not received as much focus in these countries' assessments. The relatively lower weight on this consideration might help to explain why developing countries have decided to issue CBDC while developed countries are more cautious in their approach.

In addition to studying the general differences between developed and developing countries, we would also like to explore some of the differences between individual countries. We will use four countries to exemplify the country differences in more detail: Sweden, Germany, Senegal and Iran. Sweden and Germany represent examples of high-income countries, while Senegal and Iran are examples of lower-income countries. We would like to see how countries in both the high-income and lower-income class can differ from the general results in their weighing of the considerations. Also, we would like to see how countries within the same class might differ in their focus. The relative importance of the different considerations in these four countries is illustrated in Figure 4, together with the relative importance for all countries from analysis A.

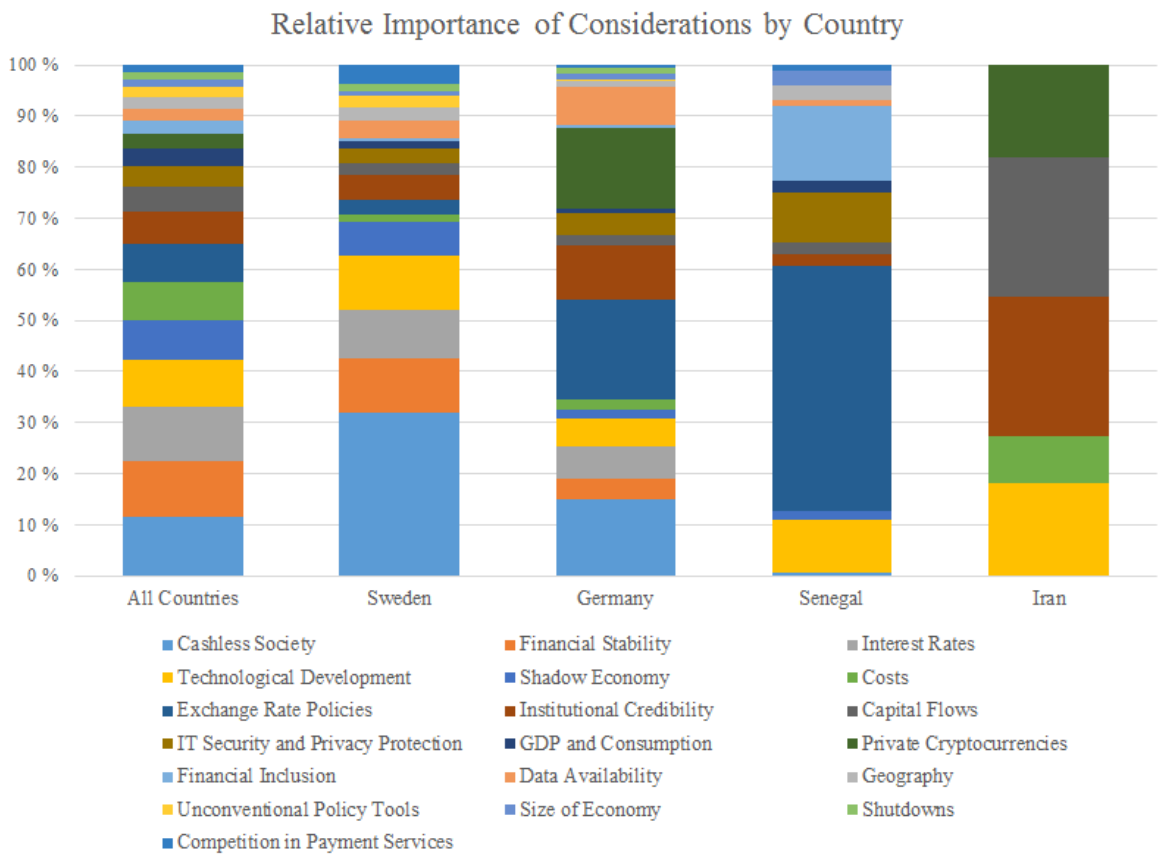

Figure 4: Relative importance of the CBDC considerations in different countries. The considerations are in order of importance according to analysis A, the general results for all countries (column to the left).

Sweden is the first country we choose to elaborate on. They represent a developed country that assigns much weight to cash. In Figure 4, we see that the cashless society segment for Sweden is almost three times as large as the cashless society segment for all countries. Moreover, we see that Sweden has less focus on the costs consideration compared to the general results. Except from this, Sweden's results resemble the general results. As Sweden is a high-income country, we would expect our general results to be an adequate fit.

Germany is another example of a high-income country, which results we would expect to match the general results well. However, from Figure 4, we notice that the German focus differs more from the general results than the Swedish. Germany assigns more weight to exchange rate policies, institutional credibility, private cryptocurrencies and data availability than both Sweden and the general results. From this we infer that also the focus of high-income countries might differ from our general results in assessments of CBDC.

Next, we elaborate on the Senegalese results. Since Senegal is an example of a lower-income country, we would expect their results to correspond less with the general results. In Figure 4, we see that Senegal differs quite a lot from our general results in how much weight is assigned to the different considerations. First, we see that the top three considerations found in analysis A, cashless society, financial stability and interest rates, are hardly mentioned in Senegal. This is also true for the shadow economy and cost considerations. Second, we see that exchange rate policies are of high importance, with a relative weight on this consideration that is almost four times the size of the weight in the general results. Financial inclusion is also very important to Senegal, being the second most important consideration. As financial inclusion is ranked 13 for all countries combined, we see that Senegal has a quite different point of view when they are evaluating the implications of CBDC. A last point worth mentioning is that Senegal gives relatively more weight to IT security and privacy protection than all countries in general, which also adds to Senegal's different focus. Our assumption that the Senegalese results would differ relatively more from the general results is confirmed.

The last country we choose to elaborate on is Iran. This country is interesting, as it only mentions five of the considerations found in our literature review: technological development, costs, institutional credibility, capital flows and private cryptocurrencies. The reason why there are so few considerations mentioned is probably due to our textual foundation only including four short web articles from Iran. Regardless, the results in Figure 4 support our assumption that developing countries' focus is likely to differ more from the general results than developed countries' focus. Another interesting aspect is that Iran has decided to issue a CBDC to evade sanctions imposed by the US (Fanusie, 2018). The main argument for Iran wanting to issue a CBDC is thereby not included as a consideration in our analysis altogether. The explanation for this is that we only used central bank publications and scientific papers as the foundation for our literature review, in which sanctions were not mentioned as a consideration. However, even if we had included sanctions as a consideration in our analysis, it would not have been considered important enough to become part of our framework, as Iran is one of very few countries that mention this argument.

Altogether, there are country differences in how applicable our results are for country level assessments of the implications of CBDC. Particularly, it appears as if our framework considerations might be a better fit for developed countries than developing countries,

although there is also variation in the representativeness within these classes of countries. These differences lead us to recommend that additional analyses of country specific conditions should be performed in addition to assessing the considerations in our framework. However, as many countries consider most of our eight framework considerations to be relatively important, we believe that an assessment building on these considerations can be a useful starting point for country level research on the implications of CBDC.

3.4 Limitations of the Textual Analysis

Our textual analysis relies on some simplifications. It is instructive to discuss the implications of these. In this section, we therefore present the two main limitations of our method.

First, we use only English written texts in our frequency analysis. If we were to include texts written in other languages, we would have to know these languages to find the relevant bigrams, or we would have to rely on online translation services to correctly translate the texts, while maintaining the content. Such an approach seems particularly unfit to textual analysis, in which we need every word to be translated correctly for the term frequencies not to be biased. However, by excluding non-English texts, we might miss important considerations. Also, we might have gotten biased frequencies for the considerations if non-English speaking countries emphasize other considerations than English speaking countries.

Second, the web articles we have included might not be fully reliable or representative. This might be the case if we include web articles that do not represent the general public's opinion. Also, because there is limited literature on CBDC, we have included some publications from crypto websites. These web articles might be solely positive, excluding the negative implications of CBDC, as the crypto websites might be interested in maintaining a positive impression of such currencies. Especially, this might be a problem in our textual foundation from developing countries. Central bank publications are less often published in these countries, which gives the crypto websites' publications more weight.

3.5 Theoretical Background for the Top 8 Considerations

In this section, we present the theoretical background for the eight considerations we have found to be the most important in the textual analysis. The objective is to understand why these considerations are important in assessing the implications of CBDC, and whether they serve as arguments in favor or disfavor of issuing a CBDC. The discussions in this part of the thesis form the foundation for our further assessment of which countries should consider issuing a CBDC. We will explain each of the considerations in chronological order based on their importance in the textual analysis. Before we move on to the in-depth theoretical presentation, we will give a short summary of what we find.

In subsection 3.5.1, we find that countries developing towards *cashless societies* can obtain benefits from issuing a CBDC. There are three main reasons for this. First, if cash was to disappear, the public would not be able to access a legal tender. Second, the disappearance of cash would mean that there was no fully risk-free alternative for saving and transacting money. Third, without cash, the payment system would be less resilient. A CBDC can be a substitute for cash, in which a risk-free legal tender will still exist and resiliency in the payment system will be maintained.

In subsection 3.5.2, we find that low *financial stability* can be an argument against issuing a CBDC. The reason is that introducing CBDC a can have adverse effects on financial stability, effects that will be hard to avoid if robustness is already low. Potential adverse effects comprise challenges to the business models, funding structure, liquidity and credit provision of commercial banks. Further, resilience to financial turmoil might be weakened if CBDC is present. Large-scale bank runs might occur, which can have severe implications.

In subsection 3.5.3, we argue that countries with particularly low *interest rates* can benefit from issuing a CBDC. This is because a CBDC might have positive effects on the central bank's monetary policy tool kit. A CBDC will provide the central bank with a new monetary policy tool and can strengthen monetary policy transmission. In addition, a CBDC will make it possible to obtain negative interest rates, either in times of crisis or as a long-term strategy.

In subsection 3.5.4, we find no basis to conclude whether *technological development* is in favor or disfavor of considering CBDC. A CBDC issuance might be a proactive strategy to

encounter challenges related to new disruptive innovations in the payment service market. However, a CBDC should not be introduced simply because it is technologically feasible; it must be significantly better than existing payment solutions for people to adopt it.

In subsection 3.5.5, we find no clear conclusion regarding the *shadow economy* consideration either. Some argue that a CBDC will be less anonymous than cash, which is the means of payment often used in illegal transactions. A CBDC has therefore, arguably, the potential to reduce illegal activity. However, if cash still exists, criminals can continue to use cash as a means of payment for illegal purposes. Moreover, if cash disappears, criminals can always find other means to carry out illegal transactions, even if CBDC is introduced.

In subsection 3.5.6, we argue that countries can obtain *cost* benefits from issuing a CBDC. Especially countries that depend highly on cash can experience cost efficiencies by introducing a CBDC, as cash is expensive to handle. There is some disagreement as to whether a CBDC will be more cost effective than existing digital payment services. As central banks will earn seigniorage from CBDC and do not maximize profit, some argue that lower fees can be charged. Moreover, cross-border transactions are argued to become more efficient with CBDC. Infrastructure costs will incur, however, which must be accounted for.

In subsection 3.5.7, we find that *exchange rate policies* are also relevant to the attractiveness of issuing a CBDC. More specifically, countries in a currency union might be restricted from issuing own currencies and lack monetary policy independence, the latter implying that the interest rate benefits of CBDC are out of scope for these countries. This also applies to countries with fixed exchange rate regimes and no capital controls. Dollarized countries, however, might benefit from issuing a CBDC if they seek to de-dollarize their economy.

In subsection 3.5.8, we find that having *weak institutions* with low trust reduces the attractiveness of issuing a CBDC. This is because a currency issued by a central bank that is not deemed trustworthy will have difficulties in gaining trust and acceptance among the public. We find that people will not use a currency of which they cannot trust the value.

3.5.1 Cashless society

A common trend in developed countries is a declining usage of cash (Lowe, 2017). For most of these countries, only a small share of the broad money supply is held in form of physical

cash, and the rest is in deposits that most often can be accessed electronically. With the money stored electronically, also payments are being carried out electronically. This tendency of cash becoming less important might be an indication of a future cashless society (Engert & Fung, 2017). If cash is disappearing, it might be convenient to issue a CBDC that can have many of the same functions as cash. We therefore argue that developments towards cashless societies is an argument in favor of issuing a CBDC, and that countries with low levels of cash should investigate whether a CBDC introduction might be beneficial.

There are three main factors driving the current decrease in cash usage, explained by Sveriges Riksbank (2017). One of them is the continuous innovation and new technology being developed within payment services, crowding out cash usage. Another factor is changes in consumption patterns and channels, in which people more often shop online. In such cases, it is not possible to pay in cash. The third factor is changing demographics. Older people use cash to a significantly higher extent than young people do, and as younger consumers replace the older ones, there will be a reduction of cash in the society. These three trends seem likely to continue, thereby maintaining the cash usage decline.

At the same time as the use of cash relative to other payment methods is declining, the value of currency in circulation (CIC) relative to GDP is in most countries increasing (Bordo & Levin, 2017; Engert & Fung, 2017). Only in Sweden, Norway and India there is a trend of CIC to GDP declining (Engert & Fung, 2017; Wilson, 2017). The increasing CIC to GDP might imply that cash is still an important means of payment in day-to-day transactions and store of value in times of crisis (Berentsen & Schär, 2016; Lowe, 2017).

Whether the growing use of electronic payments will eventually lead to cash disappearing is difficult to say. Bascand (2018) argues that if demand for cash falls significantly, the banks' and retailers' incentive to provide and accept cash might fade away because of the costs related to this service. Society is thereby left with a negative spiral of both declining usage and declining acceptance of cash. It might go so far that retailers and banks no longer accept or issue cash, and we will be in a cashless society. We do not know whether this will happen, but what is certain is that a cashless society will have consequences.

Potential consequences of a cashless society

If cash disappears from society, one consequence will be that the public is unable to access legal tender money. In most countries today, society is only able to pay with legal tender using cash, and cash is the only liquid asset for saving outside the private financial system (Berentsen & Schär, 2018). This means that in a cashless society, the population will be forced to make payments with private money. According to Skingsley (2016), there is a need both for the general public and companies to have access to legal tender money. This is needed to be certain that there exists a medium of exchange that is generally accepted. A solution is to issue a CBDC that can function as a substitute for cash, which will make the public able to hold legal tender in electronic form (Bascand, 2018; Engert & Fung, 2017).

Another consequence of cash disappearing is that there will no longer exist a truly risk-free alternative. CBDC offers a new risk-free alternative, both as a store of value and as a medium of exchange. Dyson and Hodgson (2016) argue that the need for a safe money asset in the economy is clear, as many turned to cash during and after the Financial Crisis.

First, a CBDC will be a risk-free store of value. Central banks are fully backed and cannot become illiquid, which eliminates the risk of the CBDCs losing value. This contrasts with deposits at commercial banks, which are not fully backed. Some argue that commercial banks in many countries are truly risk-free because deposits by the public are covered by depositor guarantee schemes. However, if a bank must be rescued by this scheme, it is eventually the taxpayers who pay for this (Dyson & Hodgson, 2016). Thereby, the taxpayers bear the risk instead of the depositors. A CBDC could however offer a truly risk-free alternative in a cashless society, an argument that is in favor of issuing a CBDC.

Second, a CBDC will be a risk-free medium of exchange. A CBDC will allow final settlement directly between payer and payee across the central bank's balance sheet and will thereby not entail any counterparty risk (Berentsen & Schär, 2018). This contrasts with transactions across different commercial banks, in which settlement might take some time. That means that there is a risk of the commercial bank going bankrupt before money is transferred. Nevertheless, innovations that make it possible for immediate clearings through fast payment systems have emerged (Bech, Shimizu & Wong, 2017). Counterparty risk is thereby reduced without the introduction of a CBDC. Examples of such payment systems are the Norwegian service Vipps

and the Swedish service Swish. Due to this, the reduced counterparty risk argument in favor of issuing a CBDC seems less relevant.

A further argument for issuing CBDC is increased resiliency of the payment system. Sveriges Riksbank (2017) argue that there will be more consolidation in the future payment market, because large agents will benefit from network effects, economies of scale and synergies. They argue that this will increase the risk of significant shocks to the payment system, as a shutdown in one of the payment services will affect the whole payment infrastructure. Today, cash can be used as an alternative means of payment in such circumstances. In a cashless society, however, such a single point of failure will make for a less efficient payment system, as the distribution of cash will take time to set up. Here, a CBDC will work as a good alternative payment system and result in increased resiliency and efficiency. Resiliency will especially increase if DLT is used, as the technology is distributed rather than centralized, thereby removing the risk of a single point of failure (Barrdear & Kumhof, 2016).

Another reason why a decline in cash might be negative is that the central banks might experience decreasing revenues from seigniorage. If the seigniorage decreases to the extent that central banks need to rely on government funding, this could undermine their autonomy (Engert & Fung, 2017). Nevertheless, it is not the objective of most central banks to maximize income, and even if this was the case, there would always be other ways of generating revenues to the central bank, for example through higher fees (Engert & Fung, 2017; Norges Bank, 2018). Thereby, a potential decrease in seigniorage following a development towards a cashless society does not make for a good argument in favor of issuing a CBDC.

3.5.2 Financial stability

Promoting financial stability is a key concern for most central banks, and the implications of CBDC for financial stability have been the focus of much research. In such research, financial stability considerations have been used as arguments both in favor and disfavor of issuing a CBDC. However, most research has concluded that introducing a CBDC can have adverse effects on financial stability, specifically on commercial banks' business models, funding structure, liquidity and credit provision. The potential consequences outlined in the literature are many and complex.

First, the competitive landscape of commercial banks will change if a CBDC is introduced, potentially affecting their profitability and resiliency to financial turmoil (Wadsworth, 2018). Engert and Fung (2017) suggest that to maintain their funding in competition with CBDC, banks will likely raise their deposit rates, which will have a direct impact on their profitability. To compensate for this loss of profit, they assume that banks will perform several competitive measures, including raising their lending rates and fees. Another likely result is that banks may look for assets with higher risk to earn higher nominal returns. Although some competitive responses may lead to increased efficiency, both reduced profitability and increased risk-taking can reduce banks' resiliency to financial downturns, which we argue should serve as an argument against issuing a CBDC.

Second, Wadsworth (2018) emphasizes that a CBDC will affect private banks' funding structure. She explains that if a large share of deposits shifts from private banks to CBDC, private banks will become more dependent in wholesale funding. This will lead to higher funding costs, as interest rates on wholesale funding will increase when risk premiums increase. The increase in risk premiums may come from the inflated share of wholesale funding. Also, it can result from a greater need to pledge securities, as private banks' lending from the central bank increases due to people shifting their deposits from commercial banks to CBDC (Norges Bank, 2018). Higher funding costs will affect banks' profitability and make them less resilient to downturns. Especially in small economies, banks may become more dependent on foreign wholesale funding, which can further increase costs and augment vulnerability to international shocks in offshore markets (Wadsworth, 2018). The increase in banks' vulnerability to domestic and foreign downturns is in disfavor of a CBDC issuance.

As mentioned, commercial banks may become more dependent in lending from the central bank. This expansion of the central bank balance sheet could lead to increased risk for the central bank. If central bank refinancing represents a large share of banks' liabilities, this can increase the need for the central bank to step in as a lender of last resort (Pfister, 2017). Also, if the banks perceive the central bank's role as a lender of last resort to be augmented, this may lead to an increase in moral hazard and even more risk-taking (Pfister, 2017). We argue that the inflated risk to the central bank is an argument against issuing a CBDC.

Third, several researchers find that CBDC can affect liquidity and credit with the potential of causing severe bank runs and dampened economic activity (e.g., Broadbent, 2016; Engert & Fung, 2017; Meaning et al., 2018). They underline that in normal times, the banks setting deposit rates slightly above the policy rate will likely attract deposits and maintain liquidity in the market, even in the presence of competition from a CBDC. However, financial turmoil may increase due to a potential contraction of bank lending, suppressing investment and economic activity. The reduction in bank lending may come about because of the increased funding costs and reduced profitability (Norges Bank, 2018). In times of financial stress, a CBDC will be considered a safer alternative and deposits are likely to shift from commercial bank accounts to the CBDC. Given the digital nature of CBDC, these shifts can happen instantly, around the clock and irrespectively of geographic proximity. Thereby, the presence of a CBDC can increase the risk of adverse large-scale bank runs and exacerbate financial panic and crises (e.g., Engert & Fung, 2017). We argue that these potential negative effects, both for liquidity and credit, should be considered arguments against issuing a CBDC.

In contrast to the above arguments in disfavor of CBDC, some have argued that CBDC might increase financial stability. This can happen because private banks could be forced to constrain their risk-taking behavior to avoid that consumers switch their deposits to CBDC (Berentsen & Schär, 2018). Moreover, Meaning et al. (2018) suggest that the risk of bank runs may potentially be reduced by the introduction of a CBDC, if those with the highest sensitivity to credit risk shift to the CBDC already in the period of introduction. This can potentially reduce the marginal impact of a change in the perceived risk level in the future, reducing the probability of a bank run in times of financial turbulence. If these positive effects outweigh the negative effects for financial stability, then the financial stability consideration should be an argument in favor of issuing a CBDC. However, it is our impression that most research considers the negative effects to be the most prominent, and we will therefore consider financial stability concerns an argument against issuing a CBDC.

Nevertheless, researchers argue that the potential negative effects of a CBDC on the banking system should not be exaggerated, and that most of the risks can be managed by a proactive central bank operating in a robust financial system. Most importantly, the central bank can control the attractiveness of the CBDC relative to deposits through the design of the CBDC (Kumhof & Noone, 2018). Frictions can be set to discourage large-scale bank runs, either

through daily transfer limits, notice periods for withdrawals or by imposing fees or zero interest on large CBDC balances (Meaning et al., 2018). In addition, prudential supervision, deposit insurance and lender of last resort assurance will mitigate the risk of losing deposits in bankruptcies, which in turn should reduce flightiness and risk of bank runs (Mai, 2018). In fact, modern deposit guarantee schemes have largely prevented bank runs up to this point (Grym, Heikkinen, Kauko & Takala, 2017). Also, commercial banks have historically competed with central banks without it negatively affecting resiliency (Wadsworth, 2018).

Considering the above discussion, we suggest that the current degree of financial stability could be relevant for whether a country's central bank should consider issuing a CBDC. We believe that a high degree of financial stability indicates that the financial markets are adequately regulated and supervised by the central bank, that they fulfill their functions and that they are resilient to shocks. For countries with a low degree of financial stability, we believe the opposite to be true. Thus, we consider countries with poorly regulated financial systems to be particularly exposed to the adverse effects of a CBDC, and we suggest that a relatively low degree of financial stability should be an argument against issuing a CBDC.

3.5.3 Interest rates

The use of extremely low policy rates in the aftermath of the Financial Crisis motivated the introduction of unconventional policy tools and provoked a discussion of breaking through the zero-lower bound to ensure a potent central bank in the future. We argue that, given a certain design, central banks can increase the scope and strength of their policy toolkit by introducing a CBDC. Countries facing particularly low interest rates can therefore benefit from issuing such a currency. This interest rates consideration of CBDC will be discussed in relation to two aspects; the opportunity to utilize the CBDC interest rate as a monetary policy tool, and the feasibility of applying negative interest rates as a countercyclical measure or as part of a long-term strategy to operate in a persistently low interest rate environment.

CBDC interest rate as a new policy tool

Researchers suggest that by introducing a remunerated CBDC, the central bank can expand on their conventional armory and gain a new policy tool in the CBDC interest rate. Nuño (2018) proposes that the CBDC rate can function as a key policy tool with a strengthening effect on monetary policy transmission. This strengthening effect will come about because the

CBDC interest rate will have a direct effect on household and firm saving and investment through the remuneration of the funds placed in central bank accounts, in addition to an indirect effect on commercial banks' interest rate setting. This indirect effect has been studied by Meaning et al. (2018). They find that introducing a CBDC will likely increase the sensitivity of bank's lending rates and funding costs to changes in the policy rate, and thereby strengthen the transmission to the real economy. Consequently, they argue that with a CBDC, smaller adjustments in the policy rate will be needed to stabilize the economy relative to today. However, Engert and Fung (2017) argue that the transmission from central banks' policy rates to consumer rates has historically been stable and predictable, and that a CBDC is therefore not needed to guarantee the strength of this transmission mechanism. Nevertheless, in addition to potentially strengthening the transmission mechanism of monetary policy, the central bank could also achieve a partial separation of the transmission from banks' financial situation, which may be an advantage in times of financial turmoil (Nuño, 2018).

Breaking through the zero-lower bound

There is a common-sense belief that the short-term nominal interest rates cannot be pushed below zero, as there exists a so-called zero-lower bound. The reason is that cash can be used as a store of value and has an interest rate of zero (Bernanke, Reinhart & Sack, 2004). Due to the zero-lower bound, there is no room to push policy rates further down in times when interest rates are already low. This requires the central banks to come up with new methods to stimulate their economies in these circumstances. We will suggest that this can be achieved by introducing CBDC in countries facing low interest rate levels.

Recently, it has been suggested that the zero-lower bound has restricted real interest rates from falling to the negative equilibrium levels needed to remedy the crisis (Engert & Fung, 2017). A CBDC can serve as a tool to accomplish this in the future, by allowing for negative interest rates as a countercyclical measure in times of crisis. Also, being able to set negative interest rates may facilitate the provision of money-financed fiscal stimulus and reduce the need for quantitative easing in such circumstances (Bordo & Levin, 2017). This may in turn increase the transparency of monetary policy and strengthen the nominal anchor. Hence, with a CBDC, the central bank will therefore have to make smaller adjustments in the policy rate to gain similar market effects as today. Thus, a CBDC can be beneficial in times of crisis.

Another relevant aspect of the interest rates consideration is the modest predictions of future interest rates. There are several reasons for these. First, countries are facing changing demographics, with decreasing fertility rates, increasing life expectancies and populations that are growing old (Cooley & Henriksen, 2017). This means that people are saving for longer lives, and higher savings cause the interest rates to fall. These trends are most present in advanced countries. Second, Rey & Zettlemeyer (2018) point at poor social safety nets in emerging countries, which cause people in these countries to save more as well. Third, they argue that there is a slowdown in technical progress, which reduces the marginal product of capital. Fourth, they point at a lack of safe assets to invest in, depressing investments and boosting savings. Persistently low interest rate levels have implications for the policy tools of central banks and reduce their ability to counteract future crises, especially in countries that rely heavily on policy rate adjustments as their primary policy tool.

Since global real interest rates have been falling for decades, some suggest that a CBDC should replace today's paper currency to ensure that negative interest rates are available, not only as a short-term countercyclical measure, but also as a long-term policy (Haldane, 2015; Bordo & Levin, 2017). Bordo and Levin (2017) argue that, facing persistently low interest rate levels, central banks of small open economies may still be able to stimulate their economies through foreign exchange operations, depreciating their respective currencies. However, for larger economies, this approach may not be a real alternative, leaving them without ammunition in future crises. Thus, a wait-and-see-approach to CBDC may be especially risky for large economies facing expectations of persistently low interest rates.

The interest rate argument in favor of a CBDC seems particularly relevant to countries that rely heavily on the policy rate as their primary monetary tool. In other countries that use a wider range of tools to perform cyclical control, the interest rate argument may not be assigned as much weight. Nevertheless, if such a country introduces a CBDC, it will likely involve a change in policy strategy, especially if an interest-bearing design is chosen. Therefore, we assume that both countries that use the policy rate as their primary policy tool, and those that do not, can obtain the interest rate benefits of a CBDC.

However, it is not given that the best way to achieve negative interest rates is to issue a CBDC. To be able to set negative interest rates using a CBDC, it must be interest-bearing and physical

cash must be either abolished or separated from the CBDC by frictions limiting large or frequent transfers between cash and CBDC (Bordo & Levin, 2017; Engert & Fung, 2017). Davoodalhosseini (2018) has found the co-existence of cash to have a dampening effect on the transmission of negative interest rates, if cash is still easy to obtain. This is a relevant feature, as most researchers and central bankers lay out a CBDC introduction without the abolishment of cash. Moreover, it has been argued that it is unnecessary to introduce CBDC to reduce the zero-lower bound. If the objective is to simply reduce the lower bound, another way to achieve this could be to increase the frictions of holding large amounts of cash by eliminating large denomination banknotes (Engert & Fung, 2017).

A crucial consequence of the introduction of a CBDC is that the interest rate floor becomes more binding and equal to the CBDC policy rate (e.g. Meaning et al., 2018). If a central bank chooses to introduce a CBDC that does not bear interest, the effective lower bound will be higher than today, and the effect of introducing a CBDC will be reduced strength of monetary policy. Today the effective floor is slightly below zero, because there are costs related to handling cash. The increase in the interest rate floor results from relatively lower costs of handling CBDC. This increase would create new challenges for central banks, as they would become more dependent on unconventional monetary policy tools and fiscal stimulus (Bordo & Levin, 2017). This design choice brings about serious implications for the consequences of issuing a CBDC, and we suggest that if a non-remunerated design is chosen, the interest rates consideration becomes an argument against issuing a CBDC. Nevertheless, most researchers agree that a remunerated design will be the most optimal, and with such a design, the interest rate consideration is an argument in favor of CBDC.

3.5.4 Technological development

In recent years, technological innovations have disrupted the traditional financial services industry and led to central banks all over the world reconsidering their role and responsibility. This far, the development in the payment services industry has been driven by private agents, implying that the development is a product of demand for better payment solutions (Danmarks Nationalbank, 2017). New technologies have the potential to influence all central banks' core functions, and to affect their position and monetary power within the financial system (Wadsworth, 2018; Mai, 2018). In this respect, Bordo and Levin (2017) argue that it might be

necessary for central banks to take an active stance to the rapid technological development and produce their own digital currencies. Not doing so might impose a number of risks, like loss of monetary control and increased vulnerability to economic downturns. Further, they argue that recent years have taught us that there are limitations to how much we know about macroeconomic mechanisms, so it can be dangerous not to respond actively to the innovations in payment technology. Therefore, technological innovations and rapid development in the market for payment solutions may be an argument for issuing a CBDC, given the objective to maintain control over monetary policy space.

Technology level and adoption of CBDC

The level of technological development in a given country can have implications for the attractiveness of issuing CBDC, primarily with respect to adoption rates. We find that central banks might be more likely to succeed in obtaining a sufficient user base in highly developed countries, compared to less developed countries. In technologically developed countries, the public has superior knowledge of technology and people are used to adopting new payment solutions. According to Sveriges Riksbank (2017), these features appear to make it easier to launch new successful payment services. Consequently, in countries with a high level of technological development, the potential gains of introducing CBDC might be great, if we assume that the gains are proportional to the number of users.

Nonetheless, there is no guarantee that people in highly developed countries will adopt a CBDC simply because it is technologically feasible to launch, and they have the necessary knowledge to use it. Adoption of CBDC is uncertain and will depend on the currency's ability to fill an existing need (Mai, 2018). Thus, given that the central bank does not use regulations to force the adoption of the CBDC, it will have to solve a real problem or offer increased efficiency for the public to bother adopting it. However, in technologically developed countries, the range of privately offered alternatives is large and expanding, making it increasingly difficult for a CBDC to fill an actual gap in the market. Questions have been made as to whether CBDC will be any more attractive than today's private solutions, as electronic payments are already fast and cheap alternatives in modern countries (Norges Bank, 2018; Danmarks Nationalbank, 2017). In sum, adoption in highly developed countries may be depressed by competition from private service providers, reducing the attractiveness of issuing a CBDC in these countries.

In countries that are less technologically developed, there is more likely a gap in the market that CBDC can fill and a potential to increase efficiency (Mai, 2018). We assume that this can increase adoption rates in less developed countries, given that the CBDC system is designed in a way that makes it easy to adopt even with inferior technological knowledge. However, these countries will clearly need the highest investment in new infrastructure, leading to higher set-up costs. The technology needed for introducing a CBDC will likely have strong complementarities with existing infrastructure (Panetta, 2018). Thus, less developed countries might be worse equipped for introducing CBDC, as they have in place less of the necessary infrastructure, increasing the costs of establishing the new system.

Altogether, research is undecided on technological development's impact on the attractiveness of issuing a CBDC. Thus, we are unable to conclude whether high or low technological development should be considered an argument in favor or disfavor of issuing a CBDC.

3.5.5 Shadow economy

Many illegal activities, like money laundering, tax evasion, drug transactions, financing of terrorism and human trafficking, are carried out using cash, as cash is anonymous. In subsection 3.5.1, we found that in most countries, the value of CIC to GDP is increasing. Most of the cash is in high-denomination bills, and it is unknown where these high-denomination notes are and what they are being used for (Rogoff, 2016, p 3-4). This might suggest that much cash ends up in the underground economy, where it is used for illicit activities. Moreover, with the emergence of private cryptocurrencies like Bitcoin and Ethereum, a new means of payment that is also highly anonymous has come to play. Such currencies can more easily transfer large amounts of money than cash, and the transactions can occur without the transacting parties having to be in the same geographic area. Private cryptocurrencies have thereby opened new possibilities for doing illegal activities and can cause an expansion of the shadow economy (Lowe, 2017). To decrease the size of the shadow economy, a solution might be to introduce a CBDC as a substitute for cash and private cryptocurrencies (Wadsworth, 2018). In this regard, the CBDC must be a less anonymous means of payment to make it relatively more difficult to use in illegal activities. If a CBDC can decrease the size of the shadow economy, we argue that countries with relatively large shadow economies can obtain the greatest benefits of issuing a CBDC.

The degree of anonymity depends on the design of the CBDC, which is elaborated on by Wadsworth (2018). If a value-based design is used, this will offer some anonymity. The central bank will not know who holds each token, and if tokens are regularly swapped, it will be difficult to know who initiated a payment. However, there will always be an electronic record of all the transactions, and the value-based CBDC will be less anonymous than cash. An account-based design for the CBDC will be very similar to having electronic currency stored in commercial banks, thereby offering very little anonymity. Choosing the optimal design for a CBDC will be a trade-off between privacy considerations and crime preventive considerations. A less anonymous design of the CBDC will offer less privacy to the public, but by making it more difficult to use for illegal purposes, it has the potential to decrease the size of the shadow economy.

Nevertheless, there are several limitations to the crime preventive benefits of CBDC, which weaken the standing of crime reduction as an argument for CBDC. First, for a CBDC to be truly effective in preventing crime, cash must be eliminated (Engert & Fung, 2017; Nuño, 2018). If not, cash can always be used as the vehicle for carrying out illegal transactions. Second, even if cash is no longer available, there will always be alternative assets that can be used for illicit activities, such as gold, the currencies of other countries or private cryptocurrencies (Nuño, 2018) Third, there is even a possibility that a CBDC can increase the size of the shadow economy (Fung & Halaburda, 2016). If the CBDC has a very anonymous design, it can more easily be used for illegal transactions than cash, as large amounts of CBDC can easily be transferred across geographic locations. This eases the conduct of illegal activity and can increase the size of the shadow economy. In sum, we argue that there are too many obstacles for a CBDC to be truly crime preventive. Thus, issuing a CBDC to reduce the size of the shadow economy does not make for a good argument.

3.5.6 Costs

A commonly used argument for issuing a CBDC, is that it will decrease costs. Both the costs of providing and using payment services can be reduced, and settlement time can decrease. Settlement time is a natural part of the cost consideration, as delays in a settlement impose costs to the users of the payment service (Wadsworth, 2018). If a CBDC can carry out payments at a lower cost and higher speed, the efficiency of the payment system will be

improved (Norges Bank, 2018). A more efficient payment system, in which the users can be charged with lower fees, will likely be a more attractive means of payment. Mai (2018) argues that because of economies of scale, the more people who adopts the CBDC, the lower the unit costs of providing the service will be. The causality thereby goes both ways; lower user costs increases popularity of the payment instrument, which again lowers production costs per unit because of economies of scale. With lower production costs, the central banks will be able to charge lower fees for its services, thereby increasing the attractiveness of the payment instrument.

Costs of CBDC relative to cash

Most researchers agree that a CBDC will incur lower costs than cash. In the EU, recent estimates suggest that the costs related to handling of cash amounts to almost half of the annual EU budget (Panetta, 2018). Small businesses also have substantial costs related to the sorting, cleaning and verification of cash (Bordo & Levin, 2017). These high costs of providing cash mean that the users are also levied high fees for using cash. Today, consumers usually pay fees between two and five percent when withdrawing cash from ATMs (Bordo & Levin, 2017). Even though a fee for depositing or withdrawing CBDC might be charged, these fees will probably be lower than for cash because of the relatively lower costs of processing, storing and transporting CBDC (Engert & Fung, 2017). We therefore argue that cash intensive countries with high cash handling costs might benefit from issuing a CBDC.

Costs of CBDC relative to electronic means of payment

Supply costs

How cost competitive the provision of CBDC will be compared to today's electronic payment systems depends on the design of the CBDC. Bordo and Levin (2017) argue that with an account-based design, the CBDC can function as a practically costless and instantaneous medium of exchange. With this design, there are some costs when initially creating the CBDC accounts, as the account holder's identity will need to be identified using the same procedures as when opening accounts at commercial banks today. However, once an account is opened, transactions can be conducted rapidly and securely (Bordo & Levin, 2017). This design will also make it relatively easy to monitor unusual activity and comply with Anti-Money Laundering (AML) and Countering Financing of Terrorism (CFT) laws, thereby limiting the costs related to these tasks (Wadsworth, 2018). Nevertheless, it seems difficult to justify how

a CBDC with an account-based design can be more cost effective than deposit accounts. If a value-based design is chosen, research finds that this will likely entail higher supply costs than an account-based design. First, a relatively high degree of anonymity forces higher monitoring costs in an AML/CFT perspective (Wadsworth, 2018). Second, if DLT is used, much computing power is required in addition to incentives for validation, which can increase costs (Bordo & Levin, 2017; Wadsworth, 2018). Supply costs can also be very volatile, which is an unattractive feature (Mai, 2018). Thus, it is even more difficult to argue that a CBDC with a value-based design will be a cost-effective alternative to today's electronic means of payment.

User costs

Researchers do not agree whether a CBDC will incur lower user costs than other electronic means of payment. Norges Bank (2018), for example, argue that there is no evidence for CBDC being cheaper. Mai (2018) argues that today's payment services are seemingly free-of-charge, indicating that the fees are already close to their lower limit. Nevertheless, she also argues that because the central bank earns seigniorage from issuing CBDC, the need to levy fees to cover the costs of providing CBDC is reduced. Wadsworth (2018) argues that because the central bank is not a profit-maximizing agent, it will likely be able to charge lower fees for transactions compared to current digital payment providers. We argue that countries with high fees for conducting digital transactions might be able to decrease these by introducing a CBDC.

One area in which CBDC is argued to reduce the user costs compared to other electronic means of payment is settlement time. Wadsworth (2018) argues that an account-based CBDC will improve settlement time, as the central bank is both the acquirer and issuer of funds. The need for interbank coordination between commercial banks that exists today will thereby be removed, a need that can delay settlement with hours or even days. The situation will be the same as when both parties of a transaction are customers at the same commercial bank. However, it requires that both parties have accounts at the central bank. Wadsworth (2018) also argues that a DLT design for the CBDC can improve settlement time, as clearing and settlement are combined into one step called validation. Still, as mentioned in subsection 3.5.1, there already exist innovations that secure faster payments, where money is immediately transferred from the payer to the payee (Bech, Shimizu & Wong, 2017). With such innovations, it is difficult to see how a CBDC can improve settlement time.

Another example of where a CBDC might reduce user costs compared to other digital means of payment is in cross-border financial settlements. Today, a network of banks and payment services must coordinate to make a transaction across the borders. Such a transaction can take up to five days (Wadsworth, 2018). There are also relatively high fees related to cross-border transactions, with the global average of remittance fees being 6.94% of the amount transferred (The World Bank, 2018). Wadsworth (2018) argues that with a CBDC, the amount of service providers needed to execute the transaction can be reduced on at least one side of the transaction, and thereby improve both settlement time and costs accrued. She argues that if the payment is done between two countries both having account-based CBDCs, there might only be need for a currency exchange market. With a CBDC based on DLT, only a verifier will be needed to carry out the transaction. Based on the cost advantages a CBDC can carry in this respect, we argue that countries with extensive international trade and high cross-border remittance fees might benefit from issuing a CBDC.

Infrastructure costs

One of the disadvantages of introducing a CBDC is that it will require infrastructure costs. The CBDC will need infrastructure to be created, issued and maintained, and the cost of investing in this infrastructure is unknown and can potentially be very large (Wadsworth, 2018). Furthermore, there will be a need for someone to research the challenges associated with issuing a CBDC, and thereby a need for additional investments in human capital (Panetta, 2018). Consequently, total costs for the central bank can increase. Having that said, Panetta (2018) argues that the new technology needed will have strong complementarities with existing digital networks and infrastructure, so that infrastructure costs should not be too high. If the infrastructure costs are lower than the potential gains from cost reductions to suppliers and users, decreased costs will be an argument in favor of issuing a CBDC.

3.5.7 Exchange rate policies

According to the Mundell-Fleming trilemma (Fleming, 1962; Mundell, 1963), also referred to as the Impossible Trinity, countries with fixed exchange rates to foreign currencies face special challenges related to monetary policy opportunities, or the lack thereof. In general, any policy rate change in the foreign country must be met with a corresponding policy rate change in the home country to maintain the fixed exchange rate, given free float of capital. Thus,

irrespectively of whether the country operates no own legal tender or a currency board, a conventional peg, a crawling peg, or any other such arrangement, the monetary policy space of the country's central bank is limited. We will argue that a fixed exchange rate policy with free float of capital is in isolation an argument against issuing a CBDC, because countries operating such a policy will not be able to obtain the interest rate benefits of CBDC.

However, in line with the Impossible Trinity, the above-mentioned limitations on monetary policy can be dampened or even eliminated using capital controls. These measures, including taxes, tariffs and volume restrictions, can be put in place to limit the flows of capital in and out of the country, and thereby allow for monetary policy control in a fixed exchange rate regime. By affecting the convertibility of the currency, central banks can obtain room to make interest rate adjustments based on their own considerations. Thereby, the potential interest rate benefits of CBDC may be within reach for countries with capital controls. Thus, we will have to consider both the current exchange rate regime and the existence of capital controls in combination, to correctly assess the impact of these policies on the attractiveness of a CBDC. If a fixed exchange rate regime is combined with the use of capital controls, then we will argue that exchange rate policies are no longer an argument in disfavor of issuing a CBDC, as this consideration no longer limits the monetary policy potential.

CBDC and currency unions

If a country is part of a formal currency union with a common policy, and does not intend to leave the union, we will argue that this is an argument against issuing a CBDC in the respective country. This applies most importantly if a country is part of a currency union in the strictest sense of the term, which means that there is full abandonment of separate national currencies (Cohen, 2008). We find that in such a strict currency union, the countries cannot issue a CBDC because they are not allowed to have separate currencies. There are, however, less strict versions of currency unions, in which countries can issue own currencies if they are tied together in an exchange-rate union (Cohen, 2008). In this case, a CBDC can be issued if its exchange rate is pegged to the currency of the union. However, being a part of a currency union means that monetary independence is lost. This means that currency union countries cannot themselves set their own policy rates, and the potential monetary policy benefits of a CBDC is out of reach (Danmarks Nationalbank, 2017). This removes the important interest rate argument from the discussion and makes a CBDC less attractive for countries part of a

currency union. It is nevertheless possible that a currency union as a whole could benefit from introducing a CBDC, e.g. an "e-euro", but we will not go into detail on this.

CBDC and dollarization

Regarding exchange rate policies, a theme that is occasionally mentioned in the literature on CBDC is de-dollarization. This regards countries that use dollars, or other foreign currencies, as their legal tender, or extensively use it alongside their own domestic currencies. Such countries include, among others, Ecuador and Marshall Islands. Dollarization can be an active policy choice to handle mismanagement of the local currency and ravaging inflation, or it can result from lacking trust in the currency among the public. Regardless, it reduces the central bank' monetary policy control, as the foreign currency encroaches the domestic currency. Therefore, when the local currency is stabilized, it will be optimal to de-dollarize.

We suggest that introducing a CBDC can be a potential way of achieving de-dollarization while maintaining trust in the domestic currency. This necessary trust can come about as a result of increased transparency and reliability offered by the CBDC compared to traditional fiat currency (Bordo & Levin, 2017; Meaning et al., 2018). Therefore, a dollarized economy may be an argument for issuing a CBDC, if the objective is to de-dollarize. However, this argument relies heavily on the assumption that people will trust the CBDC as a store of value and choose to adopt the CBDC instead of using dollars. In this regard, we argue that price stability must be maintained after introducing the CBDC for the strategy to be successful and for this to be a valid argument. Given that most people perceive the U.S. dollar to be a relatively safe store of value, it appears somewhat unlikely that these countries can introduce CBDCs that will gain more trust than the U.S. dollar. Thus, de-dollarization may not be a good argument for issuing a CBDC, unless the central bank and institutions have adequate trust, or in some way can deny people from using dollars instead of the issued CBDC.

3.5.8 Institutional credibility

Most central banks strive to achieve and maintain credibility among the public, an aspect that is relevant when considering the potential issuance of a CBDC. In general, a high degree of trust in the central bank requires low and stable inflation, the opportunity to make safe and efficient payments, and confidence that the money is genuine and that the issuing party is solvent and able to maintain its commitment (Norges Bank, 2018). This means that confidence

in the monetary system involves trust in that the value of money will remain stable over time. In fact, Norges Bank (2018) state that the main objective of a CBDC in Norway would be to ensure confidence in money and the monetary system. Issuing a CBDC could potentially be a way for the central bank to increase and maintain its credibility. However, institutional credibility may also pose as an obstacle to the issuance of a CBDC.

Lack of trust in the private financial system

Berentsen and Schär (2018) argue that there is a significant demand for a virtual asset issued by a trusted party that can be used to save outside the private financial system. They present data on CIC to GDP in Switzerland before and during the Financial Crisis and argue that the increase in CIC to GDP after 2008 is evidence that people demand an asset without counterparty risk in times of weakened trust in the financial system. In a financial crisis, it is not enough that people can move their money from one bank to another, as the entire financial system is deemed unstable and risky. Thus, providing central bank issued money in times of crisis is crucial for ensuring confidence in the monetary system (Norges Bank, 2018). In countries where the public lacks trust in the private financial system, a CBDC might help the central bank to ensure a well-functioning monetary system both during and after a temporary crisis (Berentsen & Schär, 2018). This argument in favor of CBDC of course hinges on the assumption that the central bank is relatively more trusted among the public than the private banks, so that the public values the new CBDC alternative. This needs not be the case.

Lack of trust in the central bank and authorities

Whether a CBDC will be trusted and valued by the public depends on the public's perception of how well it fulfills its functions (Norges Bank, 2018). Berentsen and Schär (2018) argue that for a country's central bank to be successful in issuing a central bank currency, it will need to be perceived as a credible store of value. Without credibility, the valuation of a new currency will likely be close to zero, for example if the public fears insolvency or high inflation, or they lack trust in that the central bank can ensure a stable value of the money over time. This has been the ruling verdict of most critics of the newly launched Venezuelan cryptocurrency, petro. Also, it was the case for the Ecuadorian CBDC, which was introduced in 2014 and later abolished. In Ecuador, lack of trust in institutions led to the failure of the CBDC issuance (White, 2018). We find that if trust is weak, the probability of widespread adoption of the currency is low, and it will not matter that a CBDC could potentially bring

benefits to credibility had it been adopted. We will argue that weak institutional credibility should be an argument in disfavor of issuing a CBDC, as lacking trust will have a negative effect on the valuation and adoption of CBDC, and therefore its ability to provide its potential positive implications.

Raskin and Yermack (2016) have found that in troubled economies with capital controls, private cryptocurrencies have become viable competition for central bank fiat money in times of turbulence. When institutions are weak and there is lack of trust in the central bank alternative, they find that people seek other places to deposit their money. This backs up the assumption that lack of trust in the central bank and authorities makes it unlikely for a CBDC to gain acceptance by the public.

Given that the central bank succeeds in achieving trust in its newly issued currency, there is a chance that introducing CBDC can potentially increase central bank credibility. In particular, the strength of the expectations channel of monetary transmission can be enhanced, due to more transparent policy operations increasing credibility (Bordo & Levin, 2017; Meaning et al., 2018). In this case, issuing a CBDC can be part of a strategy to increase credibility. However, we will argue that this will require a minimum level of trust already present. Further, a CBDC can maintain central bank credibility in countries with diminishing cash usage, where the public might otherwise lose confidence in that the central bank can provide an efficient and secure solution in times of crisis (Norges Bank, 2018).

In countries where lack of trust in institutions is perceived to be a challenge, some have suggested DLT as an opportunity to achieve beneficial decentralization and increased reliability. Brazil is among the countries that have set a study group to evaluate the possibility of utilizing this technology to handle its credibility related challenges. They have found that the most important advantage of DLT is reliable decentralization of trusted networks (Burgos, Filho, Suares & Almeida, 2017). Thereby, in situations that will benefit from full decentralization and resilience to individual decision making and failures, DLT can potentially be an ideal tool to enhance credibility. Still, we once again believe that a minimum level of trust will be necessary, even for the adoption of a CBDC based on DLT.

However, several central banks, including those of Denmark and Malaysia, also suggest that introducing a CBDC may have negative effects on credibility (Danmarks Nationalbank, 2017;

Ahmat & Bashir, 2017). This might happen if for example the technical features of the system are inadequate to meet consumers' requirements, if the system suffers from cyber-attacks or if the public disagrees with the objectives for introducing a CBDC. For example, the latter may happen if the public becomes aware that the CBDC is introduced mainly to achieve negative interest rates (Raskin & Yermack, 2016). In this regard, the central bank can face reputational risk if people perceive negative interest rates to harm particularly the welfare of the less financially sophisticated with few financial alternatives (Engert & Fung, 2017).

4. Which Countries Should Consider CBDC?

In this second main part, we seek to answer which countries should consider issuing a CBDC and which countries should not. We use our findings from the first main part together with country data in both a qualitative and a quantitative approach, which together comprise our framework assessment of CBDC. The country data underlying our assessment is presented in section 4.1. In section 4.2, we apply theory and data to categorize and group countries in a qualitative approach to the research question. We group the countries to get an overview of the kinds of countries that should and should not consider issuing a CBDC. In section 4.3, we calculate scores representing the attractiveness of CBDC using the frequencies from the first main part together with country data. This quantitative approach exposes differences across all countries. The rationale for using two approaches to answer our research question is to enable comparison and validation of our conclusions. Section 4.4 provide the results of our CBDC assessment. This assessment ends with a table of our recommendations together with the countries' own conclusions, which is presented in subsection 4.4.3. We finalize the second main part of our thesis by discussing the potential domino effects following a country's introduction of a CBDC in section 4.5.

4.1 Country Data

We gather country data for the considerations that we identified to be the most important in the first main part of the thesis. We seek to select measures that capture the essence of the various considerations, that are reliable and comparable across countries, and that cover the 40 countries in our sample. This is crucial to ensure the quality of our final recommendations. We use various sources to gather this data, including World Economic Forum, the IMF, Bloomberg and central banks' own statistics. The use of these sources is elaborated on in the following subsections.

We wish to keep the number of assessment properties confined to allow for a thorough discussion of each consideration. In selecting the assessment properties, we choose not to gather data on countries' shadow economies or technological development, as we were unable to find whether these considerations should serve as arguments in favor or disfavor of CBDC in section 3.5. These considerations are the fourth and fifth most mentioned considerations in

relation to CBDC, according to our textual analysis. Thus, we assume that they are important. However, there is a chance that much attention is paid to these considerations because research is indecisive about their implications for CBDC. This could mean that several possible scenarios are discussed in much of the textual foundation, promoting a relative increase in frequencies compared to the considerations for which research is more settled. Moreover, since research is undecided on these considerations, they will not contribute to our conclusions in favor or disfavor of issuing CBDC. Therefore, gathering and studying country data on these considerations will be of little value. As for the considerations of shadow economies and technological development, we do not gather data on costs. For the cost consideration, we find it too difficult to get comparable and reliable data for all the countries.

We thereby gather data on the following five considerations: cashless society, financial stability, interest rates, exchange rate policies and institutional credibility. We choose to gather data for the 40 countries that have expressed opinions about CBDC. Because these 40 countries are from all over the world and in all stages of development, this serves as a natural limit to how many and which countries to gather data on. Further, it provides us with the opportunity to compare our results with the opinions expressed by representatives of the countries. We mainly gather data from the past 12 years whenever possible, to expose developments for the different considerations. Also, we want to include data from before the Financial Crisis, and therefore choose 2006 as the starting point for our data. We will now introduce the measures that we use to perform the qualitative and quantitative assessment.

4.1.1 Cashless society

Data for the cashless society consideration is gathered from central banks' own webpages. To assess developments in use of cash, we gather information about the value of currency in circulation (CIC). CIC is the total amount of cash held by the public and is a common measure to apply when assessing cash use. This is because the central bank adds cash into the banking system when people's demand for cash increases, which means that the CIC reflects how much cash is used (Federal Reserve Bank of San Francisco, 2017). We calculate the CIC as share of countries' GDP to get comparable statistics, as the CIC data is typically stated in local currency. To evaluate whether a country is developing towards a cashless society, we study

the level of CIC to GDP. If countries have very low levels of CIC to GDP, this indicates that they might soon become cashless.

For this consideration, we only gather data for the past three years, as there might be trends in the data. For example, if a country has experienced a steady decline in cash use from quite high levels to quite low, this indicates a development towards a cashless society. If we were to use data for the past 12 years in this case, the average will be higher than what is representative for the current situation. By only using data for the past three years, we get a better indication of whether the country is close to becoming cashless. Alternatively, we could have used data for only the last year, but then we could have picked up extraordinary circumstances in the cash distribution, for example if a central bank has issued extra cash in a crisis. We thereby find it best to use data for three years on our cashless society measure.

4.1.2 Financial stability

Data for the financial stability consideration is gathered from the World Economic Forum. As our measure of financial stability, we use a subindex from the Global Competitiveness Index (GCI). The GCI uses reliable data from internationally acknowledged organizations such as the World Bank, the IMF and several UN specialized agencies. Another benefit is that it covers a wide range of countries, as many as 137 in the most recent report, providing us with a common measure for our diverse sample of countries. In general, the GCI measures all indicators on a range from 1-7 and aggregates these scores to find the overall GCI scores and rankings (World Economic Forum, 2017).

The subindex we use for measuring financial stability is named “Trustworthiness and Confidence” and is included under the eighth pillar of the GCI, named “Financial Market Development”. It measures the soundness of banks, to what extent regulators ensure the stability of the financial market and the degree of legal protection of borrowers’ and lenders’ rights (World Economic Forum, 2017). These are relevant factors to our consideration, and this subindex is therefore a good indicator for the countries’ financial stability.

The GCI has some limitations that affect the representativeness of our data. We note that the GCI is partly based on opinion surveys by the World Economic Forum. This means that subjective rather than objective measures of data are used, which could cause bias. For

example, this could happen if the media recently has paid much negative attention to financial stability issues, affecting the people to think that financial stability is lower than what it is. Moreover, the GCI is designed to measure competitiveness as a means to growth and prosperity. This implies that the selection of indicators included in the index may be suboptimal for our use. Nevertheless, the GCI is highly acknowledged, and we still believe the eighth pillar is a good indicator for financial stability.

We gather the countries' scores for the past 12 years. Thus, we include data from both before, during and after the Financial Crisis. We believe this to best capture the countries' financial stability, as we include the financial systems' responses to a crisis in the financial sector. However, we are aware that countries unaffected by the Financial Crisis might in this way appear relatively more stable than those affected by the crisis. If the reason for not being affected was a robust financial sector, then the country is in fact relatively financially stable, and our financial stability measure is correct. If the reason for not being affected was exogenous, our measure might be biased.

4.1.3 Interest rates

Data for the interest rates consideration is gathered from Bloomberg, and it is mainly provided to us by a manager in a leading Norwegian bank. Bloomberg collects data from different sources, including, among others, central banks and the IMF. We gather data on yearly averages of policy rates. We believe yearly averages to give the most appropriate representation of the interest rate situation in the respective country. Alternatively, we could use end of year data, but since changes in policy rates happen throughout the year, the end of year data need not be representative for the year's policy situation. Further, we aim at collecting policy rate data that are comparable across the countries in our sample. We find that not all countries use the policy rate actively as a monetary policy tool. As discussed in section 3.5.7, some countries are forced to set policy rates according to other countries due to exchange rate policies, which makes the interest rate data less informative. Also, some central banks use several interest rates or a set of measures to perform cyclical control, and there are typically variations in the maturity of the different interest rates. Still, to the extent that this is possible, we have comparable policy rate data.

With respect to the policy rate measure, we are interested in both the cyclical developments and the underlying trends. The cyclical component is interesting, as it provides an impression of the importance of the policy rate as a monetary policy tool in counteracting financial downturns. This should be evident in the policy rate developments following 2008 for the countries affected by the Financial Crisis. Moreover, the underlying trend component is interesting as it indicates whether the countries are developing towards persistently low interest rate levels. This last component however, is difficult to capture in the short time period for which we gather data. To get a more comprehensive representation of the underlying trend component, we could have included more historical data, in addition to predictions of future interest rates. However, we choose not to expand our analysis at this point and assume that the yearly interest rates for our period give an adequate impression of the interest rate developments.

4.1.4 Exchange rate policies

Data for the exchange rate policies consideration is gathered from the IMF. To fully capture the implications of exchange rate policies for the attractiveness of a CBDC, we gather information about both the exchange rate regimes and the use of capital controls in the relevant period. We find data on these measures from the IMF's annual reports on exchange arrangements and exchange restrictions, which are based on information from several IMF related sources. In addition, a revision of the data is performed by a manager in a leading Norwegian bank with access to reliable data and many years of experience.

4.1.5 Institutional credibility

Data for the institutional credibility consideration is gathered from the World Economic Forum. We again use the GCI, more specifically the first of the 12 pillars, which regards the quality of countries' institutions. This pillar comprises 21 different indicators measuring the quality of the legal and administrative framework, and the efficiency and behavior of stakeholders representing the institutional environment (World Economic Forum, 2017).

Measuring the level of trust in institutions on a global level is a challenging task for several reasons. First, trust is hard to quantify and could be perceived differently across different countries and cultures. Second, it is difficult to isolate single institutions in measuring trust.

The general public' perception of the trustworthiness of some institutions may very well affect their perception of other institutions that they believe are related. Third, few researchers or organizations have attempted to measure trust in institutions on a global scale, leading to a lack of available data. For example, we consider the Edelman Trust Barometer to be a promising contribution to this field. However, it only covers about half of our country sample, and since we have found institutional credibility to be an important factor in the assessment of CBDC, we need a more comprehensive measure that enables us to assess all our countries based on a common measure.

The GCI pillar on institutional quality provides us with this measure, and we believe that it serves as an acceptable proxy for what we wish to examine. We assume that the perceived level of trust in a country's institutions is likely to be related to their quality. If the institutions fail to provide adequate quality in their services, frameworks and policies, we believe this is likely to weaken trust and acceptance among the public, as the institutions fail to fulfill the responsibilities they are trusted with. For the general public, we believe the trust in the central bank to be affected by the trust in other authorities, and thus a composite indicator such as the GCI's first pillar appears to be appropriate. Clearly, in assessing the attractiveness of issuing a CBDC, it would be more optimal to apply an indicator that measures central bank credibility in isolation, but this is not obtainable.

4.2 Qualitative Approach

In this section, we use the theory outlined in section 3.5 and the country data to group similar countries together and assess the attractiveness of issuing a CBDC in each country group. The country groups and their recommendations are presented in Table 9, which can be found in subsection 4.4.1. The method explained in this section constitutes our qualitative approach to the framework assessment, while the quantitative approach is explained in section 4.3.

The main advantage of grouping countries in the qualitative approach is that it facilitates a confined discussion, in which countries with similar properties are discussed together and given common recommendations. This approach thereby provides us with an overview of which kinds of countries that should and should not consider issuing a CBDC. Grouping also makes it possible for countries outside our sample to identify in which group they best fit, by

comparing own country properties with those of the groups. Thus, countries outside our sample can get an indication of whether they should consider issuing a CBDC. This approach thereby contributes to the general global framework for future assessments that we seek to establish.

In this section, we explain how countries are grouped in the qualitative approach. This procedure has two steps. First, each of the properties that we have gathered data on are split into categories, and these categories are used to categorize countries. Next, the countries are grouped based on the categories. An overview of the grouping can be found in Table A.24 in the appendix. We describe both steps of the grouping next.

4.2.1 Categories of relevant properties

We start by categorizing the countries based on all the relevant properties. For each property, we seek to create categories that have distinct implications for the attractiveness of issuing a CBDC.

Cashless society

To categorize countries by their cash use, we apply the average level of CIC to GDP for the past three years. We make three categories of this property: low level of CIC to GDP, medium level of CIC to GDP and high level of CIC to GDP. We choose the limits for each category by using summary statistics. The average level is 8.20%, the median is 10.02%, the minimum level is 1.51% and the maximum level is 18.74%. Because we are only interested in countries that are likely to soon become cashless, we set the limit for being categorized as having low levels of CIC to GDP quite low, at 2%. This is the category of special interest in our assessment. Those countries with a level above 2% and up to 10% are categorized as having medium levels of CIC to GDP. These countries are not in the category of interest per now, but are closer to becoming cashless societies than the countries categorized as having high levels of CIC to GDP, with levels above 10% of GDP. The last two categories are considered neutral to the attractiveness of CBDC in our assessment.

Financial stability

For financial stability, we make three categories based on countries' average scores on the "Trustworthiness and Confidence" subindex: high, medium or low financial stability. To

create limits for these categories, we use summary statistics. The total average is 4.97, the median 5.08, the minimum value is 3.39 and the maximum value is 6.33. Based on these summary statistics, we find it appropriate to categorize countries with average scores of 4.5 or lower as countries with low financial stability, those with average scores above 4.5 up to and including 5.5 as countries with medium financial stability, and those with average scores above 5.5 as high stability countries. The low financial stability category is the category of special interest, as it is the countries in this category that should be most cautious to CBDC.

Interest rates

To categorize the countries in our sample based on interest rates, we again choose to create three categories. The basis for this categorization is the calculated average of the yearly policy rates. Summary statistics for this measure give an average of 3.37%, a median of 2.10%, and minimum and maximum values of -0.75% and 23.80%. We set the first category to include countries with average yearly policy rates of 2% or less. We assume this to be our main category of interest, as these countries are relatively close to the zero-lower bound. The second category comprises countries that have average yearly policy rates above 2% and below or equal to 5%. The third category has average yearly policy rates above 5%.

Exchange rate policies

When categorizing countries by exchange rate regimes, we create the following labels: “Floating”, “Soft peg”, “Currency board”, “Currency union” and “Dollarized”. Floating regimes include both free float regimes and managed float regimes. Soft peg regimes comprise conventional peg regimes, stabilized arrangements, crawling pegs and crawl-like arrangements.

Regarding the categorization of capital control policies, we make use of a simple approach and label each country as either “Yes”, “No” or “Partial” for each year of our time period. The relevant consideration in this respect is whether countries operate capital controls to achieve monetary policy independence, despite fixed exchange rate regimes. Thus, countries labeled “Yes” are assumed to have full monetary policy control, while countries labeled “Partial” or “No” are assumed to have limited control, given that they do not operate floating exchange rate regimes.

The combinations of the categories of exchange rate regimes and capital control policies provide a common and final categorization of countries based on exchange rate policies. Categories of countries that do not operate floating exchange rate regimes nor capital controls are of special interest in assessing the implications of CBDC.

Institutional credibility

The categorization of countries based on institutional credibility builds on summary statistics of the GCI's first pillar, with an average value of 4.77, a median of 4.91, and minimum and maximum values of 2.09 and 6.18. All these values are below the corresponding ones for our financial stability measure, indicating that the categorization limits for this property should be lower. In addition, as will be elaborated on in section 4.2.2, we consider institutional credibility more crucial than financial stability in our grouping, which also promotes lower thresholds. We thereby categorize countries with average scores above 5.5 as having strong institutions, those with average scores lower than 5.5 but above 4.0 as having medium institutions, and countries scoring on average 4.0 or below are categorized as having weak institutions. The last category is the most relevant for our further discussion.

4.2.2 Country groups

When grouping the countries in the next step of the qualitative assessment, we approach this in three steps. In the first step, we apply the theory from section 3.5 to decide which considerations are crucial for the success of introducing a CBDC. If countries are unable to or unsuccessful in issuing a CBDC due to some of the country properties we consider, the implications of other considerations are trivial. We therefore start by grouping on these crucial properties. In the second step, we apply the ranking from the textual analysis and continue the grouping based on the considerations' importance. In the final step, we gather the remaining countries in one last group. We elaborate on these steps in the subsequent paragraphs.

First, in subsection 3.5.7, we found that *currency unions* may have laws prohibiting member countries from issuing their own currencies. Also, if countries are part of currency unions, they are unable to independently control their own monetary policy, eliminating the monetary policy advantages a CBDC can carry. Therefore, we consider membership of a currency union to be a crucial property for the attractiveness of issuing a CBDC. Consequently, countries that fill this criterion are grouped regardless of the other properties.

Second, in subsection 3.5.8, we concluded that countries with weak *institutional credibility* will have difficulties in gaining the necessary trust in a CBDC. Attempts of issuing such a currency will therefore have a relatively low probability of succeeding. For this reason, institutional credibility is considered the second most crucial property. This means that for countries that are not members of currency unions, all countries with weak institutions are grouped together irrespective of their values on the other properties.

After having created two groups based on properties that we identify as crucial according to theory, we move forward to the second step of the grouping. In this step, we apply the ranking of the considerations from the textual analysis and create three additional groups. These groups comprise countries that are similar when considering either developments towards cashless societies, financial stability or interest rates. First, for countries that are not members of currency unions or have weak institutions, countries with low levels of CIC to GDP, thereby developing towards *cashless societies*, are grouped together. Next, we group remaining countries that have a low degree of *financial stability*. Then, we group those countries that are left in the sample and have low *interest rate levels*. In the entire second step, we only group countries that solely have arguments in favor or disfavor of issuing a CBDC.

In the third step, we gather those countries that have not yet been assigned to a group. These countries are not members of currency unions nor do they have weak institutions. They either have properties both in favor and disfavor of issuing CBDC, or all their properties are neutral to the issuance of CBDC. Since this group contains a diverse set of countries, they must be discussed individually in performing the qualitative approach to the assessment.

4.3 Quantitative Approach

In this section we explain the quantitative approach to our framework assessment of CBDC. In this approach, we combine the frequencies from the textual analysis with the country data to create a country score representing the attractiveness of issuing a CBDC. The frequencies from the textual analysis are used to weigh the different CBDC considerations, in which the most important considerations are given the most weight in calculating the scores. We calculate a score for each country, which we refer to as CBDC score, and a higher score means that the country is more likely to achieve net benefits from issuing a CBDC.

The main advantage of calculating CBDC scores is that we get a quantitative measure that enables us to rank which countries that should be the most and least interested in issuing a CBDC. By this measure, the quantitative approach exposes differences across all countries. Moreover, this approach fully utilizes the results of the textual analysis in weighing the considerations, and it thereby accounts for the relative importance of the considerations in a more exact matter than the qualitative approach. The quantitative measure functions as a supplement to the qualitative discussion, and it allows for validation of our results.

In this section, we explain how we create the CBDC scores. We use the term frequencies and country data for the same considerations as in the qualitative approach: cashless society, financial stability, interest rates, exchange rate policies and institutional credibility.

4.3.1 Normalization of country data

We start by normalizing the country data, so that the measures for the considerations have the same scale, ranging from –1 to 1. The considerations in favor of considering a CBDC are assigned positive values, while the considerations in disfavor are assigned negative values. Thus, a high CBDC score implies greater benefits of issuing a CBDC, and this score is boosted by arguments in favor of CBDC and pulled down by arguments in disfavor of CBDC. In deciding which considerations should be assigned positive and negative values, we apply the theoretical background from section 3.5. We use the maximum and minimum values of each measure as limits when normalizing the data.

When normalizing the data for the cashless society and interest rates considerations, we adjust for the fact that low levels of CIC to GDP and low policy rate averages indicate that issuing a CBDC might be beneficial. The countries with the lowest scores on these measures are likely to have the greatest benefits of issuing a CBDC. Therefore, the minimum values of the policy rate and CIC to GDP averages are assigned a value of 1, while the maximum values are set to 0. We use positive values for these two measures, as we consider the cashless society and interest rates considerations either to be arguments in favor of considering a CBDC or to be irrelevant.

For the financial stability and institutional credibility considerations, low scores are arguments against issuing a CBDC. We therefore assign the countries with the lowest scores on these

measures a value of –1 on the normalized scale. The countries with higher scores on financial stability and institutional credibility get negative values closer to 0. We apply negative values for these considerations, as we consider financial stability and institutional credibility either to be arguments in disfavor of CBDC or to be irrelevant.

The consideration of exchange rate policies does not have a quantitative measure, and we must choose values on the scale. This consideration can be an argument against issuing a CBDC, and we will therefore assign negative values ranging from –1 to 0. Countries with exchange rate regimes allowing for monetary policy independence are assigned a value of 0, as exchange rate policies pose no constraint to the potential benefits of issuing a CBDC. A value of 0 is also assigned to dollarized countries. Such countries have limited monetary policy independence, making a CBDC less attractive. However, if they seek to de-dollarize, a CBDC issuance can be a way to achieve this. As dollarized countries have both pros and cons of issuing a CBDC, we choose to assign them the neutral value of 0. Those countries with only partial monetary policy independence, typically countries with pegs and partial capital controls, are assigned a value of –0.25. Countries with soft pegs and no capital controls, which lack monetary policy independence, are given a value of –0.5. Countries with hard pegs, which are more difficult to leave than soft pegs, are assigned a value of –0.75. Last, countries in formal currency unions with common policies are attached a value of –1. These countries may not be allowed to issue own legal tenders and have no monetary policy independence. Also, it is very difficult to leave a currency union. A summary of the normalization for our five considerations is presented in Table 8.

CONSIDERATION	ARGUMENT	MEASURE	NORMALIZATION
CASHLESS SOCIETY	In favor or irrelevant	Average level of CIC to GDP	Lowest value set to 1.
INTEREST RATES	In favor or irrelevant	Average yearly policy rate	Lowest value set to 1.
FINANCIAL STABILITY	In disfavor or irrelevant	Average score on GCI's 8th pillar	Lowest value set to –1.
INSTITUTIONAL CREDIBILITY	In disfavor or irrelevant	Average score on GCI's 1st pillar	Lowest value set to –1.
EXCHANGE RATE POLICIES	In disfavor or irrelevant	Exchange rate regime and use of capital controls (CC)	Currency union is set to –1. Hard peg and no CC is set to –0.75. Soft peg and no CC is set to –0.5. Peg and CC is set to –0.25.

Table 8: Summary of normalization. If the consideration is an argument in favor of CBDC, the scale ranges from 0 to 1. If the consideration is an argument in disfavor of CBDC, the scale ranges from –1 to 0.

4.3.2 Calculation of CBDC scores

After having normalized the country data to range from –1 to 1, the normalized measure for each consideration is multiplied with the corresponding term frequency from the textual analysis. Thus, we obtain weighed measures for the considerations according to their importance. Thereafter, we add the multiplied values for each consideration to a total country score representing the attractiveness of issuing a CBDC. This gives us comparable scores for which countries should consider issuing a CBDC and which countries should not.

We inform that some countries are excluded in the quantitative approach, because we lack data on some of their properties. The calculated scores would thereby be misleading in comparison with the other countries when assessing the attractiveness of issuing a CBDC. For The Bahamas, for example, we lack data on both the financial stability and institutional credibility considerations, which would have had negative values when calculating the CBDC score. The Bahamian score would therefore be too high relative to the scores of other countries for which we have all data. The countries we have excluded in the quantitative approach are The Bahamas, Ecuador, Iran, Marshall Islands, Taiwan and Venezuela.

4.4 Results of CBDC Assessment

In this section, we discuss and recommend which countries should and should not consider issuing a CBDC. First, in a qualitative discussion, we use country data and theory for the framework considerations found in the first main part of the thesis to assess which countries should consider issuing a CBDC. We present the results of the country grouping, before we provide discussions and recommendations based on this grouping. Second, we discuss which countries should consider issuing a CBDC based on the calculated country scores representing the attractiveness of issuing a CBDC. We compare the results of the two approaches and discuss any differences. Last, we compare our final recommendations with central banks' own statements on the attractiveness of issuing a CBDC.

4.4.1 Recommendations to groups of countries

In this subsection, we present a qualitative discussion of the attractiveness of issuing a CBDC in groups of countries with similar properties. We use the theoretical background from section 3.5 to provide recommendations for these groups. The result of the country grouping is six groups of countries with different properties and different conclusions regarding the attractiveness of issuing a CBDC. The groups are listed in Table 9, together with the countries included in each group and the conclusions to whether they should consider issuing a CBDC. A further discussion of the groups will follow.

NUMBER	GROUP NAME	COUNTRIES	CONCLUSION
1	Countries in Currency Unions	Estonia, France, Germany, Malta, Finland, Spain, Netherlands, Italy, Senegal	Should not consider issuing a CBDC
2	Countries with Weak Institutions	Ukraine, Russia, Ecuador, Iran, Thailand, Venezuela	Should not consider issuing a CBDC
3	Countries Developing Towards Cashless Societies	Sweden, Norway, New Zealand	Should consider issuing a CBDC
4	Countries with Low Financial Stability	Uruguay, Tunisia, China	Should not consider issuing a CBDC
5	Countries with Low Interest Rates	Japan, Switzerland, United States, Canada, United Kingdom, Israel, Taiwan	Should consider issuing a CBDC
6	Inconclusive Countries	Denmark, Singapore, Hong Kong, Saudi Arabia, United Arab Emirates, India, Australia, Malaysia, Republic of Korea, Chile, The Bahamas, Marshall Islands	Must discuss each country

Table 9: Groups of countries with similar properties and common group conclusions to whether they should consider issuing a CBDC.

Countries in currency unions

The first group of countries consists of those that are part of formal currency unions with common policies. These countries include Estonia, Finland, France, Germany, Italy, Malta, Netherlands and Spain, all part of the eurozone, in addition to Senegal, which is part of the West African Economic and Monetary Union (WAEMU). Singapore is also part of a formal currency union together with Brunei, but because it is the Monetary Authority of Singapore that manages the union, we argue that Singapore can affect which legal tender is used and decide its own monetary policy. Singapore is therefore not included in this group. When studying country differences in the textual analysis results, we find that all the countries in this group, except France and Italy, put relatively more weight on exchange rate policies than our general results. Thus, it appears as if exchange rate policies are of particular concern to this country group.

We argue that exchange rate policies are relevant to the attractiveness of issuing a CBDC in this country group, most importantly because formal currency unions with common policies might inhibit the participating countries' central banks from issuing their own currencies. This is the current situation for the eurozone countries. An example of a eurozone country that has considered issuing its own digital currency is Estonia, planning to call its currency "Estcoin". The main argument for wanting to introduce this coin was to ease the conduct of global business (Teffer, 2017). Mario Draghi, head of the ECB, noted that "no member state can introduce its own currency; the currency of the euro zone is the euro" (Draghi & Constâncio, 2017). This means that Estonia is legally constrained to have only the euro as its legal tender. It also means that all eurozone countries are restricted from issuing a CBDC as long as they are a part of the union. Based on this discussion, we argue that the countries restricted from issuing their own currencies should not consider issuing a CBDC. Despite this, several of the eurozone countries are currently researching CBDC.

As explained in subsection 3.5.7, some currency union countries are allowed to issue their own currencies, and this affects the attractiveness of issuing a CBDC. Senegal is a currency union country in our sample that has been allowed to issue a CBDC, called eCFA, which has not been issued in the rest of the WAEMU (Chutel, 2016). The eCFA was first introduced in December 2016, and if proven successful, the digital currency will be introduced and used by the entire union. The main rationale for issuing this currency is to increase financial inclusion. The issuance of eCFA in Senegal has been made possible through keeping a fixed exchange rate to the union's legal tender, the CFA franc, which again is pegged to the euro (African Business Magazine, 2017). We see that in this case, although we have considered currency union membership to be crucial for the attractiveness of CBDC, it is not as decisive as in the case when countries are restricted from issuing their own currencies. Nevertheless, because of the need to keep a fixed exchange rate, Senegal does not have monetary policy independence, which cancels out the possible interest rate advantages of issuing a CBDC. For us to recommend Senegal to issue CBDC when the interest rate benefits are out of scope, we argue that other benefits would need to be even greater, for the gains of a CBDC to outweigh the costs. However, we find that Senegal scores among the lowest on our institutional credibility measure, a measure we have found to be crucial. As will be discussed in relation to the next country group, lack of trust in institutions complicates the issuance of CBDC, and we do therefore not recommend Senegal to issue a CBDC.

There are currently few news concerning the success of the eCFA in Senegal. However, Raue (2018) claims its failure due to lack of publicity and interest, in combination with poor execution. Poltorak (2018) argues that the eCFA is subject to corruption and manipulation. Since Senegal has a low score on the institutional credibility measure and also a low score on the financial stability measure, we argue that low trust and poor financial stability might be contributing factors if Senegal fails in introducing eCFA.

Countries with weak institutions

The second group consists of countries with weak institutions. Of the countries in our sample, this group includes Ecuador, Iran, Russia, Thailand, Ukraine and Venezuela. Exploring the country differences in the textual analysis results, we find that all the countries in this group, except from Thailand, consider institutional credibility relatively more important than our general results. In Ecuador and Russia, institutional credibility is the most important consideration, while it is the second most important in Iran and Venezuela.

In subsection 3.5.8, we concluded that lack of institutional credibility will complicate a potential introduction of a CBDC. Although a CBDC in some sense could promote increased transparency and credibility, we find the probability of a CBDC to gain acceptance among the public of these countries to be too low to potentially accomplish these possible benefits. Therefore, we believe institutional credibility to be crucial for the success of issuing a CBDC, and we argue that the countries in this group should not consider issuing a CBDC.

In addition to being supported by the literature, the significance of institutional credibility for the success of a CBDC is also supported by observations from the few adopters of CBDC. Among the countries in this group, both Ecuador and Venezuela have introduced some sort of state-backed digital currency. With respect to Venezuela, it is still too early to conclude that the introduction has failed, as the CBDC is still in circulation. However, our impression from news articles and discussions online is that the currency struggles to achieve widespread adoption. Typically, critics blame untrustworthy institutions for the public's lacking interest in the new currency (e.g. Ellsworth, 2018; Trapp, 2018). This most definitely seems to have been the situation in Ecuador, where CBDC was taken from research to reality to retirement in only three years. In the following, we will present the Ecuador case in detail to illustrate the importance of good and trustworthy institutions for the introduction of a CBDC. We argue

that the countries in this group should consider the Ecuadorian experience and be cautious in their approach to CBDC.

The Ecuador Case

Among the countries in this group, Ecuador poses as a good example of why the strength and trustworthiness of a country's institutions are crucial elements for the success of issuing a new currency. According to Rosenfeld (2015), the country was the first in the world to introduce a state-backed digital currency when Banco Central del Ecuador (BCE) began issuing dinero electrónico, electronic money, in December 2014. The reported main rationale for issuing the CBDC was to benefit the unbanked and increase financial inclusion. According to World Bank statistics, only 46.2% of the population above 15 years had an account at a bank or another financial institution in 2014. In addition to benefiting the poorest citizens, Rosenfeld reported that the electronic money was meant to reduce government spending in exchanging old notes for new dollars. Speculators, however, argued that the electronic money plan was a way of initiating a de-dollarization process. This was never confirmed by the government, which insisted that the currency system was designed to operate and support, and not replace, the dollar-based system (Rosenfeld, 2015).

As part of the introductory process of the Ecuadorian CBDC, private agents were barred from offering competing systems and cryptocurrencies were banned from the economy. The use of the CBDC was made voluntary, but despite this, the government reported to the newspaper El Comercio in December 2014 that they expected 500 000 unique user accounts opened during the first year of the new system. Nevertheless, the system was abandoned in December 2017 after only three years, due to its failure to attract a significant number of users and transactions. In terms of usage, the account balance peaked at $11.3 million, which comprise only 0.00046% of the total Ecuadorian money stock, M1 (White, 2018). The central bank has now initiated a process of transferring the responsibility of the digital currency system from the government to private banks and hopes this move will make the digital currency reach out to more of the unbanked population (El Comercio, 2018).

There are several possible reasons for the failure of the Ecuadorian CBDC, although the most crucial one is likely the lack of public trust in the central bank's ability to maintain the value of the currency. Earlier, we have proposed that a CBDC will be a default-risk-free claim on

the central bank, denominated in its own fiat currency. However, White (2018) argues that the public considered the Ecuadorian CBDC a claim on U.S. dollars that the central bank could become both unable and unwilling to pay, thus making it far from risk-free. This perception was justified by the government default on sovereign dollar-denominated bonds as late as in 2008. In contrast, the commercial banks had been considered stable and prudently run since the dollarization process started in year 2000. Further, he argues that the incentives for the commercial banks to operate prudently were perceived to be stronger than for the central bank, as the legislation did not entail prudential requirements for the BCE related to the issuance of the CBDC. Also, there was no limit to the supply of the digital currency, and thereby the risk of default was followed by the risk of devaluation. This risk was especially pressuring due to the chronic financing problems of the Treasury, forcing the central bank to behave recklessly (Calderón de Burgos, 2016). As a result, the U.S. dollar was perceived to be safer than the state-backed electronic money, because it did not rely on the Ecuadorian authorities to maintain its value, and therefore the people continued to use dollars instead of dinero electrónico (Calderón de Burgos, 2017).

Although lack of trust in the value of dinero electrónico seems to have been the most important reason why it failed, other considerations are also likely to have contributed to its failure. First, the voluntary nature of the system might have been necessary to avoid civil unrest. However, the weak promotion of the currency could have further depressed its low acceptance levels (Calderón de Burgos, 2016). Some have argued that not enough strength was given to the reception channels such as shopkeepers and other businesses in making them adopt the new system and promote its use by customers (White, 2018). Without this promotion, these agents simply refrained from adopting the currency. Secondly, the main rationale of issuing CBDC to benefit the unbanked has also been questioned. Critics have argued that the objective would have been easier to achieve by allowing for more competition rather than creating a central bank monopoly (Calderón de Burgos, 2016; White, 2018). If the public did not perceive the stated objective for the currency project to be credible, this may have further depressed their willingness to adopt the currency.

If we examine the results from the textual analysis, we find support for the above criticism of BCE's credibility. The stated Ecuadorian reasons for issuing a CBDC were to increase financial inclusion and reduce costs of cash handling. However, we find that financial

inclusion is only slightly more important in Ecuador than in our general results, ranked 11 among the considerations, while costs is among the least important considerations to Ecuador. In contrast, we find that exchange rate policies pose the second most important consideration. It thereby seems as if the central bank did in fact fail in promoting the stated rationale for issuing a CBDC, and instead much focus was paid to the speculation of de-dollarization and the attractiveness of the U.S. dollar relative to dinero electónico. The only consideration that is assigned more weight in Ecuador than exchange rate policies is institutional credibility. These findings support our conclusion that lack of institutional credibility was crucial for the failure of the Ecuadorian CBDC.

The failure of dinero electrónico resulted in a significant fiscal loss despite the short lifetime of the project. Estimations reveal a total loss of approximately $7 million, after having accounted for total savings of less than $1 million (White, 2018). From the Ecuadorian experience, we understand that introducing a CBDC might entail large costs without significant benefits if the currency fails to achieve acceptance among the public. This supports our argument that countries with weak institutions should not consider issuing a CBDC.

Countries developing towards cashless societies

Our third group consists of countries developing towards cashless societies, which includes Sweden, Norway and New Zealand from our sample. Sweden has an average level of CIC to GDP of 1.51% for the past three years, Norway of 1.54% and New Zealand of 1.94%. These low levels might indicate developments towards cashless societies. For both Sweden and Norway there has also been a trend of CIC to GDP decreasing in the latest years, which strengthens our belief that cash might disappear from these economies. New Zealand has had a rather stable level of CIC to GDP. Nevertheless, as explained in subsection 3.5.1, there are several reasons why cash usage might decrease in the future, among others the many innovations being developed within electronic payments. As New Zealand already has a low level of CIC to GDP, a cashless society is not an unlikely scenario.

As discussed in subsection 3.5.1, a CBDC might work as a good substitute to cash. With a CBDC, people can still access a central bank legal tender, a risk-free store of value and means of payment, and a resilient payment system. All these attributes would disappear or be weakened without cash. Therefore, this group of countries with low levels of CIC to GDP

could benefit from issuing a CBDC. The countries in this group also have neutral values on all properties negative to CBDC in our analysis, and there are therefore no clear arguments in disfavor of them issuing a CBDC. To conclude, we thereby argue that Sweden, Norway and New Zealand, and other countries in the same situation, should consider issuing a CBDC.

In fact, Sweden has launched a pilot project to develop an "e-krona" that can be introduced if the central bank's current research concludes that an issuance of CBDC is beneficial (Rolfe, 2018). The disappearance of cash is the main motivation for this, and our results from the textual analysis show that the cashless society consideration is by far the most important in Sweden. Norway has not yet concluded on CBDC and is planning more research to examine different issues (Norges Bank, 2018). Using the textual analysis results, we find that up until now, the main focus in Norway has been on interest rates and the cashless society consideration. New Zealand has currently rejected the idea of issuing a CBDC (Kihara, 2018), but as we have discussed, the development towards a cashless society does not seem to be as pressuring in New Zealand as in Sweden and Norway. This is evident from the textual analysis results, where we find that financial stability concerns and interest rate implications are the most important considerations to New Zealand. The cashless society consideration follows in the third place.

Countries with low financial stability

The fourth group of countries consists of those economies with a relatively low degree of financial stability and neutral values of the remaining properties. Out of the 40 countries in our sample, Tunisia, Uruguay and China are placed in this group. For the countries we have assigned to the fourth group, weak financial stability implies that an introduction of CBDC should be put on hold until financial stability is improved.

The main reason for why the countries in this group are recommended not to consider issuing a CBDC is that we assume that they are more likely than others to suffer from adverse effects on their financial system. Weaker soundness of banks, inadequate regulation and unsatisfactory legal protection of borrowers and lenders give these countries a relatively poor foundation to proactively avoid or counteract the challenges a CBDC poses to the financial system. Thus, introducing a CBDC can potentially lead to financial crisis in this group of countries. In this event, we believe that it is likely that the CBDC system would be abandoned,

and the costs of establishing the system would be sunk. The relatively high possibility of failure and sunk costs should contribute to dampen the attractiveness of CBDC.

We conclude that financially unstable countries should not consider issuing a CBDC. Especially, this is true for countries that have no other properties implying that an issuance of a CBDC would be beneficial. However, even if they have such properties, we believe the financial stability concerns to be of such priority that any country with low financial stability should be cautious in their approach to CBDC.

In practice, the countries in this group seem not to be intimidated by the potential financial stability implications of a CBDC. Tunisia issued a blockchain based CBDC called "e-Dinar" in 2015, Uruguay presented a plan to start a CBDC pilot project in 2017 and China has established a research institute for digital currency (Leung, 2015; Banco Central del Uruguay, 2017; Huillet, 2018). Although the Chinese central bank has stressed that a development of a CBDC must consider financial stability issues (China Daily, 2018), our results from the textual analysis show that financial stability is only the eight most important consideration in China. The same is true in Uruguay, while the Tunisian publications never even mention the financial stability consideration. Thus, it appears as if these countries have paid little attention to the potential adverse effects of issuing a CBDC, an approach we deem to be risky, given the relatively low robustness of these countries' financial systems.

Countries with low interest rates

The fifth group consists of those countries with low interest rates that have not yet been put in any other group, and that have neutral values on all the other properties. The countries included in this group are Japan, Switzerland, the US, Canada, the UK, Israel and Taiwan, presented in chronological order from lowest to highest interest rate average. The interest rate averages for these countries range from 0.13% to 1.96%. We inform that for Taiwan, we found no data on CIC to GDP. If Taiwan in fact has low levels of CIC to GDP, it should be in Group 3 with the countries that are developing towards cashless societies.

The low interest rates in these countries indicate that they could benefit from issuing a CBDC. In subsection 3.5.3 we discussed the opportunity a CBDC provides in breaking through the zero-lower bound, which is an attractive feature in a low interest rate environment. All the countries included in this group are quite advanced economies, which we have explained to

face changing demographics promoting higher savings. This, combined with increased savings due to a lack of safe assets for investment and a slowdown in technical progress, imply that interest rates should be expected to remain low for these countries, supporting the attractiveness of a CBDC.

In subsection 3.5.3 we also argued that a CBDC can provide a new monetary policy tool and strengthen the expectation channel of monetary policy transmission, so that smaller adjustments in the policy rates are necessary. This too will be positive for countries pushing towards the lower bound, as they have a tight leeway of setting interest rates. Most of the countries in this group rely on the policy rate as their primary monetary policy tool and could be argued to need an enhancement of their policy toolkit. We thereby argue that this group of countries should consider issuing a CBDC.

As an additional note, in subsection 3.5.3, we found that the size of the economy can be relevant to the attractiveness of a CBDC. Large economies face difficulties depreciating their currencies, which limits their possibility to stimulate the economy in times when conventional interest rates cannot be further reduced. Hence, the interest rates consideration of CBDC becomes even more important. In our group, this applies most strongly to the US, but also Japan, the UK and Canada are among the world's ten largest economies.

In practice, the countries in this group have currently rejected the opportunity of issuing a CBDC.[5] We find in our textual analysis results that Japan, Israel and Switzerland have hardly focused on the interest rates consideration this far. This suggests that they might not be fully aware of the potential interest rate benefits that could be obtained from issuing a CBDC. For example, a reason for Japan not considering an issuance of a CBDC is that they assume cash must be abolished for the interest rate benefits to be obtainable (Partz, 2018). This we found not to be a requirement in subsection 3.5.3. In the other countries with low interest rates, Canada, the UK, the US and Taiwan, the interest rates consideration has been more thoroughly assessed, and the consideration is among the three most important. However, all the countries in this group have expressed concerns about the risks of issuing a CBDC, particularly to the

[5]For explanations of why these countries have rejected CBDC, see e.g., Allen (2018), Bank of England (2018), Brainard (2018), CCN (2018), Financial Post (2018) and Partz (2018).

financial system. It thereby appears as if the need for monetary policy improvement is not considered great enough for an introduction of a CBDC to be deemed worthwhile. Still, as these countries plan to continue research on CBDC, we believe they might change their minds in the future, if they succeed in finding solutions to the financial stability issues of CBDC.

Inconclusive countries

The last group of countries consists of those for which we cannot give unambiguous conclusions to whether they should consider issuing a CBDC based on the country data. The group consists of Denmark, Singapore, Hong Kong, United Arab Emirates, Saudi Arabia, India, Australia, the Republic of Korea, Malaysia, Chile, The Bahamas and Marshall Islands. The reason why we cannot conclude which stance these countries should have on the issuance of a CBDC is that they have properties both in favor and disfavor of issuing a CBDC, or they do not have any properties that point in either direction. We have argued that membership of currency unions and institutional credibility are crucial factors, and countries in Group 1 and Group 2 are therefore not inconclusive, even though they may also have properties that are positive to CBDC. In the following, we will discuss each of the inconclusive countries and potentially provide some conclusions.

Denmark and Singapore

The first countries we want to discuss are Denmark and Singapore. Both these countries have experienced low interest rates for the past 12 years. As for the low-interest-rate-group, this is an argument in favor of considering a CBDC. However, for this argument to be relevant, the countries must have monetary independence. Both Denmark and Singapore operate soft pegs; Denmark has a conventional peg against the euro, while Singapore operates a stabilized arrangement. Also, both countries exercise free float of capital. According to the Mundell-Fleming trilemma, these countries have therefore lost their monetary policy independence.

Both Singapore and Denmark aim for stable prices when conducting their monetary policy. The Singapore dollar is managed against a basket of currencies of major trading partners and competitors. Singapore thereby manages monetary policy based on an exchange rate target, which means that the Monetary Authority of Singapore does not have control over domestic interest rates. Denmark’s monetary policy is aimed at holding the euro exchange rate fixed, which means that the Danish central bank sets interest rates solely based on what is compatible

with a stable exchange rate towards the euro. If a CBDC was introduced to replace or coexist with either the Singapore dollar or the Danish krone, we assume that the interest rate on the digital currency would have to follow the target of the central bank's existing policies. Thus, no monetary policy benefits would be achieved, and the exchange rate policy argument would cancel out the interest rate argument. This is true given that the countries maintain their exchange rate policies when issuing CBDC. Besides this, we find that Denmark and Singapore score neutrally on the other properties included in our assessment. We are therefore inconclusive to whether these countries should consider issuing a CBDC.

In practice, both Denmark and Singapore have currently rejected issuing a CBDC (Danmarks Nationalbank, 2017; Noonan, 2018). Both countries are concerned about the potential adverse effects on the financial systems and worry that the benefits will not outweigh the costs. In the textual analysis results, we find that the financial stability consideration is the second most important in both countries. Exchange rate policies appear not to be in focus, as it is outside the eight most important considerations in both countries. This contrasts with our focus in the assessment of these countries. Interest rates are among the top three considerations in both countries, but whether this is mentioned frequently to explain why the interest rate benefits of CBDC are out of scope is not possible to tell from the textual analysis results.

Hong Kong

Our discussion of Hong Kong will have many of the same features as the discussion of Singapore and Denmark. Hong Kong has low interest rates, in which monetary policy could benefit from issuing a CBDC. However, Hong Kong has a currency board and does not exercise capital controls, making monetary policy independence restricted. The central bank of Hong Kong is thereby not able to take advantage of the potential interest rate benefits of a CBDC and the interest rates consideration is irrelevant. As Hong Kong scores neutrally on all other properties, we are inconclusive to whether a CBDC should be issued. Hong Kong could abandon its currency board to achieve the interest rate advantages that follow from a CBDC, but hard pegs tend to remain for a long time (Stone, Anderson & Veyrune, 2008). Also, leaving a currency board might result in a loss of credibility to the central bank (Galic, 2012). We note that the Hong Kong Monetary Authority have reported that they have no plans of issuing a CBDC, as they consider their existing infrastructure to be robust and efficient (Chan, 2018). An interesting finding for Hong Kong is that the shadow economy consideration is the most

important consideration according to the textual analysis. This may imply that they believe a CBDC could impact the size of the shadow economy. This consideration has not been discussed in our assessment, as we found in subsection 3.5.5 that a CBDC is unlikely to have significant effects on the size of the shadow economy.

The United Arab Emirates and Saudi Arabia

The United Arab Emirates and Saudi Arabia are another two countries from our sample that are labeled inconclusive in our analysis due to their values of the five key properties. Both these countries have relatively low interest rate averages, which is an argument in favor of considering a CBDC. However, both countries operate soft peg arrangements against the U.S. dollar, without the use of capital controls. These exchange rate policies pose limitations to the monetary policy benefits of a CBDC and make the interest rates consideration irrelevant.

In Saudi Arabia, we note that Bloomberg has reported the introduction of capital controls to ban betting against the Saudi riyal (Albanese, Martin & Sharif, 2016). In theory, capital controls can increase monetary policy control in the presence of fixed exchange rates. Still, we find that increased monetary policy space does not seem to be the objective in Saudi Arabia. We thereby assume that these partial capital controls do not make the argument of a pegged exchange rate less valid, and the interest rate benefits are still considered irrelevant.

The betting against the Saudi riyal hints at the fact that financial stability could be a potential concern in an assessment of CBDC. From the data, we note that Saudi Arabia scores 4.63 on our financial stability measure, and therefore it is close to being categorized as having low financial stability. The UAE is also close to the limit, with a value of 4.66. This suggests that these two countries should be cautious in their approach to CBDC.

Given that the UAE and Saudi Arabia wish to maintain their pegged policies, the countries' exchange rate policies cancel out the monetary policy implications of a CBDC, and there are no considerations left that provide a clear indication to whether the UAE and Saudi Arabia should consider issuing a CBDC. We therefore remain inconclusive on these two countries, although we would like to emphasize that financial stability issues should be addressed if these countries are to consider issuing a CBDC.

In fact, according to Reuters, Saudi Arabia and the UAE are currently collaborating on issuing a common digital currency (Carvalho, 2017). However, the digital currency is only meant to be used by banks, facilitating more efficient cross-border transactions, and not by the general public. This has clearly been the focus of these countries' publications on CBDC, as the capital flows consideration is by far the most important in Saudi Arabia and the third most important in the UAE. However, wholesale CBDC is not within the scope of this thesis.

India

India is another country for which we cannot conclude whether they should consider issuing a CBDC. The country is not in the category of special interest for any of the framework considerations in our assessment. However, we note that although India is not considered a country with weak institutions, its 4.10 score on this property is only slightly above the limit. From this, we interpret that India might not have strong enough institutions to successfully issue a CBDC. The institutional challenges should be thoroughly assessed if India decides to consider issuing a CBDC. If not, the country might end up spending scarce resources on introducing a CBDC that never provides its potential benefits due to low acceptance. We remain inconclusive to whether India should consider issuing a CBDC, although we acknowledge that relatively low institutional credibility could pose challenges to an issuance.

From our textual analysis results, we find that the most important considerations in India differ somewhat from our framework considerations. More specifically, data availability and shadow economy are the most important considerations. Also, capital flows and IT security and privacy protection are among the eight most important considerations. The different focus in India might imply that our general framework is not a perfect fit, and had we included other considerations in our framework we might have been able to provide a conclusion for India. In practice, the Reserve Bank of India is researching a blockchain based CBDC (Reserve Bank of India, 2018).

Australia

Australia also scores neutrally on all relevant properties. This implies that there are no obvious arguments in favor or disfavor of CBDC, making it difficult to draw an unambiguous conclusion to whether Australia should consider issuing a CBDC. However, the country shares trends and characteristics with other countries in our sample that appear relevant to discuss. To start with, Australia suffered from the Financial Crisis to a much lesser extent than many

other advanced economies. In some ways, their experience resembles the Norwegian experience of the years after 2008. Compared to other industrialized economies, Australia and Norway experienced only a modest slowdown, followed by a relatively fast recovery due to both smart policies and good fortune (Bollard & Ng, 2012). Beneficial trade conditions with emerging countries in Asia, especially China, promoted growth fueled by massive exports of commodities.

Due to this experience, there is reason to believe that the interest rate development in Australia during the period of our data will differ from that of other industrialized countries that were more affected by the crisis. The cyclical effect of the Financial Crisis on interest rates has likely been more temporary in Australia compared to for example the eurozone, the US and Japan. While for these latter countries the monetary policy responses to the crisis have affected the interest rates for most of our data period, the underlying trend could potentially be more evident in the Australian interest rates. That underlying trend seems to be a development towards lower interest rate levels, possibly due to reasons explained in subsection 3.5.3. Considering this development, it appears difficult to argue that Australia should differ from the low-interest-rate group of countries in an assessment of CBDC.

In conclusion, the interest rate consideration of CBDC is likely to increase in importance to Australia, and thereby become an argument in favor of issuing a CBDC. Thus, we conclude that Australia should consider issuance of a CBDC. However, in our textual analysis results, we find that Australia has hardly focused on the interest rates consideration of CBDC this far. This consideration is only ranked as the eight most important. This could explain why the Australian central bank has currently rejected issuing a CBDC, pointing to the fact that the existing system works well (Eyers, 2018).

The Republic of Korea

For the Republic of Korea, we are also inconclusive about the attractiveness of a CBDC, due to neutral values on all properties. However, we note that policy rates have been lowered in recent years, tightening the monetary policy space. In our data, there appears to be a negative trend in the interest rate data of the Republic of Korea similar to that of other advanced economies. This trend increases the relevance of the interest rates consideration. We argue that the Republic of Korea should evaluate the attractiveness of the interest rate implications

of CBDC, while considering that their financial stability and institutional credibility are only in the middle range. Particularly, they score 4.57 on the financial stability measure, which is almost low enough to be categorized as having low financial stability. Due to the tradeoff between the interest rates and the financial stability considerations, we remain inconclusive to whether the Republic of Korea should consider issuing a CBDC.

We find that financial stability is in fact the most important consideration in the Republic of Korea. Also, The Bank of Korea has expressed opposition to the issuance of a CBDC, among other reasons due to its potential to destabilize the markets (Yoo-chul, 2018). However, according to our textual analysis results, the interest rate consideration of CBDC has not been assessed in the Korean publications. This consideration could make a CBDC more attractive to The Bank of Korea.

Malaysia

Malaysia also scores neutrally on all properties. However, Malaysia can be considered a newly industrialized economy, giving it a slightly different background for assessing an introduction of a CBDC compared to advanced economies. We note from our interest rate data that Malaysia does not seem to experience the same downward trend in interest rates as the advanced economies. This may be because the expected growth in Malaysia is still higher than that of the more developed countries, primarily because of continuous increase in private sector expenditure following from growth in wages and employment (Bank Negara Malaysia, 2018). Thus, we assume that the interest rate opportunities of CBDC are not as relevant to Malaysia today as in the advanced economies. As there are no evident reasons for why or why not Malaysia should consider issuing a CBDC, we remain inconclusive. Considering the results of the textual analysis, we note that our framework seems to fit well with the Malaysian ranking, as six of the framework considerations are among the top eight for Malaysia. Thus, our discussion and inconclusiveness are supported by the fact that the Malaysian central bank has not itself managed to conclude on the issue of CBDC (Ahmat & Bashir, 2018).

Chile

Chile is another country which properties give no indication of whether a CBDC should be considered. We note that policy rates have been lowered in recent years, but there is no evident trend in the Chilean interest rate data. Thus, the interest rate implications of a CBDC seem less attractive to Chile than to advanced countries. We argue that Chile should recognize that

their financial stability and institutional credibility are only in the middle range. However, we remain inconclusive about whether Chile should consider issuing a CBDC.

In the textual analysis results for Chile, the considerations of data availability and financial inclusion are among the top three. Given that these considerations are not included in our framework, they could have led us to conclude that Chile should consider issuing a CBDC, had we taken them into account. It does however seem like the Chilean central bank considers the benefits of increased data availability and financial inclusion to be too modest, as the bank has stated that an issuance of a CBDC is still many years away (Marcel, 2017).

The Bahamas and Marshall Islands

The final two countries we want to discuss are The Bahamas and Marshall Islands. These are both island countries that either use the U.S. dollar as legal tender or have a currency pegged to the U.S. dollar. We lack data for both these countries, which makes it hard to provide recommendations to whether they should consider issuing a CBDC. Still, we use the available data to identify which directions the assessments of CBDC would take in these countries.

For The Bahamas, we only have data on interest rates, exchange rate policies and CIC to GDP. All these properties have neutral values, and we therefore have no arguments in favor or disfavor of issuing a CBDC. To elaborate on the neutrality of the Bahamian exchange rate policies, this neutrality results from having a conventional peg against the U.S. dollar and at the same time exercising capital controls. Because of these capital controls, The Bahamas has monetary independence and is free to set interest rates as desired. In fact, we see that The Bahamas has had interest rates higher than the US, something that when the Bahamian dollar is pegged to the U.S. dollar, is possible through exercising capital controls.

Using the subindices from the World Economic Forum's GCI, we have not found data on institutional credibility or financial stability for The Bahamas. However, according to Schmid, Wright, Wenner, Bollers, Khadan, Smets, ... , Waithe (2018) from the Inter-American Development Bank, the Bahamians retain trust in most of their institutions. Nevertheless, they argue there to be some weaknesses in the quality of the Bahamian institutions, one of them being a lack of independence and transparency of the central bank. We have argued that central bank credibility is crucial for the issuance of a CBDC and we therefore recommend that The Bahamas should not consider issuing a CBDC.

In contradiction to our conclusion, The Bahamas has launched a pilot project on CBDC (Jamaica Observer, 2018). The main rationale for experimenting with a CBDC is to increase financial inclusion. Since the country consists of hundreds of islands, many experience poor access to financial services. In our textual analysis results, we find that geography is in fact by far the most important consideration in the Bahamian CBDC publications. Financial inclusion is also deemed relatively important, ranked sixth in the Bahamian results. However, since we consider institutional credibility to be a crucial factor in our CBDC assessment, taking these considerations into account would not have changed our conclusion. We still believe that The Bahamas should do a thorough assessment of its potential institutional challenges in issuing a CBDC, so that the country does not waste resources on issuing a currency that is not adopted.

There is also lack of available data for Marshall Islands. In our discussion, we will therefore focus on the consideration of exchange rate policies, for which we have data. Marshall Islands has used the U.S. dollar as legal tender since its independence in 1986 and has never had an own currency. In addition, the island state does not have a central bank. In recent years, the state has made efforts to attract foreign investment and establish an independent economy (U.S. Department of State, 2017). Still, the Marshallese economy is closely linked to the US, both in terms of trade and investment, and security and defense. In subsection 3.5.7, we found that a dollarized economy could be an argument in favor of issuing a CBDC, given an objective to de-dollarize the economy. If this is the case, and the aim of de-dollarization is accompanied by trusted institutions and financial stability, we would recommend Marshall Islands to consider issuing a CBDC. However, if they wish to maintain the current dollarized system, we become inconclusive. We note, however, that lacking data on all the other properties has narrowed our discussion, and that access to this data could improve the assessment of CBDC and affect our conclusion.

In the results from the textual analysis, it appears as if the focus in Marshall Islands has been slightly different than the focus in our general results. We find that only three of our framework considerations are among the top eight considerations in Marshall Islands. More specifically, institutional credibility is considered most important, followed by financial stability and geography. Thereafter GDP and consumption, unconventional policy tools, data availability, capital flows and shadow economy are the next most important. This different focus could promote contradiction between our discussion and their conclusion.

In February 2018, Reuters reported that Marshall Islands will issue its own sovereign cryptocurrency called SOV (Chavez-Dreyfuss, 2018). There appears to be no plans of de-dollarizing the economy, as the U.S. dollar still maintains its legal tender status. Nevertheless, the IMF has recommended that Marshall Islands should "seriously reconsider the issuance of the digital currency as legal tender" (IMF, 2018, p.7). They argue that the potential costs from economic, reputational, AML/CFT, and governance risks will be considerably larger than the potential revenue gains. Moreover, Marshall Islands is recommended to consider the macroeconomic and financial stability risks of introducing a decentralized CBDC in the absence of a monetary policy framework. Also, the authorities are made aware that by introducing the SOV, they will increase the risk of losing the last U.S. dollar correspondent banking relationship, which allows for transferring dollars in and out of the country. The authorities have confirmed that they will address the macroeconomic issues at a later stage, and that by taking into account all the necessary considerations it will likely take years to issue the SOV (IMF, 2018).

Summary of recommendations to country groups

To sum up, in this qualitative approach, we find that some groups of countries should consider issuing a CBDC while other groups of countries should not. We recommend that currency union members that are restricted from introducing their own currencies should not consider issuing a CBDC. This also applies to countries with weak institutions and low financial stability. In contrast, we recommend countries developing towards cashless societies or facing particularly low interest rate levels to consider issuance of a CBDC. For countries not included in these country groups, we have mostly not been able to provide recommendations by applying our framework. A general finding in our qualitative approach is that we typically recommend developed countries to consider CBDC, while the developing countries are recommended to be cautious in their approach.

4.4.2 Country recommendations based on CBDC scores

In this subsection, we present and discuss the results of the second approach to the assessment, specifically the quantitative approach. The outcome of this approach is a list of all the countries in our sample together with their calculated CBDC scores. The CBDC scores are ranging from -0.3959 to 1.1034. A higher CBDC score means that the country is more likely to find a CBDC

issuance beneficial, and we argue that the countries with the highest scores should consider issuing a CBDC, while the countries with the lowest scores should not consider issuance. The results from the quantitative approach can be found in Table 10, together with our conclusions from the qualitative part of the assessment. In accordance to our general finding from the qualitative approach, we observe that the countries with the highest CBDC scores are developed countries, while those with lower CBDC scores are typically developing countries.

RANK	COUNTRY	CBDC SCORE	CONCLUSION FROM QUALITATIVE APPROACH
1	New Zealand	1.1034	Should consider issuing a CBDC
2	Sweden	1.0123	Should consider issuing a CBDC
3	Norway	0.9994	Should consider issuing a CBDC
4	Canada	0.9521	Should consider issuing a CBDC
5	Australia	0.9509	Should consider issuing a CBDC
6	United Kingdom	0.8581	Should consider issuing a CBDC
7	Denmark	0.7505	Inconclusive
8	Israel	0.7182	Should consider issuing a CBDC
9	Singapore	0.6878	Inconclusive
10	Malaysia	0.6858	Inconclusive
11	Switzerland	0.6828	Should consider issuing a CBDC
12	United States	0.6717	Should consider issuing a CBDC
13	Chile	0.5796	Inconclusive
14	United Arab Emirates	0.4808	Inconclusive
15	Republic of Korea	0.4479	Inconclusive
16	Saudi Arabia	0.3971	Inconclusive
17	Uruguay	0.3948	Should not consider issuing a CBDC
18	Hong Kong	03853	Inconclusive
19	Finland	0.3649	Should not consider issuing a CBDC
20	India	0.2756	Inconclusive

21	China	0.2654	Should not consider issuing a CBDC
22	Thailand	0.2647	Should not consider issuing a CBDC
23	Japan	0.2428	Should consider issuing a CBDC
24	Germany	0.1469	Should not consider issuing a CBDC
25	Netherlands	0.1386	Should not consider issuing a CBDC
26	Malta	0.1108	Should not consider issuing a CBDC
27	France	0.1071	Should not consider issuing a CBDC
28	Estonia	0.0986	Should not consider issuing a CBDC
29	Tunisia	0.0318	Should not consider issuing a CBDC
30	Spain	−0.0991	Should not consider issuing a CBDC
31	Russia	−0.1782	Should not consider issuing a CBDC
32	Senegal	−0.2529	Should not consider issuing a CBDC
33	Italy	−0.3162	Should not consider issuing a CBDC
34	Ukraine	−0.3959	Should not consider issuing a CBDC
35	The Bahamas	N/A	Should not consider issuing a CBDC
36	Ecuador	N/A	Should not consider issuing a CBDC
37	Iran	N/A	Should not consider issuing a CBDC
38	Marshall Islands	N/A	Inconclusive
39	Taiwan	N/A	Should consider issuing a CBDC
40	Venezuela	N/A	Should not consider issuing a CBDC

Table 10: Results from quantitative approach compared to recommendations from qualitative approach. Country scores represent attractiveness of issuing a CBDC. Scores are not calculated for countries with lacking data.

In Table 10, we see that most of the countries we have recommended to consider issuing a CBDC in the qualitative approach also get high scores in the quantitative approach. The six countries with the highest CBDC scores, New Zealand, Sweden, Norway, Canada, Australia and the UK, are all countries we have argued should consider issuing a CBDC. The countries that are developing towards cashless societies are the ones with the highest CBDC scores. This

is partly because the cashless society consideration is most important in our textual analysis, thereby obtaining a large weight in calculating the CBDC scores. In addition, these countries have quite low interest rates, increasing the CBDC score, which also applies to the next three countries on the list. We see that the top six countries are highly developed countries.

Three of the other countries that we have recommended to consider issuance of a CBDC, Israel, Switzerland, and the US, also have quite high CBDC scores, ranking among the top 12 countries. These countries are deemed developed countries as well, like the top six countries. The main reason why these countries have somewhat lower scores and therefore lower rankings than the top six countries is that they have higher levels of CIC to GDP. They are therefore further away from becoming cashless societies. This applies especially to Switzerland. For the US and Israel, another reason why they are not ranked among the top six is that they score lower on institutional credibility. Nevertheless, Israel, Switzerland and the US all have relatively high CBDC scores. Our recommendations for these countries therefore remain.

Japan stands out with an especially low score compared to the other countries we have argued should consider issuing a CBDC. The score of Japan is 0.2428 and the rank is 23. One reason for this is that the country has a relatively low degree of financial stability. An even more important reason is that Japan is the country in our sample with the highest level of CIC to GDP. As this measure has the highest weight in calculating the CBDC score, this has a large negative effect on the score of Japan, implying that a CBDC is less attractive. In fact, head of the FinTech Centre at the Bank of Japan, Yuko Kawai, argues that Japanese people do not need a digital currency because they love cash so much (Bloomberg, 2018). Bank of Japan's deputy governor Masayoshi Amamiya claims that a CBDC will not be an effective economic tool because of Japan's large cash holdings (Partz, 2018). He assumes that for a CBDC to enable negative interest rates, which is a commonly used argument for issuing a CBDC, cash would have to be removed from society. With Japan being the country in our sample with the lowest interest rates, this country could have clear benefits of breaking through the zero-lower bound. This is the reason why we argued that Japan should consider issuing a CBDC in our qualitative discussion. In contrast to Amamiya, we argue that with the right design, a CBDC could facilitate negative interest rates even though cash holdings are large. Therefore, we still argue that Japan could benefit from issuing a CBDC, despite its low CBDC score.

Countries that have quite high CBDC scores, but which we have not recommended to consider issuing a CBDC, are Denmark, Singapore and Malaysia. All these countries have higher CBDC scores than Switzerland and the US, which are countries that we have recommended to consider issuing a CBDC. It is therefore interesting to further assess why these countries have obtained such high CBDC scores.

Denmark and Singapore are two countries that we are inconclusive about in our qualitative approach, but which get quite high CBDC scores in the quantitative approach. The reason why we have no recommendations for these countries is that they have pegged exchange rates and no capital controls, and thereby lack monetary policy independence. Hence, the interest rate argument for issuing CBDC is irrelevant. The exchange rate policies consideration has a relatively low term frequency compared to the other considerations, and it therefore gets a low weight in calculating the CBDC score. At the same time, these countries have high normalized values on the interest rate measure, a consideration with much weight. This contributes to the relatively high CBDC scores of Denmark and Singapore. Further on, these countries score well on the institutional credibility and financial stability considerations, properties that would have pulled the CBDC scores down if not. Nevertheless, because the interest rate consideration is irrelevant for countries without monetary independence, we are still inconclusive as to whether Denmark and Singapore should consider issuing a CBDC.

Malaysia also has a quite high CBDC score in the quantitative approach, despite us being inconclusive to whether Malaysia should consider issuing a CBDC. The reason why Malaysia gets a high CBDC score is that even though all the country properties are neutral, Malaysia has quite low interest rates and high financial stability. These considerations are among the three most important, and thereby have large weights when calculating the CBDC score. This results in a quite high score for Malaysia. However, we found in our qualitative discussion that Malaysia does not have a downward trend in interest rates in our data period, and we expect interest rates to remain at higher levels than in more advanced countries for at least some time. Moreover, high financial stability is not an argument in favor of CBDC. We therefore remain inconclusive about whether Malaysia should consider issuing CBDC.

Table 10 further shows that the results from the quantitative approach generally also comply with the results from the qualitative approach with respect to which countries should not

consider issuing a CBDC. Except from Hong Kong, India and Japan, all the countries with ranks from 18 and down are recommended not to consider issuing a CBDC in our qualitative discussion. The low scores of these countries in the quantitative approach supports our recommendations. We note that there are no clear patterns in which of the groups of countries recommended not to consider CBDC that get the lowest scores.

In the middle range of Table 10, we find many of the countries we were inconclusive about in the qualitative approach. These include Chile, the UAE, the Republic of Korea and Saudi Arabia. These countries have scores that are neither in the upper nor the lower range, supporting the inconclusiveness of whether they should consider issuing a CBDC. We were also inconclusive about Hong Kong and India in the qualitative discussion. Despite these countries ranking among countries that we have recommended not to consider issuing CBDC, this is just barely the case, with only two such countries ranking above them. We therefore consider Hong Kong and India as having scores in the middle range, which supports our inconclusiveness.

An interesting result from the quantitative analysis is that Senegal, which is one of the few countries that have already introduced a CBDC, gets one of the lowest scores. This implies that Senegal is especially poorly suited for issuing a CBDC. One reason for Senegal's very low score is that it is part of a currency union. We have established that being part of a currency union is among the most crucial reasons for not issuing a CBDC, as these countries typically are not allowed to issue their own currencies. Senegal, however, has been allowed to issue a CBDC, as we elaborated on in subsection 4.4.1. This might imply that Senegal's score is lower than warranted. Because the eCFA is pegged to the CFA franc, monetary policy independence is nevertheless lost, and the interest rate consideration is cancelled out. In addition, Senegal scores low on financial stability and institutional credibility, which implies that Senegal should be careful in issuing a CBDC. There is no sign of the Senegalese CBDC succeeding, and our conclusion that Senegal should not issue a CBDC remains.

Another interesting result from the CBDC scores is that Ukraine, which is positive to a CBDC issuance, gets the lowest score. An important reason why this country wants to introduce CBDC is that it can reduce costs and delays of transactions. The costs consideration is proven important in our textual analysis, but we have not considered costs in our recommendations

due to lack of relevant and comparable data. Had we included this consideration, it could have been that Ukraine would have gotten a higher score and that our recommendation would change. This could also apply to the other countries in our sample.

In sum, we see that we obtain mostly the same results using the quantitative approach to the CBDC assessment, as when we apply the qualitative approach. Thus, our results and conclusions are supported. There are some countries for which the CBDC scores do not fully comply with what we conclude in the qualitative discussion, but when studying these instances, we find that the scores can be explained, and there are no changes in our conclusions. We are aware that both the qualitative and the quantitative approach build on the same considerations and the same data foundation, so that limitations to these inputs will give less reliable results for both approaches.

4.4.3 Comparison of recommendations with practice

In the second main part of our thesis, we have provided recommendations to which countries should and should not consider issuing a CBDC taking both a qualitative and a quantitative approach to this assessment. These approaches have utilized the results from the first main part of the thesis, in which we found the most important considerations in assessing the implications of CBDC by use of textual analysis. We believe that the recommendations provided in this part could also hold for other countries with similar properties, making our analysis a general framework for country level assessment of CBDC. Table 11 presents a summary of our recommendations, together with information about what the countries' central banks have concluded themselves. For countries where our recommendations contradict with the countries' own conclusions, we present comments from the central bank statements that describe the basis for their conclusions. Comments for all countries can be found in Table A.25 in the appendix.

COUNTRY	OUR CONCLUSION	THEIR CONCLUSION	COUNTRY COMMENTS
NEW ZEALAND	Should consider CBDC	Currently rejected	Unclear whether CBDC will bring conclusive benefits. Increases likelihood of bank runs.
SWEDEN	Should consider CBDC	Starts pilot project next year	
NORWAY	Should consider CBDC	Researching	
CANADA	Should consider CBDC	Currently rejected, but researching	Do not recommend issuing a CBDC unless risks can be managed through design.
AUSTRALIA	Should consider CBDC	Currently rejected, but researching	Existing payment systems work well.
UNITED KINGDOM	Should consider CBDC	Currently rejected, but researching	Could have wide-ranging implications for monetary policy and financial stability.
DENMARK	Inconclusive	Rejected	
ISRAEL	Should consider CBDC	Currently rejected	Many material and technological difficulties and risks of CBDC issuance.
SINGAPORE	Inconclusive	Currently rejected	
MALAYSIA	Inconclusive	Researching	
SWITZERLAND	Should consider CBDC	Currently rejected	Concerned about impact on financial stability and monetary policy.
UNITED STATES	Should consider CBDC	Currently rejected, but researching	Banking system is sufficiently efficient and innovative, and there is no decline in cash demand
CHILE	Inconclusive	Currently rejected	
UNITED ARAB EMIRATES	Inconclusive	Researching	
REPUBLIC OF KOREA	Inconclusive	Rejected	
SAUDI ARABIA	Inconclusive	Researching	
URUGUAY	Should not consider CBDC	Presented plan to issue pilot project	Reduce costs, as cash handling is expensive.
HONG KONG	Inconclusive	Currently rejected	

FINLAND	Should not consider CBDC	Researching	
INDIA	Inconclusive	Researching	
CHINA	Should not consider CBDC	Researching	
THAILAND	Should not consider CBDC	Currently rejected	
JAPAN	Should consider CBDC	Rejected	Unlikely to improve existing monetary systems. Assume that cash must be abolished to implement negative interest rates, which is currently not an option.
GERMANY	Should not consider CBDC	Currently rejected	
NETHERLANDS	Should not consider CBDC	Currently rejected, but researching	
MALTA	Should not consider CBDC	No central bank statements	
FRANCE	Should not consider CBDC	Researching	
ESTONIA	Should not consider CBDC	Rejected	
TUNISIA	Should not consider CBDC	Introduced CBDC	CBDC is a more competitive currency that eases transactions and reduces fees.
SPAIN	Should not consider CBDC	Currently rejected, but researching	
RUSSIA	Should not consider CBDC	Researching	
SENEGAL	Should not consider CBDC	Introduced CBDC	CBDC promotes financial inclusion.
ITALY	Should not consider CBDC	Currently rejected	
UKRAINE	Should not consider CBDC	Researching, positive	Step towards a cashless society. CBDC reduces costs and time of transactions.
THE BAHAMAS	Should not consider issuing CBDC	Launching pilot project	CBDC promotes financial inclusion.
ECUADOR	Should not consider CBDC	Introduced CBDC, later abolished	See section 4.4.1

IRAN	Should not consider CBDC	Will issue	Issues CBDC to avoid U.S. sanctions.
MARSHALL ISLANDS	Inconclusive	Introduced CBDC	
TAIWAN	Should consider CBDC	Currently rejected	Assumes CBDC to be a cryptocurrency, which does currently not work as a means of payment.
VENEZUELA	Should not consider CBDC	Introduced CBDC	Help increase the income of the workers. CBDC easies international trade.

Table 11: Our recommendations together with countries' own conclusions, ordered by CBDC score.

From Table 11, we see that countries often disagree with our recommendations. Many of the developed countries that we have recommended to consider issuing a CBDC have currently rejected this form of currency. They typically explain this with CBDC posing too many risks to the financial systems, or with that a CBDC will not improve the existing payment systems. However, most of these countries are still researching the concept of CBDC and have not ruled out that a CBDC with an appropriate design might be introduced in the future. Those countries that have issued CBDC or are positive to CBDC are typically developing countries, which we have recommended not to consider issuing a CBDC. Typical explanations used by these countries are that a CBDC will decrease transaction costs or increase financial inclusion. Nevertheless, we have seen that countries that have jumped at CBDC without thoroughly researching its implications do not seem to be successful in doing this. In the first main part, subsection 3.3.2, we hypothesized that the opinions of developing countries would deviate more from our recommendations than those of developed countries, due to a less optimal fit with our general framework considerations. We do however see from Table 11 that there are no clear patterns supporting this, as both developed and developing countries have made statements contradicting with our recommendations.

It is instructive to highlight that only five considerations have been used and discussed in our country assessment. In our textual analysis, we also found three other considerations to be relatively important when assessing the implications of CBDC: technological development, shadow economy concerns, and costs related to operating and establishing a CBDC system. We recommend that countries should take such considerations into account when assessing the attractiveness of a CBDC. Especially, we recommend countries to evaluate how a CBDC

might impact costs, as cost reductions is a frequently used argument for issuing a CBDC. Taking such concerns into account might affect the countries' conclusions.

4.5 Potential Domino Effects

We end the second main part of the thesis with a discussion of potential domino effects that might arise if one country successfully issues a CBDC. A limitation of our assessment is that it is based on the current situation, in which only a few countries have introduced CBDC. The attractiveness of issuing a CBDC might change if another country is successful at issuing such a currency. This seems particularly likely if a large, influential economy issues a CBDC that achieves widespread adoption. In this event, our recommendations may no longer hold.

First, in section 3.5.6, we found that a CBDC reduces the number of service providers needed for cross-border transactions, especially if both countries have introduced CBDCs. Trade across countries can thereby be conducted more easily and to a lower cost. We thus argue that countries trading with each other are likely to have greater benefits of issuing a CBDC if their trading partners have successfully issued a CBDC. We argue that especially trade intensive countries will be able to achieve cost advantages of following its trading partners' issuance of a CBDC.

Second, for small open economies that must follow other countries' interest rates to avoid appreciation, introduction of CBDCs in these other countries could affect the attractiveness of a CBDC. Specifically, if other countries introduce CBDCs to set negative interest rates, small open economies could potentially be forced to issue CBDCs as well, to allow for negative interest rates and avoid appreciation. Not doing so might weaken their competitiveness.

Third, introduction of foreign CBDCs could potentially increase the risk of dollarization in unstable economies. A foreign CBDC is likely to be perceived as a less risky alternative compared to the currency of an unstable economy and will be easier to access than foreign cash. Thus, a minor loss in confidence in the central bank could lead to the abandonment of the domestic currency in favor of foreign CBDCs (Grym et al., 2017). The increased risk of dollarization that follows from other countries implementing CBDCs could lead to unstable economies also issuing CBDCs.

It might not always hold that issuance of a CBDC in one country causes a domino effect in which other countries also issue CBDCs. If the first country to issue a CBDC is one with low financial stability or institutions that cannot be trusted, it is unlikely that this CBDC will gain any popularity, neither among its own inhabitants nor among other countries. In this case, it is unlikely that other countries will follow suit. The Ecuador case is a good example of this. Ecuador is a country with both low financial stability and low institutional credibility. The dinero electrónico failed to gain popularity, making the CBDC introduction unsuccessful. In this case, there was no country that followed suit and introduced its own CBDC because of the Ecuadorian issuance.

5. Conclusion

The emergence of private cryptocurrencies has provoked a discussion of whether central banks should issue their own digital currencies, and what the implications of this would be. In this thesis, we identify the most important considerations in an assessment of the implications of CBDC and create a general framework for future assessments. Applying our framework, we recommend which countries should and should not consider issuing a CBDC.

We find eight considerations to be most important based on textual analysis of global publications on CBDC. These considerations are developments towards cashless societies, financial stability, interest rates, technological development, shadow economies, costs, exchange rate policies and institutional credibility. We find that there are differences between developed and developing countries in which considerations are considered most important. Also, there are differences within country classes, implying that a country level assessment of CBDC should consider country specific conditions in addition to the general framework.

In general, we find that developing countries should not consider issuing a CBDC, while developed countries should. We find that countries with weak institutions and low financial stability should not consider issuing a CBDC, as they are relatively unlikely to get acceptance by the public and more likely to experience adverse effects on the financial system. Further, we find that countries facing particularly low interest rates or developments towards cashless societies should consider issuing a CBDC, given that they are not restricted from issuing their own currencies through membership in a currency union. Although our recommendations are in accordance with theory and are based on both a qualitative and a quantitative approach, we find that they contradict with current practice. Today's adopters of CBDC are typically developing countries, whereas developed countries are more cautious in their approach to CBDC. We suggest that introduction of CBDC should not be rushed and must be based on a thorough assessment of the relevant implications, to avoid destabilizing the financial system without obtaining significant benefits.

We hope that our work can provide a framework for future assessments of CBDC and contribute to an increased international effort. Further research could aim at improving the framework by allowing for inclusion of additional considerations depending on country characteristics. Also, a similar framework could be developed for wholesale CBDC.

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Appendix

	TEXTS	SHARE OF BIGRAMS CENTRAL BANK	SHARE OF BIGRAMS WEB ARTICLES
AUSTRALIA	4	66.6%	33.4%
CANADA	8	92.2%	7.8%
CHILE	3	0.0%	100.0%
CHINA	6	0.0%	100.0%
DENMARK	14	76.5%	23.5%
ECUADOR	9	0.0%	100.0%
ESTONIA	7	0.0%	100.0%
FINLAND	2	97.0%	3.0%
FRANCE	1	100.0%	0.0%
GERMANY	5	0.0%	100.0%
HONG KONG	5	43.1%	56.9%
INDIA	6	0.0%	100.0%
IRAN	4	0.0%	100.0%
ISRAEL	5	0.0%	100.0%
ITALY	10	61.4%	38.6%
JAPAN	9	0.0%	100.0%
MALAYSIA	3	78.8%	21.2%
MALTA	2	0.0%	100.0%
MARSHALL ISLANDS	13	0.0%	100.0%
NETHERLANDS	4	0.0%	100.0%
NEW ZEALAND	3	100.0%	0.0%
NORWAY	21	72.3%	27.7%
REPUBLIC OF KOREA	8	0.0%	100.0%

RUSSIA	6	0.0%	100.0%
SAUDI ARABIA	7	0.0%	100.0%
SENEGAL	11	0.0%	100.0%
SINGAPORE	3	0.0%	100.0%
SPAIN	7	45.1%	54.9%
SWEDEN	13	68.7%	31.3%
SWITZERLAND	4	0.0%	100.0%
TAIWAN	2	0.0%	100.0%
THAILAND	10	0.0%	100.0%
THE BAHAMAS	5	0.0%	100.0%
TUNISIA	7	0.0%	100.0%
UKRAINE	5	0.0%	100.0%
UNITED ARAB EMIRATES	4	0.0%	100.0%
UNITED KINGDOM	8	95.6%	4.4%
UNITED STATES	11	24.8%	75.2%
URUGUAY	6	0.0%	100.0%
VENEZUELA	10	0.0%	100.0%

Table A.1: Number of texts by country, in addition to share of bigrams from central bank papers and share of bigrams from web articles.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
cashless society	0,000323011	enabling cashless	2,12644E-05	bankes cash	9,28445E-06
cash usage	0,000293188	payments cash	2,10891E-05	cash offered	9,28445E-06
cash transactions	0,000277653	cash increased	2,0389E-05	cash operations	9,28445E-06
cash payments	0,000271695	cash production	1,92201E-05	cash reserves	9,28445E-06
replace cash	0,000173633	cashless future	1,83542E-05	cash held	8,99609E-06
cash demand	0,000154782	payment cash	1,80023E-05	cash decline	8,54599E-06
use cash	0,000128297	uses cash	1,78289E-05	increase cash	8,49322E-06
cash withdrawals	0,000106599	cash dependency	1,75722E-05	cash less	8,30483E-06
cash transacting	9,49037E-05	cash utilisation	1,75722E-05	accepting cash	8,09889E-06
cash use	8,75974E-05	cashless living	1,75722E-05	eccashless societyed	7,90288E-06
cashless payments	7,89974E-05	cashless payment	1,75722E-05	full cashless	7,50856E-06
without cash	7,71994E-05	towards cashlessness	1,75722E-05	eliminating cash	7,49009E-06
using cash	7,56614E-05	using cashless	1,75722E-05	use cashed	7,49009E-06
supplement cash	7,04358E-05	banknotes cash	1,63803E-05	bankse cash	7,44774E-06
cashless retail	6,72837E-05	cash dying	1,63803E-05	cash transfer	7,33321E-06
noncash payments	6,70801E-05	cash holding	1,63803E-05	abandoning cash	6,99964E-06
cash payment	5,66033E-05	cash remains	1,63803E-05	almost cashless	6,99964E-06
accept cash	5,12312E-05	disrupt cash	1,63803E-05	cashless bank	6,99964E-06
cash provides	4,86345E-05	noncash transaction	1,63803E-05	diminishing cash	6,8574E-06
holding cash	4,63092E-05	noncash usage	1,63803E-05	cash disappeared	6,74509E-06
cashloving populace	4,60193E-05	noncash usages	1,63803E-05	issues cash	6,74509E-06
eccashless economyed	4,2715E-05	noncash withdrawals	1,63803E-05	reduces cash	6,74509E-06
noncash settlementsed	4,2715E-05	replenishing cash	1,63803E-05	withdrawals cash	6,74509E-06
promoting cashless	4,2715E-05	withdrawals noncash	1,63803E-05	withdrawing cash	6,09265E-06
reduced cash	3,95536E-05	abolishing cash	1,56222E-05	cash draining	1,59518E-06
noncash transactions	3,87571E-05	cash available	1,55056E-05	cash withdrawal	1,59518E-06
cash circulation	3,83766E-05	cash used	1,55056E-05	demand cash	5,69732E-06
falling cash	3,81694E-05	issued cash	1,55056E-05	offer cash	5,34536E-06
cash services	3,59807E-05	avoiding cash	1,47551E-05	cash circulated	4,9934E-06
cash supply	3,48751E-05	go cashless	1,4415E-05	cash growth	4,9934E-06
replacing cash	3,03025E-05	substituting cash	1,42778E-05	created cash	4,9934E-06
less cash	3,38466E-05	removing cash	1,42352E-05	becoming cashfree	4,80501E-06
cash shortages	3,27826E-05	eliminate cash	1,38913E-05	cash printing	4,80501E-06
encouraging cashless	3,27826E-05	noncash payment	1,38345E-05	cash transitioning	4,80501E-06
cash money	3,21104E-05	cash disappear	1,34902E-05	circulating cash	4,80501E-06
issue cash	3,16714E-05	cash falls	1,34902E-05	coin cash	4,80501E-06
supplying cash	3,03318E-05	cash notes	1,34902E-05	going cashless	4,80501E-06
cash declines	2,88138E-05	coins cash	1,34902E-05	paying cash	4,80501E-06
cash distribution	2,66961E-05	cash provider	1,3416E-05	abolish cash	4,00874E-06
cash holdings	2,20803E-05	abolished cash	1,28912E-05	bringing cash	4,00874E-06
tocaa cashless	2,59747E-05	supply cash	1,2697E-05	cash disappears	4,00874E-06
lesscash economy	2,45622E-05	cashless world	1,20262E-05	cash owners	4,00874E-06
handling cash	2,43688E-05	hold cash	1,14565E-05	cashless one	4,00874E-06
carry cash	2,36996E-05	decreased cash	1,04995E-05	cashless scenario	4,00874E-06
prefer cash	2,31996E-05	paper cash	1,04904E-05	circulation cash	4,00874E-06
declining cash	2,30693E-05	cashless economy	1,03572E-05	denomination cash	4,00874E-06
cash users	2,17679E-05	provide cash	1,03572E-05	eccashlessed society	4,00874E-06
remove cash	2,15077E-05	cashonly scheme	9,98679E-06	limiting cash	4,00874E-06
cashless transactions	2,12644E-05	cash buying	9,61003E-06	owning cash	4,00874E-06

Table A.2: Bigrams for cashless societies consideration, part 1.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
cash pay	1,09925E-06	accept banknotes	3,49982E-06	online payment	3,41136E-05
cash withdrawn	1,09925E-06	need notes	3,49982E-06	online transferwise	2,13575E-05
create cash	1,09925E-06	provide banknotes	2,84866E-06	transfers online	1,97013E-05
offer cashlike	1,09925E-06	reserves notes	2,84866E-06	usages online	1,63803E-05
physical banknotes	0,00017706	using notes	2,84866E-06	increasingly online	1,55056E-05
replacing notes	9,49037E-05	currency banknotes	2,4967E-06	transactions online	1,55056E-05
currency notes	6,45623E-05	note distribution	2,4967E-06	online marketplace	1,2362E-05
reserves banknotes	4,0482E-05	note production	2,4967E-06	online stores	1,2362E-05
paper banknotes	3,53106E-05	note supply	2,4967E-06	payments online	1,17811E-05
notes issuance	3,27826E-05	notes access	2,4967E-06	online purchases	8,19402E-06
cash banknotes	2,12644E-05	notes declined	2,4967E-06	online sales	5,39846E-06
banknotes issued	2,06009E-05	notes decreases	2,4967E-06	online commerce	4,00874E-06
issue banknotes	1,92024E-05	notes falls	2,4967E-06	avoid online	2,4967E-06
issues banknotes	1,86507E-05	notes outstandingein	2,4967E-06	online merchants	2,4967E-06
banknotes offering	1,77384E-05	note issue	2,19851E-06	online spending	2,4967E-06
holding banknotes	1,77384E-05	currencies note	1,09925E-06	online transfers	2,4967E-06
transactions banknotes	1,77384E-05	issued notes	1,09925E-06	selling online	2,4967E-06
using banknotes	1,77384E-05	note issued	1,09925E-06	use online	2,4967E-06
replace banknotesed	1,75722E-05	paper banknote	1,09925E-06	**Sum frequencies**	**0,65 %**
supplying banknotes	1,75722E-05	spend note	1,09925E-06		
existing banknotes	1,74247E-05	need cash	2,04209E-05		
banknote payments	1,55056E-05	needs cash	4,00874E-06		
banknote production	1,55056E-05	cash needs	1,09925E-06		
circulate banknote	1,46664E-05	using atms	4,00874E-06		
physical notes	1,4063E-05	atm cash	1,09925E-06		
bankissued notes	1,34902E-05	atm users	1,09925E-06		
obtain banknotes	1,3416E-05	use atm	1,09925E-06		
issue notes	9,70607E-06	card payments	0,000330174		
issuing banknotes	7,50856E-06	card transactions	6,79059E-05		
notes issued	7,1919E-06	card payment	4,82392E-05		
use banknotes	6,99964E-06	cardnotpresent transactions	1,77384E-05		
providing banknotes	6,74509E-06	card usages	1,63803E-05		
reserve notes	6,50544E-06	card purchases	1,55056E-05		
note issuance	4,9934E-06	cards using	1,3416E-05		
notes outstanding	4,9934E-06	accepting cards	9,28445E-06		
circulation banknotes	4,80501E-06	cardbased payment	8,30483E-06		
note physical	4,80501E-06	card usage	5,69732E-06		
abolishing banknotes	4,00874E-06	card use	4,80501E-06		
banknote cancellation	4,00874E-06	cardbased payments	4,80501E-06		
banknote usage	4,00874E-06	card customers	4,00874E-06		
banknote users	4,00874E-06	cards access	4,00874E-06		
banning notes	4,00874E-06	accept card	3,49982E-06		
existing notes	4,00874E-06	cards payment	2,90949E-06		
issueetangible banknotes	4,00874E-06	card transaction	2,4967E-06		
issuing notes	4,00874E-06	cardseare reducing	2,4967E-06		
need banknotes	4,00874E-06	card users	2,19851E-06		
note issues	4,00874E-06	online payments	7,02257E-05		
note removal	4,00874E-06	online shopping	5,16546E-05		
notes circulated	4,00874E-06	online transactions	3,45403E-05		

Table A.3: Bigrams for cashless societies consideration, part 2.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
money flows	2,01536E-05	significant transfers	1,09925E-06	transparent crossborder	2,92099E-05
severe flow	1,34902E-05	financial receivables	2,84866E-06	crossborder transaction	2,69804E-05
money flow	7,33321E-06	capital movements	2,40251E-05	across borders	2,61295E-05
capital flows	1,59518E-06	free movement	7,65367E-06	banks crossborder	2,45622E-05
net flows	3,29776E-06	costlessly move	1,59518E-06	changeca crossborder	2,45622E-05
flows across	2,90949E-06	moves abroad	4,80501E-06	crossborder panic	2,45622E-05
easily flow	2,4967E-06	exchange trade	1,09925E-06	border payments	2,12644E-05
large flows	1,09925E-06	facilitate trade	1,09925E-06	crossborder scope	2,09809E-05
larger flows	1,09925E-06	trade balance	1,09925E-06	growing crossborder	2,09809E-05
net flow	1,09925E-06	capital flight	4,93854E-05	crossborder funds	1,7372E-05
reserves flowing	1,09925E-06	capital flightcaby	4,20521E-05	crossborder fixed	1,63803E-05
significant flow	1,09925E-06	financial position	1,09925E-06	crossborder paymentsed	1,47551E-05
current accounts	0,000101509	free flights	5,69732E-06	possibly crossborder	1,47551E-05
current account	9,4123E-05	large movements	3,49982E-06	border transactions	6,74509E-06
currentaccount deposits	1,4415E-05	risks volatility	5,39846E-06	crossborder settlement	6,74509E-06
currentaccount deficit	7,33321E-06	increased volatility	4,9934E-06	currency crossborder	6,74509E-06
currently crossborder	6,74509E-06	additional volatility	4,00874E-06	improve crossborder	6,74509E-06
assets currentaccount	4,80501E-06	financial volatility	2,4967E-06	payments crossborder	6,74509E-06
comprise currentaccount	4,80501E-06	deficit imports	1,97013E-05	provide crossborder	6,74509E-06
comprising currentaccount	4,80501E-06	importing goods	1,97013E-05	borders instantaneously	4,80501E-06
currentaccount balance	4,80501E-06	imported goods	1,2362E-05	transactions crossborder	2,90949E-06
deposit currentaccount	4,80501E-06	existing import	5,39846E-06	consider crossborder	2,4967E-06
reserve currentaccount	4,80501E-06	iranes exporters	4,20521E-05	crossborder issues	2,4967E-06
net financial	2,84866E-06	domestic exports	1,97013E-05	make crossborder	2,4967E-06
borderless account	2,13575E-05	eg exports	1,47551E-05	crossborder financial	1,09925E-06
national accounts	1,61954E-05	crossborder transactions	0,000358654	safe haven	2,89526E-05
national account	1,07969E-05	crossborder payments	0,000111331	tax haven	1,07969E-05
crossborder transfer	6,55652E-05	current crossborder	6,55652E-05	tax havened	5,39846E-06
international transfers	3,43153E-05	facilitate crossborder	5,84197E-05	esafe havene	1,09925E-06
crossborder transfers	2,45622E-05	new borderless	4,2715E-05	haven currency	1,09925E-06
remotely transfer	2,44834E-05	crossborder payment	3,00372E-05	havene flows	1,09925E-06
easily transferred	2,11644E-05	crossborder deals	2,92099E-05	foreign exchange	0,000159009
transferred across	1,63503E-05	crossborder transactionscafor	2,92099E-05	exchange rate	0,000356862
currency transfer	1,37954E-05	ease crossborder	2,92099E-05	exchange rates	2,57081E-05
transfer easily	4,00874E-06	instant crossborder	2,92099E-05	ecexchange rateed	2,84866E-06
quickly transferred	2,90949E-06	instantaneous crossborder	2,92099E-05	**Sum frequencies**	**0,26 %**
international transfer	2,4967E-06	transform crossborder	2,92099E-05		

Table A:4: Bigrams for capital flows consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
direct competition	2,17471E-05	increased consolidation	1,74991E-05
increased competition	2,13345E-05	consolidation efforts	1,61954E-05
great competition	2,09809E-05	relatively unconsolidated	1,37954E-05
competition threat	1,50112E-05	unconsolidated technology	1,37954E-05
currency competition	2,1427E-05	consolidated among	1,04995E-05
greater competition	1,20946E-05	consolidated act	9,61003E-06
main competition	1,47551E-05	increasing consolidation	6,99964E-06
open competition	1,46664E-05	high consolidation	3,49982E-06
additional competition	8,34027E-06	increasingly consolidated	3,49982E-06
strong competition	9,28445E-06	phase consolidation	3,49982E-06
competition among	7,24568E-06	merged together	1,28912E-05
reduce competition	6,8574E-06	bargaining power	4,9934E-06
intensified competition	5,69732E-06	emerging rivalry	3,49982E-06
increase competition	3,94792E-06	monopoly powers	1,75722E-05
benefit competition	3,49982E-06	monopolize money	1,63803E-05
alter competition	2,84866E-06	statutory monopolist	1,46664E-05
banks competition	2,84866E-06	bank monopoly	1,28912E-05
facilitates competition	2,84866E-06	monopoly issuer	6,50544E-06
intensify competition	2,84866E-06	monopoly supplier	4,9934E-06
promoting competition	2,84866E-06	ultimate monopoly	4,9934E-06
restricting competition	2,84866E-06	monopolylike conditions	4,80501E-06
sustain competition	2,84866E-06	electrcbnico monopoly	4,00874E-06
cbdc competition	2,4967E-06	bankes monopoly	1,09925E-06
competition level	2,4967E-06	monopoly competitive	1,09925E-06
current competition	2,4967E-06	monopoly power	1,09925E-06
increasing competition	2,19851E-06	monopoly privilege	1,09925E-06
provide competition	2,19851E-06	reducing concentration	1,63803E-05
bank competition	1,09925E-06	excessive concentration	1,38345E-05
competition challenge	1,09925E-06	free market	0,000189807
competition digital	1,09925E-06	improved competition	1,59518E-06
ecincreasing competition	1,09925E-06	monopolistic competition	1,59518E-06
encourage competition	1,09925E-06	intense competition	1,59518E-06
encouraging competition	1,09925E-06	competition accessibility	1,59518E-06
greatest competition	1,09925E-06	monopolistically competitive	1,59518E-06
little competition	1,09925E-06	monopolistic producer	1,59518E-06
market competition	1,09925E-06	**Sum frequencies**	**0,07 %**
fiscal consolidation	3,77892E-05		

Table A.5: Bigrams for competition in payment services consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
transaction fees	0,000271342	lowcost efficient	1,77384E-05	costless case	2,4967E-06
payment fees	3,92804E-05	lowcost payments	1,77384E-05	costless cbdc	2,4967E-06
lower fees	3,18413E-05	lowcost solutions	1,77384E-05	costly cbdc	2,4967E-06
transaction fee	3,14825E-05	provides lowcost	1,77384E-05	costs banks	2,4967E-06
bank fees	2,64936E-05	transaction cost	4,00708E-05	costs distribution	2,4967E-06
higher fees	2,11362E-05	incurs costs	1,75722E-05	costs rates	2,4967E-06
currency fees	1,97013E-05	cost solutions	1,63803E-05	generates costs	2,4967E-06
fee capped	1,97013E-05	costeffective answer	1,63803E-05	incur cost	2,4967E-06
fee paid	1,97013E-05	costly alternative	1,63803E-05	infrastructure cost	2,4967E-06
fees slashed	1,97013E-05	monitoring costs	2,91417E-05	less costs	2,4967E-06
fee levels	1,85689E-05	reduce costs	1,63255E-05	lowering cost	2,4967E-06
paying fees	1,75722E-05	operational costs	1,62921E-05	minimize costs	2,4967E-06
settlement fees	1,75722E-05	low costs	1,62646E-05	production costs	2,4967E-06
fees associated	1,63503E-05	substantial costs	1,59939E-05	related costs	2,4967E-06
fees small	1,47551E-05	cost advantage	1,71007E-05	relatively lowcost	2,4967E-06
low fees	1,47551E-05	operating costs	1,69831E-05	still costless	2,4967E-06
fee income	1,46829E-05	costs increasing	1,38345E-05	switching costs	2,4967E-06
fees contributions	1,2362E-05	costs incurred	1,38345E-05	undertake costreduction	2,4967E-06
interchange fees	1,15173E-05	saving costs	1,38345E-05	bankes costs	1,09925E-06
generate fee	9,28445E-06	adds costs	1,37954E-05	costless manner	1,09925E-06
low fee	9,28445E-06	production cost	1,37954E-05	increases cost	1,09925E-06
pertransaction fees	9,28445E-06	new costs	1,34902E-05	reduces costs	1,09925E-06
systems fees	9,28445E-06	costs benefits	1,3416E-05	time cost	1,09925E-06
high fees	9,24179E-06	high cost	1,3416E-05	expenses higher	1,46664E-05
charge fees	7,49009E-06	householdse costs	1,3416E-05	lower expenses	1,3416E-05
expensive fees	6,74509E-06	maintenance costs	1,3416E-05	expenses related	9,28445E-06
fee revenues	6,74509E-06	software costs	1,3416E-05	total expenses	2,4967E-06
fees competition	6,74509E-06	zero cost	1,3416E-05	expense required	1,09925E-06
large fees	6,74509E-06	allow costcutting	1,28912E-05	operating expenses	1,09925E-06
lower fee	6,74509E-06	transactions costs	1,28912E-05	significant expense	1,09925E-06
payment fee	6,74509E-06	additional costs	1,23921E-05	efficiency gains	0,000143903
reduced fees	6,74509E-06	cost associated	1,06907E-05	improve efficiency	0,000103401
imposing fees	1,59518E-06	costs blockchain	1,04904E-05	enhance efficiency	3,47439E-05
fee revenue	5,39846E-06	lower cost	1,12838E-05	increase efficiency	3,21898E-05
fees charged	3,59595E-06	cost benefits	9,61003E-06	efficiency improvement	3,06269E-05
usage fees	2,84866E-06	costs digital	9,28445E-06	greater efficiency	2,45622E-05
card fees	2,4967E-06	least cost	9,28445E-06	generating efficiencies	1,77384E-05
charging fees	2,4967E-06	costs cash	9,24179E-06	potential efficiencies	1,77384E-05
eliminating fees	2,4967E-06	cost effectively	7,89516E-06	ecenhance efficiency	1,7372E-05
nofee international	2,4967E-06	reduced cost	9,43952E-06	increasingly efficient	1,38345E-05
small fee	2,4967E-06	costless cash	7,49009E-06	promote efficient	9,28445E-06
substantial fees	2,19851E-06	costsaving mechanism	7,33221E-06	increased efficiency	6,99964E-06
transaction feesed	1,09925E-06	transfer costs	7,33221E-06	reduce inefficiencies	6,74509E-06
transaction costs	0,000383273	cost depending	6,74509E-06	resolve inefficiencies	6,74509E-06
low cost	0,00014512	incur costs	6,74509E-06	improving efficiency	4,9934E-06
rising costs	0,000122811	setup cost	6,74509E-06	efficiency gain	2,84866E-06
costs related	0,000129102	setup costs	6,74509E-06	efficiency improvements	2,4967E-06
costs associated	0,000116952	significant cost	6,74509E-06	efficiencyimproving digital	2,4967E-06
storage costs	9,95157E-05	associated costs	6,50544E-06	efficiencyimproving technology	2,4967E-06
costly access	9,49037E-05	administrative costs	5,99652E-06	promote efficiency	2,4967E-06
high costs	9,0288E-05	administrative cost	1,59518E-06	achieve efficiencies	1,09925E-06
lower costs	8,70881E-05	cost banks	1,59518E-06	capital charges	2,57825E-05
reduced costs	6,37787E-05	costlessly move	1,59518E-06	atm charges	4,00874E-06
lowcost electronic	5,57118E-05	higher costs	3,19035E-06	bank charges	2,4967E-06
costs involved	4,34392E-05	handling costs	5,69732E-06	associated chargesed	1,09925E-06
costly inconvenience	3,81694E-05	operation costs	5,69732E-06	incurring charges	1,09925E-06
total cost	3,82641E-05	practically costless	5,49627E-06	increasingly expensive	4,2715E-05
significant costs	3,68669E-05	shippingeis costly	5,39846E-06	extremely expensive	3,27826E-05
costs physical	3,27826E-05	cbdc costs	4,9934E-06	prohibitively expensive	1,97013E-05
adaptation costs	3,23908E-05	costless medium	4,39702E-06	least expensive	4,9934E-06
costs arising	3,23908E-05	costly process	4,00874E-06	less expensive	4,9934E-06
costs ease	2,92099E-05	imposing cost	4,00874E-06	expensive payment	2,4967E-06
issuance costs	2,92099E-05	bankse costs	3,49982E-06	relatively inexpensive	2,4967E-06
cheap costs	2,85266E-05	cost increases	3,49982E-06	cost increased	1,59518E-06
cost compared	2,85266E-05	costeffective solutions	3,49982E-06	cost reductions	1,59518E-06
cut costs	2,59747E-05	costs fell	3,49982E-06	costs adds	1,59518E-06
cost savings	2,71758E-05	management costs	3,49982E-06	effectively costless	1,59518E-06
cost efficiency	2,55491E-05	settlement costs	3,49982E-06	explosive costs	1,59518E-06
cost considerations	2,45622E-05	costs required	2,90949E-06	large costs	1,59518E-06
costs ofcafiatcacurrency	2,45622E-05	cost argument	2,84866E-06	minor costs	1,59518E-06
increasing costs	2,45622E-05	cost related	2,84866E-06	user cost	1,59518E-06
less costly	2,38704E-05	costs increased	2,84866E-06	carrying cost	1,59518E-06
reducing costs	2,36644E-05	system costs	2,84866E-06	efficiency effects	1,59518E-06
cost involved	1,77384E-05	total costs	2,84866E-06	technological efficiency	1,59518E-06
customers lowcost	1,77384E-05	carrying costs	2,4967E-06	**Sum frequencies**	**0,429 %**
easy lowcost	1,77384E-05	cbdc cost	2,4967E-06		
efficient lowercost	1,77384E-05	costeffective way	2,4967E-06		

Table A.6: Bigrams for costs consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
big data	0,000354949	inform monetary	2,12644E-05
data collection	6,55652E-05	inform governments	1,97013E-05
data access	3,95489E-05	provide information	1,70049E-05
collecting data	3,88366E-05	realtime information	1,55056E-05
government database	3,27826E-05	crucial information	1,47551E-05
allow data	1,75722E-05	gathering information	9,28445E-06
detailed data	1,75722E-05	complete information	7,49009E-06
massive data	1,7372E-05	providing information	4,00874E-06
banking database	1,63803E-05	facilitates wellinformed	1,09925E-06
centralized database	1,63803E-05	wellinformed decisionmaking	1,09925E-06
metadata associated	1,47551E-05	economics statistics	1,37954E-05
user data	1,32932E-05	paymentrelated statistics	3,49982E-06
data analysis	1,2362E-05	reliable statistics	3,49982E-06
historical data	1,10024E-05	financial statistics	1,09925E-06
little data	9,28445E-06	decisionmaking process	2,4967E-06
data disclosed	4,80501E-06	ecdomestic knowledgebased	4,20521E-05
ensures data	4,80501E-06	knowledge money	3,49982E-06
households data	4,80501E-06	background knowledge	1,09925E-06
centralised database	2,84866E-06	monetary knowledge	1,09925E-06
data availability	2,19851E-06	monitor macroeconomic	6,1282E-05
bank data	1,09925E-06	government monitors	1,63803E-05
collect data	1,09925E-06	effectively monitor	1,37954E-05
data available	1,09925E-06	monitor transactions	1,36188E-05
immense data	1,09925E-06	additional monitoring	1,34902E-05
limited data	1,09925E-06	monitoring levels	1,2362E-05
macro data	1,09925E-06	monitoring developments	1,1086E-05
national data	1,09925E-06	monitor payments	1,07538E-05
economic surveillance	4,25288E-05	monitoring reporting	5,39846E-06
speed surveillance	9,28445E-06	transaction monitoring	5,39846E-06
state surveillance	9,28445E-06	continuously monitor	4,80501E-06
surveillance may	4,80501E-06	monitor private	4,80501E-06
surveillance moreover	4,80501E-06	actively monitoring	2,90949E-06
efta surveillance	2,84866E-06	broad monitoring	2,4967E-06
surveillance authority	2,84866E-06	easily monitored	2,4967E-06
financial information	7,09636E-05	easily monitor	1,09925E-06
make informed	3,00372E-05	monitoring borrowers	1,09925E-06
informative content	2,57825E-05	**Sum frequencies**	**0,13 %**

Table A.7: Bigrams for data availability consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
european union	0,00014625	eu widespread	9,28445E-06	partiallydollarized nations	4,00874E-06
monetary union	0,000104913	euro based	9,28445E-06	partiallydollarized usually	4,00874E-06
union waemu	9,44138E-05	euro given	9,28445E-06	dollarization limits	1,09925E-06
thatcawestern unioncawill	2,92099E-05	euro will	9,28445E-06	towards dedollarization	1,09925E-06
economic union	1,47551E-05	eurobased cryptocurrency	9,28445E-06	petrodollar coin	4,2715E-05
union eeu	1,47551E-05	euroisation however	9,28445E-06	dollar correspondent	3,23908E-05
monetary unioncalink	1,04904E-05	european banking	9,28445E-06	dollared president	1,07969E-05
monetary unioned	1,04904E-05	euros preconditions	9,28445E-06	dollar counterpart	7,33321E-06
union system	9,28445E-06	euros sovereign	9,28445E-06	dollar dependency	7,33321E-06
currency union	3,49982E-06	eurozone cryptocurrencycc	9,28445E-06	dollarbased monetary	7,33321E-06
europen union	2,4967E-06	euro crisis	9,61266E-06	cfa franc	0,000146866
union presenting	2,4967E-06	eu must	4,80501E-06	ecfa will	8,39234E-05
thus unions	1,09925E-06	euro danmarks	4,80501E-06	currency ecfa	4,19617E-05
unions category	1,09925E-06	eurocad cbdc	4,80501E-06	ecfa backed	4,19617E-05
unions payment	1,09925E-06	european nations	4,80501E-06	ecfa distribution	3,14713E-05
stability board	5,61946E-05	eurosystemes primary	4,80501E-06	ecfa capability	2,09809E-05
system board	1,77384E-05	issue eurocbdc	4,80501E-06	tender ecfa	2,09809E-05
system boards	1,77384E-05	kroneeuro exchange	4,80501E-06	african cfa	1,04904E-05
board maintaining	4,00874E-06	euro exit	4,00874E-06	called ecfa	1,04904E-05
currency board	4,00874E-06	greek euro	4,00874E-06	ecfa aims	1,04904E-05
peg will	8,01749E-06	eu treaties	3,49982E-06	ecfa digital	1,04904E-05
government peg	4,00874E-06	eues decision	3,49982E-06	ecfa follows	1,04904E-05
involves unpegging	4,00874E-06	eurozone state	3,49982E-06	ecfaes development	1,04904E-05
managed peg	4,00874E-06	directive eu	2,84866E-06	electronic cfa	1,04904E-05
tighter peg	4,00874E-06	eu regulatory	2,84866E-06	senegales ecfa	1,04904E-05
currency pegged	1,09925E-06	eues settlement	2,84866E-06	titled ecfa	1,04904E-05
fixed exchange	7,40255E-05	eu countries	1,09925E-06	traditional cfa	1,04904E-05
fixed rate	4,28422E-05	euro bill	1,09925E-06	ecbs governing	2,13575E-05
fixed sovereign	3,23908E-05	european payments	1,09925E-06	ecb conducts	9,28445E-06
fixedexchangerate policy	2,40251E-05	waemu region	6,29426E-05	ecb legislative	3,49982E-06
denmarkes fixedexchangerate	4,80501E-06	waemu brm	2,09809E-05	ecb stopped	3,49982E-06
rate fixed	4,80501E-06	waemu capital	2,09809E-05	ecbs objectives	3,49982E-06
keeping fixed	3,49982E-06	waemu will	2,09809E-05	stability ecb	1,09925E-06
restriction fixed	2,84866E-06	waemu consequently	1,04904E-05	inflationary pressure	3,23908E-05
kept fixed	2,4967E-06	waemu ecthe	1,04904E-05	high inflation	3,07162E-05
fixed policy	1,09925E-06	waemu ecwe	1,04904E-05	countryes hyperinflation	2,45622E-05
european central	0,000467933	waemu west	1,04904E-05	hyperinflation however	2,45622E-05
euro area	0,000270266	dollarization amplifies	1,55056E-05	less inflationary	1,75722E-05
crypto euros	0,000222827	dollarization ie	1,55056E-05	experiencing hyperinflation	1,63803E-05
eu country	9,49037E-05	dollarization instead	1,55056E-05	hyperinflation conversely	1,63803E-05
euro cash	7,50433E-05	dollarization may	1,55056E-05	stabilizing inflation	1,63803E-05
euro zone	6,88775E-05	dollarization typically	1,55056E-05	sucre hyperinflation	1,46664E-05
european countries	4,8868E-05	financial dollarization	1,55056E-05	combat inflationary	1,37954E-05
euro can	4,2715E-05	increase dollarization	1,55056E-05	inflationary pressures	1,37954E-05
european country	4,2715E-05	instead dollarization	1,55056E-05	countryes inflationplagued	1,2362E-05
conventional euros	2,85266E-05	reduce dollarization	1,55056E-05	crippling hyperinflation	1,2362E-05
euro dnb	2,85266E-05	sense dollarization	1,55056E-05	defeated hyperinflation	1,2362E-05
eu monitor	2,78533E-05	dollarization imposed	1,46664E-05	end hyperinflation	1,2362E-05
eu legislation	2,38104E-05	dollarization regime	1,46664E-05	escape hyperinflation	1,2362E-05
area european	2,13575E-05	dollarize fixing	1,46664E-05	everincreasing inflation	1,2362E-05
euro eci	2,13575E-05	dollarized system	1,46664E-05	hyperinflation pushing	1,2362E-05
euro estcoins	2,13575E-05	ecuadores dollarized	1,46664E-05	hyperinflationstricken currency	1,2362E-05
euroed ecb	2,13575E-05	officially dollarize	1,46664E-05	wild inflation	1,2362E-05
euroed estcoins	2,13575E-05	since dollarization	1,46664E-05	digit inflation	7,33321E-06
european nation	2,13575E-05	toward dedollarization	1,46664E-05	control inflation	6,59552E-06
european economies	1,75722E-05	dollarised economy	1,2362E-05	stabilise inflation	1,59518E-06
eurosystems target	1,55056E-05	zimbabwe dollarised	1,2362E-05	hyperinflation leading	5,39846E-06
eu monetary	1,47551E-05	official dedollarization	8,43246E-06	disaster historicallycahyperinflation	2,90949E-06
eu policies	1,47551E-05	dedollarization white	7,33321E-06	inflationary periods	2,90949E-06
eurosystem bank	1,37954E-05	dollarisation plan	7,33321E-06	controlling inflation	1,09925E-06
european money	1,3416E-05	dollarisation process	7,33321E-06	doubledigit inflation	1,09925E-06
eurosystem entered	1,3416E-05	dollarization economist	7,33321E-06	excessive inflation	1,09925E-06
regulation eu	9,61003E-06	ecuadorian dollarisation	7,33321E-06	great inflation	1,09925E-06
cryptocurrencies eu	9,28445E-06	dedollarizing even	4,00874E-06	limit inflation	1,09925E-06
cryptocurrency euro	9,28445E-06	difficulties dedollarizing	4,00874E-06	**Sum frequencies**	**0,42 %**

Table A.8: Bigrams for exchange rate policies consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
financial inclusion	0,000736588	accessing banking	1,04904E-05
inclusive economic	6,1282E-05	unbanked africans	1,04904E-05
inclusion reasons	2,85266E-05	unbanked citizens	4,00874E-06
inclusive characteristics	2,09809E-05	bank access	2,84866E-06
financial inclusioncaglobal	1,04904E-05	unbanked agents	2,4967E-06
financial inclusiveness	8,01749E-06	banked ukrainian	4,2715E-05
promote inclusive	5,39846E-06	remain unbanked	1,04904E-05
fullyinclusive financial	4,00874E-06	unbanked digital	1,04904E-05
increase inclusion	2,4967E-06	go unbanked	4,00874E-06
full integration	3,81694E-05	underbanked live	1,04904E-05
highly integrated	1,77384E-05	financially excluded	1,09925E-06
deeply integrated	4,80501E-06	financial exclusion	3,51529E-05
account holders	0,000115277	ensure access	3,49982E-06
account holder	2,06859E-05	account households	4,80501E-06
hold accounts	1,92553E-05	account opening	4,00874E-06
account holderes	4,80501E-06	account holding	3,49982E-06
providing accounts	2,4967E-06	issueaccount holding	3,49982E-06
account holdersef	1,09925E-06	account holdings	2,90949E-06
held accounts	1,09925E-06	account provide	1,09925E-06
provide accounts	1,09925E-06	account providing	1,09925E-06
providing account	1,09925E-06	account service	1,09925E-06
unbanked people	3,94027E-05	account statistics	1,09925E-06
unbanked households	2,6832E-05	universally accessible	5,96419E-05
accessing bank	2,09809E-05	universally available	2,84866E-06
unbanked populationed	1,46664E-05	universallyaccessible cbdc	9,57106E-06
banks accessible	1,37954E-05	**Sum frequencies**	**0,148 %**
unbanked consumers	1,3416E-05		

Table A.9: Bigrams for financial inclusion consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
financial stability	0,001743961	bank instability	2,90949E-06	liquidity requirements	1,77421E-05
financial stabilityed	0,000135911	promote stability	2,84866E-06	prudential requirement	1,46664E-05
financial stabilitycamoreover	6,74509E-06	creating stability	1,09925E-06	prudential requirements	1,07969E-05
financial stabilitycaof	2,90949E-06	exacerbating instability	1,09925E-06	lendingbank requirements	2,84866E-06
ecfinancial stability	1,09925E-06	guarantee stability	1,09925E-06	financial regulation	2,77577E-05
economic stability	0,000110576	macroeconomic instability	1,09925E-06	bank regulations	9,28445E-06
system stability	9,84888E-05	maintaining stability	1,09925E-06	bank regulation	5,34536E-06
stability report	9,49037E-05	stability ecfinancial	1,09925E-06	financial regulations	2,90949E-06
stability monetary	7,19745E-05	stability financial	1,09925E-06	regulation financial	2,90949E-06
financial instability	6,40228E-05	stability history	1,09925E-06	fnancial regulations	1,09925E-06
higher instability	3,72406E-05	stability trust	1,09925E-06	disrupt credit	2,90949E-06
stability mandate	3,54767E-05	bank runs	0,000447889	credit contraction	1,09925E-06
stability risks	1,39777E-05	bank run	0,000243056	reduce credit	1,09925E-06
monetary stability	1,95292E-05	ecbank runed	4,00874E-06	reducing credit	1,09925E-06
stability implicationsca	2,45622E-05	massive withdrawals	1,37954E-05	bankse funding	4,28248E-05
economic instability	2,12644E-05	immediate withdrawal	4,00874E-06	banks vulnerable	2,59747E-05
macroeconomic stability	2,12732E-05	large withdrawals	2,84866E-06	impaired banks	2,57825E-05
maintain stability	1,77041E-05	largescale withdrawals	2,84866E-06	bankse liquidity	1,99035E-05
restore stability	1,75722E-05	significant withdrawals	1,09925E-06	prudential banking	1,61954E-05
stability concerns	1,75722E-05	debt distress	1,61954E-05	bank panic	1,37954E-05
monetary instability	1,72946E-05	actorse overindebtedness	1,55056E-05	banking panic	1,37954E-05
stability banks	1,55056E-05	overindebtedness borrowing	1,55056E-05	banking paniced	1,37954E-05
achieving stability	1,47551E-05	household debt	7,59697E-06	banking panics	1,37954E-05
stabilityed bank	1,3416E-05	debttogdp ratio	1,81599E-05	bankse lending	1,3416E-05
ececonomic stabilityed	1,2362E-05	debt crisis	2,90949E-06	bank prudential	6,74509E-06
nancial instability	9,61003E-06	debttogdp ratios	2,90949E-06	regulated banking	5,39846E-06
nancial stability	9,61003E-06	debt togdp	1,09925E-06	bank panics	5,108E-06
stability might	9,61003E-06	household indebtedness	1,09925E-06	bankse margins	3,49982E-06
stability policy	4,09187E-06	indebtedness relative	1,09925E-06	regulateded bank	1,09925E-06
stability reduce	6,74509E-06	banking crisis	3,61417E-05	incentivizes banks	4,00874E-06
systemwide instability	6,74509E-06	systemic crisis	2,11853E-05	bankse incentives	3,49982E-06
systemwide instabilityedepositors	6,74509E-06	next crisis	8,72847E-06	systemic risks	0,000155837
widespread instability	6,74509E-06	crisis strikes	4,80501E-06	liquidity risk	0,000143333
instability issues	1,59518E-06	crisis emerges	4,00874E-06	financing risks	8,13389E-05
finanical stability	5,39846E-06	crisis triggered	4,00874E-06	financial risksed	6,1282E-05
stability ensure	5,39846E-06	potential crisis	3,49982E-06	systemic risksed	4,91244E-05
stability riskse	5,39846E-06	future crisis	1,09925E-06	systemic risk	4,55589E-05
cial instability	4,80501E-06	insolvency crisis	1,09925E-06	financial risks	2,92251E-05
cial stability	4,80501E-06	liquidity crisis	1,09925E-06	risks financial	3,00372E-05
instability bit	4,80501E-06	reserve requirements	0,000101343	financing risk	2,59747E-05
instability households	4,80501E-06	reserve requirement	2,40515E-05	liquidity risks	2,39094E-05
stability stable	4,80501E-06	reserve requirementscaa	2,90949E-06	bank risks	2,12644E-05
stability risk	5,99219E-06	capital requirements	2,78687E-05	bankse risktaking	1,55056E-05

Table A.10: Bigrams for financial stability consideration, part 1.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
finance risks	1,37954E-05	funding available	6,8574E-06	stability driving	4,00874E-06
prudent risk	6,74509E-06	low funding	1,59518E-06	stability legal	3,49982E-06
financial risk	6,40931E-06	begin funding	5,39846E-06	stability regardless	3,49982E-06
bankes risk	1,59518E-06	alternative funding	3,49982E-06	stability will	3,49982E-06
banking risk	5,39846E-06	cheaper funding	2,84866E-06	stabilitycaof course	2,90949E-06
bigger risk	5,60392E-06	depositbased funding	2,84866E-06	stability one	2,84866E-06
riskbased requirements	2,84866E-06	funding liquidity	2,4967E-06	stability although	2,4967E-06
systemic risked	2,84866E-06	reduces funding	2,4967E-06	stability currently	2,4967E-06
incremental risktaking	2,4967E-06	deposit outflow	2,12644E-05	stability next	2,19851E-06
risk financial	1,09925E-06	financial stabilcad	4,80501E-06	stability point	2,19851E-06
reducing liquidity	1,28912E-05	stability issue	3,54767E-05	stability analyses	1,59518E-06
reduce liquidity	4,9934E-06	political stability	2,59021E-05	stability benefits	1,59518E-06
liquidity stress	4,80501E-06	poses stability	2,45622E-05	stability better	1,59518E-06
supply liquidity	2,84866E-06	stability safety	2,45622E-05	stability considerations	1,59518E-06
extraordinary lenderoflastresort	1,09925E-06	instability said	1,77384E-05	stability issueed	1,59518E-06
lenderoflastresort actions	1,09925E-06	stability given	1,77384E-05	stability management	1,59518E-06
last resort	8,39284E-05	market stability	1,75722E-05	stability resiliency	1,59518E-06
lolr operations	2,57825E-05	stability recently	1,75722E-05	stability steady	1,59518E-06
resort lolr	2,57825E-05	stability rogoff	1,63803E-05	stabilityed earlier	1,59518E-06
bank lolr	1,28912E-05	stability since	1,48946E-05	instability popper	1,09925E-06
lolr assistance	1,28912E-05	stability introducing	1,37954E-05	instability suppose	1,09925E-06
lolr policy	1,28912E-05	stability mean	1,37954E-05	issues stability	1,09925E-06
lolr rather	1,28912E-05	stability others	1,3416E-05	stability argentina	1,09925E-06
much lolr	1,28912E-05	stability moreover	1,28804E-05	stability consequently	1,09925E-06
rulebased lolr	1,28912E-05	stability issues	1,06703E-05	stability core	1,09925E-06
switching deposits	1,63803E-05	instability issuing	9,61003E-06	stability transitioning	1,09925E-06
switch rapidly	1,3416E-05	stability section	9,24179E-06	prudential regulation	3,79736E-05
switch banks	1,59518E-06	stability depending	8,30483E-06	prudential supervision	3,7811E-05
rapid shifts	2,90949E-06	stability correa	7,33321E-06	prudentially regulated	3,54767E-05
major shifts	2,84866E-06	instability table	6,74509E-06	strong prudential	1,77384E-05
sudden shifts	2,84866E-06	stability depositors	6,74509E-06	macroprudential functionscaat	1,38345E-05
unpredictable shifts	2,84866E-06	stability firstly	6,74509E-06	macroprudential management	1,38345E-05
drawback commercial	2,85266E-05	stability judgement	6,74509E-06	introducing prudential	1,07969E-05
wholesale funding	9,7571E-05	stability relative	6,74509E-06	existing prudential	6,74509E-06
using wholesale	5,21159E-05	stabilitycamoreover existing	6,74509E-06	prudential scrutiny	6,74509E-06
wholesale funds	5,37111E-05	stability finally	5,40619E-06	prudentially supervised	6,74509E-06
wholesale level	2,85266E-05	instability central	4,80501E-06	prudential standards	5,39846E-06
wholesale rates	4,78553E-06	instability danmarks	4,80501E-06	macroprudential policy	1,59518E-06
utilise wholesale	3,49982E-06	stability alternatively	4,80501E-06	**Sum frequencies**	**0,62 %**
funding costs	7,03513E-05	stability instead	4,80501E-06		
deposit fundinged	3,47439E-05	stability issuing	4,80501E-06		
crowdfunding proceeds	2,13575E-05	stability without	4,80501E-06		
deposit funding	1,37979E-05	stability can	4,39702E-06		

Table A.11: Bigrams for financial stability consideration, part 2.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
yearly gdp	9,49037E-05	efficient allocation	2,41608E-05	substantial gdp	1,59518E-06
gdp growth	2,9279E-05	generating efficiencies	1,77384E-05	tax revenuetogdp	1,59518E-06
gdp according	2,75699E-05	potential efficiencies	1,77384E-05	debt pressure	9,28445E-06
gdp increased	2,09809E-05	ecenhance efficiency	1,7372E-05	settle debts	5,39846E-06
gdp gross	1,47551E-05	potential efficiency	1,62646E-05	debt declines	3,19035E-06
gdp measured	1,47551E-05	increasingly efficient	1,38345E-05	repays debt	2,84866E-06
real gdp	9,19214E-06	increased efficiency	6,99964E-06	debt burden	1,59518E-06
annual gdp	1,07969E-05	improving efficiency	4,9934E-06	debt ratio	1,59518E-06
gdp relative	1,07969E-05	efficiency gain	2,84866E-06	debttonetworth ratio	1,59518E-06
nominal gdp	9,43952E-06	efficiency improvements	2,4967E-06	debttooutput ratio	1,59518E-06
gdp climbed	7,33321E-06	efficiencyimproving digital	2,4967E-06	require debt	1,59518E-06
percent gdp	7,33321E-06	efficiencyimproving technology	2,4967E-06	indebtedness relative	1,09925E-06
debttogdp ratio	1,81599E-05	efficient allocations	2,4967E-06	repay debt	1,09925E-06
gdp annually	5,39846E-06	efficient outcome	2,4967E-06	liquidity taxes	4,46649E-05
gdp ea	5,39846E-06	achieve efficiencies	1,09925E-06	gains tax	2,31589E-05
gdp us	5,39846E-06	efficient implications	1,09925E-06	lumpsum taxes	1,43566E-05
gdp without	5,39846E-06	peoplees welfare	6,1282E-05	distortionary taxation	6,3807E-06
countryes gdp	3,49982E-06	welfare gains	3,99472E-05	lumpsum taxation	6,3807E-06
times gdp	3,49982E-06	welfareenhancing efbfbdjust	2,12644E-05	growthfriendly tax	5,39846E-06
gdp ratio	6,48811E-06	welfareenhancing policy	7,49009E-06	lumpsum tax	4,78553E-06
debttogdp ratios	2,90949E-06	higher welfare	4,9934E-06	tax cuts	3,19035E-06
increased debttogdp	2,90949E-06	maximizes welfare	4,9934E-06	tax reduce	2,84866E-06
increase gdp	2,4967E-06	welfaremaximizing monetary	4,9934E-06	tax reductions	2,19851E-06
product gdp	2,4967E-06	increase welfare	2,84866E-06	fiscal tax	1,59518E-06
product gdpeis	2,4967E-06	ie welfaremaximizing	2,4967E-06	liquidity taxed	1,59518E-06
cbdc gdp	1,09925E-06	maximize welfare	2,4967E-06	lower taxation	1,59518E-06
debt togdp	1,09925E-06	possible welfare	2,4967E-06	taxes decrease	1,59518E-06
gdped barrdear	1,09925E-06	potential welfare	2,4967E-06	reduce distortionary	3,19035E-06
govdebtgdp will	1,09925E-06	welfare davoodalhosseini	2,4967E-06	two distortionary	3,19035E-06
overall gdp	1,09925E-06	welfare enhancing	2,4967E-06	budget distortionary	1,59518E-06
togdp ratios	1,09925E-06	welfare maximizing	2,4967E-06	constant distortionary	1,59518E-06
wrt govdebtgdp	1,09925E-06	public consumption	1,20262E-05	countercyclical distortionary	1,59518E-06
government debt	9,51879E-05	additional consumption	2,4967E-06	rates distortionary	1,59518E-06
national debt	7,33321E-06	expanding wealth	1,09925E-06	rule distortionary	1,59518E-06
public debt	6,8574E-06	extra wealth	1,09925E-06	three distortionary	1,59518E-06
consumption debt	1,09925E-06	liquidity tax	5,88478E-06	varies distortionary	1,59518E-06
debt financing	1,09925E-06	increased liquidity	2,2576E-05	efficiency can	3,21104E-05
debt government	1,09925E-06	tax rates	7,60826E-05	efficiency aspects	6,74509E-06
debt reduced	1,09925E-06	government debttogdp	1,27614E-05	socioeconomic efficiency	2,84866E-06
debt reduction	1,09925E-06	gdp effects	6,3807E-06	economic efficiency	2,4967E-06
debts public	1,09925E-06	gdp immediately	6,3807E-06	efficiency effects	1,59518E-06
government debtbonds	1,09925E-06	deficittogdp ratio	4,78553E-06	technical efficiency	1,59518E-06
government debts	1,09925E-06	gdp credit	3,49982E-06	technological efficiency	1,59518E-06
public debted	1,09925E-06	depositstogdp ratios	3,19035E-06	welfare level	1,74769E-05
state debt	1,09925E-06	gdp gain	3,19035E-06	optimal welfare	7,49009E-06
percentcataxcaon individuals	4,2715E-05	loanstogdp ratios	3,19035E-06	economic welfare	4,9934E-06
reducing tax	1,47551E-05	additional gdp	1,59518E-06	consequently welfare	2,4967E-06
consumption tax	1,98721E-05	affect gdp	1,59518E-06	intermediate welfare	2,4967E-06
distortionary taxes	2,36465E-05	cbdctogdp ratios	1,59518E-06	longterm welfare	2,4967E-06
lower taxes	7,7416E-06	coefficient dgdp	1,59518E-06	liquid wealth	8,04959E-05
revenue tax	5,39846E-06	deficittogdp ratios	1,59518E-06	liquidity benefits	1,11662E-05
facilitate tax	2,90949E-06	fiscal deficittogdp	1,59518E-06	additional liquidity	7,97588E-06
cut taxes	2,84866E-06	gdp almost	1,59518E-06	liquidity generation	6,3807E-06
distortionary tax	3,59954E-05	gdp can	1,59518E-06	boost liquidity	5,39846E-06
consumption taxes	5,88478E-06	gdp consumption	1,59518E-06	higher liquidity	4,44384E-06
government tax	1,09925E-06	gdp effect	1,59518E-06	liquidity ratios	3,79368E-06
reduce taxes	1,09925E-06	gdp equal	1,59518E-06	liquidity ratio	3,29776E-06
reduced taxation	1,09925E-06	gdp following	1,59518E-06	generate liquidity	1,59518E-06
distorting effect	2,84866E-06	gdp reached	1,59518E-06	liquidity benefit	1,59518E-06
distorted allocation	2,4967E-06	gdp roughly	1,59518E-06	liquidity increases	1,59518E-06
less distorted	2,4967E-06	gdp tax	1,59518E-06	liquidity refinements	1,59518E-06
lower distortionary	6,98404E-06	government deficittogdp	1,59518E-06	exerting synergies	1,38345E-05
efficiency gains	0,000143903	raise gdp	1,59518E-06	synergies arise	3,49982E-06
improve efficiency	0,000103401	result gdp	1,59518E-06	positive synergies	1,59518E-06
enhance efficiency	3,47439E-05	sectorial depositstogdp	1,59518E-06	**Sum frequencies**	**0,19 %**
increase efficiency	3,21898E-05	set dgdp	1,59518E-06		
greater efficiency	2,45622E-05	smaller depositstogdp	1,59518E-06		

Table A.12: Bigrams for GDP and consumption consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
island nation	0,000223238	technical infrastructure	3,6068E-05
island state	1,63803E-05	infrastructure projects	3,23908E-05
small island	1,07969E-05	telecommunication infrastructure	1,07969E-05
island country	5,39846E-06	favourable infrastructure	9,28445E-06
island nations	5,39846E-06	countryes infrastructure	7,33321E-06
islands located	5,39846E-06	infrastructure requires	6,74509E-06
long distances	4,61869E-05	telecommunication infrastructuree	5,39846E-06
physical distance	1,3416E-05	infrastructure stops	4,80501E-06
vast distances	4,00874E-06	technical infrastructures	3,49982E-06
distance payments	2,84866E-06	extensive infrastructure	2,84866E-06
distance purchases	2,84866E-06	technology infrastructure	2,19851E-06
great distances	1,09925E-06	public infrastructure	1,09925E-06
geographical position	1,55056E-05	currency distribution	9,44313E-05
geographical sense	1,55056E-05	cash distribution	2,66961E-05
traditional geographical	1,55056E-05	distribution channels	2,59743E-05
geographical characteristics	1,34902E-05	distribution system	2,52292E-05
geography means	6,74509E-06	currencyes distribution	2,09809E-05
however geographical	6,74509E-06	distributional consequences	1,3416E-05
zealandes geographical	6,74509E-06	nontrivial distributional	1,3416E-05
zealandes geography	6,74509E-06	distribution issues	1,04904E-05
geographical proximity	5,69732E-06	distribution channel	9,6886E-06
geographical dispersion	5,39846E-06	distribution challenges	6,74509E-06
unique geography	5,39846E-06	distributional benefits	6,74509E-06
geographical location	3,94792E-06	card distribution	3,49982E-06
thus geographical	2,84866E-06	efficient distribution	3,49982E-06
across geographical	2,4967E-06	cbdc distribution	2,84866E-06
geographical distributions	2,4967E-06	transportation can	0,000114508
geographical locations	2,4967E-06	convenient transportation	3,81694E-05
certain geographical	1,09925E-06	moreover transportation	3,81694E-05
geographical regions	1,09925E-06	transportation services	3,81694E-05
particular geographical	1,09925E-06	production transportation	2,6832E-05
widely accessible	3,66258E-05	transportation disposal	1,3416E-05
electronically accessible	6,99964E-06	shippingeis costly	5,39846E-06
accessible electronic	3,29776E-06	cashintransit companies	6,99964E-06
accessible flexible	1,09925E-06	cashintransit vehicles	6,74509E-06
accessible forms	1,09925E-06	cash transitioning	4,80501E-06
vast territory	1,38345E-05	transitory fluctuations	2,19851E-06
infrastructure required	6,1282E-05	**Sum frequencies**	**0,13 %**

Table A.13: Bigrams for geography consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
guarantee trustea	8,04959E-05	trusted institutions	1,09925E-06	fully reliable	1,59518E-06
remain trustworthyed	6,1282E-05	trusted payment	1,09925E-06	allows reliable	2,90949E-06
trusted institution	4,23121E-05	untrustworthy although	1,09925E-06	reliable alternatives	2,90949E-06
enhance trust	2,92099E-05	increased credibility	2,95103E-05	reliable decentralized	2,90949E-06
seeking trust	2,13575E-05	bank credibility	2,12644E-05	need reliable	1,09925E-06
fundamental trust	1,85689E-05	credibility must	2,12644E-05	bank independence	1,69E-05
citizens trust	1,63803E-05	credibility loss	1,28912E-05	independent monetary	1,20262E-05
mutual mistrust	1,47551E-05	nationalbankes credibility	4,80501E-06	independent national	1,07969E-05
example ecmistrust	1,46664E-05	necessary credibility	4,80501E-06	independent payment	8,54599E-06
fact mistrust	1,46664E-05	credibility problem	4,00874E-06	policy independence	6,74509E-06
justified distrust	1,46664E-05	banks credibility	2,90949E-06	central independent	4,80501E-06
low trustworthiness	1,46664E-05	bankes credibility	1,09925E-06	independent financial	4,80501E-06
public mistrust	1,46664E-05	credible commitment	1,09925E-06	systemic independence	4,00874E-06
mostly trustless	1,38345E-05	ecensure confidence	5,74166E-05	independent judiciary	1,09925E-06
trustless ledgers	1,38345E-05	public confidence	1,53436E-05	fully convincing	1,28912E-05
develop trust	1,34902E-05	inspire confidenceed	1,46664E-05	successfully convincing	5,39846E-06
guarantee trust	1,3416E-05	ensure confidence	8,54599E-06	convincing central	4,00874E-06
preserve trust	1,3416E-05	ensuring confidence	3,49982E-06	try convincing	4,00874E-06
trusted authority	1,25822E-05	lose confidence	3,49982E-06	people believe	2,90949E-06
build trust	1,2362E-05	low confidence	3,49982E-06	trusted third	5,91814E-05
tokenes trustworthiness	1,2362E-05	promoting confidence	3,49982E-06	put trust	4,23611E-05
trusted central	1,17811E-05	gain confidence	2,90949E-06	trusted electronic	3,14713E-05
central trusted	9,28445E-06	bank ecconfidence	2,84866E-06	trust among	3,14361E-05
common trusted	9,28445E-06	boost confidence	2,84866E-06	trusting others	2,85266E-05
high trust	9,28445E-06	build confidence	2,84866E-06	without trusted	2,85266E-05
trusted infrastructure	9,28445E-06	eensure confidencee	2,84866E-06	compact trust	2,15938E-05
trustworthiness cael	7,33321E-06	failing confidence	2,84866E-06	will trust	1,63708E-05
trustworthiness el	7,33321E-06	maintain confidence	2,84866E-06	trust opening	1,46664E-05
trustworthy form	6,74509E-06	secure confidence	2,84866E-06	trustworthiness personally	1,46664E-05
public trust	1,59518E-06	system confidence	2,84866E-06	years trust	1,46664E-05
trust inherent	1,59518E-06	weakens confidence	2,84866E-06	investors trust	1,2362E-05
continued trust	4,80501E-06	bankse confidence	1,09925E-06	trust open	1,2362E-05
trust centralized	4,80501E-06	nominal anchor	4,39702E-06	trust trust	1,03837E-05
building trust	4,00874E-06	firmly anchored	1,09925E-06	popular trust	9,28445E-06
must trust	4,00874E-06	political uncertainty	2,78533E-05	trust asked	9,28445E-06
trusted party	4,00874E-06	uncertainty political	1,47551E-05	trust eceasy	9,28445E-06
sufficient trust	2,90949E-06	political stability	2,59021E-05	trusted also	9,28445E-06
trustless network	2,90949E-06	perceived financial	6,74509E-06	trust one	8,60782E-06
ensure trust	2,84866E-06	keep faith	2,59747E-05	trust just	8,01749E-06
reestablishing trust	2,84866E-06	good faith	4,00874E-06	anonymous trustless	5,39846E-06
trustworthy option	2,84866E-06	reasonable transparent	1,59518E-06	islands trust	5,39846E-06
authority trusted	1,09925E-06	government sincerely	1,46664E-05	involves trust	4,80501E-06
building trusts	1,09925E-06	reliable alternative	4,13286E-05	trust comes	4,00874E-06
current trust	1,09925E-06	reliable infrastructure	3,349E-05	trusted medium	4,00874E-06
ecurrency trust	1,09925E-06	reliable medium	2,45622E-05	leveraging trust	2,90949E-06
gain trust	1,09925E-06	reliable enough	2,12644E-05	without trust	2,90949E-06
losing trust	1,09925E-06	reliable way	1,63803E-05	trusted form	2,84866E-06
stability trust	1,09925E-06	less reliable	1,34902E-05	agentse trust	1,59518E-06
trust leads	1,09925E-06	reliable unit	8,72847E-06	ensuring trust	1,59518E-06

Table A.14: Bigrams for institutional credibility consideration, part 1.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
trusted intermediary	1,09925E-06	generate reputational	2,4967E-06	public institutions	2,51575E-05
trusted notary	1,09925E-06	te reputational	2,19851E-06	public support	1,55056E-05
trusts among	1,09925E-06	associated reputation	1,59518E-06	public recognized	1,46664E-05
seen confidence	5,39846E-06	reputational costs	1,59518E-06	public institution	1,1483E-05
declining confidence	4,80501E-06	institution fearing	2,59747E-05	public protocol	1,07969E-05
absolute confidence	4,00874E-06	institutions consideration	1,77384E-05	public service	5,108E-06
confidence customers	2,90949E-06	institutional frictioncain	1,38345E-05	public authority	3,49982E-06
shake confidence	2,90949E-06	institutions characteristics	1,38345E-05	public perception	3,49982E-06
confidence issuing	2,84866E-06	developed country	7,88542E-05	public authoritiesed	2,84866E-06
extra confidence	2,84866E-06	government developed	2,92099E-05	public infrastructure	1,09925E-06
holder confidence	2,84866E-06	developed economies	1,79755E-05	legal framework	0,000152145
inflation confidence	2,84866E-06	developed nations	1,55984E-05	legal system	7,48496E-05
longterm confidence	2,84866E-06	developed societies	9,61003E-06	legal entities	4,91243E-05
prioritise confidence	2,84866E-06	developed countries	6,20725E-06	legal frameworks	3,06419E-05
business confidence	1,09925E-06	highlydeveloped countries	4,80501E-06	legal protection	8,54599E-06
confidence ecthe	1,09925E-06	developed financial	2,84866E-06	legal requirements	8,49322E-06
confidence meant	1,09925E-06	undeveloped countries	4,00874E-06	legal authorities	4,00874E-06
confidence removing	1,09925E-06	poor regulatory	5,39846E-06	legal principle	4,00874E-06
confidence safety	1,09925E-06	poor governance	3,49982E-06	legal systems	4,00874E-06
relative confidence	1,09925E-06	competent authorities	5,39846E-06	legal authority	2,4967E-06
credible motives	1,28912E-05	governmentes intervention	3,23908E-05	administrative functions	2,7669E-05
find credible	1,28912E-05	government oversight	2,13575E-05	administrative challenges	1,4415E-05
major credibility	1,28912E-05	increased government	1,47551E-05	administrative functionscathe	1,38345E-05
credible link	1,2362E-05	government failing	1,38345E-05	county administrative	6,99964E-06
credible resolution	4,80501E-06	governmentes policies	1,2362E-05	administration regulatory	3,49982E-06
preparing credible	4,80501E-06	failed government	1,13419E-05	administratively complex	3,49982E-06
credible rogoff	4,00874E-06	government struggles	7,33321E-06	country administrative	3,49982E-06
privacy credible	4,00874E-06	bad governments	6,91823E-06	economic reforms	4,20521E-05
credible motivation	2,4967E-06	government influence	5,39846E-06	banking reforms	9,28445E-06
credible run	2,4967E-06	governmentprovided basic	4,00874E-06	monetary reform	5,60392E-06
credibly commit	2,4967E-06	governments ability	2,90949E-06	fiscal reforms	5,39846E-06
credible deposit	1,59518E-06	sustainable government	2,84866E-06	management reforms	5,39846E-06
exercise credible	1,59518E-06	governmentes ability	1,09925E-06	regulatory reform	5,39846E-06
credible moreover	1,09925E-06	governmentes power	1,09925E-06	security reform	5,39846E-06
credible nominal	1,09925E-06	manipulation political	1,47551E-05	structural reforms	5,39846E-06
credibly fixed	1,09925E-06	education ministry	9,49037E-05	banking reform	4,00874E-06
economic reputational	3,77892E-05	educated population	4,20521E-05	well facilitated	1,77384E-05
reputational risks	3,74054E-05	highly educated	4,20521E-05	wellestablished payment	9,28445E-06
reputational risk	2,58334E-05	educational programs	3,81694E-05	wellmanaged large	5,39846E-06
nationes reputation	2,13575E-05	education center	3,00372E-05	less welldeveloped	4,80501E-06
developments reputational	1,47551E-05	education centre	3,00372E-05	welldeveloped payment	4,80501E-06
positive reputation	9,28445E-06	population education	1,38345E-05	wellfunctioning payments	4,80501E-06
reputationchallenged central	7,33321E-06	formal education	1,3416E-05	wellfunctioning society	4,80501E-06
bad reputation	5,39846E-06	low education	1,3416E-05	welldeveloped ecosystem	2,4967E-06
countryes reputational	5,39846E-06	public sector	0,00014048	wellspecified policy	1,59518E-06
reputation among	5,39846E-06	public authorities	7,08019E-05	wellestablished central	1,09925E-06
reputation risk	4,09187E-06	public services	4,10527E-05	wellestablished monetary	1,09925E-06
bank reputation	2,4967E-06	public systems	3,86737E-05	**Sum frequencies**	**0,37 %**
bankes reputation	2,4967E-06	public spending	2,75908E-05		

Table A.15: Bigrams for institutional credibility consideration, part 2.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
zero lower	0,000156303	rate environment	2,4967E-06	near zero	1,09925E-06
zerointerestrate bound	1,37954E-05	rates historically	2,4967E-06	zero pushes	1,09925E-06
effective zero	1,28912E-05	lower rates	1,09925E-06	temporarily negative	1,74795E-05
zero boundec	4,00874E-06	policy transmission	0,000139783	negative nominal	1,25981E-05
zero bound	2,90949E-06	policy alternative	0,000122564	accept negative	6,74509E-06
ezero lower	2,4967E-06	policy instruments	7,94001E-05	use negative	4,00874E-06
eczero lower	2,19851E-06	policy tool	8,52652E-05	actually negative	3,49982E-06
zerolower bound	1,09925E-06	policy instrument	6,52217E-05	negative yield	2,4967E-06
effective zlb	1,28912E-05	policy framework	5,89159E-05	negativeeto encourage	2,4967E-06
bound zlb	5,60392E-06	rate policy	2,14392E-05	negativeinterest financial	1,59518E-06
bounded zlb	1,09925E-06	monetarypolicy instrument	9,61003E-06	require negative	1,59518E-06
zlb constrainted	1,09925E-06	policy mechanism	6,74509E-06	becomes negative	1,09925E-06
zlb e	1,09925E-06	monetarypolicy framework	4,80501E-06	bounds central	1,59518E-06
floor system	7,97588E-06	monetarypolicy opportunities	4,80501E-06	lower bounds	1,59518E-06
effective floor	2,75908E-05	new monetarypolicy	4,80501E-06	bound refers	1,09925E-06
floor currently	1,28912E-05	primary monetarypolicy	4,80501E-06	key policy	9,87004E-05
floor created	1,59518E-06	policy tools	4,39702E-06	policy effectiveness	3,62221E-05
floor however	1,59518E-06	main policy	4,00874E-06	real policy	1,97454E-05
floor systems	1,59518E-06	stabilisation policy	2,84866E-06	policy transmissioncafourth	1,38345E-05
negative interest	0,000569755	interest policy	2,19851E-06	changerate policy	4,80501E-06
implement negative	7,20706E-05	longterm policy	1,09925E-06	aggressive policy	3,19035E-06
negative rates	6,24041E-05	policy alternatives	1,09925E-06	increased policy	2,84866E-06
negative policy	5,74027E-05	policy measures	1,09925E-06	corridortype policy	2,4967E-06
set negative	2,97912E-05	stabilization policy	1,09925E-06	feasible policy	2,4967E-06
setting negative	2,27975E-05	lower bound	0,000337994	transmissionefrom policy	2,4967E-06
achieve negative	1,63803E-05	bound problem	2,34629E-05	additional policy	1,59518E-06
negative remuneration	1,37954E-05	lower bounded	1,86821E-05	lowinterest cbdc	6,40019E-06
negative remunerations	1,37954E-05	lower bounde	2,4967E-06	lowinterest checking	1,59518E-06
negative rate	1,019E-05	bound constraint	1,09925E-06	via lowinterest	1,59518E-06
go negative	1,07538E-05	bounded problem	1,09925E-06	real interest	7,65762E-05
charge negative	5,60392E-06	rates falls	2,84866E-06	productivity will	6,35163E-05
enforcing negative	9,28445E-06	rates falling	1,09925E-06	global productivity	1,47551E-05
introduce negative	4,80501E-06	interest bound	1,09925E-06	productivity global	1,47551E-05
impose negative	4,00874E-06	policy rate	0,000407415	productivity level	1,59518E-06
negative level	3,59595E-06	policy rates	6,41607E-05	global projection	1,59518E-06
negative repo	3,49982E-06	zero interest	4,56755E-05	forecast future	2,84866E-06
achieving negative	2,4967E-06	socalled zero	3,50598E-05	forecastbased interest	2,69443E-06
allow negative	1,09925E-06	zero level	2,75908E-05	economic forecasts	1,09925E-06
negative levels	1,09925E-06	zero percent	1,77535E-05	forecasted economic	1,09925E-06
rate level	4,49152E-05	virtually zero	1,3416E-05	forecasted monetary	1,09925E-06
current lowinterestrate	1,21067E-05	exactly zero	3,49982E-06	interest rates	0,001416718
lowinterestrate environment	1,21067E-05	equals zero	3,19035E-06	interest rate	0,001203898
lower rate	1,59518E-06	reaches zero	2,84866E-06	interest ratesed	4,9934E-06
decreasing rates	3,49982E-06	become zero	2,4967E-06	interest ratesetting	2,84866E-06
rate levels	3,49982E-06	toward zero	2,4967E-06	interest rateeultimately	2,4967E-06
ratesetting alternatives	2,84866E-06	ensures zero	1,59518E-06	interest ratescaa	1,59518E-06
generate negative	2,4967E-06	towards zero	1,59518E-06	interest rateed	1,09925E-06
interestrate channel	2,4967E-06	approaches zero	1,09925E-06	**Sum frequencies**	**0,60 %**
longerterm rates	2,4967E-06	around zero	1,09925E-06		

Table A.16: Bigrams for interest rates consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
cyber security	0,000105012	attack security	1,38345E-05	computer security	1,09925E-06
cyber attacks	3,90278E-05	security loopholeed	1,38345E-05	major security	1,09925E-06
successfulcacyberheistcaof us	2,85266E-05	settlement security	1,38345E-05	security questions	1,09925E-06
safety cyber	2,45622E-05	security requirements	1,36188E-05	hacking attacks	4,2715E-05
cybersecurity breach	2,12644E-05	scalability security	1,28912E-05	malicious attacks	1,77384E-05
eg cybersecurity	2,12644E-05	reported security	9,28445E-06	attackingcavirtual currencies	1,37954E-05
cyber risk	2,01611E-05	security depends	9,28445E-06	recent attack	1,3416E-05
cyber risks	1,8221E-05	security security	9,28445E-06	data breaches	1,7372E-05
carry cybersecurity	1,75722E-05	security standards	9,28445E-06	fraud hacking	4,2715E-05
innovation cybersecurity	1,75722E-05	maintenance security	8,72847E-06	hacked something	4,2715E-05
cybersecurity measures	1,7372E-05	adequate security	7,33321E-06	faced hacking	2,92099E-05
new cybersecurity	1,7372E-05	security fixes	7,33321E-06	hacking issues	2,92099E-05
cyberspace administration	1,38345E-05	security flaws	7,33321E-06	hackers typically	2,85266E-05
cyberattack might	1,37954E-05	security infrastructure	7,33321E-06	hacks lately	2,85266E-05
cyberattacks anonymous	1,37954E-05	security lapses	7,33321E-06	secure hackers	2,85266E-05
cyberattacks must	1,3416E-05	personal security	5,99652E-06	got hacked	2,12644E-05
foremost cyber	1,3416E-05	security challenges	5,69732E-06	hacking resulting	2,12644E-05
towards cyberattacks	9,61003E-06	security administration	5,39846E-06	hacking ecnine	1,77384E-05
cyber resilience	6,74509E-06	security reform	5,39846E-06	can hack	1,63803E-05
cyberattacks pro	6,74509E-06	better security	4,80501E-06	hack onees	1,63803E-05
cybertheft globally	6,74509E-06	builtin security	4,80501E-06	hacking money	1,55056E-05
face cyber	6,74509E-06	improve security	4,80501E-06	digital hacking	1,3416E-05
highprofile cyberattacks	6,74509E-06	security measures	4,80501E-06	hackers everywhere	1,3416E-05
raises cybersecurity	5,39846E-06	severe security	4,80501E-06	undoubtedly hackers	1,3416E-05
cyberrisk cf	4,80501E-06	security issues	4,59907E-06	hackers wonet	1,2362E-05
attacks cyber	2,90949E-06	simplifies security	4,00874E-06	occasional hacks	3,49982E-06
cyber counterfeiting	2,90949E-06	security breach	3,59595E-06	hacked either	2,84866E-06
cyber theft	2,90949E-06	available security	3,49982E-06	hackers gain	2,4967E-06
cyber threatsespecially	2,90949E-06	development security	3,49982E-06	ransomware hacks	2,19851E-06
cybersecurity money	2,90949E-06	information security	3,49982E-06	computer hackersed	1,09925E-06
system security	6,9065E-05	management security	3,49982E-06	example hacking	1,09925E-06
security technology	6,55652E-05	security blocks	3,49982E-06	hacked stolen	1,09925E-06
high security	4,19617E-05	security functions	3,49982E-06	hackerproof systems	1,09925E-06
highsecurity digital	4,19617E-05	security operational	3,49982E-06	hackers ask	1,09925E-06
security features	4,15015E-05	security performance	3,49982E-06	hackers sauer	1,09925E-06
security concerns	3,99415E-05	special security	3,49982E-06	hackersed yermack	1,09925E-06
security threats	3,38598E-05	security protections	2,90949E-06	hacking people	1,09925E-06
one security	2,85266E-05	authenticationsecurity mechanism	2,84866E-06	hacks regarding	1,09925E-06
security problem	2,85266E-05	operational security	2,84866E-06	confidential information	2,90949E-06
securityes sake	2,85266E-05	perceived security	2,84866E-06	confidentiality requirements	2,90949E-06
security risks	2,70589E-05	possible authenticationsecurity	2,84866E-06	preserve confidentiality	2,90949E-06
security breaches	2,39751E-05	related security	2,84866E-06	preserving confidentiality	2,90949E-06
cryptographic security	2,09809E-05	say security	2,84866E-06	confidentiality integrity	2,84866E-06
security cryptographic	2,09809E-05	security act	2,84866E-06	enhanced confidentiality	1,09925E-06
security digital	2,09809E-05	security banks	2,84866E-06	personal information	6,47153E-05
security protocols	2,09809E-05	security carrying	2,84866E-06	cybercash failed	4,00874E-06
blockchain security	1,97013E-05	security must	2,84866E-06	technology cyber	1,59518E-06
security benefits	1,97013E-05	security protection	2,84866E-06	privacy protection	7,93997E-05
security fintech	1,97013E-05	security solutions	2,84866E-06	privacy concerns	4,20635E-05
technical security	1,85689E-05	creates security	2,4967E-06	preserve privacy	2,57825E-05
networkes security	1,63803E-05	greater security	2,4967E-06	data protection	7,41505E-05
security tokens	1,63803E-05	note security	2,4967E-06	personal data	2,2961E-05
security feature	1,58544E-05	additional security	1,09925E-06	**Sum frequencies**	**0,23 %**

Table A.17: Bigrams for IT security consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
private cryptocurrencies	0,000351258	bitcoin holders	4,00874E-06
private cryptocurrency	5,60264E-05	bitcoin privatelyissued	4,00874E-06
private cryptoassets	2,84866E-06	bitcoin user	4,00874E-06
trading bitcoin	0,000121936	bitcoines distributed	4,00874E-06
using bitcoin	9,51339E-05	bitcoines settlement	4,00874E-06
bitcoin transactions	7,52738E-05	holding bitcoin	4,00874E-06
recognise bitcoin	6,35163E-05	transaction bitcoines	4,00874E-06
embracing bitcoin	4,20521E-05	transfer bitcoin	4,00874E-06
bitcoin trading	2,77557E-05	uses bitcoined	4,00874E-06
ban bitcoin	2,31876E-05	adopt bitcoinlike	2,90949E-06
bitcoin transaction	2,21757E-05	purchased bitcoin	2,90949E-06
kept bitcoin	2,15938E-05	transactions bitcoin	2,90949E-06
owned bitcoin	1,77384E-05	bitcoin introducing	2,84866E-06
accepting bitcoin	1,75722E-05	bitcoin remains	4,44384E-06
recognized bitcoin	1,75722E-05	acquire bitcoins	1,09925E-06
bitcoin activity	1,7372E-05	bitcoin gain	1,09925E-06
transactionssecond bitcoin	1,63803E-05	bitcoin issuance	1,09925E-06
bitcoin production	1,55056E-05	bitcoin reserves	1,09925E-06
adopt bitcoin	1,47551E-05	bitcoin stipulated	1,09925E-06
buying bitcoin	1,38345E-05	bitcoin transfers	1,09925E-06
hold bitcoin	1,38345E-05	bitcoines success	1,09925E-06
bitcoin payments	1,32932E-05	sending bitcoin	1,09925E-06
bitcoin launched	1,28912E-05	transactions bitcoins	1,09925E-06
bought bitcoins	1,28912E-05	privatelyissued cryptocurrencies	1,63803E-05
bitcoin activities	1,2362E-05	privatelyissued cryptocurrency	1,59518E-06
bitcoin introduced	1,2362E-05	running ethereum	3,27606E-05
bitcoin uses	1,2362E-05	gains ethereum	2,13575E-05
buy bitcoin	1,2362E-05	used ethereum	1,2362E-05
bitcoins created	1,03837E-05	ethereum user	1,09925E-06
bitcoin supply	9,50501E-06	cryptocurrencies emerged	1,63803E-05
accept bitcoin	9,28445E-06	rises bitcoin	4,80501E-06
avoid bitcoin	9,28445E-06	towards cryptocurrenciesed	4,60193E-05
bitcoin payment	9,28445E-06	towards cryptocurrency	4,49627E-05
bitcoin traders	9,28445E-06	towards cryptocurrencies	3,44565E-05
bitcoins allocated	9,28445E-06	cryptocurrency replaces	3,23908E-05
embraced bitcoin	9,28445E-06	rise incatokenscaandcacryptocurrencies	2,45622E-05
restrict bitcoin	9,28445E-06	cryptocurrencies challenging	1,75722E-05
bitcoins outstanding	8,01749E-06	threat cryptocurrency	1,75722E-05
bitcoin users	7,60469E-06	cryptocurrency risks	1,47551E-05
bitcoin adoption	7,30171E-06	cryptocurrency competition	1,37954E-05
use bitcoin	6,50544E-06	cryptocurrencies competition	9,28445E-06
deposits bitcoin	1,59518E-06	riskscacryptocurrencies may	2,90949E-06
bitcoin attain	5,39846E-06	cryptocurrencies implement	1,59518E-06
preventing bitcoin	5,39846E-06	cryptocurrencies introduce	1,59518E-06
bitcoin operates	4,80501E-06	allows cryptocurrencies	1,59518E-06
embrace bitcoin	4,80501E-06	**Sum frequencies**	**0,170 %**

Table A.18: Bigrams for private cryptocurrencies consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
underground economy	0,000118963	financial frauds	3,23908E-05	distribute counterfeit	3,10111E-05
black economy	9,71723E-05	preventreduce fraud	1,47551E-05	possible counterfeiting	1,77384E-05
black market	0,000114745	fraud money	1,37954E-05	counterfeiting innovations	1,63803E-05
black markets	2,90949E-06	fraudulent payments	6,74509E-06	preventing counterfeiting	1,63803E-05
blackmarket transactions	1,09925E-06	fraudulently spend	6,74509E-06	bitcoin noncounterfeitability	1,55056E-05
illegal activities	0,000119961	fraudulent transactions	5,108E-06	cash noncounterfeitability	1,55056E-05
illegal transactions	8,71771E-05	fraudulent property	4,00874E-06	recordkeeping noncounterfeitability	1,55056E-05
illegal criminal	6,55652E-05	banking fraud	1,09925E-06	cash counterfeiting	1,38345E-05
illegal withdrawal	4,2715E-05	fraud prevention	1,09925E-06	noncounterfeiting nonaccountbased	1,38345E-05
conducting illegal	3,00372E-05	payments fraud	1,09925E-06	counterfeiting banknotes	1,3416E-05
finance illegal	2,85266E-05	preventing fraudulent	1,09925E-06	counterfeit notes	1,20262E-05
illegal trades	2,85266E-05	widespread fraud	2,90949E-06	prevent counterfeiting	1,04904E-05
offeringsewas illegal	2,13575E-05	widespread fraudcasaid	2,90949E-06	counterfeit banknotes	8,01749E-06
illegal transactionsed	1,97013E-05	evade taxation	3,23908E-05	depositing counterfeit	8,01749E-06
illegal activity	1,8015E-05	tax evaders	8,01749E-06	counterfeiting issues	7,33321E-06
illegal usescaof	1,2362E-05	tax evasion	0,00021752	counterfeiting reduction	7,33321E-06
laundering illegal	1,2362E-05	evasion money	4,56755E-05	counterfeit note	4,00874E-06
encourage illegal	3,49982E-06	evasion offenses	3,23908E-05	make counterfeiting	4,00874E-06
facilitating illegal	2,4967E-06	tax evasionca	3,23908E-05	cyber counterfeiting	2,90949E-06
illegal trade	2,4967E-06	evasioncathird cash	2,90949E-06	fighting counterfeiting	2,90949E-06
shadows cash	1,63803E-05	tax evasioncaifcathis	2,90949E-06	electronic counterfeiting	2,4967E-06
shadow banking	1,62742E-05	tax evasioncathird	2,90949E-06	less anonymity	2,02353E-05
shadow economies	1,09925E-06	terrorist financing	0,000157529	preserve anonymity	1,34902E-05
money laundering	0,000946442	terrorism financing	0,000128425	guarantee anonymity	1,3416E-05
laundering evasion	6,55652E-05	terrorist financingca	2,45622E-05	limited anonymity	8,01749E-06
laundering act	4,37882E-05	evasion terrorist	1,49338E-05	little anonymity	6,74509E-06
laundering risks	3,29467E-05	terrorist financinged	5,39846E-06	anonymity provided	4,00874E-06
launder money	1,78433E-05	finance terrorism	4,80501E-06	anonymity offered	3,49982E-06
laundering fraud	1,76646E-05	blocking terrorism	1,38345E-05	anonymity concerns	2,4967E-06
money launderingcatherefore	1,38345E-05	money scam	1,09925E-06	losing anonymity	2,4967E-06
laundering financial	1,37954E-05	illicit activities	0,000136754	anonymity features	1,09925E-06
laundering prevention	6,99964E-06	activities illicit	1,37954E-05	anonymity cash	6,51018E-05
money launderers	5,39846E-06	illicit activity	5,39846E-06	anonymous alternative	6,1282E-05
money launderinged	5,39846E-06	prevent illicit	5,39846E-06	nonanonymous cbdc	3,96975E-05
laundering offence	3,49982E-06	illicit trade	4,00874E-06	thirdparty anonymity	3,3693E-05
laundering offences	3,49982E-06	facilitates corruption	0,000114508	anonymity also	3,23908E-05
launderingfinancing terrorism	3,49982E-06	corruption today	3,81694E-05	anonymous central	3,23908E-05
money launderingfinancing	3,49982E-06	facilitates corruptioned	3,81694E-05	anonymous finance	3,23908E-05
laundering procedures	2,90949E-06	possibly corrupt	1,38345E-05	anonymous payments	3,11205E-05
moneylaundering risks	2,90949E-06	corruption failure	7,33321E-06	anonymous cbdc	3,00875E-05
laundering violations	1,09925E-06	sector corruption	7,33321E-06	anonymous nature	3,00372E-05
ecantimoney launder	1,09925E-06	sex trafficking	1,09925E-06	anonymous trading	3,00372E-05
ecantimoney launderinged	1,09925E-06	gambling hub	9,49037E-05	payments anonymously	2,75908E-05
drug money	1,47551E-05	gambling site	4,00874E-06	remain anonymous	2,39379E-05
drug cartel	4,00874E-06	online gambling	4,01E-06	**Sum frequencies**	**0,44 %**
tax fraud	6,89769E-05	digital counterfeiting	7,36865E-05		
reduces fraud	6,35163E-05	counterfeit transactions	3,10111E-05		

Table A.19: Bigrams for shadow economy consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
coming shutdown	1,46664E-05	operational failure	1,60295E-05
shutdown ironically	1,46664E-05	systemes failure	1,46664E-05
backup solution	7,12165E-05	system fails	1,23045E-05
independent backup	3,41839E-05	systems fail	5,69732E-06
backup system	1,66135E-05	system failure	4,80501E-06
backup arrangements	6,74509E-06	technical failure	4,80501E-06
backup cash	6,74509E-06	technology failure	1,09925E-06
backup payment	6,74509E-06	technology failures	1,09925E-06
important backup	6,74509E-06	ocean flooding	5,39846E-06
backup functionality	5,69732E-06	natural disasters	4,7031E-05
backup solutions	2,84866E-06	natural disaster	1,48057E-05
deposits backup	2,84866E-06	power outage	1,63803E-05
backup option	1,09925E-06	power outages	1,32505E-05
backup plan	1,09925E-06	electricity outage	6,74509E-06
bank resiliency	3,37254E-05	electricity outages	6,74509E-06
greater resilience	2,85266E-05	internet outages	6,74509E-06
less resilient	2,02353E-05	digital disruption	1,75722E-05
resilient technology	1,3416E-05	technological disruptions	1,04995E-05
enhancing resilience	1,28912E-05	technical disruption	4,80501E-06
reduced resilience	1,02449E-05	nationwide disruption	1,09925E-06
bank resilience	6,74509E-06	widespread disruptions	1,09925E-06
blockchain resilient	6,74509E-06	payment alternatives	1,46664E-05
cyber resilience	6,74509E-06	technical alternatives	1,37954E-05
increases resilience	6,74509E-06	alternative technical	9,28445E-06
operational resilience	6,74509E-06	technical alternative	9,28445E-06
building resilience	5,39846E-06	alternative platform	6,99964E-06
resilient investment	5,39846E-06	technology alternatively	6,74509E-06
system stops	1,63803E-05	technological alternatives	4,80501E-06
stop functioning	1,4415E-05	infrastructure alternatively	4,00874E-06
system stop	1,4415E-05	prolonged downtime	4,80501E-06
infrastructure stops	4,80501E-06	disrupt cash	1,63803E-05
stops working	4,80501E-06	improve resiliency	1,59518E-06
service stoppage	2,84866E-06	increased resiliency	1,59518E-06
system failures	3,27606E-05	system resiliency	1,59518E-06
operational failures	2,02353E-05	without electricity	3,49982E-06
internet failure	1,63803E-05	safe robust	9,26084E-05
payment failures	1,63803E-05	robust payment	5,41246E-05
system failed	1,63803E-05	**Sum frequencies**	**0,097 %**

Table A.20: Bigrams for shutdowns consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies
small open	3,29776E-06	g countries	1,09925E-06
major economy	1,75722E-05	smallest country	9,49037E-05
globalized economy	1,47551E-05	small country	4,66171E-05
large economy	1,38345E-05	african country	4,06822E-05
largest economy	1,38345E-05	eastern countryes	3,23908E-05
open economy	2,69443E-06	populated country	1,38345E-05
advanced economies	0,000147976	scandinavian country	6,34848E-06
major economies	2,02351E-05	countryes capacity	5,39846E-06
large economies	1,47551E-05	countryes gdp	3,49982E-06
biggest economies	1,38345E-05	nordic country	3,49982E-06
significant economies	7,30171E-06	scandinavian countryes	3,49982E-06
scandinavian economies	2,84866E-06	scandinavian countrys	2,84866E-06
larger economies	2,19851E-06	major nations	1,75722E-05
open economies	2,19851E-06	african nation	1,04904E-05
big countries	1,38345E-05	african nations	1,04904E-05
larger countries	5,39846E-06	small island	1,07969E-05
larger countrys	5,39846E-06	small african	1,04904E-05
nordic countries	2,31592E-05	powerful actors	4,00874E-06
major countries	1,63312E-05	capital flows	1,59518E-06
powerful countries	1,47551E-05	exchange traded	9,28445E-06
highincome countries	1,3416E-05	exchange trade	1,09925E-06
smallest countries	1,07969E-05	trade balance	1,09925E-06
scandinavian countries	7,44774E-06	yearly gdp	9,49037E-05
small countries	5,39846E-06	annual gdp	1,07969E-05
smaller countries	5,39846E-06	**Sum frequencies**	**0,08 %**

Table A.21: Bigrams for size of economy consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
new technology	0,000228376	mobile banking	2,56758E-05	technological developments	9,6977E-05
innovative technology	6,35163E-05	mobilephone payments	1,75722E-05	developed fintech	6,1282E-05
technology improvements	5,19494E-05	mobilepay mobile	9,61003E-06	develop digital	3,84799E-05
payment technology	3,92246E-05	using mobilepay	9,61003E-06	development environment	2,92099E-05
technology innovation	3,27826E-05	mobile wallets	6,74509E-06	already developed	1,8255E-05
internet technology	1,47551E-05	launch mobilepay	4,80501E-06	develop technology	1,75722E-05
infrastructure technology	1,34902E-05	today mobilepay	4,80501E-06	developed payment	9,28445E-06
technology possibilities	8,01749E-06	transfers mobile	4,80501E-06	technical development	8,54599E-06
existing technology	7,65367E-06	via mobilepay	4,80501E-06	new development	7,33321E-06
todayes technology	5,99652E-06	mobile transactions	4,00874E-06	new developments	5,40619E-06
established technology	1,59518E-06	electronic payments	0,000586579	developed mobile	4,80501E-06
modern technology	5,69833E-06	electronic payment	0,000362812	technically developed	4,80501E-06
advanced technology	5,39846E-06	electronic wallet	9,12632E-05	welldeveloped payment	4,80501E-06
smartphone technology	3,49982E-06	transactions electronically	6,35163E-05	develop payment	3,49982E-06
suitable technology	3,49982E-06	electronic transactions	5,7629E-05	pushing developments	3,49982E-06
mature technology	2,84866E-06	chipbased electronic	1,55056E-05	rapid development	3,49982E-06
needed technology	2,4967E-06	cards electronic	6,99964E-06	technologically developed	3,49982E-06
current technology	2,4967E-06	card electronic	3,49982E-06	developing digital	2,84866E-06
technology infrastructure	2,19851E-06	swish payments	6,99964E-06	software development	2,84866E-06
vipps service	8,54599E-06	swish mobile	1,09925E-06	significant developments	2,4967E-06
mobile payment	0,000146442	contactless payments	0,000144605	developing new	1,09925E-06
mobile payments	6,79218E-05	contactless transactions	6,35163E-05	fast development	1,09925E-06
africaes mpesa	7,33321E-06	contactless card	9,28445E-06	rapid developments	1,09925E-06
mpesa programme	7,33321E-06	contactless dankort	4,80501E-06	modern payments	9,61003E-06
kenyaes mpesa	4,00874E-06	contactless cards	3,49982E-06	modern payment	4,80501E-06
mpesa mobile	4,00874E-06	contactless cardseare	2,4967E-06	modern system	4,80501E-06
mpesa users	4,00874E-06	contactless payment	1,09925E-06	modern moneyissuing	4,00874E-06
kenyanbased mpesa	2,90949E-06	ecommerce business	4,20521E-05	modern technologically	2,84866E-06
africas mpesa	2,4967E-06	walmartes ecommerce	4,20521E-05	modernized digitalbased	2,84866E-06
mpesa system	2,4967E-06	rising ecommerce	2,13575E-05	modernday banking	2,4967E-06
mpesa platform	2,19851E-06	increased ecommerce	3,49982E-06	modern digital	1,09925E-06
mpesa transactions	1,09925E-06	ecommerce sales	2,4967E-06	adopting innovations	6,55652E-05
mpesaea transaction	1,09925E-06	retail ecommerce	2,4967E-06	technology dlt	0,000319034
paypal online	2,84866E-06	new payment	0,000142789	dlt technology	5,23162E-05
using paypal	1,3416E-05	new paymentcamethods	1,59518E-06	using dlt	3,57796E-05
paypal account	9,98679E-06	advanced digital	2,13575E-05	ledger technology	0,000788167
card paypal	2,84866E-06	digitally advanced	2,13575E-05	ledger technologies	6,25472E-05
like paypal	4,80501E-06	advanced applications	1,97013E-05	current knowledge	3,10111E-05
klarna izettle	3,49982E-06	advanced transaction	1,97013E-05	**Sum frequencies**	**0,509 %**
mobile money	0,000557075	technologically advanced	2,84866E-06		
mobile wallet	2,7003E-05	technological development	0,000130112		

Table A.22: Bigrams for technological development consideration.

Bigram	Scaled frequencies	Bigram	Scaled frequencies	Bigram	Scaled frequencies
quantitative easing	3,40459E-05	tative easing	1,09925E-06	transferred directly	4,3628E-05
purchases quantitative	1,59518E-06	policy transmission	0,000139783	direct involvement	2,71686E-05
without quantitative	3,49982E-06	policy instruments	7,94001E-05	direct deposits	1,8877E-05
unconventional measures	1,3416E-05	policy tool	8,52652E-05	deposited directly	1,74795E-05
unconventional monetary	8,58935E-06	policy instrument	6,52217E-05	direct monetary	6,74509E-06
unconventional policies	1,59518E-06	policy framework	5,89159E-05	direct transmission	6,74509E-06
regarding unconventional	2,4967E-06	new policy	1,75722E-05	direct transfer	5,34536E-06
support unconventional	2,4967E-06	monetarypolicy instrument	9,61003E-06	direct provision	2,4967E-06
eunconventionale monetary	1,09925E-06	untested policy	7,33321E-06	direct transfers	2,4967E-06
traditional qe	8,1907E-06	policy mechanism	6,74509E-06	direct fiscal	1,09925E-06
effective qe	1,59518E-06	monetarypolicy framework	4,80501E-06	direct manipulation	1,09925E-06
interaction qe	1,59518E-06	monetarypolicy opportunities	4,80501E-06	direct mechanism	1,09925E-06
qe alternatively	1,59518E-06	new monetarypolicy	4,80501E-06	fiscal policy	9,81569E-05
qe can	1,59518E-06	policy tools	4,39702E-06	fiscal adjustment	6,47815E-05
qe induces	1,59518E-06	policy echelicopter	2,4967E-06	fiscal framework	2,15938E-05
qe one	1,59518E-06	helicopter money	6,15143E-05	fiscal stimulus	1,85788E-05
way qe	1,59518E-06	implement helicopter	2,23636E-05	fiscal stimuli	1,63803E-05
qe etc	2,84866E-06	helicopter drop	1,32846E-05	fiscal measure	1,46664E-05
finally qe	2,4967E-06	ehelicopter moneye	4,89294E-06	fiscal maneuver	8,43246E-06
easing qe	2,19851E-06	echelicopter moneyed	7,89516E-06	coordinated monetaryfiscal	1,09925E-06
qe program	2,19851E-06	socalled ehelicopter	1,59518E-06	fiscal expansion	1,09925E-06
either qe	1,09925E-06	ehelicopter dropse	3,29776E-06	fiscal interventions	1,09925E-06
implemented qe	1,09925E-06	implementing helicopter	3,29776E-06	monetaryfiscal interactions	2,69443E-06
investment qe	1,09925E-06	famous helicopter	2,90949E-06	monetaryfiscal policy	1,09925E-06
qe acts	1,09925E-06	helicopter cash	2,90949E-06	moneyfinanced fiscal	1,09925E-06
qe banks	1,09925E-06	echelicopter moneyedeand	2,4967E-06	balance sizes	4,00874E-06
qe becomes	1,09925E-06	evenly helicopter	2,4967E-06	sheet monetary	6,99964E-06
qe depends	1,09925E-06	firmsesocalled echelicopter	2,4967E-06	formal quantitative	3,19035E-06
qe helicopter	1,09925E-06	allow helicopter	1,09925E-06	support quantitative	2,4967E-06
qe must	1,09925E-06	bank ehelicopter	1,09925E-06	ecquantitative easinged	1,59518E-06
qe open	1,09925E-06	debt helicopter	1,09925E-06	quantitative tool	1,59518E-06
qe relied	1,09925E-06	ehelicopter drope	1,09925E-06	robust quantitative	1,59518E-06
qees conducted	1,09925E-06	finances helicopter	1,09925E-06	similar quantitative	1,59518E-06
unlike qe	1,09925E-06	helicopter drops	1,09925E-06	easinged qe	1,59518E-06
easing however	3,19035E-06	issuing helicopter	1,09925E-06	qe increasing	1,59518E-06
easing alternatively	2,19851E-06	making ehelicopter	1,09925E-06	qe also	1,59518E-06
credit easing	1,09925E-06	occasional ehelicopter	1,09925E-06	qe conducted	1,59518E-06
easing flooding	1,09925E-06	regular ehelicopter	1,09925E-06	qe policies	1,59518E-06
easing introduction	1,09925E-06	monetary toolkit	1,59518E-06	bonds qe	1,09925E-06
easing programme	1,09925E-06	toolkit cbdc	1,59518E-06	**Sum frequencies**	**0,12 %**
easing thus	1,09925E-06	kit concerns	2,4967E-06		
quantitive easing	1,09925E-06	tool kit	2,4967E-06		

Table A.23: Bigrams for unconventional policy tools consideration.

Countries	Exchange Rate Policies	Institutional Credibility	CIC to GDP	Financial Stability	Policy Rate	Group
Italy	Currency union	3,54	10,26 %	3,82	1,30	1
Estonia	Currency union	4,94	10,26 %	5,13	1,30	1
France	Currency union	4,91	10,26 %	5,18	1,30	1
Germany	Currency union	5,39	10,26 %	5,15	1,30	1
Malta	Currency union	4,65	10,26 %	5,32	1,30	1
Spain	Currency union	4,21	10,26 %	4,53	1,30	1
Netherlands	Currency union	5,66	10,26 %	4,99	1,30	1
Finland	Currency union	6,08	10,26 %	5,86	1,30	1
Senegal	Currency Union	3,75	10,30 %	4,21	2,50	1
Thailand	Floating + no capital controls	3,89	10,58 %	4,67	2,49	2
Russia	Floating + partial capital controls	3,33	10,26 %	3,54	7,44	2
Ukraine	Floating + capital controls	3,08	13,98 %	3,93	11,68	2
Venezuela	Soft peg + capital controls	2,30		3,39	18,64	2
Iran	Soft peg + capital controls	3,68		3,51	13,48	2
Ecuador	Dollarized	3,15	12,04 %	3,73		2
Sweden	Floating + no capital controls	5,83	1,51 %	5,49	1,16	3
New Zealand	Floating + no capital controls	5,99	1,96 %	6,33	3,82	3
Norway	Floating + no capital controls	5,80	1,54 %	5,58	2,05	3
China	Soft peg + capital controls	4,23	8,74 %	4,29	3,12	4
Tunisia	Managed float + capital controls	4,40	11,26 %	3,77	4,55	4
Uruguay	Float + no capital controls (dollarized)	4,64	2,95 %	4,50	8,49	4
USA	Floating + no capital controls	4,80	7,81 %	5,49	1,29	5
UK	Floating + no capital controls	5,34	3,59 %	5,42	1,61	5
Israel	Floating + no capital controls	4,67	6,35 %	5,60	1,86	5
Canada	Floating + no capital controls	5,39	3,47 %	5,81	1,53	5
Japan	Floating + no capital controls	5,22	18,74 %	5,04	0,13	5
Switzerland	Floating + no capital controls	5,80	11,44 %	5,59	0,40	5
Taiwan	Managed float + no capital controls	4,82		4,72	1,96	5
Saudi Arabia	Soft peg + partial capital controls	5,04	8,09 %	4,63	1,28	6
UAE	Soft peg + no capital controls	5,52	4,60 %	4,66	1,14	6
Singapore	Soft peg + no capital controls	6,08	9,79 %	6,28	1,02	6
Denmark	Soft peg + no capital controls	5,68	3,36 %	5,64	1,20	6
Hong Kong	Currency board + no capital controls	5,67	15,97 %	6,26	1,83	6
Republic of Korea	Floating + no capital controls	4,14	5,58 %	4,57	2,77	6
Chile	Floating + no capital controls	4,80	5,12 %	5,00	4,04	6
Malaysia	Managed float+ partial capital controls	4,92	7,42 %	5,70	3,03	6
Australia	Floating + no capital controls	5,39	4,31 %	6,30	3,78	6
The Bahamas	Soft peg + capital controls		2,09 %		4,79	6
India	Floating + capital controls	4,10	10,42 %	5,11	5,90	6
Marshall Islands	Dollarized					6

Table A.24: Grouping of countries, explained in section 4.2. Green labels mean that countries could benefit from a CBDC, red labels mean that countries could have difficulties introducing a CBDC and yellow labels are neutral to the attractiveness of a CBDC. Grey labels mean that country data is missing.

COUNTRY	OUR CONCLUSION	THEIR CONCLUSION	COUNTRY COMMENTS
AUSTRALIA	Should consider CBDC	Currently rejected, but researching	Existing payment systems work well.
THE BAHAMAS	Inconclusive	Launching pilot project	Increasing financial inclusion.
CANADA	Should consider CBDC	Currently rejected, but researching	Do not recommend issuing unless risks can be managed through design.
CHILE	Should not consider CBDC	Rejected	Technical challenges and a replacement of the classical role of central banks.
CHINA	Should not consider CBDC	Researching	CBDC is technologically inevitable.
DENMARK	Should not consider CBDC	Rejected	No improvement of existing payment system. Benefits will not outweigh the challenges. Central bank direct competitor with commercial banks, and risk of financial instability.
ECUADOR	Should not consider CBDC	Introduced CBDC, later abolished	Initially introduced to promote financial inclusion and reduce costs related to cash handling. See section 4.4.1.
ESTONIA	Should not consider CBDC	Rejected	Part of a currency union, cannot issue own legal tender. See section 4.4.1.
FINLAND	Should not consider CBDC	Researching	Could have benefits, but could also affect financial stability.
FRANCE	Should not consider CBDC	Researching	Commercial banks might become dependent on central bank financing. They would only disappear in a limit scenario.
GERMANY	Should not consider CBDC	Currently rejected	Too risky to implement: financial stability risk and more difficult to combat illegal activities. Benefits, like faster payments, could be achieved in other ways.
HONG KONG	Should not consider CBDC	Currently rejected	Not superior to existing infrastructure.
INDIA	Inconclusive	Researching	Rapid changes in the global payment industry and high cash handling costs calls for CBDC.
IRAN	Should not consider CBDC	Will issue	Issuing due to US sanctions.
ISRAEL	Should consider CBDC	Currently rejected	Many material and technological difficulties and risks of CBDC issuance.

ITALY	Should not consider CBDC	Currently rejected	Advantages at best unclear. Might threaten the financial system.
JAPAN	Should consider CBDC	Rejected	Unlikely to improve existing monetary systems. Assume that cash must be abolished to implement negative interest rates, which is currently not an option. See section 4.4.2.
MALAYSIA	Inconclusive	Researching	Implications of CBDC are unclear.
MALTA	Should not consider CBDC	No central bank statements	
MARSHALL ISLANDS	Inconclusive	Introduced CBDC	See section 4.4.1.
NETHERLANDS	Should not consider CBDC	Currently rejected, but researching	Critical due to uncertainties and risks, especially for the financial system.
NEW ZEALAND	Should consider CBDC	Currently rejected	Unclear whether CBDC will bring conclusive benefits. Increases likelihood of bank runs.
NORWAY	Should consider CBDC	Researching	Need to assess purposes, solutions, benefits and costs.
REPUBLIC OF KOREA	Should not consider CBDC	Rejected	Risks associated with credit, liquidity and legal management
RUSSIA	Should not consider CBDC	Researching	Discussion of launching a Cryptoruble to avoid western sanctions, but central bank cautious about the issue
SAUDI ARABIA	Should not consider CBDC	Researching	Focuses on issuing a wholesale CBDC. No plans of issuing a CBDC to the general public.
SENEGAL	Should not consider CBDC	Introduced CBDC	To promote financial inclusion.
SINGAPORE	Should not consider CBDC	Currently rejected	Highlights associated risk with a retail CBDC, for example a chance of bank runs.
SPAIN	Should not consider CBDC	Researching	Could benefit monetary policy and financial infrastructure, but wait-and-see approach.
SWEDEN	Should consider CBDC	Starts pilot project next year	Ensuring access to state-guaranteed means of payment if cash disappears.
SWITZERLAND	Should consider CBDC	Currently rejected	Concerned about impact on financial stability and monetary policy.
TAIWAN	Inconclusive	Currently rejected	Assumes CBDC to be a cryptocurrency, which does currently not work as a means of payment.

THAILAND	Should not consider CBDC	Currently rejected, but researching	Retail CBDC is complex and time-consuming to create. Will not replace cash within the next 3-5 years.
TUNISIA	Should not consider CBDC	Introduced CBDC	More competitive currency that eases transactions and reduces fees.
UKRAINE	Should not consider CBDC	Researching, positive	Step towards a cashless society. Reduce costs and time of transactions.
UNITED ARAB EMIRATES	Should not consider CBDC	Researching	Focuses on issuing a wholesale CBDC. No plans of issuing a CBDC to the general public.
UNITED KINGDOM	Should consider CBDC	Currently rejected, but researching	Could have wide-ranging implications for monetary policy and financial stability.
UNITED STATES	Should consider CBDC	Currently rejected, but researching	Banking system is sufficiently efficient and innovative, and there is no decline in cash demand
URUGUAY	Should not consider CBDC	Presented plan to issue pilot project	Reduce costs, as cash handling is expensive.
VENEZUELA	Should not consider CBDC	Introduced CBDC	Help increase the income of the workers. Make it easier to trade internationally.

Table A.25: Comparison of final recommendations with practise. Comments from central bank statements are included for all countris.