



Whitepaper

# Global Custodians, Sub-Custodian Networks and Credit Risk

June 2020

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# Executive Summary

- ✦ Custodians are responsible for safekeeping their clients' assets such as stocks, bonds and cash and for securely processing transactions. Global custodians serve clients across the globe using a network of sub-custodians composed of their own local branches, subsidiaries or local custodian banks.
- ✦ Even though the global custodians provide their clients with service in many of the same countries, their sub-custodian networks differ significantly.
- ✦ Many of the sub-custodian entities utilized by the major global custodians are not rated by the main credit rating agencies (CRAs).
- ✦ Whilst Asset Owners are not typically directly exposed to the credit risk of sub-custodians, their assets may be vulnerable if these entities fail, and access to their assets could be frozen until the failure is remedied and a more benign climate returns. This could take a significant amount of time.
- ✦ It is important to understand the creditworthiness and real-world risk of the sub-custody network during the selection process and to constantly monitor changes as they occur.
- ✦ Consensus credit data can help illuminate risks associated with non-CRA rated entities.

This whitepaper is the second in a series that looks at the potential application of Consensus credit data to help tackle the challenges posed by the consolidation of clearing, settlement and trading functions in the global capital markets.

Following on from the previous paper [“The Creditworthiness of CCPs and the Global Clearing Member Network”](#), this paper focuses on the largest eight global custodians and their sub-custodian networks.

Since the pandemic began, the world has suddenly been thrust into a malign risk climate and understanding the creditworthiness of the counterparts entrusted with the safeguarding of your assets is more important than ever.

This paper aims to explore and understand the interconnectedness and creditworthiness of the different sub-custodial networks used by eight of the largest global custodians.

Reviewing the strength and creditworthiness of a counterpart's sub-custodial network should be a matter of standard due diligence. This paper illustrates how Consensus credit data can help illuminate hidden risks within the complex sub-custodial networks.

## About Credit Benchmark

Credit Benchmark produces a comprehensive view of credit risk by creating consensus ratings and analytics on the credit quality of companies, financial institutions, sovereigns and funds.

The data is sourced from the risk departments of more than 40 global financial institutions, representing the work of over 20,000 analysts and is also used by regulators to monitor Basel rules on capital adequacy.

Credit Benchmark collects a specific measure of credit risk: a one-year, forward-looking Probability of Default (PD) and forward-looking senior unsecured Loss Given Default (LGD).

The underlying inputs from contributors are subject to a rigorous data quality approval process and derived from models that are approved by regulatory authorities. The resultant accuracy of each PD and LGD leads to a credible market view of credit risk.

After being anonymized and aggregated, the contributed risk estimates are mapped to the appropriate credit category on the Credit Benchmark Consensus scale, which is calibrated periodically and can be used as a comparison to the scales published by the rating agencies.

Credit Benchmark produces regular data updates with history going back to 2015.

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# 1. Introduction

The old adage that “possession is nine tenths of the law” is instructive. One of the great responsibilities of ownership is the selection of custodians for your assets. This paper re-enforces that point and sheds some light upon the challenges faced by all asset owners who entrust the safekeeping of their assets to others.

Over recent months, the world has shifted in an unimaginable way. Since the 2008 financial crisis, the world of credit and counterpart risk management has been largely benign. This relative stability slowly facilitated a global recovery. Suddenly, everything has changed. Now, knowing the relative riskiness of the entities in possession of your assets is of critical importance.

This paper focuses on the Global Custodians and their sub-custodian networks. Custodians are responsible for safekeeping their clients’ assets such as stocks, bonds and cash and for processing of transactions. Assets held in such a manner are typically owned by investment institutions like banks, insurance companies, mutual funds, hedge funds, pension funds and sovereign wealth funds. Global custodians serve clients across the globe using a network of sub-custodians composed of their local branches or other local custodian banks.

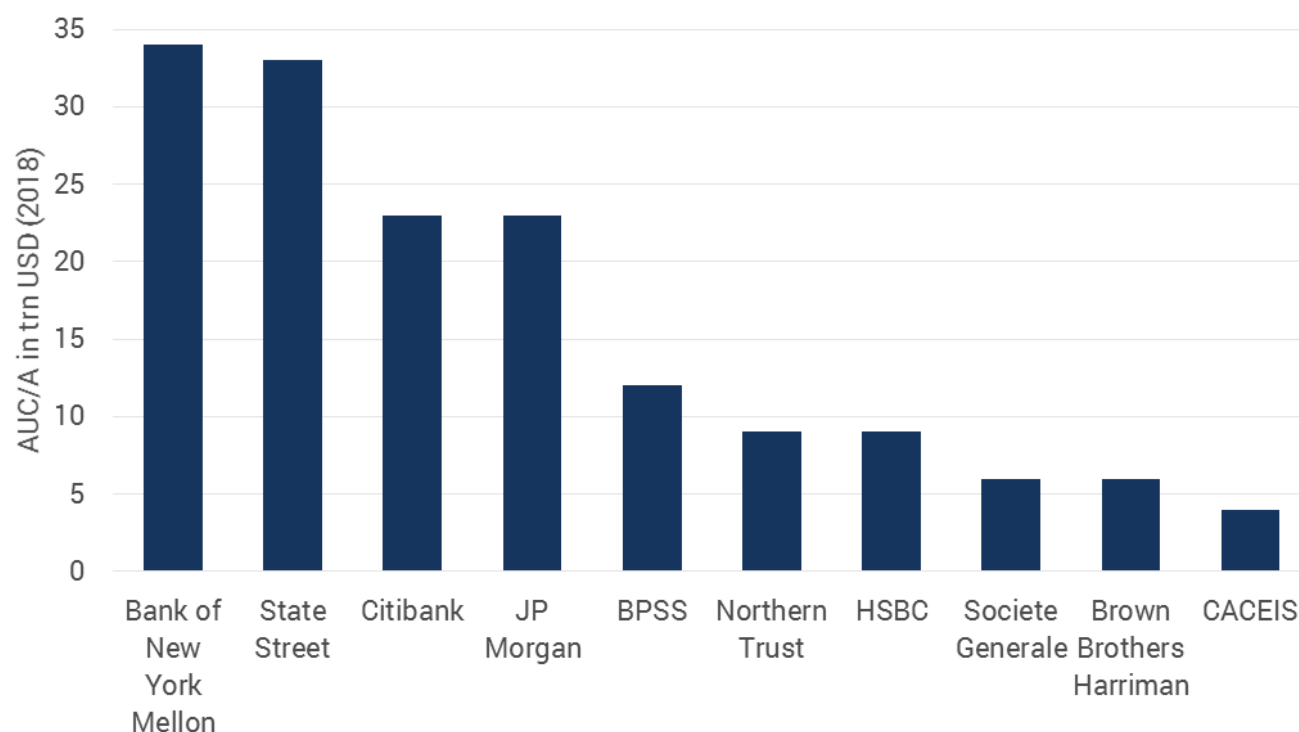
This paper explores the interconnectedness of eight major global custodians and their much larger sub-custodian networks. As an asset owner or asset manager, one has a duty of care and fiduciary responsibility to one’s underlying beneficial owners. This responsibility means that it is important to understand where your assets may be held within your chosen custodian’s broader network – and whether this sub-custodian relationship represents a point of weakness and therefore poses a threat to the security of the assets in question during volatile times.

While an asset is generally safeguarded by strict legal agreements between the investor and the custodian, and in turn the custodian and sub-custodian, we return to the idea that “possession is nine tenths of the law”. If the sub-custodian holding your assets in custody was to default or go under, how will you retrieve said assets? How long will your assets be frozen? And how will your investment capabilities and performance be impeded while matters are slowly resolved? Such a situation is most likely to occur at times of or precipitate extreme market volatility and any gating issue will therefore be exacerbated e.g. prime brokerage clients at Lehman Brothers in 2008 had their assets frozen, some of them for several years.

You may not have direct credit risk exposure to a sub-custodian but when selecting a global custodian, reviewing the strength and creditworthiness of their sub-custodial network should be a matter of standard due diligence. The safety of your assets and the continuity of your operations depends upon it. Consensus credit data can help quantify, observe and manage credit risk as an input when reviewing custodial arrangements and conducting searches and requests for proposals (RFPs).

The custody industry is very concentrated due to price competition. As Deloitte<sup>1</sup> reported, in 2018 half of the total assets were under the custody of the four largest players: Bank of New York Mellon, State Street, Citibank and JP Morgan Chase, who together accounted for more than \$100trn assets under custody and administration (“AUC/A”). This report covers the network of sub-custodians of eight out of the nine biggest custodian based on the 2018 AUC/A values and analyses the sub-custodians’ credit risk. Besides the above mentioned big four, the analysis covers Northern Trust, HSBC, Societe Generale and Brown Brothers Harriman with additional combined 2018 AUC/A of \$30trn. **Figure 1.1** shows the lead table of custodians by 2018 AUC/A.

<sup>1</sup> Deloitte. (2019). *The evolution of a core financial services: Custodian & Depository Banks*. Retrieved April 22, 2020, from <https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/financial-services/lu-the-evolution-of-a-core-financial-service.pdf>

**Figure 1.1 Largest Custodians by Assets Under Management or Administration**


Source: Deloitte (2019)

The custodians report their network of sub-custodians on their websites (mostly under Luxembourg or British jurisdiction). See appendix for full list of sources.

## Background on Credit Benchmark and Consensus Credit Risk Data

By bringing together the internal credit risk views of the world's leading financial institutions, Credit Benchmark provides an independent and unique measure of credit risk. The data contributed by our partners is subject to rigorous internal ratings systems and/or strict regulatory requirements. Credit Benchmark anonymizes and aggregates the data before releasing it in the form of Consensus ratings ("CBRs") and aggregate analytics.

This growing credit dataset offers insights into the Consensus views of the creditworthiness of ~50,000 global entities including financials, sovereigns, corporates and funds. The majority of the entities within the sub-custodial networks of the eight global custodians referred to within this paper hold a current CBR (coverage ranges from 85-99% by respective custodian). Comparatively, the major credit rating agencies (CRAs) rate between 38-61% of the named sub-custodians.

Entity-level credit risk information is available when a minimum of three observations are contributed on that particular entity. The rule of three applies to ensure the anonymity of those contributing credit views to the Credit Benchmark dataset. Basing a Consensus rating on a minimum of three separate observations prevents reverse engineering and enriches the depth of the data.

For those entities that do not meet this rule of three, Credit Benchmark has formulated 'aggregates', which can be thought of as a basket of obligors. These aggregates are macro-level risk indicators that assess credit trends, activity and distribution across 105 countries, 300 industries and 75 sectors. Our analysis of the custodial and sub-custodial networks covers data at both the entity and aggregate level.

The information that feeds into Consensus ratings and aggregates is not a hypothetical opinion made by those paid to rate an entity or issuer. This Consensus reflects real world judgements made by specialists charged with the pressure and responsibility of protecting their organisation's capital, reputation and stakeholders. They need to identify which entity poses a risk, the interconnectedness of that entity to others, and to quantify as best they can the creditworthiness of those entities.

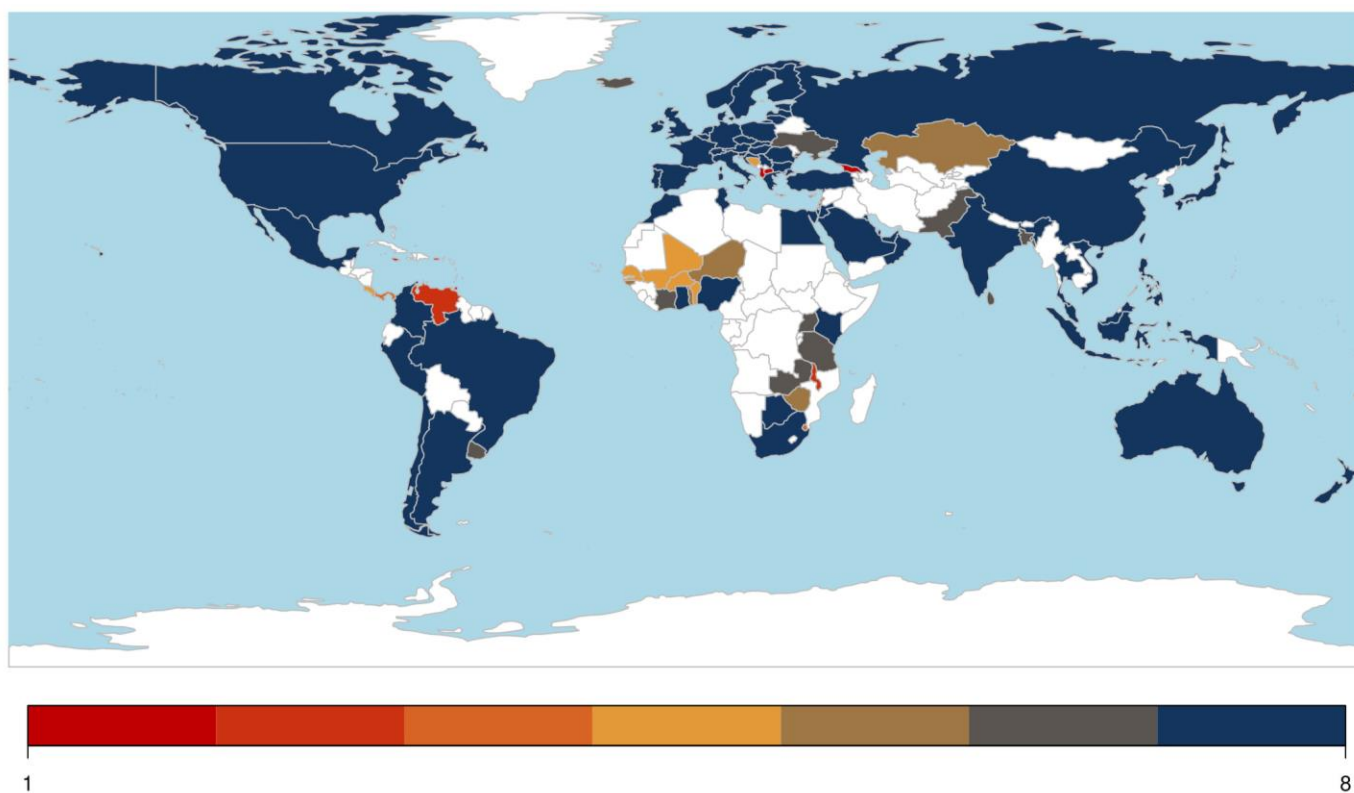
Understanding the diversity of credit opinions derived from the regulated models used by banks and non-bank financial institutions provides colour that is missing from other credit rating sources. It enables contributors and subscribers to the Credit Benchmark Consensus dataset to understand how their internal view of a counterpart's creditworthiness, at the entity level, compares to the expert opinions of three or more peers with skin in the game.

This is a new Consensus view of creditworthiness that can help inform the key decisions that face anyone considering sub-custodial network risk and the entities that are part of that network.

## 2. Network of Sub-Custodians

Each of these global custodians provide custodial services all around the world. All of them cover more than 80 countries with Citibank having the widest presence in 101 countries. Some countries are covered by just one or two banks. These include Albania (State Street), Jamaica (Citibank), Palestine (BNY, HSBC) and Trinidad and Tobago (JP Morgan). Other countries such as Bolivia, Paraguay or Algeria are not covered by any of these banks. **Figure 2.1** presents a world map showing the country-by-country depth of coverage based on the eight largest custodians.

**Figure 2.1 World Map with Sub-Custodian Coverage**



Even though there is country-to-country overlap between the custodians, their sub-custodian networks differ significantly. The global banks such as Citibank and HSBC rely heavily on the network of their local subsidiaries, while others use the custodian services of other institutions as summarised in **Figure 2.2**.

**Figure 2.2** shows that both Citibank and HSBC use 18 companies from their own family group and these internal relationships cover 58% and 40%, respectively, of their sub-custodian network. The other custodians also use the widespread networks of these two institutions as sub-custodians, representing 10-20% of their relationships and significantly impacting the stability of their custodian services. Citibank's most frequently used sub-custodian entities are Citibank NA, NY and Citibank Europe Plc, while HSBC's are Hong Kong & Shanghai Banking Corp Ltd and HSBC Bank Middle East Ltd. On the other hand, Brown Brothers Harriman's and State Street's own sub-custodians represent less than 5% of their relationships.



Within the 'other' category noted in **Figure 2.2**, the most important sub-custodian players are Standard Chartered Plc, Deutsche Bank AG, UniCredit SpA, Standard Bank Group Ltd and BNP Paribas SA.

**Figure 2.3** shows the degree of overlap between the sub-custodians of the individual banks. It shows that Brown Brothers Harriman and State Street use the same sub-custodian in 62% of countries that they both service. The smallest overlap is observed for Citibank and Societe Generale (13%).

**Figure 5.1A** in the Appendix shows the complete network inter-dependency.

**Figure 2.2 Interlink of Sub-Custodian Networks**

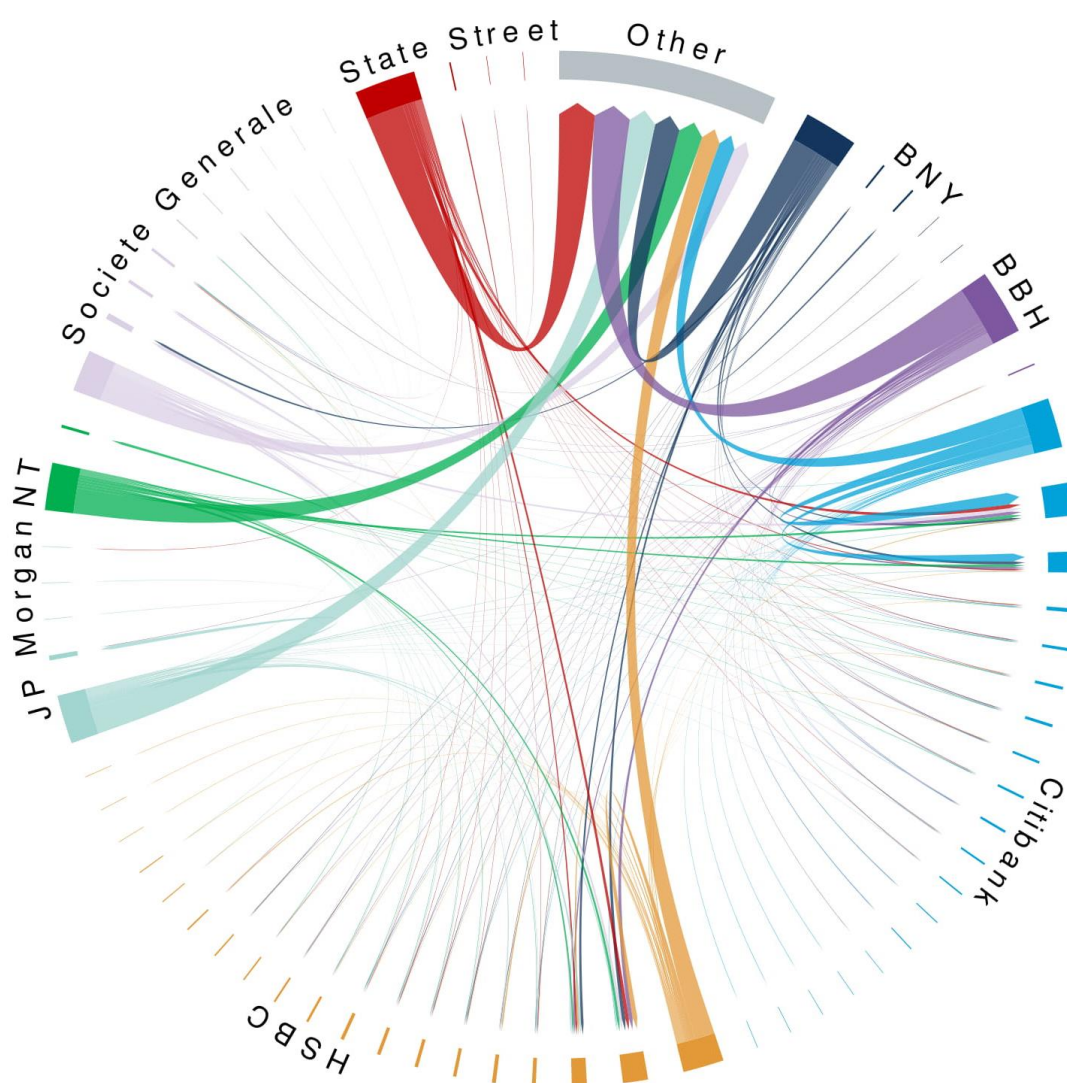




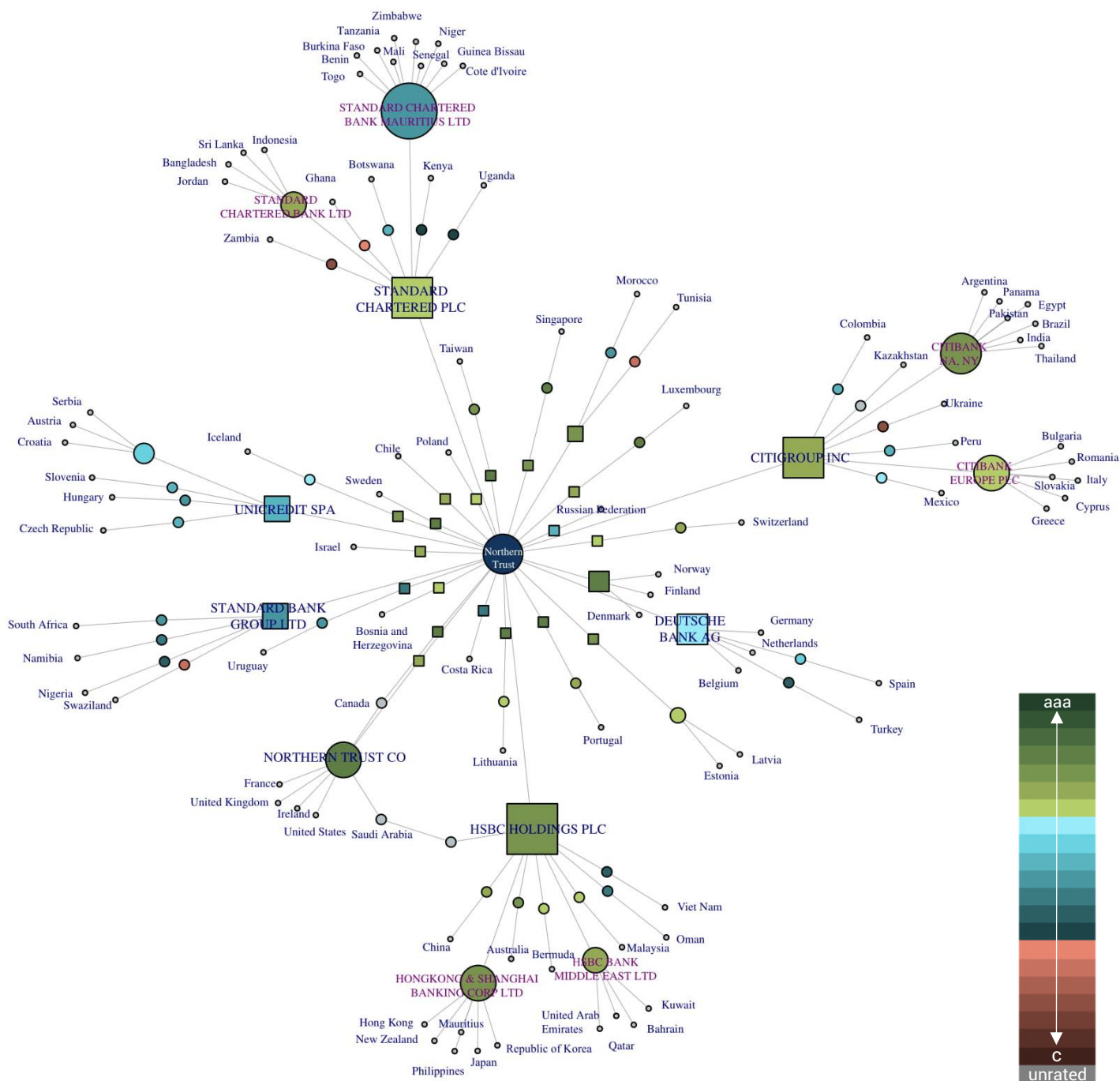
Figure 2.3 Sub-Custodian Networks Overlap

	BNY	BBH	Citibank	HSBC	JPM	NT	SG	SS
BNY		46%	32%	38%	33%	37%	28%	46%
BBH			52%	48%	59%	56%	32%	62%
Citibank				27%	42%	41%	13%	51%
HSBC					43%	49%	32%	44%
JPM						44%	24%	56%
NT							28%	48%
SG								27%
SS								

The individual networks of sub-custodians are complex, as a single entity will often cover multiple countries. **Figure 2.4** shows the network used by Northern Trust and the corresponding Credit Benchmark Consensus Rating (“CBR”) of the sub-custodians and their ultimate parents. The squares depict the ultimate parents, the circles are the service-providing subsidiaries; both are linked to the covered countries. The colour of the square or circle indicates the Consensus credit quality (CBR) of the sub-custodians.

Northern Trust offers custodian services in 98 countries using 55 sub-custodians from 26 bank groups. **Figure 2.4** shows that Northern Trust itself provides custody services only in Canada, France, Ireland, Saudi Arabia, United Kingdom and United States. Northern Trust relies on services by other custodian banks elsewhere and its strongest relationships are with CitiGroup (for Latin America and South East Europe), HSBC (for Middle East and Asia-Pacific) and Standard Chartered (for Africa and South East Asia), each covering more than 15 countries for Northern Trust. A significant number of European countries are covered by local banks. Focusing on the credit quality of the sub-custodian network, Credit Benchmark provides a CBR for 96% of the 55 sub-custodians used by Northern Trust. 64% of the sub-custodians are rated as investment grade (**bbb-** or better) while 13% have low credit quality, with a CBR of **b+** or worse (placing them in high-yield territory). The entities with a higher credit risk are concentrated in Africa.

**Figure 2.4 Northern Trust Network**



Credit Benchmark covers more than 85% of the sub-custodian network for each of the analysed custodians and the data indicates that each of the custodians is exposed to a different level sub-custodian credit risk, as summarised in **Figure 2.5**.

**Figure 2.5 Sub-Custodian Credit Risk Overview**

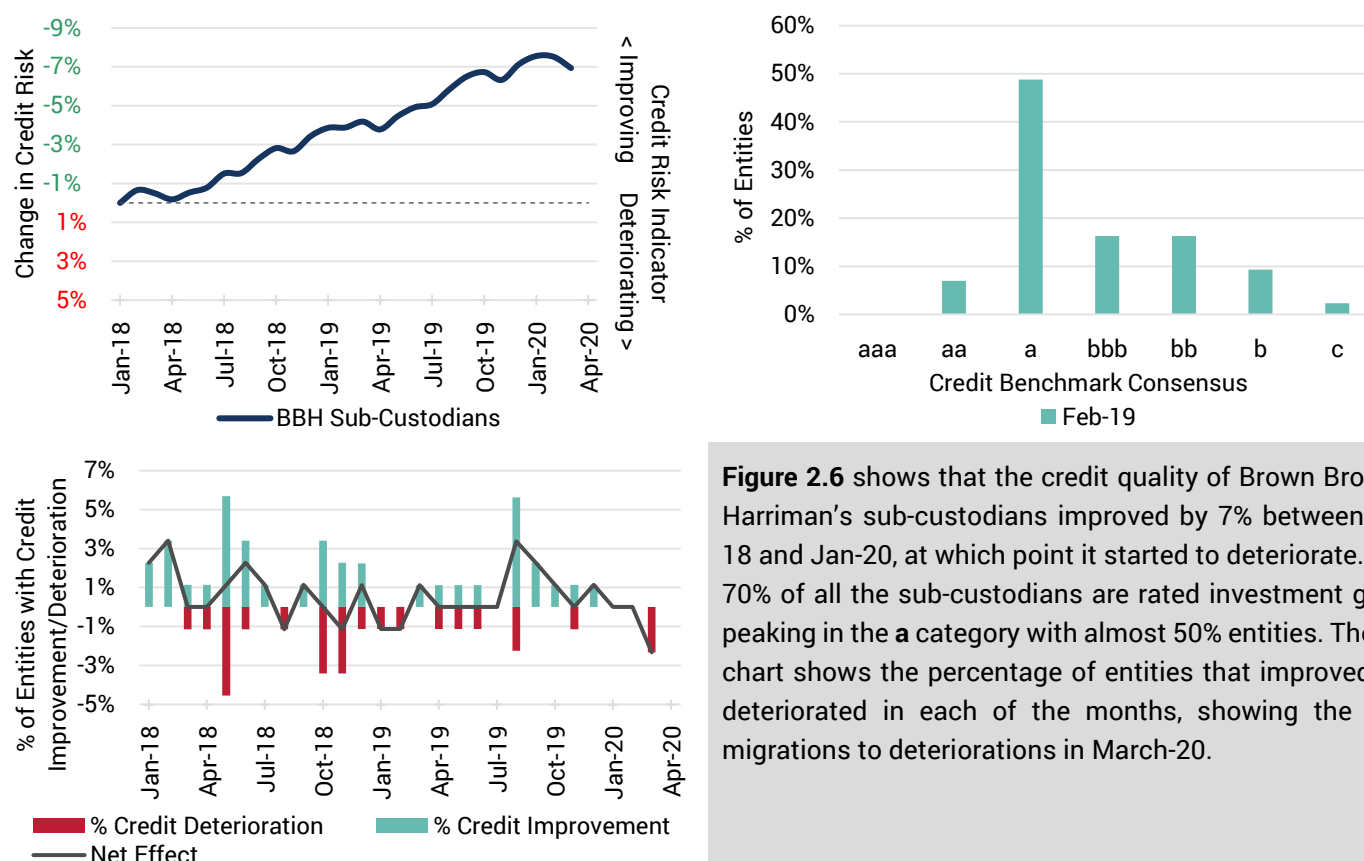
	BNY	BBH	Citibank	HSBC	JPM	NT	SG	SS
# of countries	98	87	101	82	97	96	82	100
# of sub-custodians	69	90	50	59	67	55	46	79
% CRA* rated sub-custodians	61%	59%	38%	53%	46%	53%	57%	49%
% CB rated sub-custodians	99%	91%	88%	92%	94%	96%	85%	92%
Average CBR**	9.1	8.5	9.8	9.2	9.4	9.0	8.0	9.4

\*CRA = credit rating agency

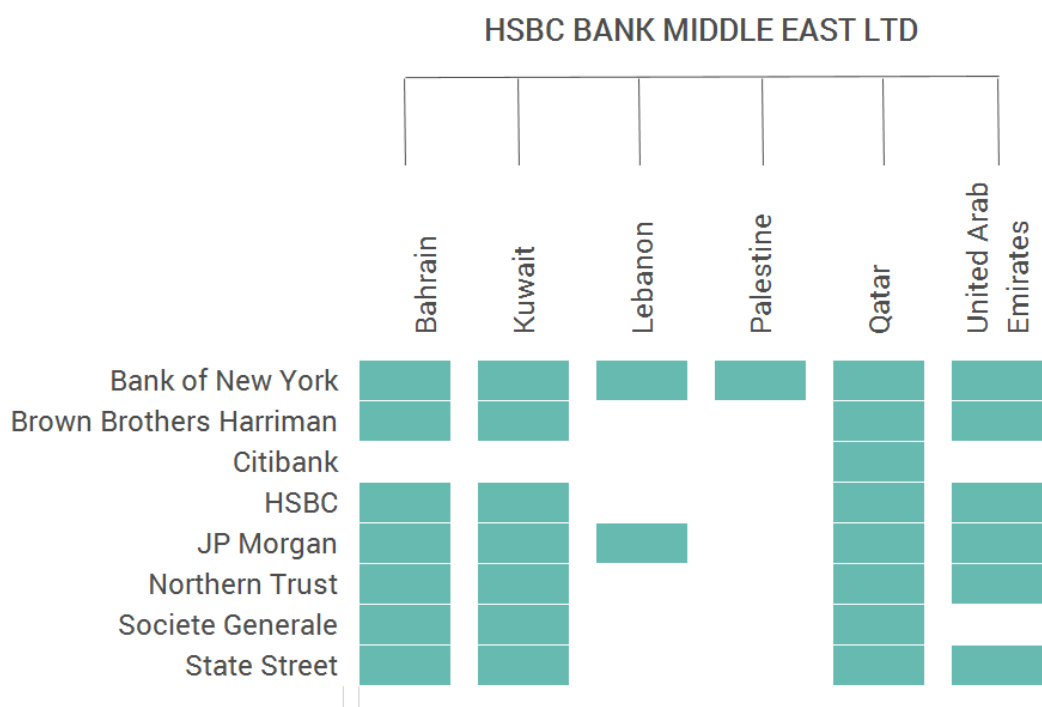
\*\*Note: Average CBR of 8 equates to **bbb+**, 9 to **bbb** and 10 to **bbb-**. Thus, an average CBR of 8.5 means that the average credit risk is halfway between **bbb+** and **bbb** and so on.

Credit Benchmark also produces aggregate outputs summarising portfolio credit risk changes over time. **Figure 2.6** shows the aggregate outputs for the sub-custodian network of Brown Brothers Harriman.

**Figure 2.6 Aggregate of Brown Brother Harriman's Sub-Custodian Network**



Next we look at a prominent sub-custodian and the countries it services, and the custodians using the services of this bank in each given country. **Figure 2.7** shows HSBC Bank Middle East Ltd, one of the largest sub-custodians in the Middle East, and its clients.

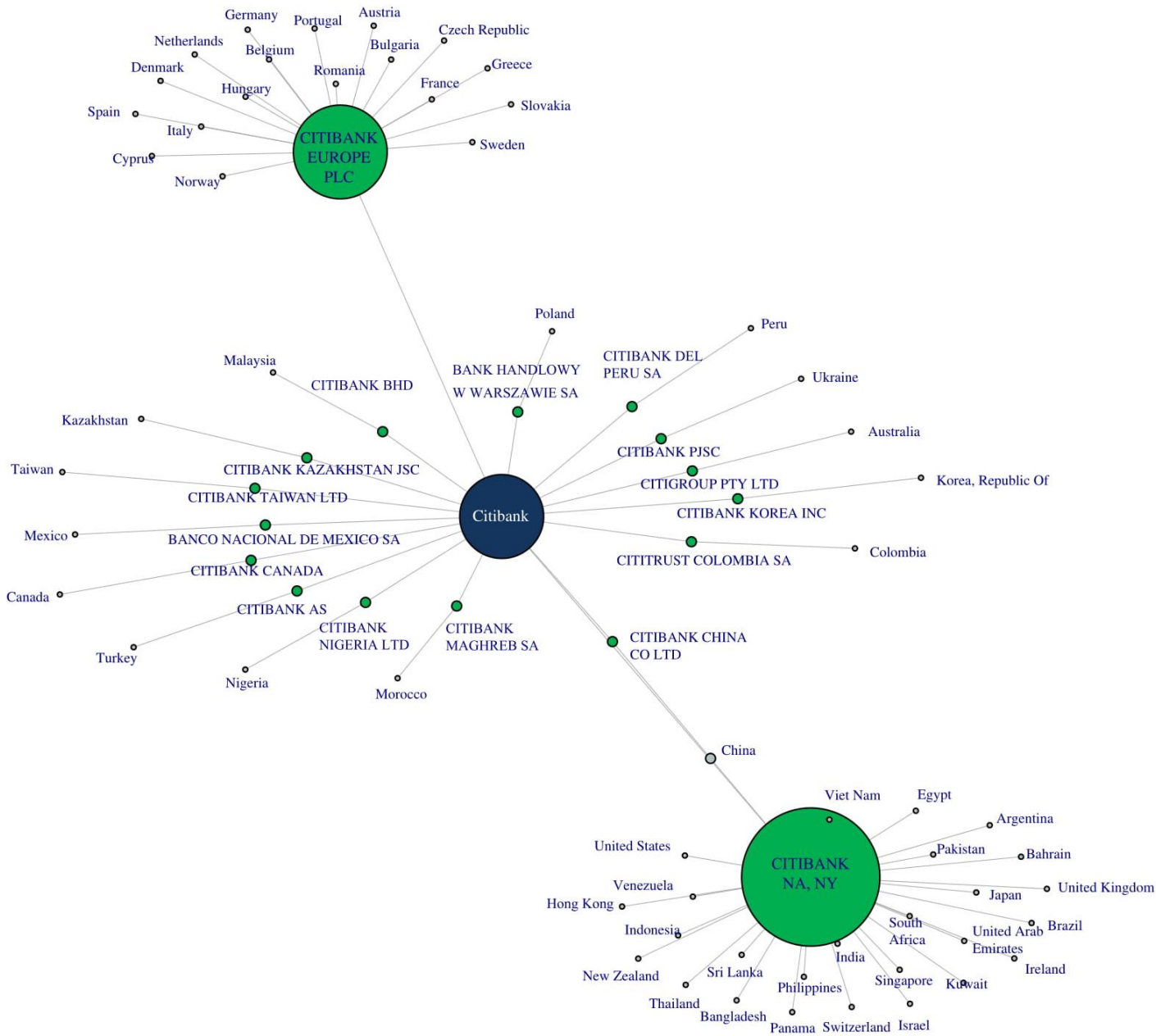
**Figure 2.7 Custodians Using HSBC Bank Middle East Ltd**

**Figure 2.7** shows that HSBC Bank Middle East Ltd covers the custody services in six countries including Qatar and United Arab Emirates. All eight analysed custodians use the bank in at least one of the countries. Bank of New York Mellon uses the bank in all of the countries, while Citibank only uses the bank in Qatar. It appears that HSBC Bank Middle East Ltd actually has a monopoly on the custodian services in Qatar as it is used by all eight custodians. Interestingly, HSBC itself uses alternative local banks for servicing its own sub-custodian needs in Lebanon and Palestine.

Citibank has on-the-ground finance securities services operations in more than 60 markets, more than any other custodian bank. **Figure 2.8** shows Citibank's internal network. The bank uses 17 subsidiaries to cover 60 countries using its own network but there are some countries where Citibank does have a presence, but chooses to use alternative local banks for its own sub-custodian needs – even while their own subsidiary is used by other custodians (e.g. in Croatia, Latvia, Lithuania and Uruguay).

**Figure 2.8** shows that there are two main subsidiaries covering 75% of all the internally serviced countries; Citibank NA, NY and Citibank Europe Plc. The rest are covered by local subsidiaries e.g. Citibank Kazakhstan JSC.

Figure 2.8 Citibank Internal Network



### 3. Regions Specialists

Some financial institutions choose to focus on specific regions where they become custodian specialists. Global Finance<sup>2</sup> prepares an annual overview of the best sub-custodian banks in seven global regions and concludes that in 2019 Citibank dominated in the Americas; UniCredit and BNP in Europe; Standard Bank in Africa; DBS in Asia-Pacific; and Standard Chartered Bank in the Middle East. This conclusion is partly reflected in Credit Benchmark's data but we can see some differences as shown in **Figure 3.1**, listing the biggest players in each of the regions using the relationships of the eight analysed custodians. The Global Finance winners are marked in orange.

**Figure 3.1 Biggest Regional Players**

Sub-Custodian	% Relationships	Sub-Custodian	% Relationships
<b>Africa</b>		<b>Latin America</b>	
STANDARD CHARTERED PLC	49%	CITIGROUP INC	53%
STANDARD BANK GROUP LTD	24%	ITAU UNIBANCO HOLDING SA	16%
SOCIETE GENERALE SA	15%	<b>Middle East</b>	
<b>Asia</b>		HSBC HOLDINGS PLC	60%
HSBC HOLDINGS PLC	38%	CITIGROUP INC	12%
CITIGROUP INC	21%	STANDARD CHARTERED PLC	9%
STANDARD CHARTERED PLC	15%	<b>North America</b>	
<b>Europe</b>		CITIGROUP INC	26%
CITIGROUP INC	21%	HSBC HOLDINGS PLC	21%
UNICREDIT SPA	12%		
BNP PARIBAS SA	9%		

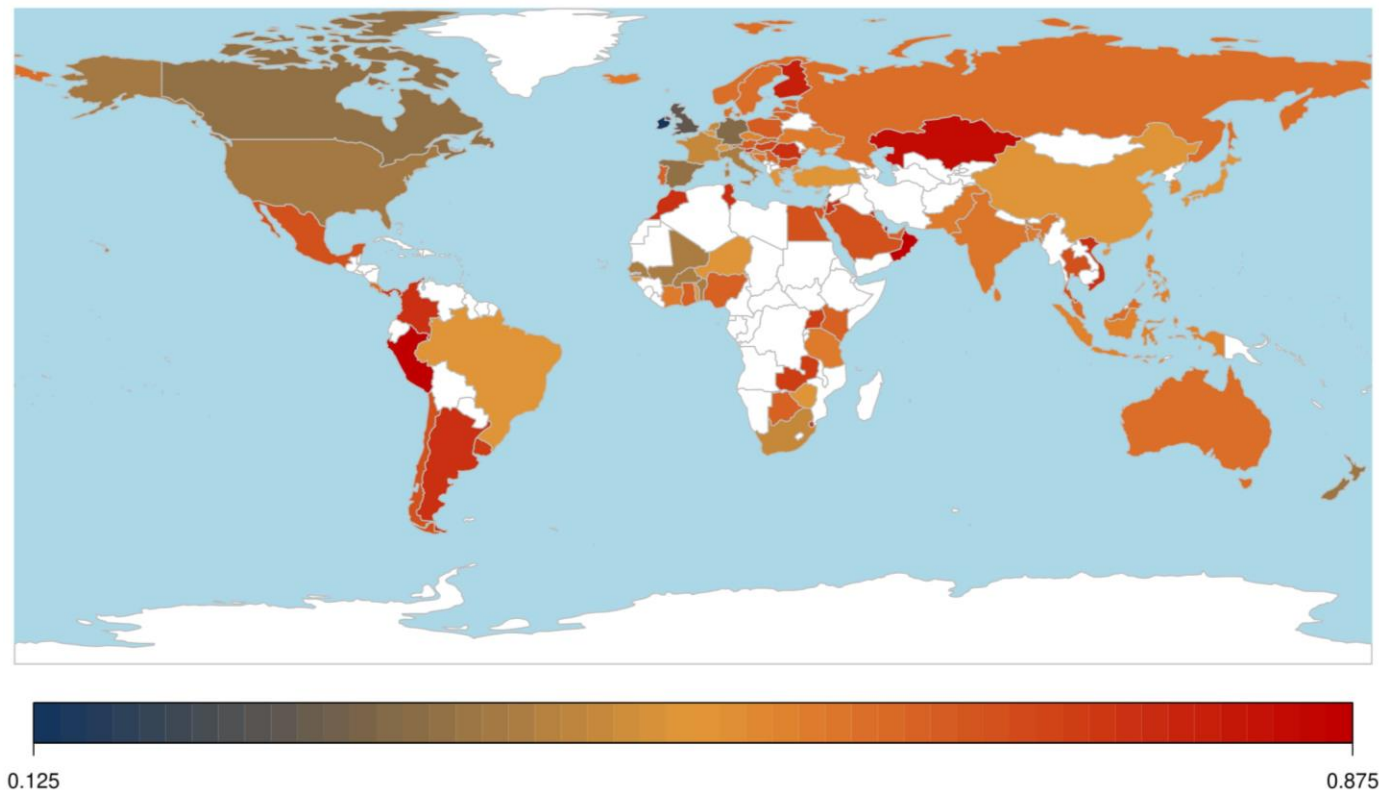
**Figure 3.1** shows that some of the markets have a clear sub-custodian leader (Standard Chartered in Africa, HSBC in Asia and the Middle East, Citigroup in Latin America), while North America and Europe show a broader spread of sub-custodian distribution.

A similar tendency can be observed at the country level. Some countries appear to be monopolised by one sub-custodian while other countries have a far more diverse sub-custodian market. Peru appears to only be covered by Citibank del Peru SA, while Chile is covered by three sub-custodians - Banco De Chile SA, Banco Santander Chile SA and Itau Corpbanca. **Figure 3.2** shows the concentration of the exposures for countries covered by at least four of the analysed custodians. The concentration is defined as one minus the ratio of the number of country sub-custodian banks and the number of custodian relationships, the closer the value is to one the more concentrated (closer to monopoly) the market is.

<sup>2</sup> Global Finance. (2019, July). *World's Best Sub-Custodian Banks 2019*. Retrieved May 1, 2020, from <https://www.gfmag.com/magazine/julyaugust-2019/worlds-best-sub-custodian-banks-2019>



Figure 3.2 Concentration of Sub-Custodians



## 4. Conclusion

Global Custodians and their clients rely upon the services of a global network of sub-custodians. These resultant sub-custodian networks are complex and more interconnected than a first glance may suggest. Each sub-custodian operating in a specific country carries its own unique risk profile – the credit risk component of this may be substantial, but is largely unknown due to a lack of public credit rating information. That credit risk component can now be measured, monitored and managed by accessing Consensus credit data.

As demonstrated in an earlier whitepaper, [“The Creditworthiness of CCPs and the Global Clearing Member Network”](#), mapping the interconnectedness within the CCP Network combined with the application of Consensus credit data (at both entity and aggregate level) can help inform risk management decisions and avoid CCP default waterfalls upstream. This approach is equally applicable to the world of global custodians and their sub-custodian networks.

Whilst asset owners are reassured by their custodial contracts and the fiduciary obligations these incorporate, they should consider if they are willing to entrust their stocks, bonds and cash to an institution that might not meet their credit criteria. At the extreme, inadequate consideration of such counterparty risk could manifest itself in a pool of assets held in custody becoming inaccessible or frozen indefinitely, leading to potential losses or opportunity cost.

Although credit risk is only one of several factors that may lead to the default of a sub-custodian, any resource that can be used to mitigate risk amidst unforeseen crisis is of value when initiating or reviewing custodial arrangements. Credit Benchmark’s dataset is derived from a growing number of leading financial institutions around the globe; institutions who have “skin in the game” and who conduct detailed credit analysis in-house for a number of reasons. The credit decisions that they make every day are often inextricably linked to liquidity and solvency decisions; factors of which have proven to be of increasing importance across the past decade.

With Consensus credit coverage of up to 99% of the sub-custodian networks beneath these major global custodians, Credit Benchmark can help measure, monitor and manage the credit risk that asset owners are exposed to through their custodial networks.

## 5. Appendix

Figure 5.1A Summary of the Sub-Custodian Relationships

Sub-Custodian	Ultimate Parent	Sub-Custodian	BNYM	BBH	Citibank	HSBC	JPM	NT	SG	SS	Total
BANK OF NEW YORK MELLON CORP	BANK OF NEW YORK MELLON CORP	BANK OF NEW YORK MELLON CORP	4								4
BANK OF NEW YORK MELLON CORP	BANK OF NEW YORK MELLON	BANK OF NEW YORK MELLON	1								1
BANK OF NEW YORK MELLON CORP	INTERNATIONAL LTD	INTERNATIONAL LTD									
BANK OF NEW YORK MELLON CORP	BANK OF NEW YORK MELLON SA	BANK OF NEW YORK MELLON SA	4								4
BANK OF NEW YORK MELLON CORP	CIBC MELLON TRUST CO	CIBC MELLON TRUST CO	1								1
BROWN BROTHERS HARRIMAN & CO	BROWN BROTHERS HARRIMAN & CO	BROWN BROTHERS HARRIMAN & CO		1		1			1		3
CITIGROUP INC	BANCO NACIONAL DE MEXICO SA	BANCO NACIONAL DE MEXICO SA	1	1	1		1	1		1	6
CITIGROUP INC	BANK HANDLOWY W WARSZAWIE SA	BANK HANDLOWY W WARSZAWIE SA		1	1		1			1	4
CITIGROUP INC	CITIBANK ANONIM SIRKETI	CITIBANK ANONIM SIRKETI		1							1
CITIGROUP INC	CITIBANK AS	CITIBANK AS			1		1			1	3
CITIGROUP INC	CITIBANK BHD	CITIBANK BHD			1						1
CITIGROUP INC	CITIBANK CANADA	CITIBANK CANADA			1						1
CITIGROUP INC	CITIBANK CHINA CO LTD	CITIBANK CHINA CO LTD		1	1						2
CITIGROUP INC	CITIBANK DEL PERU SA	CITIBANK DEL PERU SA	1	1	1	1	1	1	1	1	8
CITIGROUP INC	CITIBANK EUROPE PLC	CITIBANK EUROPE PLC	7	5	18	1	2	6	1	3	43
CITIGROUP INC	CITIBANK KAZAKHSTAN JSC	CITIBANK KAZAKHSTAN JSC		1	1	1	1	1		1	6
CITIGROUP INC	CITIBANK KOREA INC	CITIBANK KOREA INC		1	1						2
CITIGROUP INC	CITIBANK MAGHREB SA	CITIBANK MAGHREB SA	1	1	1	1				1	5
CITIGROUP INC	CITIBANK NA, NY	CITIBANK NA, NY	5	8	27	2	2	7	8	9	68
CITIGROUP INC	CITIBANK NIGERIA LTD	CITIBANK NIGERIA LTD			1						1
CITIGROUP INC	CITIBANK PJSC	CITIBANK PJSC		1	1		1	1		1	5
CITIGROUP INC	CITIBANK TAIWAN LTD	CITIBANK TAIWAN LTD			1						1
CITIGROUP INC	CITIGROUP PTY LTD	CITIGROUP PTY LTD	1	1	1				2		5
CITIGROUP INC	CITITRUST COLOMBIA SA	CITITRUST COLOMBIA SA	1	1	1		1	1		1	6
HSBC HOLDINGS PLC	HONGKONG & SHANGHAI BANKING CORP LTD	HONGKONG & SHANGHAI BANKING CORP LTD	8	9	1	11	3	6	6	8	52
HSBC HOLDINGS PLC	HSBC BANK ARGENTINA SA	HSBC BANK ARGENTINA SA				1	1				2
HSBC HOLDINGS PLC	HSBC BANK AUSTRALIA LTD	HSBC BANK AUSTRALIA LTD		1		1		1			3
HSBC HOLDINGS PLC	HSBC BANK BERMUDA LTD	HSBC BANK BERMUDA LTD	1	1	1	1	1	1		1	7
HSBC HOLDINGS PLC	HSBC BANK CHINA CO LTD	HSBC BANK CHINA CO LTD	1	1		1	1	1	1	1	7
HSBC HOLDINGS PLC	HSBC BANK EGYPT SAE	HSBC BANK EGYPT SAE	1	1		1					3
HSBC HOLDINGS PLC	HSBC BANK MALAYSIA BHD	HSBC BANK MALAYSIA BHD		1		1	1	1	1		5
HSBC HOLDINGS PLC	HSBC BANK MIDDLE EAST LTD	HSBC BANK MIDDLE EAST LTD	6	4	1	4	5	4	3	4	31
HSBC HOLDINGS PLC	HSBC BANK OMAN SOAG	HSBC BANK OMAN SOAG	1	1	1	1	1	1	1	1	8
HSBC HOLDINGS PLC	HSBC BANK PLC	HSBC BANK PLC	1	1		3	2		1		8
HSBC HOLDINGS PLC	HSBC BANK TAIWAN LTD	HSBC BANK TAIWAN LTD	1	1		1			1		4
HSBC HOLDINGS PLC	HSBC BANK TURKEY AS	HSBC BANK TURKEY AS				1					1
HSBC HOLDINGS PLC	HSBC BANK VIETNAM LTD	HSBC BANK VIETNAM LTD	1	1		1	1	1	1	1	7
HSBC HOLDINGS PLC	HSBC FRANCE SA	HSBC FRANCE SA		1		2					3
HSBC HOLDINGS PLC	HSBC SAUDI ARABIA LTD	HSBC SAUDI ARABIA LTD		1	1	1	1	1	1	1	7
HSBC HOLDINGS PLC	HSBC TRINKAUS & BURKHARDT AG	HSBC TRINKAUS & BURKHARDT AG				1					1
HSBC HOLDINGS PLC	PT BANK HSBC INDONESIA	PT BANK HSBC INDONESIA				1	1				2
JPMORGAN CHASE & CO	BANCO JPMORGAN SA	BANCO JPMORGAN SA					1				1
JPMORGAN CHASE & CO	JP MORGAN CHASE BANK NA	JP MORGAN CHASE BANK NA		1			9				10
JPMORGAN CHASE & CO	JPMORGAN BANK INTERNATIONAL LLC, MOSCOW	JPMORGAN BANK INTERNATIONAL LLC, MOSCOW					1				1
JPMORGAN CHASE & CO	JPMORGAN BANK LUXEMBOURG SA	JPMORGAN BANK LUXEMBOURG SA								1	1
NORTHERN TRUST CORP	NORTHERN TRUST CO	NORTHERN TRUST CO						6			6
SOCIETE GENERALE SA	BRD GROUPE SOCIETE GENERALE SA	BRD GROUPE SOCIETE GENERALE SA							1		1
SOCIETE GENERALE SA	JOINT STOCK COMMERCIAL BANK ROSBANK PJSC	JOINT STOCK COMMERCIAL BANK ROSBANK PJSC	1						1		2
SOCIETE GENERALE SA	KOMERCNI BANKA AS	KOMERCNI BANKA AS							1		1
SOCIETE GENERALE SA	SOCIETE GENERALE COTE D'IVOIRE	SOCIETE GENERALE COTE D'IVOIRE	5						8		13

SOCIETE GENERALE SA	SOCIETE GENERALE LUXEMBOURG SA						1		1
SOCIETE GENERALE SA	SOCIETE GENERALE MAROCAINE DE BANQUE SA				1	1	1		3
SOCIETE GENERALE SA	SOCIETE GENERALE SA	1					6		7
SOCIETE GENERALE SA	SOCIETE GENERALE SECURITIES SERVICES SPA	1					1		2
SOCIETE GENERALE SA	UNION INTERNATIONALE DE BANQUES	1	1	1			1	1	6
STATE STREET CORP	STATE STREET BANK & TRUST CO								3
STATE STREET CORP	STATE STREET BANK INTERNATIONAL GMBH								1
STATE STREET CORP	STATE STREET TRUST CO CANADA								1
Other*	AB SEB BANKAS	1			1	1	1		5
Other*	BANCO BCT SA					1			2
Other*	BANCO BILBAO VIZCAYA ARGENTARIA SA	1	1						2
Other*	BANCO DE CHILE SA	1	1	1			1		4
Other*	BANCO ITAU URUGUAY SA	1	1	1			1	1	6
Other*	BANCO NACIONAL DE COSTA RICA	1		1			1		3
Other*	BANCO S3 MEXICO SA INSTITUCION DE BANCA MULTIPLE	1						1	2
Other*	BANCO SANTANDER CHILE SA				1	1		1	3
Other*	BANK AUDI SAL					1			1
Other*	BANK HAPOALIM BM	1	1					1	4
Other*	BANK LEUMI LE ISRAEL LTD				1	1	1		3
Other*	BANK OF JORDAN					2			2
Other*	BANK OF TAIWAN		1				1		2
Other*	BANK POLSKA KASA OPIEKI SA		1		1		1	1	4
Other*	BANQUE INTERNATIONALE ARABE DE TUNISIE SA	1				1			2
Other*	BLOMINVEST BANK SAL					1			1
Other*	BNP PARIBAS SECURITIES SERVICES SCA	3	9		5	6	1	4	30
Other*	BRADESCO KIRTON CORRETORA DE TITULOS E VALORES MOBILIARIOS SA				1				1
Other*	CACEIS BANK SA		1		1				2
Other*	CANADIAN IMPERIAL BANK OF COMMERCE					1			1
Other*	CESKOSLOVENSKA OBCHODNI BANKA AS				2			1	4
Other*	CHINA CONSTRUCTION BANK CORP		1			1		1	3
Other*	CIBC MELLON TRUST CO		1						1
Other*	CLEARSTREAM BANKING SA			3	1				5
Other*	CREDIT SUISSE AG	1							1
Other*	CREDIT SUISSE SCHWEIZ AG		1		1		1		4
Other*	DBS BANK LTD	1	1			1	1		4
Other*	DEUTSCHE BANK AG	6	7			2	3	2	32
Other*	DEUTSCHE BANK AS	1	1				1		4
Other*	DEUTSCHE BANK LTD	1							1
Other*	DEUTSCHE BANK MALAYSIA BHD	1						1	2
Other*	DEUTSCHE BANK SAE						1		2
Other*	DEUTSCHE BANK SPA							1	1
Other*	EUROCLEAR BANK SA NV	1		1	1		1	6	10
Other*	FIRST ABU DHABI BANK PJSC							1	1
Other*	FIRSTSTRAND BANK LTD					1			1
Other*	HSBC MEXICO SA				1				1
Other*	INDUSTRIAL & COMMERCIAL BANK OF CHINA LTD		1						1
Other*	ING BANK NV	1							1
Other*	ING BANK SLASKI SA	1	1						2
Other*	INTESA SANPAOLO SPA							1	1
Other*	ISLANDSBANKI HF					1			1
Other*	ITAU CORPBANCA	1						1	2
Other*	ITAU SECURITIES SERVICES COLOMBIA SA SOCIEDAD FIDUCIARIA				1			1	2
Other*	ITAU UNIBANCO SA	1	1						2
Other*	JSC BANK OF GEORGIA			1				1	2
Other*	KB KOOKMIN BANK						1		1

Other*	KBL EUROPEAN PRIVATE BANKERS SA	1								1
Other*	KEB HANA BANK	1								1
Other*	LANDSBANKINN HF	1	1			1	1	1		5
Other*	MITSUBISHI UFJ FINANCIAL GROUP INC	1								1
Other*	MIZUHO BANK LTD	1	1		1				1	4
Other*	MONTE TITOLI SPA	1								1
Other*	MUFG BANK LTD		1							1
Other*	NATIONAL AUSTRALIA BANK LTD	1								1
Other*	NORDEA BANK ABP		2	1	2	3	3	2		13
Other*	NORDEA BANK DANMARK AS		1		1		1	1		4
Other*	NORDEA BANK NORGE ASA		1		1		1	1		4
Other*	PRIVREDNA BANKA ZAGREB DD	1		1	1	1			1	5
Other*	QATAR NATIONAL BANK ALAHLY							1		1
Other*	RAIFFEISEN BANK INTERNATIONAL AG			1		1				2
Other*	RAIFFEISEN BANK SHA								1	1
Other*	RBC INVESTOR SERVICES TRUST		1							1
Other*	REPUBLIC BANK LTD					1				1
Other*	ROYAL BANK OF CANADA				1	1	1	1		4
Other*	SANTANDER INVESTMENT SA	1								1
Other*	SANTANDER SECURITIES SERVICES BRASIL DTVM SA							1		1
Other*	SANTANDER SECURITIES SERVICES SAU					1				1
Other*	SBI SG GLOBAL SECURITIES SERVICES PVT LTD							1		1
Other*	SCOTIA INVESTMENTS JAMAICA LTD			1						1
Other*	SEB LATVIJAS UNIBANKA AS	1			1				1	3
Other*	SEB PANK AS	1			1				1	3
Other*	SKANDINAVISKA ENSKILDA BANKEN AB	4	4		4				4	16
Other*	SKB BANKA DD							1		1
Other*	STANBIC BANK BOTSWANA LTD	1								1
Other*	STANBIC BANK GHANA LTD	1								1
Other*	STANBIC BANK KENYA LTD	1								1
Other*	STANBIC BANK TANZANIA LTD	1		1		1				3
Other*	STANBIC BANK UGANDA LTD	1								1
Other*	STANBIC BANK ZAMBIA LTD	2								2
Other*	STANBIC BANK ZIMBABWE LTD	1		1		1			1	4
Other*	STANBIC IBTC BANK PLC	1	1		1	1	1		1	6
Other*	STANDARD BANK GROUP LTD	1				1			1	3
Other*	STANDARD BANK NAMIBIA LTD	1	1	1		1	1		1	6
Other*	STANDARD BANK OF SOUTH AFRICA LTD	1	1		1		1		1	5
Other*	STANDARD BANK SWAZILAND LTD	1	1				1		1	4
Other*	STANDARD CHARTERED BANK BOTSWANA LTD		1	1	1	1	1		1	6
Other*	STANDARD CHARTERED BANK CHINA LTD		1							1
Other*	STANDARD CHARTERED BANK COTE DIVOIRE SA		1	8		8			8	25
Other*	STANDARD CHARTERED BANK GHANA LTD		1	1	1	1	1		1	6
Other*	STANDARD CHARTERED BANK HONG KONG LTD		1						2	3
Other*	STANDARD CHARTERED BANK KENYA LTD		1	1	1	1	1		1	6
Other*	STANDARD CHARTERED BANK KOREA LTD					1				1
Other*	STANDARD CHARTERED BANK LTD	1	5	1		2	4	2	2	17
Other*	STANDARD CHARTERED BANK MALAYSIA BHD		1						1	2
Other*	STANDARD CHARTERED BANK MAURITIUS LTD					1		10	3	14
Other*	STANDARD CHARTERED BANK NIGERIA LTD								1	1
Other*	STANDARD CHARTERED BANK PAKISTAN LTD		1			1				2
Other*	STANDARD CHARTERED BANK SINGAPORE LTD		1							1
Other*	STANDARD CHARTERED BANK TAIWAN LTD		1						1	2
Other*	STANDARD CHARTERED BANK TANZANIA LTD		1						1	2

Other*	STANDARD CHARTERED BANK THAI PUBLIC CO LTD	1			1			1	3	
Other*	STANDARD CHARTERED BANK UGANDA LTD	1	1	1	1	1		1	6	
Other*	STANDARD CHARTERED BANK ZAMBIA LTD	1	1	1	1	1		1	6	
Other*	STANDARD CHARTERED BANK ZIMBABWE LTD	1							1	
Other*	SUMITOMO MITSUI BANKING CORP	1							1	
Other*	SVENSKA HANDELSBANKEN AB					1			1	
Other*	SWEDBANK AB	1	1						2	
Other*	SWEDBANK AS	2	2		2	2			8	
Other*	TURK EKONOMI BANKASI AS						1		1	
Other*	UBS SWITZERLAND AG	1			1			1	3	
Other*	UNICREDIT BANK AUSTRIA AG	1	1	1	1	3	1	1	9	
Other*	UNICREDIT BANK CZECH REPUBLIC & SLOVAKIA AS				2	1		2	5	
Other*	UNICREDIT BANK DD, MOSTAR	1	1	1				1	4	
Other*	UNICREDIT BANK HUNGARY ZRT	1		1		1		1	4	
Other*	UNICREDIT BANK SRBIJA AD	1	1	1	1	1		1	6	
Other*	UNICREDIT BANKA SLOVENIJA DD	1	1	1	1	1	1	1	7	
Other*	UNICREDIT BULBANK AD			1				1	2	
Other*	UNITED OVERSEAS BANK LTD, SG	1						1	2	
Other*	ZAGREBACKA BANKA DD		1					1	2	
Other*	ZAO CITIBANK	1	1	1	1		1	1	6	
Total		112	135	103	85	101	98	87	127	848

\*Other' category includes but is not limited to Standard Chartered Plc, Deutsche Bank AG, UniCredit SpA, Standard Bank Group Ltd and BNP Paribas SA.

The data on sub-custodian networks was sourced from:

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54.82

D.67

42.96

A.14

9.8