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March 24, 2022

## TECHNICAL NOTE

VULNERABILITIES IN NBFIs, MARKET-BASED FINANCE,  
AND SYSTEMIC LIQUIDITY

Prepared By  
**Monetary and Capital Markets  
 Department**

This Note was prepared by IMF staff in the context of an IMF Financial Sector Assessment Program (FSAP) in the United Kingdom. The FSAP was led by Mr. Udaibir Das. The note contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

## CONTENTS

Glossary	5
<b>EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS</b>	<b>7</b>
<b>INTRODUCTION</b>	<b>12</b>
<b>THE NBFI SYSTEM</b>	<b>13</b>
A. Size, Functions, and Interlinkages	13
B. Global Importance	13
C. Data Gaps	16
D. Recommendations	16
<b>MACROFINANCIAL LINKAGES</b>	<b>16</b>
A. Non-Bank Credit	16
B. Credit Cycles	18
C. Lending Under Stressed Conditions	19
D. Data Gaps	22
E. Recommendation	22
<b>ASSET MANAGEMENT</b>	<b>22</b>
A. Money Market Funds	23
B. Open-Ended Funds	28
C. Alternative Investment Funds	28
D. Swing Pricing	34
E. Recommendations	34
<b>CENTRAL COUNTERPARTIES</b>	<b>35</b>
A. Shock Transmitters	35

B. Stress Testing Framework	37
C. Recommendations	37
<b>SYSTEMIC LIQUIDITY VULNERABILITIES BACKGROUND</b>	<b>40</b>
A. Key Developments in the BOE’s Operational Framework Since the 2016 FSAP	40
<b>THE IMPACT OF THE COVID CRISIS ON CORE LIQUIDITY MARKETS</b>	<b>42</b>
A. The Performance of Key Liquidity and Funding Markets in the United Kingdom During the Covid-19 Crisis	42
B. The Main Channels of Liquidity Dysfunction in Sterling Markets	43
<b>THE BANK OF ENGLAND’S RESPONSE</b>	<b>46</b>
A. Support of Sterling Money Markets	46
B. Support of Gilts and Corporate Bond Markets	47
C. FX Swap Lines and Support of FX Funding Markets	48
D. Regulatory Support Aimed at Increasing the Bank’s Leverage on Market Liquidity	48
<b>CHALLENGES IN SUPPORTING THE LIQUIDITY NEEDS OF INTERMEDIARIES AND THEIR CUSTOMERS</b>	<b>49</b>
A. The Transmission of Central Bank Liquidity Support to Wider Market Liquidity	49
B. Supporting Liquidity Among Core Intermediaries	51
C. Supporting Liquidity Needs of the Non-Bank Sector	54
D. Challenges in Managing Moral Hazard	56
<b>DEVELOPMENTS IN THE EMERGENCY LIQUIDITY ASSISTANCE AND RESOLUTION LIQUIDITY FRAMEWORKS</b>	<b>58</b>
<b>BOX</b>	
1. Determinants of Direct Lending by NBFIs	21
<b>FIGURES</b>	
1. The U.K. Financial System	14
2. Interlinkages	14
3. Global Importance	15
4. Loans and Securities	17
5. Credit Growth	18
6. Credit Cycles	20
7. Sterling Money Market Funds	25
8. Open-Ended Funds Flows and Potential Liquidity Needs	29
9. Open-Ended Funds Liquidation Profile	30

10. Alternative Investment Funds Financial Leverage _____	30
11. Alternative Investment Funds Liquidity Mismatch _____	31
12. Alternative Investment Funds Stressed P/L and Leverage _____	33
13. IM and VM Calls _____	36
14. IM and VM Calls by U.K. CCP Clearing Member Domicile _____	38
15. Liquidity of U.K. Core Markets Around the Covid-19 Shock Period _____	45
16. Bank of England Operational Response to the Covid-19 Shock _____	50
17. Factors impacting the willingness and capacity of intermediaries to provide liquidity _____	52

**TABLES**

1. Main Recommendations _____	10
2. Proportional Liquidation Asset Profile for Sterling Money Market Funds Under a Weekly Redemption Shock _____	27
3. Proportional Liquidation Maturity Profile for Sterling Money Market Funds Under a Weekly Redemption Shock _____	27
4. Evaluation of the BoE’s Proposed Framework for CCP Stress-Testing _____	39

**APPENDIX**

I. Status of the Recommendations of the 2016 FSAP _____	60
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## Glossary

AIF	Alternative Investment Fund
AIFMD	AIF Managers Directive
AUM	Assets Under Management
BOE	Bank of England
BofA	Bank of America
CP	Commercial Paper
CCP	Central Counterparties
CFTC	Commodity Futures Trading Commission
CRE	Commercial Real Estate
CS01	The Credit Spread Value of a Basis Point Change
DTI	Deposit Taking Institutions
DV01	The Dollar Value of a Basis Point Change
EBA	European banking Authority
ECB	European Central Bank
EMIR	European Market Infrastructure Regulation
ETF	Exchange Traded Fund
EU	European Union
FCA	Financial Conduct Authority
FPC	Financial Policy Committee
FSB	Financial Stability Board
FSAP	Financial Sector Assessment Program
FSMA	Financial Services and Markets Act
GFC	Global Financial Crisis
Gilt	U.K. Government Bonds
G SIB	Global Systemically Important Bank
HF	Hedge Funds
HMT	HM Treasury
IOSCO	International Organization of Securities Commissions
IM	Initial Margin
IR	Interest Rate
LTAF	Long Term Asset Fund
MIFID	Markets in Financial Instruments Directive
MOU	Memorandum of Understanding
MPC	Monetary Policy Committee
MMF	Money Market Fund
MMFR	Money Market Fund Regulation
NBFI	Non-Bank Financial Intermediaries
NFC	Non-financial Corporate
NPL	Non-performing Loan
OEF	Open-end Fund
OFI	Other Financial Intermediary
OIF	Other Investment Fund
ONS	Office of National Statistics
PQD	Public Quantitative Disclosures
PRA	Prudential Regulatory Authority
PRC	Prudential Regulatory Committee

RoW	Rest of the World
SME	Small and Medium Enterprises
TN	Technical Note
TPR	Temporary Permission Regime
TTP	Temporary Transitional Power
VM	Variation Margin
U.K.	United Kingdom
U.S.	United States

## EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

**The Financial Sector Assessment Program (FSAP) carried out a focused review of the non-banks in the United Kingdom and systemic liquidity.** It reviewed five areas: (i) The overall NBFIs system, its links to banks and the rest of the world; (ii) NBFIs direct lending to the U.K. economy; (iii) Sterling investment funds (OEFs, AIFs, and MMFs); (iv) CCPs; and (v) Systemic liquidity. The NBFIs are defined as all non-deposit-taking corporations, listed in Figure 1, and with the following limited coverage: Pension Funds and Insurance Companies are covered to the extent they lend to the economy and interact with CCPs; Investment funds only to the extent of Sterling Funds; and broker-dealers only to the extent they interact with CCPs. Regulatory aspects of NBFIs are covered in a parallel Technical Note (TN).

**The NBFIs play a very important role in the U.K. financial system.** NBFIs are a very large and heterogeneous group that includes insurers, pension funds, various types of investment funds, finance companies and money lenders, broker-dealers, and CCPs. Slightly more than a half of total financial assets is held by NBFIs. Non-banks hold a third of corporate bonds, a third of corporate loans, and nearly a half of unsecured consumer loans.<sup>1</sup> They provide credit to various retail and corporate market niches and are a critical part of the financial market infrastructure. Nevertheless, NBFIs interact with and rely on banks for intermediation through trading and market-making, brokerage, and wholesale funding.

**Non-banks have stepped into riskier domestic lending segments after tighter regulation in the post-GFC period led to banks' de-risking.** Non-banks feature prominently in CRE and SME loans, as well as in certain mortgage products and unsecured consumer credit. Some non-bank lending, such as buy-now-pay-later schemes and corporate loans, remains outside of the regulatory perimeter and data for a comprehensive asset quality and systemic risk analysis are limited. Several non-bank lenders use bank credit lines and securitization to obtain funding, creating non-trivial interlinkages across the financial sector. Some NBFIs are directly owned by banks. This is partly why analyses suggest that lending cycles of banks and non-banks are largely synchronized. Nevertheless, in stress tests, non-bank lending appears to be less procyclical compared to banks.

**Non-banks are providing globally important financial infrastructure.** The United Kingdom is also the largest net exporter of financial and insurance services (as percent of GDP) in the world (mostly commission and fee-based income) and a third of non-banks' assets are located offshore. Non-bank balance sheet linkages also exist, but are less quantifiable, with overseas banks and other non-banks, e.g., hedge funds. The United Kingdom is an important marketplace, particularly for wholesale funding and derivatives trading. A third, and in some products even a half, of the world's currencies and derivatives are traded and cleared in London. U.K. CCPs offer significant netting benefits through transacted volume and the variety of products cleared and serve clients across the globe (clearing members in 23 countries).

<sup>1</sup> Reported NBFIs loans and bond holdings may include also those held by nonresident NBFIs.

**Investment managers and CCPs may impact market liquidity during downturns, but data gaps do not allow an accurate evaluation.** During the March 2020 episode of dash-for-cash variation and initial margins at U.K. CCPs—as well as in CCPs across the world—increased as uncertainty peaked. Some CCP clients were unprepared for these increases but clearing members were able to meet the margin calls. Globally, as well as in the U.K., asset managers, particularly those managing money market funds, also faced large redemptions and liquidated parts of their portfolios. The challenge of estimating future liquidity demands by asset managers in a stress event is an international issue. There is limited data available on the liquidity of their holdings and challenges in projecting the underlying investors' future demands for liquidity.

**The Bank of England's operational framework is relatively broad based, widely available and has been stable since the 2016 FSAP.** The BOE's Sterling Monetary Framework (SMF) provides liquidity insurance to banks, building societies, financial market infrastructures and designated investment firms. Relatively few changes have been made to the SMF since the 2016 FSAP although the recommendations of the FSAP were implemented. SMF participation has steadily grown, and the BOE introduced a Resolution Liquidity Framework (RLF) to support firms in resolution.

**U.K. markets were severely tested by the Covid-19 shock.** The unprecedented global “dash for cash” in March 2020 thoroughly stress tested the U.K. core liquidity markets and the BOE's operational framework. While short term interbank markets weathered the storm relatively well (supported by the SMF) greater pressures were seen in the sterling Gilts, commercial paper, corporate bond, and FX markets. Bid-offer spreads widened significantly, market pricing indicators were stretched, and dealers were forced to ration liquidity to Non-Bank Financial Institution (NBFI) customers in the face of significant balance sheet constraints.

**The unprecedented nature of the shock combined with limited preparedness of key NBFI players were the key drivers of liquidity stress.** The Covid-19 shock was an unusual global shock, that, while not financial-sector centric, resulted in unusual changes in market prices and sharply increased volatility. Some NBFI's were particularly unprepared for this combination of factors and found it difficult to raise sufficient liquidity to meet margin calls on derivatives portfolios and to fund outflows. The shock highlighted the relatively poor level of liquidity preparedness amongst some NBFIs compared to banks, whom were much better prepared after their Global Financial Crisis (GFC) stress test and consequent regulatory improvements. NBFIs heavily relied on intermediaries to liquefy them but ran into dealer balance sheet constraints that, while effective in insulating dealers from distress, increased stress in markets.

**The BOE, in concert with other central banks, took aggressive action and effectively backstopped markets.** The BOE stepped up lending and front-loaded Gilts purchases to help absorb the supply of securities from NBFI investors in need of liquidity. Co-ordinated FX liquidity provision operations by central banks quelled FX funding pressures. U.K. end-user firms' funding needs were met with joint BOE/Treasury (HMT) financing facilities. The BOE's interventions quelled pressures relatively quickly, albeit through a significant expansion of the BOE's balance sheet.

**The Covid-19 shock showed that the BOE’s SMF caters well to the needs of banks and core intermediaries although more might be done to channel liquidity more widely.** Firms with direct access to the BOE were well placed to deal with the shock and the SMF held up well. There were challenges with the flow through of BOE funding to wider markets given the balance sheet constraints of intermediaries. These constraints reflect both the willingness and capacity of firms to provide liquidity and take risk in times of stress. Supervisors could examine the flexibility of the capital allocation frameworks of core intermediaries to try and ensure that usable buffers are available for use in the business units where intermediaries provide funding in markets and make markets in securities. The mission believes the BOE could help ease bottlenecks by considering the use of clearing in its repo operations. Liquidity certainty could be enhanced with regular short term repo operations, particularly in the period when asset purchases are being phased out. The BOE should leverage high frequency detailed trading data on sterling bonds to supplement its market intelligence efforts.

**One of the lessons from the Covid-19 period is that NBFIs need to be more resilient to liquidity stress.** In the United Kingdom, liquidity pressures among NBFIs were a key conduit of stress. Regulators (in the United Kingdom and globally) need to enhance NBFIs liquidity regulation to better buttress this sector.

**Implementing arrangements that would allow some NBFIs more direct access to BOE’s liquidity would broaden the BOE’s options to manage future liquidity stress.** Market based finance and the role of NBFIs is only growing. The BOE needs to extend its toolkit beyond asset purchases with core intermediaries to better respond to market liquidity pressures emanating from NBFIs. The concern should not be with backstopping idiosyncratic needs of NBFIs but on mitigating broad stresses in the most interconnected markets. As the NBFIs sector is more diverse than banks, there is a need for both asset purchase and lending facilities. These new facilities could be part of the existing SMF or a separate framework. Some important NBFIs active in sterling markets are not U.K. based, requiring options to backstop them either directly or via their home country central bank.

**Moral hazard risks need to be managed—although there is significant hazard in the status quo.** Risks of over-reliance by NBFIs on central bank support need to be mitigated if more direct access to BOE liquidity is offered. Nonetheless, repeated bouts of asset purchases in times of stress have likely been incorporated into market expectations of market support, hence moral hazard already exists. The BOE could manage risks by better circumscribing expectations of BOE support by emphasizing the objective of support is to backstop markets as opposed to specific entities as well as being more specific on the nature of and to whom support might be provided for the purpose of backstopping markets. Focusing support on the United Kingdom’s core, benchmark and most interconnected markets would send a signal to firms (and their regulators) on the risks they take ex-ante. Facilities available to appropriately regulated and systemically interconnected NBFIs could be structured to make a tighter link between ex-ante risk taking and ex-post support for example through access fees and tighter, more prescriptive regulatory requirements aimed at preemptively mitigating liquidity mismatches.

**Table 1. United Kingdom: Main Recommendations**

<b>Recommendation</b>	<b>Priority</b>	<b>Timeline</b>
<u>Interlinkages</u>	Medium	MT
1. The analysis of interlinkages between NBFIs and deposit taking institutions (DTIs) should also include their links with NBFIs and DTIs in the Rest of the World. (¶14)		
2. Continue reducing the size of unidentified exposures in experimental statistics on NBFIs balance sheets (Who-to-whom data by ONS). (¶13, ¶16)	Medium	MT
3. Collect or systematize the collection and reporting of data for all Sterling holdings by all investors, including each NBFIs. Use these data to enhance the analysis of concentration of NBFIs investors in key sterling markets – e.g., equity, corporate bonds, CPs, Gilts, including implications for liquidity under stress in these markets. (¶15)	High	MT
<u>NBFIs loans</u>	Medium	MT
4. Analyze lending behavior of different types of NBFIs under stress, including implications for lender’s solvency and liquidity. (¶16-18)		
<u>Asset Managers</u>	High	MT
5. In collaboration with the international regulatory community, consider the most effective and proportionate way to collect data and analyze the: <ul style="list-style-type: none"> <li>a. liquidation needs of the portfolios of asset managers under stress, based on potential redemptions, variation and initial margin, leverage, and financing of their positions,</li> <li>b. liquidity profile of holdings of the portfolios of asset managers during times of stress. (¶24-26)</li> </ul>		
6. Incorporate observed fund actions during times of stress, such as deleveraging and cash hoarding, in system-wide financial stability simulations. (¶28, ¶30, ¶34)	High	MT
7. For money market funds, decouple obligations for a manager to impose fees and gates from regulatory thresholds for minimum liquid assets, while continuing to require fund managers to take any necessary action in line with the best interests of all fund investors. (¶39)	Medium	MT
<u>CCPs</u>	High	MT
8. Coordinate supervisory stress testing of CCPs with stress tests on CCP-clearing members and clients so that the results of each test can inform the other tests. (¶46)		
9. Report aggregate measures of CCP stress liquidity demands on clearing members and clients as part of the output of supervisory stress tests. (¶47)	High	MT

**Table 1. United Kingdom: Main Recommendations (concluded)**

<b>Recommendation</b>	<b>Priority</b>	<b>Timeline</b>
10. Augment transparency of CCP stress liquidity demands towards clearing members and clients. (¶147)	Medium	MT
<u>Future-proofing the Sterling Monetary Framework</u>	Medium	MT
11. Investigate use of cleared Gilt repo operations (¶181) and offer regular short term repo operations. (¶182)		
12. Develop capacity to monitor Gilt and Sterling corporate bond trading flows to complement the BOE's market intelligence. (¶183)	High	NT
<u>Expanding the perimeter of the SME</u>	High	NT
13. Consider allowing appropriately regulated and systemically interconnected NBFIs with a significant presence in the sterling gilt and repo markets access to some repo and/or Gilt purchase operations in times of stress. (¶188-91)		
14. Develop and clearly communicate the terms on which the BOE will provide liquidity to eligible NBFIs including objectives, markets, instruments, eligible participants and the exit criteria and approach that will be employed (¶194-96).	High	NT
<u>Supporting incentives and capacity of intermediaries to provide liquidity to markets in periods of stress</u>	Medium	NT
15. Ensure that supervisory expectations of U.K. regulated intermediaries do not excessively constrain regulated firms' ability to manage their internal allocation of capital and liquidity in times of stress. (¶180)		
NT = Near Term (now to one year); MT = Medium Term (within 1 to 3 years)		

## INTRODUCTION<sup>2</sup>

**1. This technical note analyzes the risks and vulnerabilities stemming from market-based finance.** It focuses on five selected areas:

- *Structure and interlinkages of NBFIs with DTIs and the rest of the world.* To the extent available data allows, this technical note quantifies the size of NBFI balance sheets, and measures balance sheets exposures to banks and the rest of the world. It also maps the type and directions of U.K.'s bilateral trade in financial and insurance services. Lastly, this note assesses the data gaps and outlines that filling these would aid understanding of the United Kingdom's cross border vulnerabilities from NBFIs.
- *Sterling investment funds.* This technical note analyzes the March 2020 episode of dash-for-cash by Sterling investment funds and uses a mix of commercial and supervisory databases to evaluate potential liquidation needs of Sterling OEFs, HFs, and MMFs under stress. It also assesses the data gaps in funds data and Sterling assets holdings as well as current tools available to funds, such as gates and swing pricing.
- *Systemic liquidity.* The Covid-19 shock to global and U.K. markets significantly stressed the liquidity of core U.K. markets and significantly increased demand from market participants on the BOE's liquidity facilities and operations. The systemic liquidity analysis examines the impact of Covid-19 on core U.K. liquidity markets and the effectiveness of the BOE's operational framework and backstopping the liquidity needs of markets. While the BOE's framework withstood the significant stresses of Covid-19 well, some areas for improvement are highlighted.
- *The liquidity implications of CCP margins for clearing members and clients and the BOE's supervisory approach.* This technical note analyzes CCP margins during the March 2020 stress as shock transmitters. It also reviews the Bank of England's proposed stress-testing framework for CCPs and the associated dissemination standards.
- *NBFI direct lending to the U.K. economy.* This technical note uses correlation analysis to estimate the degree of synchronization of trend growth of non-bank credit with bank credit. In addition, it estimates determinants of non-bank lending and using this, applies stress-test scenarios developed for prudential bank stress testing to evaluate cyclicity of non-bank lending under stress.

**2. The FSAP team appreciated the excellent cooperation, including extensive provision of internal guidelines, supervisory files, and reports.** In particular, the team would like to thank the Bank of England (BOE), Prudential Regulation Authority (PRA), and Financial Conduct Authority (FCA) staff who responded to the extensive and detailed requests promptly and accurately prior to and during the missions at a very difficult time, given the ongoing coronavirus pandemic.

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<sup>2</sup> The technical note was prepared by Kelly Eckhold, Jan Moeller, Jiří Podpiera (all IMF) and Stathis Tompaidis (IMF expert).

## THE NBFİ SYSTEM

### A. Size, Functions, and Interlinkages

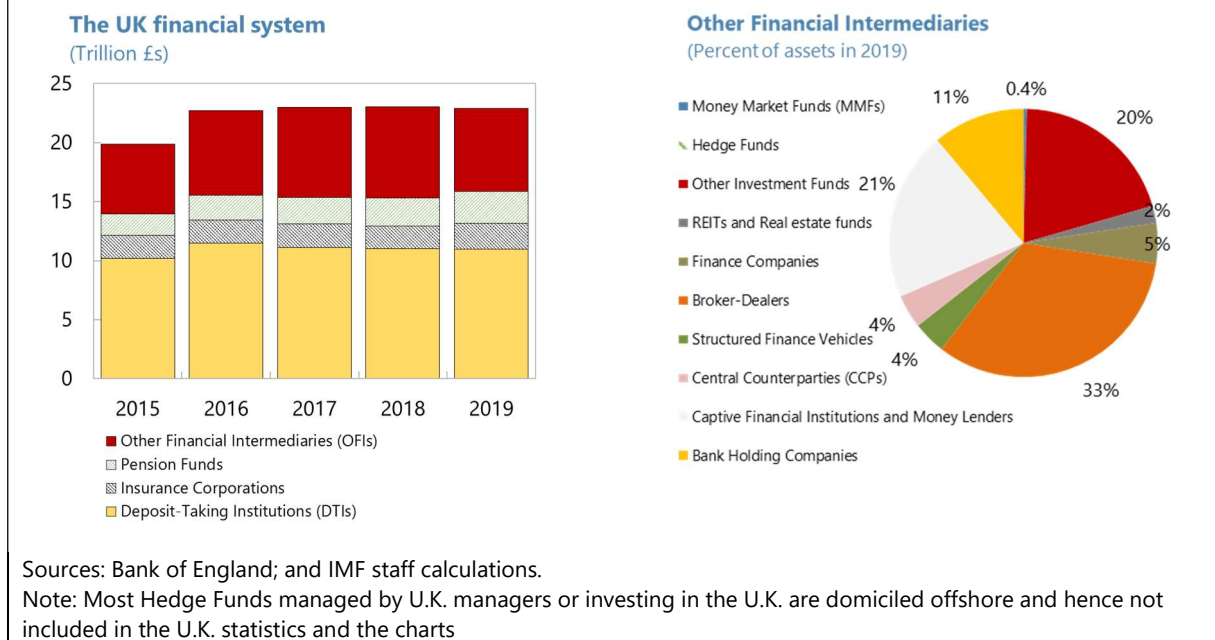
**3. Non-banks in the United Kingdom are very large and diverse.** Their overall size, by assets, is only marginally below that of banks. Besides the more commonly known insurers and pension funds, there is a very large and heterogenous group of other financial intermediaries (OFIs). The OFIs include various types of investment funds, finance companies and money lenders, broker-dealers, and CCPs. The size of the sector is understated in the data we have used below, as it does not include assets associated with HFs and some other investment funds that are operated by U.K. managers, but that are not domiciled in the United Kingdom (Figure 1). Separately, the majority of AUM in Sterling MMFs is in MMFs domiciled in non-U.K. jurisdictions, operated by non-U.K. fund managers, although portfolio management for such funds will often be carried out in the United Kingdom by a U.K. person under delegation arrangements.

**4. Non-banks undertake a great variety of financial activities.** Non-banks provide credit to retail and corporate market niches, invest in various asset classes, and are a critical part of the financial market infrastructure. In the United Kingdom, they hold a third of corporate bonds, a third of corporate loans, and nearly a half of unsecured consumer loans. Banks and non-banks are interlinked though balance sheets, activities, and often ownership (hence a large part of non-bank activities is prudentially consolidated in banks, Figure 2).

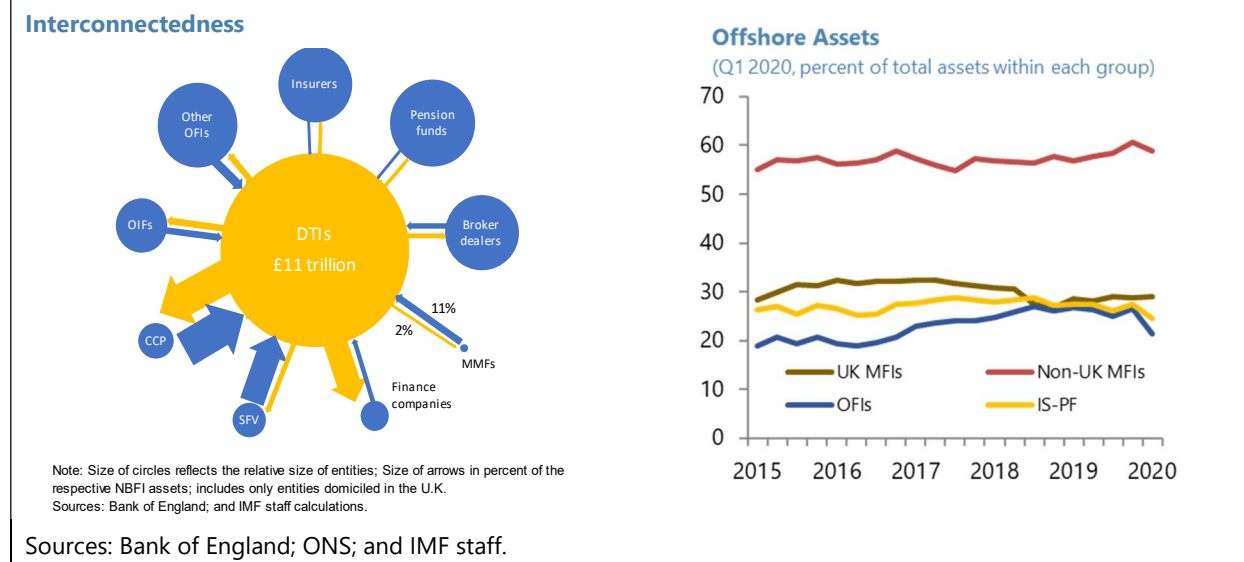
### B. Global Importance

**5. The financial sector is globally integrated through both sides of the balance sheets of banks and non-banks and through United Kingdom's CCPs.** The United Kingdom is home to four G SIBs. Half of the United Kingdom's banking sector's assets and liabilities and a third of non-banks' assets are located offshore. The U.K. financial system is an important marketplace, particularly for wholesale funding and derivatives trading. It is also the largest net exporter of financial and insurance services in the world (mostly commission and fee-based income). A third, and in some products even a half, of the worlds' currencies and derivatives are traded and cleared in London. The three U.K. CCPs offer significant netting benefits through large, transacted volume and the variety of products cleared and serve clients across the globe (clearing members in 23 countries), Figure 3.

**Figure 1. United Kingdom: The U.K. Financial System**

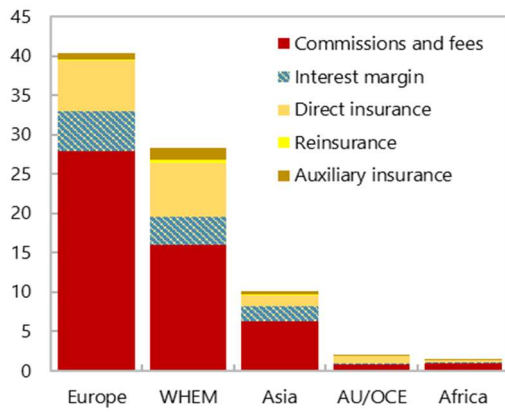


**Figure 2. United Kingdom: Interlinkages**

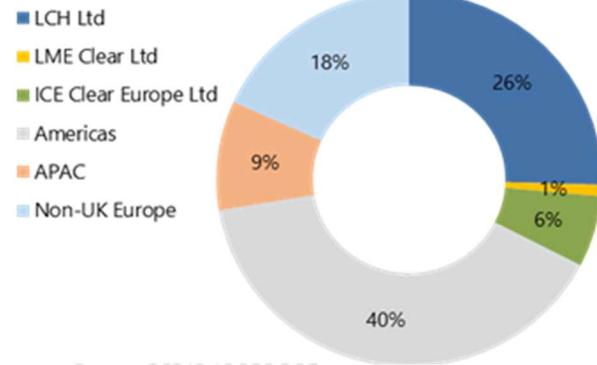


**Figure 3. United Kingdom: Global Importance**

**UK Export of Financial/Insurance Services**



**Global CCP Market**  
(Percent of total IM, 2019)

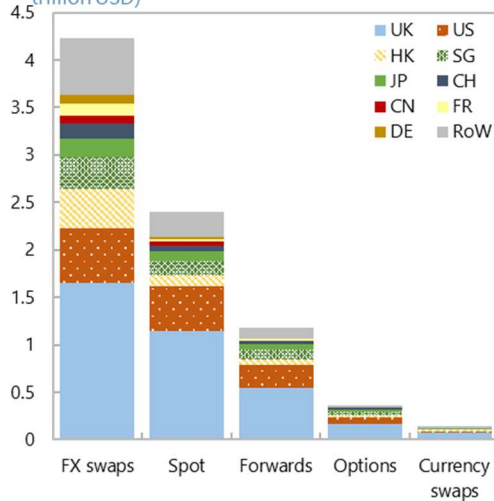


Sources: ONS UK; and IMF Staff calculations.

Source: CCP12; IOSCO PQD.

**Global Currency Market**

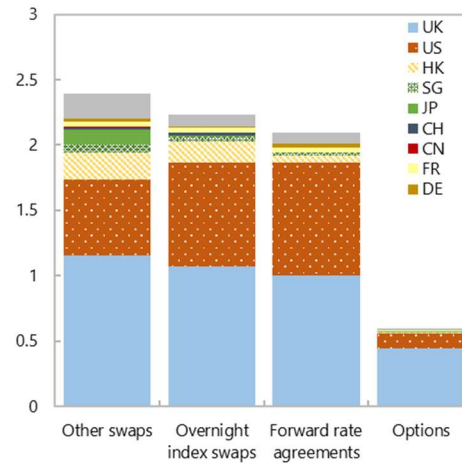
(Average daily volume in 2019, in trillion USD)



Source: BIS.

**Global Market for IR Derivatives**

(Average daily volume in 2019, in trillion USD)



Source: BIS.

## C. Data Gaps

**6. Several interlinkages are currently not quantifiable.** This is particularly true for links within the U.K. non-bank sector and banks vis a vis banks and non-banks domiciled in the Rest of the World. The experimental statistics on sectoral exposures, first published by ONS in October 2020, are an important first step. However, granular data on domestic and foreign non-banks are missing, reported as not identified.

**7. Market liquidity risk assessment is limited by incomplete data on holdings of investment instruments.** The lack of comprehensive data on holdings of Sterling assets, namely equities, Gilts, CPs, and Corporate Bonds, limits the ability to assess concentration of similar types of investors, and potential liquidation pressure in these markets. This is an important drawback, as it somewhat limits the BOE's foresight across Sterling markets during various stress episodes.

**8. Data gaps with respect to non-banks is largely an international issue that is shared by regulators globally.** Given the international nature of the non-bank sector, the U.K. authorities will need to continue engaging internationally to ensure these gaps are effectively plugged.

## D. Recommendations

**9. The U.K. authorities, in close association with international regulators where appropriate, are strongly encouraged to:**

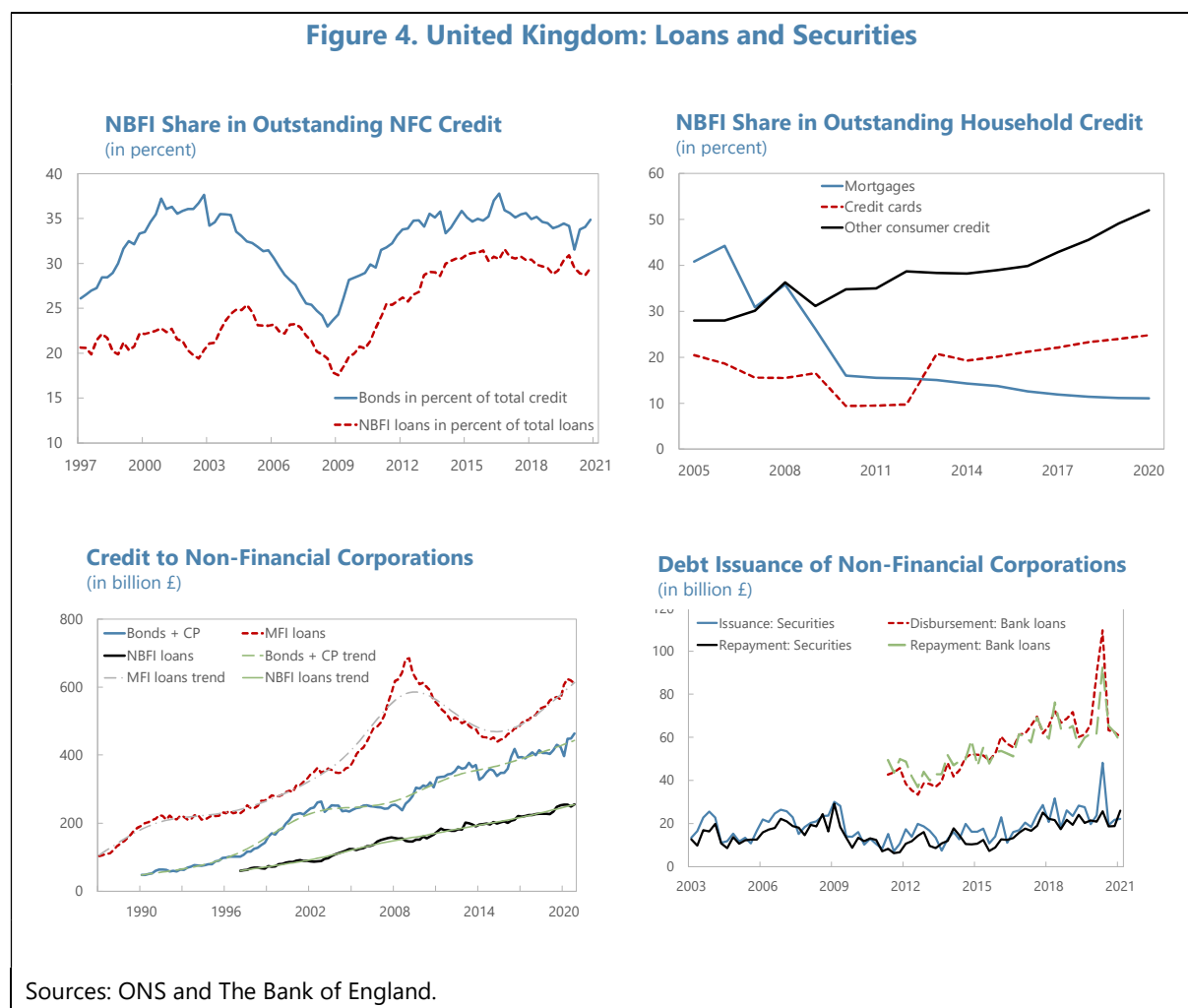
- Continue improving the experimental statistics on balance sheet exposures compiled by the ONS, especially filling the information gaps on the NBFIs sector.
- Analyze interlinkages between NBFIs, Banks, and Rest of the World's entities more systematically, including possible concentration of exposures and trades within the NBFIs.
- Collect or systematize the collection and reporting of data for all Sterling holdings by all investors, including each NBFIs. Use these data to enhance the analysis of concentration of NBFIs investors in key sterling markets—e.g., equity, corporate bonds, CPs, Gilts, including implications for liquidity under stress in these markets

# MACROFINANCIAL LINKAGES

## A. Non-Bank Credit

**10. Non-banks provide credit to U.K. households and firms through direct loans and investing in corporate bonds.** Many non-banks originate, service, and often securitize loans and invest in corporate bonds and securitized products. They offer residential mortgages, unsecured consumer credit, corporate loans, and commercial real estate loans. Loans are originated among others by specialist mortgage lenders, consumer credit subsidiaries of commercial banks, pension funds, other investment funds, and insurers. In the corporate loan market, and especially in the high-yield segment, non-banks are the dominant investors and include pension funds, insurance

companies, and asset managers. The non-bank lending series is derived indirectly as the difference between total private credit and bank credit (Figure 4).



### 11. Non-bank intermediation appears to be, at least to some degree, reliant on banks.

While some non-bank lenders, such as pension funds that provide loans directly typically rely less on banks, others have links to banks and other non-banks through:

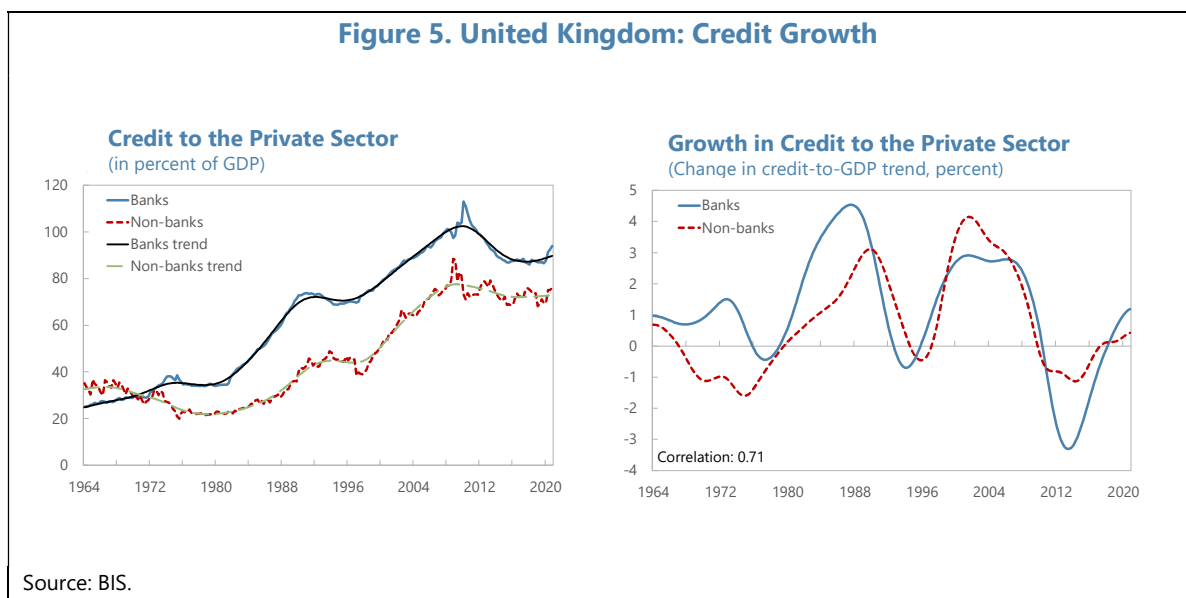
- *Their funding models.* At the origination stage, various non-bank lenders source wholesale funding from commercial banks. For example, in the case of non-bank mortgage lenders, a consortium of commercial banks may provide a credit line to fund the origination of residential mortgages. Likewise, when a non-bank lender is a subsidiary of a commercial bank, funding tends to be channeled via the lender's parent.
- *Sale of loan portfolios.* A non-bank lender could issue asset-backed securities for a portion of originated loans. Investors participating in the securitization stage are both commercial banks and NBFIs, such as asset managers, while the issuing non-bank retains some part of the security.

**12. Corporates use both loans and bond financing from banks and non-banks, but it remains unclear whether non-banks behave differently than banks during stress episodes.**

Loan disbursements to U.K. non-financial companies (NFCs) in the second half of 2020 increased sharply, in part due to banks' committed credit line drawdowns as well as government loan guarantee schemes. Based on aggregate data, it appears that bond issuance has been used in the second quarter of 2020 to repay loans—the mirror image of a contemporaneous spike in bond issuances and loan repayments (Figure 5). Unfortunately, with the data currently available it is not possible to determine whether non-banks provide more or less financing through bonds and loans than banks, including during times of stress.

## B. Credit Cycles

**13. Bank and non-bank credit cycles are largely synchronized.** While the correlation between bank and non-bank credit cycles is very high and statistically significant (consistent with findings in Kemp et al., 2018)<sup>3</sup>, there are noticeable differences in magnitudes as well as timing. For example, trend growth of aggregate credit diminished post-GFC, yet the decline was stronger among banks, effectively resulting in increasing market share for non-banks. Therefore, despite the common cyclicity of bank and non-bank credit, which indicates complementarity between the two, along the margins they appear to be substitutes.



**14. Non-bank lenders gained market share since the GFC as banks practically withdrew from certain riskier segments.** Following the GFC, banks reduced lending to the unsecured consumer credit segment and to commercial real estate lending, while non-banks stepped in. In contrast, in the residential mortgage market, non-banks lost market share as they moved away from unsustainable subprime lending. Instead, evidence from market participants points to NBFIs serving

<sup>3</sup> Kemp, Esti, René van Stralen, Alexandros Vardoulakis, and Peter Wierts, 2018, "The Non-Bank Credit Cycle", Finance and Economics Discussion Series, Federal Reserve Board, Washington, DC.

clients that have difficulties accessing mortgages under the high-volume, low-touch lending approach by commercial banks, including in the buy-to-let segment.

**15. The risk migration from banks to non-banks post-GFC may be partly driven by stricter bank regulation.** Capital requirements under Basel III made lending in certain segments unattractive to banks. On the contrary, non-banks were unaffected by Basel capital requirements and provisioning rules for banks, and thus were able to fill the gap. Motivated by higher yield, non-banks served borrowers shunned by banks. Nevertheless, since some non-banks are funded by banks, some of the risks underwritten by non-banks ends up on the balance sheets of banks through non-banks' securitized products.

### C. Lending Under Stressed Conditions

**16. Simulations of non-bank lending under stress are useful to assess the cyclicity of non-bank credit.** Under an event, where market valuations may face a decline, the quality of their direct loans may deteriorate, and their funding may come under pressure, continued non-bank credit intermediation to the U.K. economy may be at risk.

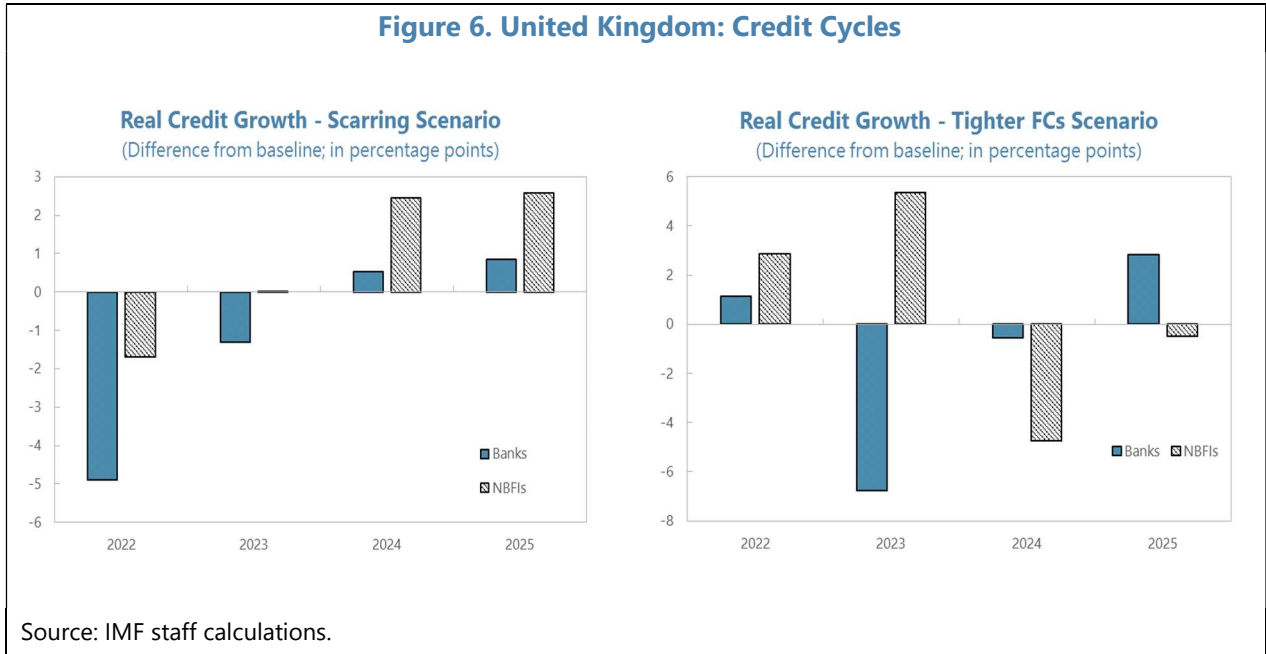
**17. Simulations use the estimated determinants of non-bank lending and apply them to two macroeconomic stress scenarios designed for prudential bank stress tests.** The estimation of non-bank lending determinants suggests that non-bank lending dynamics depend on bank lending with a lag. Further determinants include income growth, slope of the yield curve, performance of stocks, and unemployment (Box 1). The scenarios used are the ones applied to bank stress tests, namely:

- **Adverse scarring scenario** with a protracted recession with lasting economic scars from the pandemic, resulting from losses of consumer and investor confidence (temporary) dislocations in productive capacity; and
- **Adverse scenario with tightening financial conditions**, as a response to a surge in global inflation. The U.K. economy would be impacted through high imported inflation, supply bottlenecks, and increased risk premia.

**18. Lending under stressed conditions shows lower procyclicality of non-bank credit compared to banks.** Under the recessionary scenario with 'scarring' effects on the economy, non-bank credit contracts less and resumes growth faster than bank credit. In the case of tightening of global financial conditions, non-bank lending contracts less and is more countercyclical than bank lending (Figure 6).<sup>4</sup> While useful, this analysis could be much more informative if replicated individually, at least for each type of NBFi, which is currently not possible due to limited data

<sup>4</sup> The unemployment rate projections contribute only minimally to the dynamics of non-bank lending. For instance, in the scarring scenario, the unemployment rate in 2022/2021 contributes countercyclically only 0.06 percent, compared to the decline in lending by 1.5 percent.

availability, since each NBFi type is subject to different degrees of regulation, including NPLs/loss treatment and capital standards.



### Box 1. Determinants of Direct Lending by NBFIs

In the pursuit to shed light on the factors that influence the growth of lending from NBFIs, this box establishes key drivers of NBFIs direct lending to the economy. The results are then used for simulations of NBFIs lending under stressed economic conditions – two adverse scenarios, scarring and tightening financial conditions, respectively.

NBFIs are a heterogeneous group of lenders. However, their direct lending activities are likely driven by the same underlying motivation as banks: search for yield. The regression analysis considers the following factors for NBFIs lending:

- *Slope of the yield curve*—Slope—the difference between long- and short-term yields on government bonds. When the term premium increases, one would expect NBFIs to increase investments in bonds and reduce origination of direct loans.
- *Returns on stocks* – EqYield - it is expected that higher returns on stocks would attract more NBFIs investors and reduce growth of NBFIs direct lending.
- *Bank loans* – BL - several NBFIs (mainly money lenders) have funding links to banks and serve more market niches that are more complex and riskier than the ones served by banks. It is expected that reduced bank lending signals less appetite for banks to fund NBFIs lenders and thus NBFIs lending would slow down, potentially with a lag.
- *Income* – real GDP – a traditional determinant of lending by banks, income, is expected to be also a significant determinant of non-bank lending. Higher income growth positively correlates with NBFIs lending growth.
- *Unemployment rate* – UR – higher unemployment is typically associated with more difficulty to obtain bank credit but in the case of NBFIs lenders, who focus on more complex clients in general, higher unemployment is expected to increase their lending as clients move from banks to nonbanks.

Estimated relationship through least squares applied to quarterly data from 2007: Q1 to 2021: Q1:

$$gNBL_t = 0.78^{***} gGDP_{t-1} + 0.36^{***} gBL_{t-4} - 2.67^{***} Slope_t - 0.15^{***} EqYield_t + 0.79^{***} UR_t$$

(0.29)                      (0.14)                      (0.66)                      (0.04)                      (0.21)

Where  $g$  denotes year-on-year growth in real terms (deflated by CPI) and NBL denotes the loans made by NBFIs. The regression makes use of 80 observations and explains 61 percent of the variation in NBFIs lending. The lags were chosen based on the strongest correlation with the dependent variable and the exclusion of other lags was not rejected by the F-test.

All factors have the expected signs. NBFIs lending appears to be encouraged by declining stock returns and long-term yields, as well as income growth and bank lending (with a lag). In addition, NBFIs seem to be substitute options for households' loans in time of growing unemployment.

Source: IMF Staff.

## D. Data Gaps

**19. Data on non-bank lending activities remain somewhat incomplete globally.** Aggregate lending statistics for insurers, pension funds, OFIs, and finance companies are calculated on an annual basis, however, some lenders are not captured, such as fintech-enabled consumer credit – buy-now-pay-later, employer salary advance schemes, and corporate loans. Depending on their materiality, these activities may need to be brought inside the perimeter. Data on asset quality of non-bank SME loans and commercial real estate loans are also not consistently available.

## E. Recommendation

**20. Authorities are encouraged to further enhance the analytical framework by analyzing lending behavior of each type of non-bank under stress.** An analysis of lending under stress and implications from losses across non-bank types would be helpful to assess potential vulnerabilities in non-banks. This recommendation may need to be taken forward globally.

# ASSET MANAGEMENT

**21. The U.K. asset management industry is the largest in Europe and the second largest in the world.** As of end-2020, the size of the assets under management is £11 trillion. The industry contributes around 1 percent of the United Kingdom’s GDP and employs 114,000 people (42,200 directly). The industry includes portfolio management and fund administration and manages the savings, pensions, and investments of millions of people across the world. At Budget 2020, the U.K. government announced plans to review the U.K. funds regime.<sup>5</sup> The United Kingdom is also leading the transition to green the financial system as part of its net-zero commitment.<sup>6</sup>

**22. Liquidity demands from asset managers during stress events, often driven by redemption demands from their investors, is a key area of focus of the international regulatory community.** The international regulatory community has been evaluating policies to strengthen the sector following the ‘dash-for-cash’ during March 2020. According to a report by the IMF, “the global nature of the investment fund business and fungibility of financial flows makes it vital to ensure consistency of global policy choices that can secure financial stability by precluding regulatory arbitrage.”<sup>7</sup> The U.K. authorities are actively engaged and often lead the international regulatory efforts.

<sup>5</sup> Review of the UK funds regime: a call for input,” HM Treasury, published January 26, 2021, available at <https://www.gov.uk/government/publications/review-of-the-uk-funds-regime-a-call-for-input>.

<sup>6</sup> “Greening Finance: A Roadmap to Sustainable Investing,” HM Treasury, published October 18, 2021, available at <https://www.gov.uk/government/publications/greening-finance-a-roadmap-to-sustainable-investing>.

<sup>7</sup> “Investment Funds and Financial Stability: Policy Considerations,” by Antonio Garcia Pascual, Ranjit Singh, and Jay Surti, September 17, 2021, available at <https://imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2021/09/13/Investment-Funds-and-Financial-Stability-Policy-Considerations-464654>. See also “Enhancing the Resilience of Non-Bank Financial Intermediation: Progress report,” November 1, 2021, available at <https://fsb.org/2021/11/enhancing-the-resilience-of-non-bank-financial-intermediation-progress-report>, and “Assessing the resilience of market-based finance,” a report by the Bank of England that includes the conclusions of the joint Bank of England and Financial Conduct Authority review, published on July 13, 2021, available at <https://bankofengland.co.uk/report/2021/assessing-the-resilience-of-market-based-finance>.

**23. Asset managers are tightly linked to the financial system.** Liquidating portfolios held by asset managers, often driven by the underlying investors' desire to reduce their investment exposure, can have knock-on effects to markets and other market participants holding similar portfolios. Asset managers are also linked to the financial system through direct borrowing and lending, their role in market-based finance, activity in the derivatives markets, and cross-border flows. If they hold unleveraged portfolios, they may be forced to liquidate part of their portfolio due to redemptions. But leveraged managers that invest in derivatives may also be forced to liquidate due to losses in derivative positions, increases in initial margins, increased borrowing costs, and de-levering.

**24. Many funds used by U.K. investors and/or investing in U.K. assets are domiciled outside the United Kingdom.** The evaluation of systemic risk arising from forced liquidations by asset managers remains a challenge due to the global nature of the sector. U.K. regulators rely partly on fund surveys and on commercial databases for simulations to assess the market impact of the actions of non-U.K. domiciled funds that may be relevant to U.K. markets. In relation to U.K. domiciled funds, the U.K. authorities can and do collect information through both regular regulatory reporting requirements and ad hoc data requests. The U.K. authorities have several MoUs on cooperation in place and are exploring data sharing agreements with regulators in funds' domiciles. However, a complete assessment of market liquidity in core markets will require collecting more information on holdings of sterling financial instruments. An international consensus on regulation and United Kingdom's engaging in data sharing agreements with regulators of funds operating in the United Kingdom will need to continue for better monitoring and addressing liquidity vulnerabilities.

**25. Assessing liquidity risks posed by asset managers needs to be based on fund-specific risks.** Measuring fund liquidity and leverage should be tailored to the activities of each fund: as with all open-ended funds, open ended corporate bond funds, and money market funds (MMFs), may need to liquidate assets due to large redemptions; funds using derivatives may need to liquidate assets to meet variation margin calls due to losses, and increases in initial margin due to increased uncertainty; levered funds may need to reduce leverage when uncertainty and funding costs increase.

**26. Due to the high-level nature of the data that are available, it is difficult to evaluate liquidity risks.** An effective assessment of funds' liquidity needs would need to distinguish between different liquidation needs of funds and match those against the liquidity profiles of funds' asset holdings during stress events. Available data are not granular enough, in terms of frequency and detail, to conduct such an analysis.

## A. Money Market Funds

**27. MMFs were stressed in March 2020 but did not use their liquidity buffers.** The dash-for-cash and the increased margin requirements during March 2020 resulted in large withdrawals from MMFs in major MMF jurisdictions, including the EU, in which as noted above, the majority of sterling MMF assets are domiciled. The BOE estimates the total outflow from Sterling MMFs to be

approximately 25 billion GBP.<sup>8</sup> Market intelligence indicates that out of concern that using these buffers would trigger gate redemptions and fees, MMFs did not use their liquidity buffers.<sup>9</sup> Instead, they lowered the maturity of their holdings. It would be useful to decouple obligations for a manager to impose fees and gates from regulatory thresholds for minimum liquid assets, while continuing to require fund managers to take any necessary action in line with the best interests of all fund investors.<sup>10</sup>

**28. Stress testing Sterling MMFs.** Using security-level commercial data, the stress test stresses liquidity system-wide in Sterling MMFs domiciled in Ireland and Luxemburg (the vast majority by assets), and the United Kingdom. The data are available at a daily frequency and include information on the funds' inflows and outflows, allowing the analysis of potential liquidity needs. Figure 7 illustrates weekly flows and potential liquidation needs over the January 2020-March 2021 period.<sup>11</sup> Flows and potential liquidation needs are reported for all funds as well as for government and prime funds separately. The figure reveals that the biggest liquidation needs occurred between March 12 and March 19, 2020. Applying the redemption shocks that each fund faced during this time, i.e., the redemption shock during the worst week of system-wide redemptions, to the portfolios held by funds on April 9th, 2021, Tables 2, 3 show two potential liquidation profiles. Table 2 shows the liquidation profile when liquidations are proportional to fund holdings by type of asset, while Table 3 shows the liquidation profile when liquidations are proportional to fund holdings by maturity.<sup>12</sup> The total liquidation needs for Sterling MMFs calculated from the stress test are £22 billion, similar to the level of liquidations in March 2020.

<sup>8</sup> "The role of non-bank financial intermediaries in the 'dash for cash' in sterling markets," Financial Stability paper No. 47, by Robert Czech, Bernat Gual-Ricart, Joshua Lillis and Jack Worlidge, published on June 25, 2021, available at <https://bankofengland.co.uk/financial-stability-paper/2021/the-role-of-non-bank-financial-intermediaries-in-the-dash-for-cash-in-sterling-markets>.

<sup>9</sup> An ESRB working paper, "Do liquidity limits amplify money market fund redemptions during the COVID crisis?" ERSB working paper No. 127, published October 1, 2021, by Peter G. Dunne and Raffaele Guiliana, available at <https://esrb.europa.eu/pub/series/working-papers/html/index.en.html>, makes the point that proximity to liquidity thresholds during March 2020 was strongly associated with outflows.

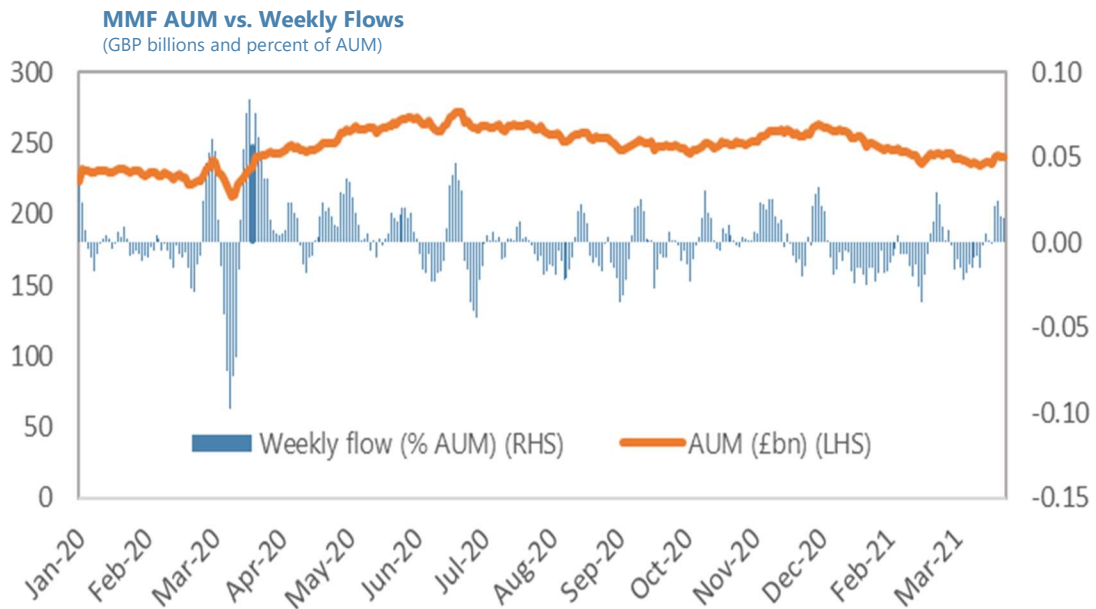
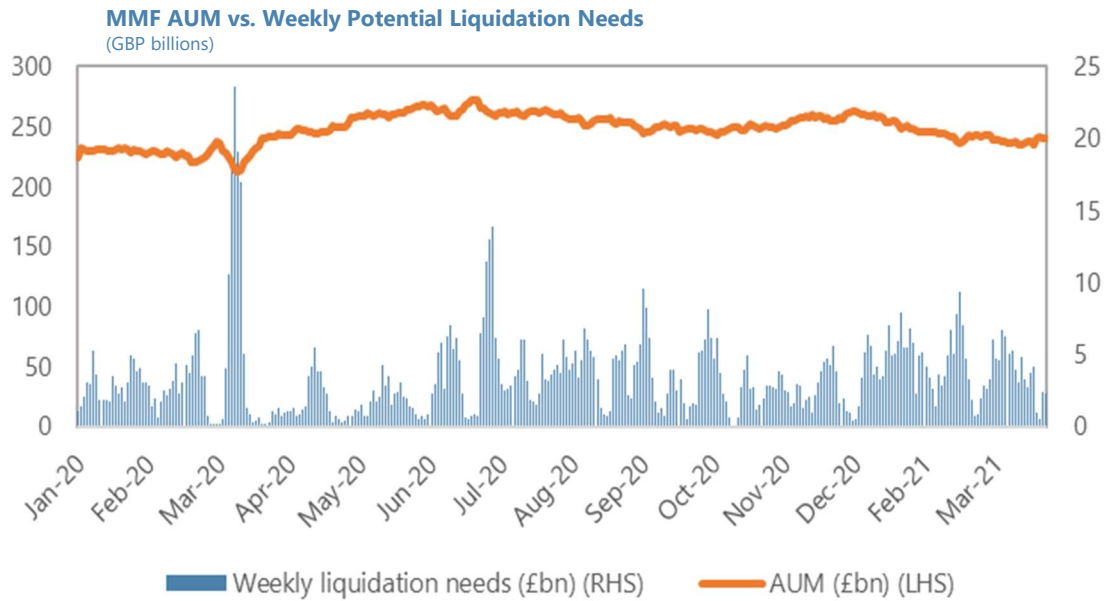
<sup>10</sup> This recommendation is in line with the recommendation by the Financial Stability Board. In "Policy proposals to enhance money market fund resilience: Final Report", October 11, 2021, available at <https://www.fsb.org/2021/10/policy-proposals-to-enhance-money-market-fund-resilience-final-report/>

The FSB recommends to "address regulatory thresholds that may give rise to cliff effects".

<sup>11</sup> Potential liquidation needs differ from flows. While flows are aggregated across funds and time, potential liquidation needs are only aggregate across time, but not across funds. The reason for this is that during the 'dash for cash' episode during March 2020, funds that received in-flows did not necessarily use them to purchase assets, but rather increased their cash buffers.

<sup>12</sup> We have not calculated a liquidation profile based on liquidating most liquid assets first, since the observed actions by MMFs during March 2020 was to avoid breaching their liquidity buffers and decrease the weighted maturity of their holdings. These actions suggest that liquidations were either proportional by the maturity of the holdings, or that longer maturity holdings were liquidated before shorter maturity ones.

**Figure 7. United Kingdom: Sterling Money Market Funds**

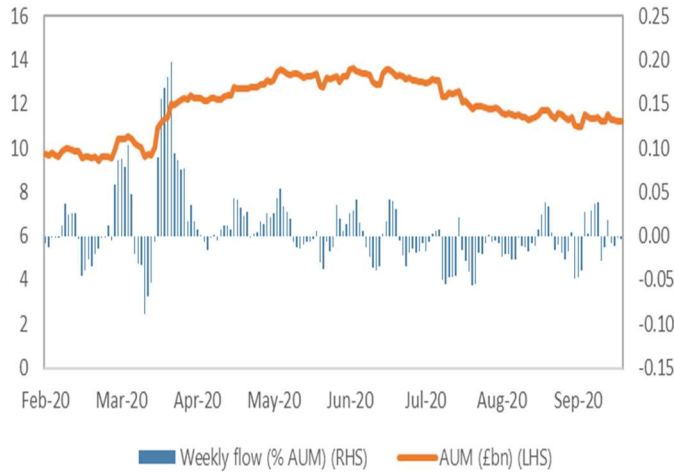


Source: Crane.

**Figure 7. United Kingdom: Sterling Money Market Funds (concluded)**

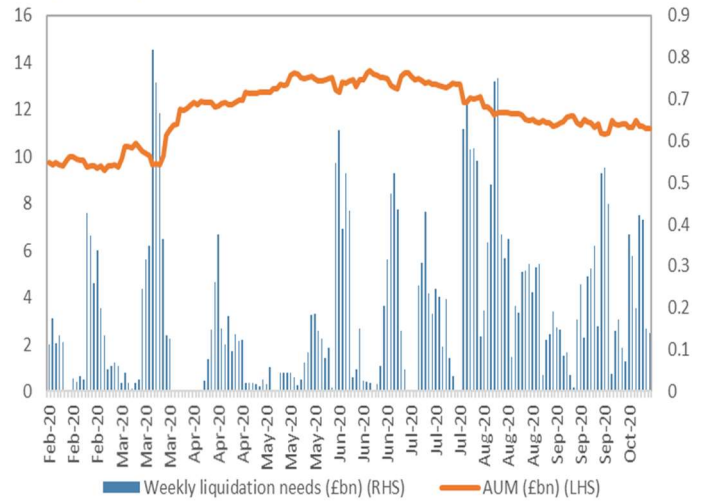
**Government MMF AUM vs. Weekly Flows**

(GBP billions and percent of AUM)



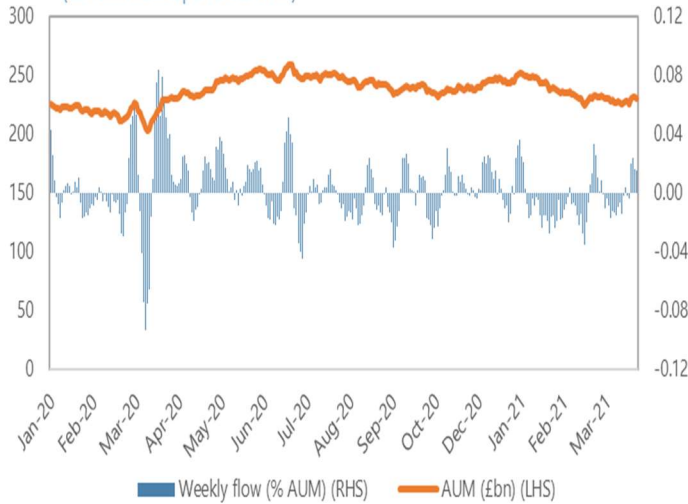
**Government MMF AUM vs. Weekly Potential Liquidation Needs**

(GBP billions)



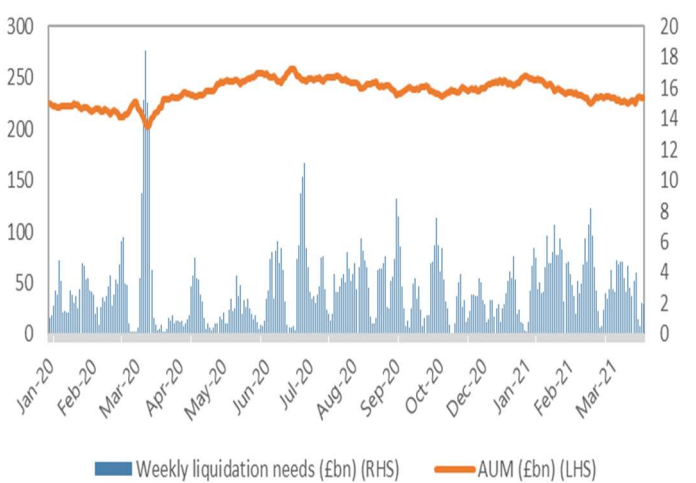
**Prime MMF AUM vs. Weekly Flows**

(GBP billions and percent of AUM)



**Prime MMF AUM vs. Weekly Potential Liquidity Needs**

(GBP billions)



Source: Crane.

**Table 2. United Kingdom: Proportional Liquidation Asset Profile for Sterling Money Market Funds Under a Weekly Redemption Shock**

	Treas	Govt	Repo	CD	CP	ABCP	TD	Other	Total
Total Liquidation Needs	0.29	0.02	5.05	8.24	3.64	0.49	3.54	0.75	22.0
Liquidation Needs									
Government	0.14	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.8
Liquidation Needs Prime	0.16	0.02	4.43	8.24	3.64	0.49	3.54	0.75	21.3
Total asset Government	1.52	0.00	8.32	0.00	0.02	0.00	0.00	0.00	9.9
Total assets Prime	3.30	0.33	42.23	88.13	41.22	7.10	37.90	10.76	231.0
% Liquidation Needs									
Government	8.9%		7.4%		0.8%			1.7%	7.6%
% Liquidation Needs									
Prime	4.8%	6.2%	10.5%	9.3%	8.8%	6.9%	9.3%	6.9%	9.2%

Sources: Crane data and staff calculations.

Note: MMF portfolio reference date April 9, 2021, values in £ billions.

**Table 3. United Kingdom: Proportional Liquidation Maturity Profile for Sterling Money Market Funds Under a Weekly Redemption Shock**

	1 day	2-7 days	8-30 days	31-60 days	61-90 days	91-180 days	181-365 days	Total
Total Liquidation								
Needs	8.10	1.97	2.43	2.70	2.76	3.07	0.98	22.0
Liq. Needs								
Government	0.53	0.05	0.06	0.08	0.00	0.03	0.01	0.8
Liquidation Needs								
Prime	7.58	1.92	2.37	2.62	2.75	3.04	0.97	21.3
Total asset								
Government	5.84	1.13	0.74	0.86	0.31	0.86	0.11	9.9
Total assets Prime	78.96	21.39	28.62	27.77	28.66	31.75	13.77	231.0
% Liquidation.								
Needs Government	9.0%	4.3%	8.4%	8.8%	1.0%	3.5%	5.0%	7.6%
% Liquidation Needs								
Prime	9.6%	9.0%	8.3%	9.4%	9.6%	9.6%	7.0%	9.2%

Sources: Crane data and staff calculations.

Note: MMF portfolio reference date April 9, 2021, values in £ billions.

## B. Open-Ended Funds

**29. Data on open-ended funds (OEFs) are limited.** OEFs include a variety of investment funds. The FCA can obtain *ad hoc* data as needed from all UK managers, including daily data. Supervisory data exist that provide line by line security holdings information, but the data are only available annually or semi-annually with a significant reporting delay of up to four months for most OEFs. In the case of U.K. MMFs, additional data including line by line security level holdings is reported to the FCA quarterly under U.K. MMFR rules. Data on the liquidity of the holdings are not available either during regular times or during times of stress.

**30. Stress testing fixed income and equity funds.** Existing data indicate that Sterling corporate bond and equity funds are largely unleveraged, making it possible to carry out a stress test based on redemptions alone, similar to the case of MMFs.<sup>13</sup> Yet, since the data are only available, at best, at a monthly frequency, the analysis is necessarily incomplete. Figure 8 shows the monthly flows and potential liquidation needs for fixed income and equity open-ended funds. As with other jurisdictions, higher frequency data would be beneficial: the largest potential liquidation needs for fixed income funds occur during November 2020, while the largest potential liquidation needs for equity funds occur during October 2020. Applying the corresponding monthly redemption shocks at the fund level on the portfolios held by funds in July 2021, Figure 9 provides the liquidation profile under two liquidation policies: (i) proportional to the portfolio composition, and (ii) most liquid asset first.<sup>14</sup>

## C. Alternative Investment Funds

**31. Some funds have complicated leverage, borrowing, and liquidity profiles.** Unlike MMFs and unleveraged funds that may be forced to liquidate part of their portfolios primarily due to redemptions, certain other funds face several additional risks leading to a need for liquidity. Funds that are leveraged, and/or invest in derivatives, may need to liquidate due to increased funding costs, derivatives losses, or increased initial margin requirements. Managers of such funds that are AIFs provide, at best, quarterly information through the AIF Managers Directive (AIFMD) on financial leverage, types of borrowers and lenders, portfolio sensitivities to interest rate and credit risk movements, and on the liquidity of their AIFs' assets.

**32. AIF's financial leverage is vulnerable to funding shocks.** Data in AIFMD provides information on the extent that AIFs are connected to other financial institutions through borrowing.<sup>15</sup> Figure 10 shows that, on aggregate, hedge funds borrow to fund their positions, and their borrowing is largely concentrated in repos and collateralized borrowing via prime brokers, which suggests that they are vulnerable to increases in the cost of funding.

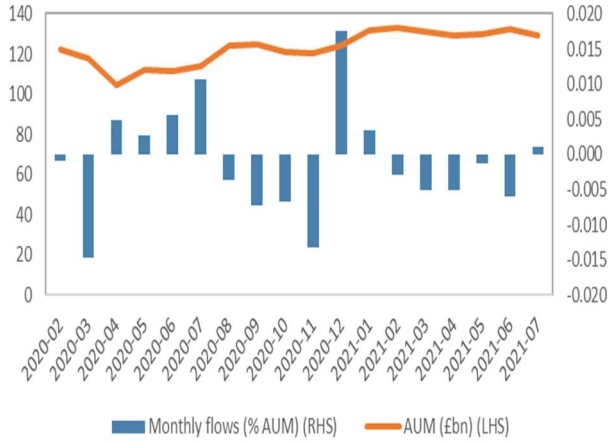
<sup>13</sup> Another possible reason for funds to liquidate part of their holdings may be the downgrade of investment grade assets – fixed income assets graded BBB or higher. Figure 8 shows that fixed income funds hold large amounts of BBB bonds – approximately 38 percent of their total holdings – making them vulnerable to systemic downgrades.

<sup>14</sup> In terms of most liquid to least liquid, the assets are ordered by cash; equity; AAA; AA; A; BBB; BB; B; Below B; and Not rated.

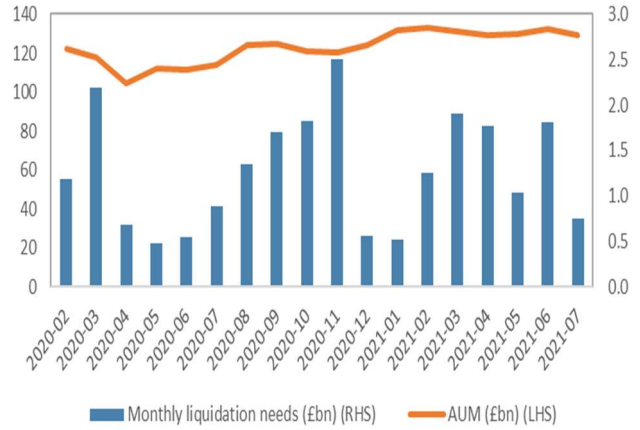
<sup>15</sup> Borrowing can be unsecured or secured with collateral. Collateral can often be further re-hypothecated, increasing the leverage in the system.

**Figure 8. United Kingdom: Open-Ended Funds Flows and Potential Liquidity Needs**

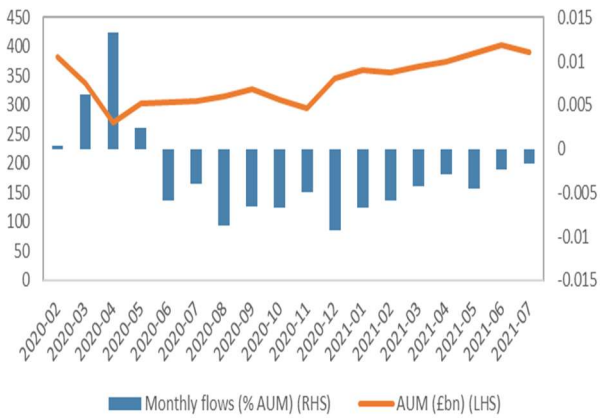
**Fixed Income OEFs AUM vs. Monthly Flows**  
(GBP billions and percent of AUM)



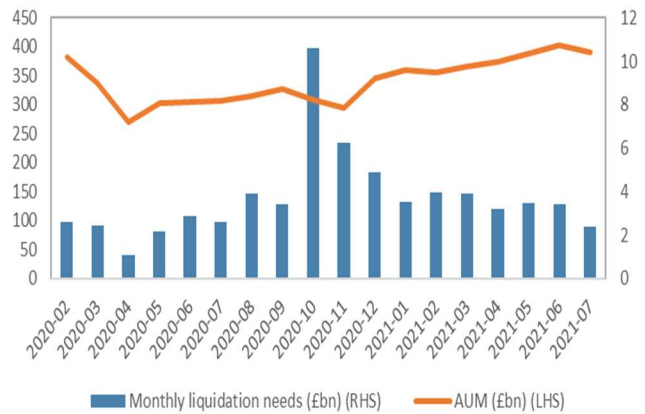
**Fixed Income OEFs AUM vs. Potential Liquidity Needs**  
(GBP billions)



**Equity OEFs AUM vs. Monthly Flows**  
(GBP billions and percent of AUM)

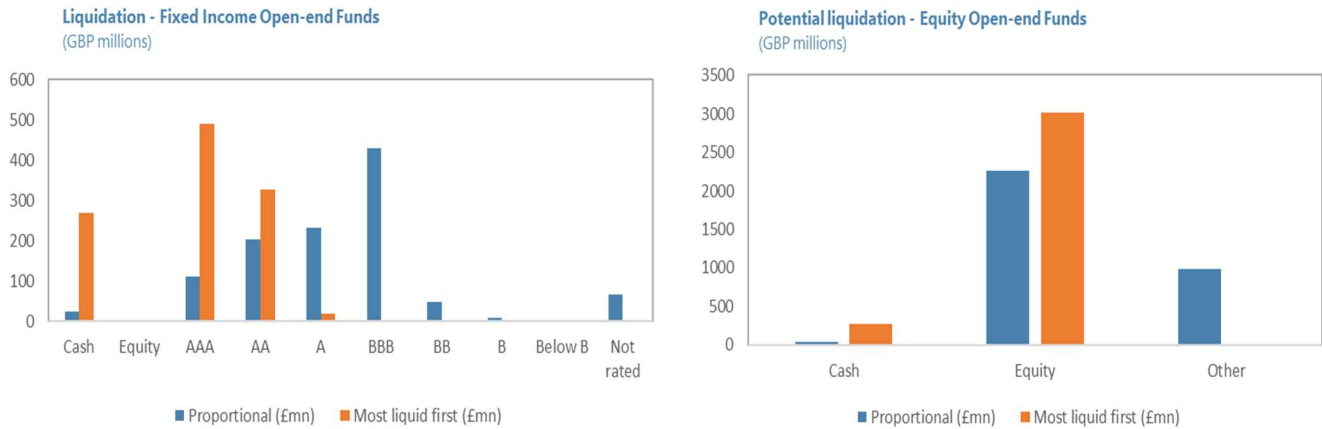


**Equity OEFs AUM vs. Potential Liquidity Needs**  
(GBP billions)



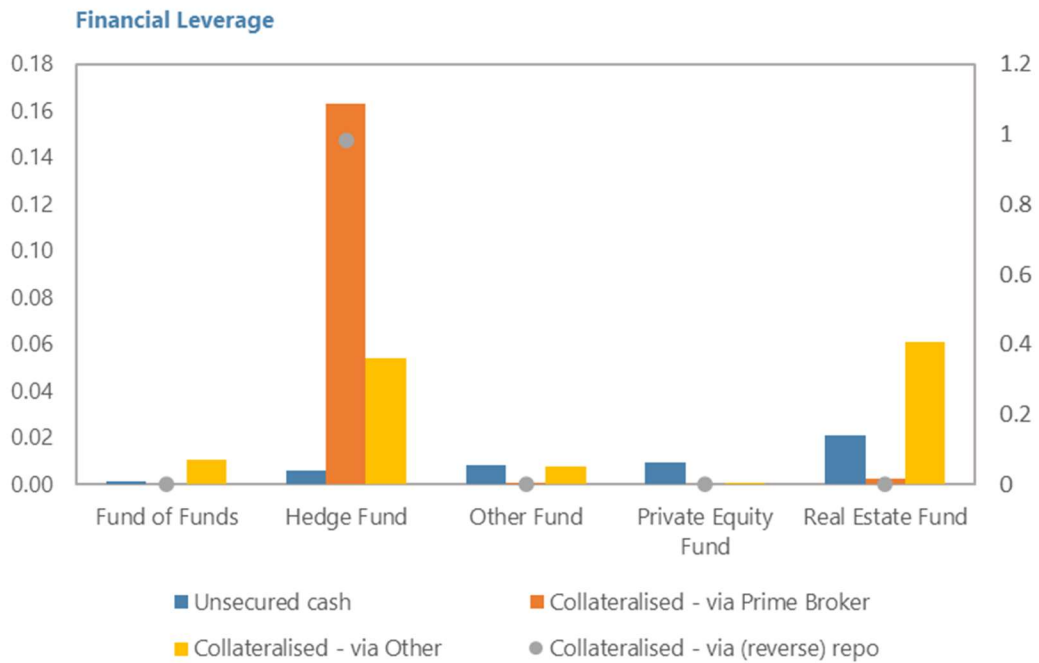
Source: Morningstar. The figure includes all funds under Morningstar categories "EAA Fund U.K." and "EAA GBP Fund".

**Figure 9. United Kingdom: Open-Ended Funds Liquidation Profile**

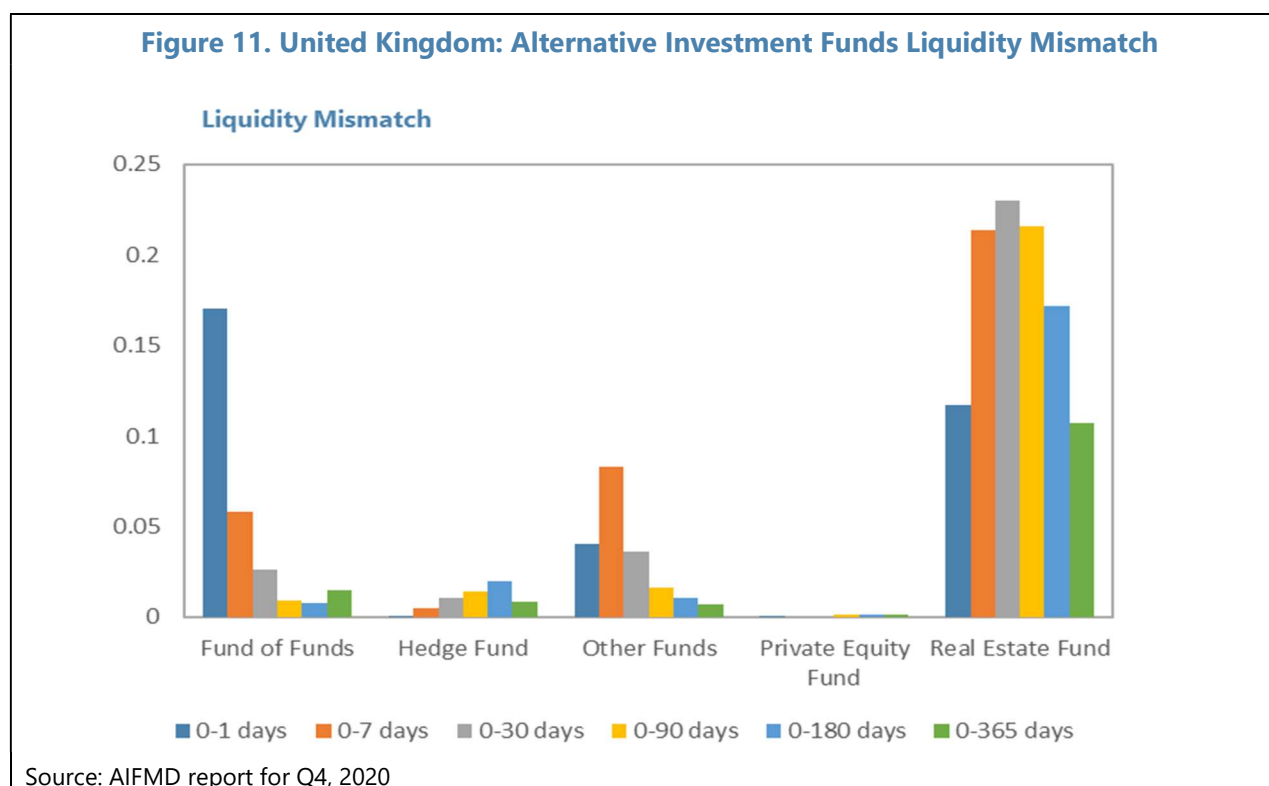


Source: Morningstar.

**Figure 10. United Kingdom: Alternative Investment Funds Financial Leverage**



Source: AIFMD report for Q4, 2020.



**33. Liquidity mismatch appears to be limited.** Funds' reports in AIFMD provide information on the liquidity profile of their holdings. This information can be used to understand the liquidity pressure that funds may face under redemptions. The aggregate data, shown in Figure 11, indicate that—besides Real Estate Funds across all horizons and Funds of Funds at the 0–1 day horizon—the liquidity mismatch, i.e., the mismatch between the liquidity profile of the holdings of the fund and the liquidity profile of the potential redemptions, is limited.<sup>16</sup> The vertical axis expresses liquidity mismatch as a percentage of total assets under management over different horizons. We note that the definition of liquidity mismatch assumes that investors redeem their entire investment at the appropriate time horizon. For example, this means that Real Estate Funds would face a liquidation need if redemptions exceeded 80% of their assets.

**34. Stressed profits and losses show a small overall impact, but aggregation may mask individual variations.** The AIFMD includes information on the sensitivities of the values of the holdings of AIFs with respect to changes to interest rates—DV01—and credit spreads—CS01. The information is broken down by maturity: less than 5 years; between 5 and 15 years, and more than 15 years. It is also broken down by short and long positions, as well as net exposures. This information can help provide an estimate of aggregate profit and loss for each fund category under a particular shock to interest rates and credit spreads. The top panels of Figure 12 provide the aggregate profit and loss estimates for AIFs, based on AIFMD Q4 2020 data. The shocks applied to interest rates changes in each maturity bucket match the observed changes to the 1-year, 10-year,

<sup>16</sup> The FCA has proposed a framework to lengthen redemption periods for funds that invest in property and has introduced a new framework for funds that invest in other highly illiquid assets (LTAFs)'.

and 30-year US Treasury constant maturity rate between February 18 and March 9, 2020. The top left panel of Figure 12 reports aggregate profit and loss estimates for credit spread changes that match the observed changes for the ICE Bank of America (BofA) 1-3-year, 7-10-year, and 15+year US corporate index effective yield between March 9 and March 20, 2020.<sup>17</sup> The top two panels of Figure 12 suggest that, on aggregate, losses are moderate, with the biggest loss corresponding to the less than 5-year credit spread bucket for hedge funds—approximately 2% of asset value. Given the magnitude of the moves, these losses appear small, but aggregation over all reporting funds may mask large individual variations.<sup>18</sup> Regulators have access to information at the individual AIF level. An additional caveat on the accuracy of these results includes the objective difficulty of aggregating a measure such as DV01 and CS01 across different positions. For example, a position that is long a three-year corporate bond issued by one firm and short another three-year corporate bond issued by another firm may have a very small value of DV01 and CS01. However, since the bonds are issued by different firms, the aggregate values of DV01 and CS01 may, at best, only capture part of the risk associated with the portfolio. Similar challenges exist when aggregating sensitivities of bonds of different maturities.

**35. Assessing funds' liquidity implications from leverage is not straightforward.** Calculating leverage for a portfolio is complicated when the portfolio includes derivatives positions – several definitions exist. To estimate potential liquidation needs, the two bottom panels of Figure 12 use a risk-based measure that captures the sensitivity of short and long positions relative to the net sensitivity, that is, the ratio of the sum of the absolute value of DV01 (CS01) for short and long positions over the absolute value of the net DV01 (CS01). For example, if the sum of the absolute value of DV01 for short and long positions (the gross value of DV01) for assets with maturities less than or equal to 5 years were 68 million, and the absolute value of the net DV01 for assets with the same maturity were 17 million, then the corresponding leverage would be equal to 4. This measure captures the effective relative sizes of the short and long positions vs. the net position and can be a useful estimate of the potential liquidation needs funds may face if they were to reduce their leverage. To illustrate this correspondence, consider funds with a long-short strategy that corresponds to the leverage value of 4, calculated above. To change the leverage, for example from 4 to 2, the funds could reduce the gross DV01 from 68 million to 34 million, perhaps by liquidating parts of their long and short positions.<sup>19</sup> If liquidations are proportional to the original holdings, half of the gross positions would need to be absorbed by other market participants. The two bottom panels of Figure 12 provide aggregate values for each type of fund reporting in AIFMD. The two panels suggest that hedge funds exhibit the highest leverage in credit-sensitive assets with maturities more than 15 years – a leverage ratio over 10. Whether this leverage may lead to small or large liquidation needs depends on the actual magnitude of the CS01 values, which turn out to be

<sup>17</sup> The indices used (constant maturity US Treasury rates and ICE BofA US corporate) are indicative of the changes that occurred during March 2020. Other indices exhibited similar changes.

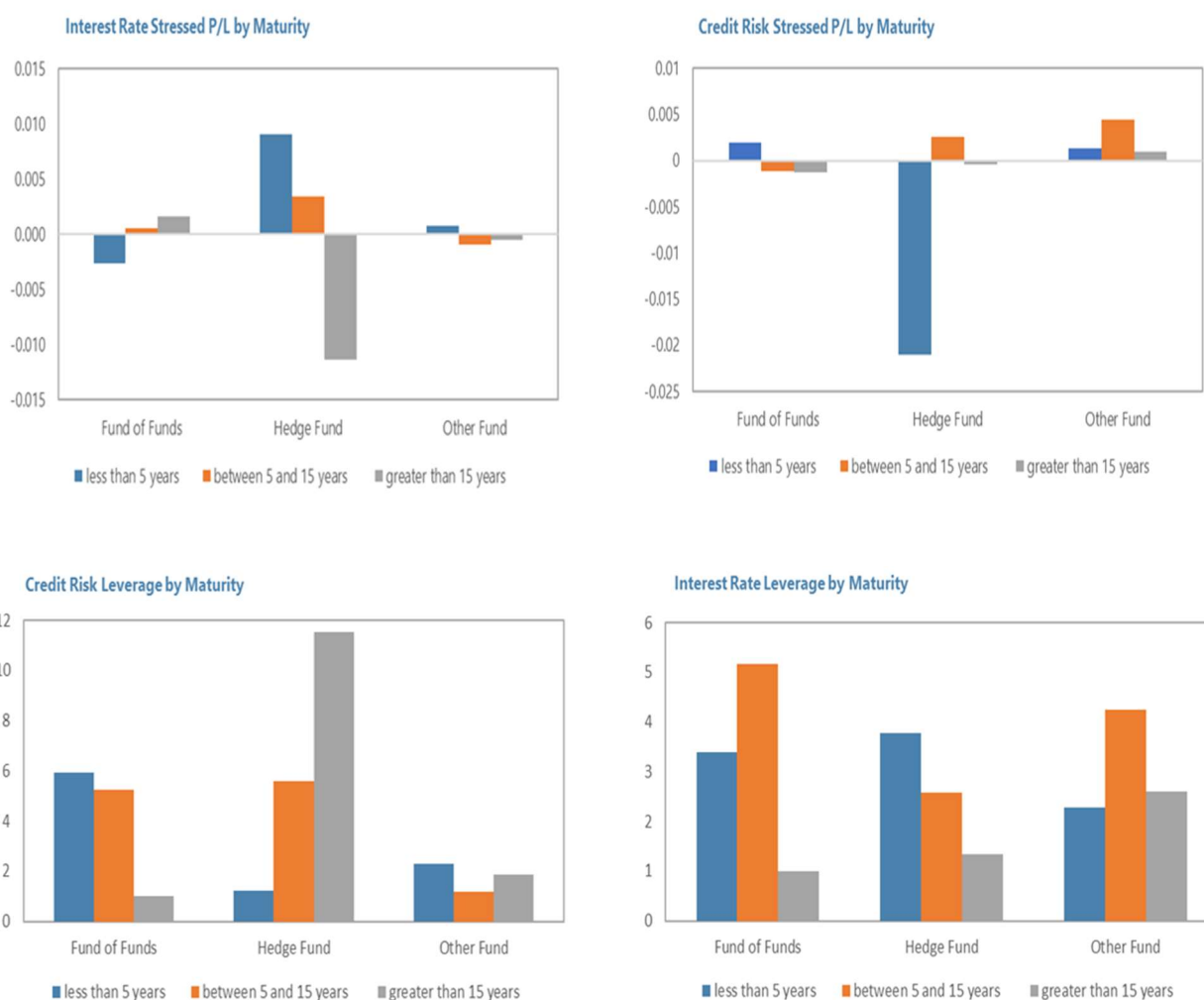
<sup>18</sup> Regulators have access to information at individual AIF level.

<sup>19</sup> This example illustrates a potential use of this particular leverage measure. But additional information would be required to capture other possible actions of funds as they try to reduce their exposures when they de-lever their portfolios.

small relative to the size of assets under management. Similar to the calculation of stressed profits and losses, the results are aggregate – leverage for individual funds may be much larger, or smaller.

**36. Stress Testing the AIFs is complicated for several reasons.** While the data in AIFMD give an indication of the potential liquidation needs that funds may face, it is difficult to combine the information to assess liquidity needs in a stress event. One problem is the low frequency and the delay in reporting. Another difficulty is that data on initial margin requirements are missing.<sup>20</sup> The biggest difficulty is that the data do not account for dependence between the different risks; for example, whether leverage declines when initial margin increases, and funding becomes more expensive. Given the complicated dependence between the risks, it may be preferable to directly estimate the potential liquidation needs, e.g., using historical information, or by considering specific stress scenarios, to determine the liquidity pressures that AIFs may place on markets and other participants.

**Figure 12. United Kingdom: Alternative Investment Funds Stressed P/L and Leverage**



Source: AIFMD report for Q4, 2020.

<sup>20</sup> Potentially this information could be found in EMIR data.

## D. Swing Pricing

### 37. **There may be benefits from stronger and more consistent liquidity management tools.**

The joint BOE/FCA study released in 2021 showed that fund managers used swing pricing frequently but inconsistently during the Covid crisis.<sup>21</sup> Funds typically set swing factors to protect investors from dilution. In March 2021, the FPC judged that the calculation and application of swing pricing could in principle be enhanced to better address the potential financial stability risks associated with first-mover advantage. Bank and FCA staff have proposed a possible framework for enhancing swing pricing. The FPC also recognized that a consistent and more realistic liquidity classification is an essential first step towards ensuring fund managers can manage liquidity mismatches. Bank and FCA staff have set out a possible framework for consistent and realistic liquidity classification of a fund's assets, but acknowledge that for this to be more effective, it would need to be applied on a global basis. In addition, the FCA has proposed that funds that invest in property should have notice periods before an investment can be redeemed, and has introduced a new fund structure, the long-term asset fund, which through its use of infrequent redemption periods and notice periods is designed to more closely align the redemption terms with the liquidity of the underlying assets. The FPC judged that it will be important to address these issues internationally given the global nature of asset management.

**38. It is difficult to consistently calculate swing factors during highly volatile events.** One challenge with consistently applying swing pricing is that, in order to avoid diluting remaining investors in favor of redeeming investors, funds need to estimate the market impact of the liquidation of part of their portfolio. This estimation is particularly difficult during times of stress, when prices are changing quickly, and market volume is elevated. One possibility would be to use ETF price data to calculate swing factors.<sup>22</sup> Another possibility would be to consider lengthening the redemption period based on the volume of redemptions and calculate the price that redeeming investors receive after liquidation, rather than in advance. When considering these possibilities, it is important to make sure that any swing pricing rules do not encourage investors to withdraw at the first sign of stress – for example by using thresholds associated with swing pricing factors that are linked to redemptions relative to the size of assets under management.

## E. Recommendations

### 39. **The authorities are strongly encouraged to:**

- In collaboration with the international regulatory community, consider the most effective and proportionate way to collect data and analyze the:

<sup>21</sup> "Assessing the resilience of market-based finance," a report by the Bank of England that includes the conclusions of the joint Bank of England and Financial Conduct Authority review, published on July 13, 2021, available at <https://bankofengland.co.uk/report/2021/assessing-the-resilience-of-market-based-finance>.

<sup>22</sup> See Box B in "Assessing the resilience of market-based finance," a report by the Bank of England that includes the conclusions of the joint Bank of England and Financial Conduct Authority review, published on July 13, 2021, available at <https://bankofengland.co.uk/report/2021/assessing-the-resilience-of-market-based-finance>.

- liquidation needs of the portfolios of asset managers under stress, based on potential redemptions, variation and initial margin, leverage, and financing of their positions,
- liquidity profile of holdings in asset managers' portfolios during times of stress.
- Incorporate observed fund actions during times of stress, such as deleveraging and cash hoarding, in system-wide financial stability simulations.
- For money market funds, decouple obligations for a manager to impose fees and gates from regulatory thresholds for minimum liquid assets, while continuing to require fund managers to take any necessary action in line with the best interests of all fund investors.

## CENTRAL COUNTERPARTIES

### A. Shock Transmitters

**40. U.K.-based CCPs are among the oldest and largest in the world.** LCH Ltd., Ice Clear Europe Ltd. and LME Clear Ltd. are central counterparties domiciled in London with clearing members in 23 jurisdictions. The aggregate size of the initial margin (IM) they collect is close to 33 percent of the total amount of IM collected by CCPs worldwide (Figure 3). Given their long history and size, U.K. regulators have significant experience supervising them and participate actively in international regulatory bodies.

**41. U.K.-based CCPs proved resilient through the March 2020 episode.** On the back of volatility spikes across asset classes, margins increased for clearing members and clients. According to CCPs' Public Quantitative Disclosures (PQDs), variation margins increased sharply during 2020 Q1: maximum VM doubled at LCH Ltd. relative to the average over the previous four quarters, while it more than tripled at ICE Clear Europe Ltd. Initial margins for house accounts at these two clearing houses rose by 15 percent and 42 percent respectively, while initial margins for client accounts rose by 34 percent at LCH Ltd. and more than doubled at ICE Clear Europe Ltd. (Figure 13). The larger increases for client accounts reflects the fact that clients often hold directional positions while clearing members typically hold balanced portfolios.

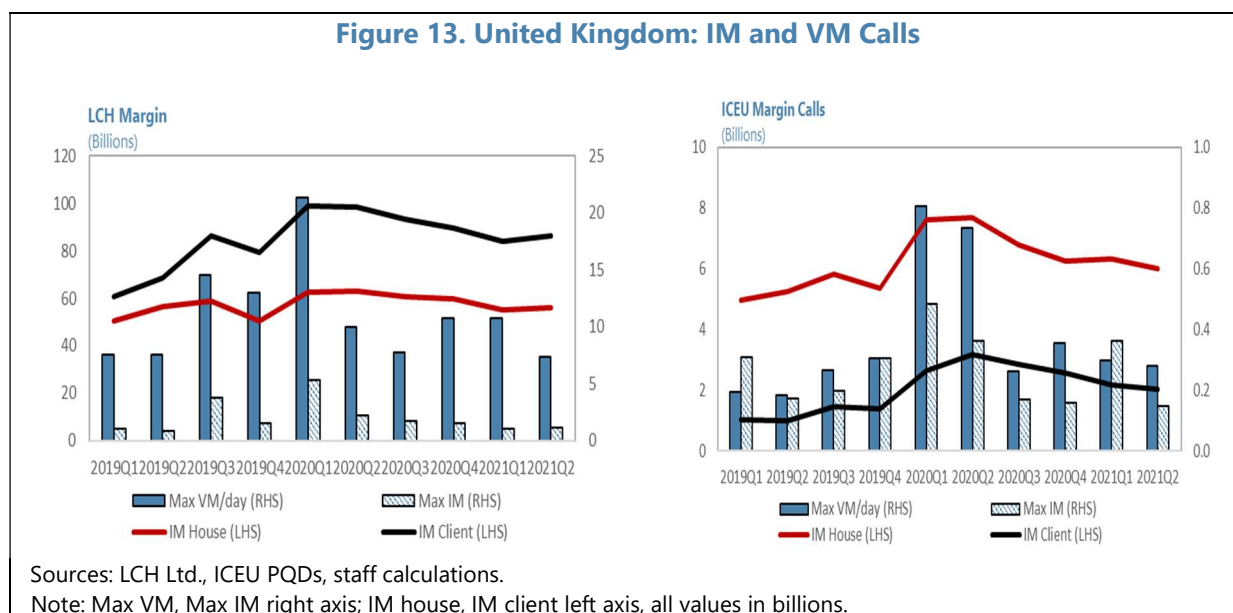
**42. Clearing members' preparedness for these increased margin calls was mixed, but they were able to meet margin calls when due.** One way to evaluate the resilience of CCPs is to monitor the frequency with which initial margin posted on an account is breached by the account's variation margin. While, according to the CCPs' PQDs, breaches increased during March 2020, supervisory data show that the increase was within the risk tolerances set in models used to calculate initial margins.<sup>23 24</sup>

<sup>23</sup> An ESRB working paper, "Empirical analysis of collateral at central counterparties" ERSB working paper No. 131, published December 30, 2021, by Magdalena Grothe, N. Aaron Pancost, and Stathis Tompaidis, available at <https://esrb.europa.eu/pub/series/working-papers/html/index.en.html> found that, while initial margins increased substantially during March 2020, margin breaches did not change significantly.

<sup>24</sup> PQD information on breaches of initial margin are sometimes difficult to reconcile across CCPs – it would be useful if PQD reporting of initial margin breaches were more uniform.

**43. The spike in variation and initial margin requirements exposed differences across clearing members, clients, and jurisdictions.** Demand for higher margins varied by product and affected U.K. CCP’s clearing members differently across jurisdictions. For example, while for clearing members in the United States, the IM towards U.K. CCPs increased by at most 16 percent relative to average IM, and variation margin (VM) tripled, clearing members in Switzerland saw an increase in IM towards U.K. CCPs by 44% and increase in VM by 5.5 times (Figure 14). Discussions with market participants and authorities also suggest a range of abilities and preparedness to deal with the higher margin calls.<sup>25</sup>

**44. Lack of information on potential liquidity needs could be at the heart of members’ and clients’ different ability to plan.** While some reported that they could handle calls with ease, others struggled somewhat to meet requirements. CCPs provide limited information regarding potential increased initial margins in advance of a stress, particularly towards clients. Increasing transparency on liquidity demands, in advance of a future crisis, would help balance the need for resilience of CCPs and the potential effects on clearing members, clients, and markets. One way to achieve transparency would be to evaluate potential liquidity demands in future supervisory stress tests and report the results.



<sup>25</sup> Figure 14 only captures changes in IM and VM. Clearing members may have faced additional requirements due to their contributions to various buffers meant to guarantee CCP resilience.

## B. Stress Testing Framework

**45. The BOE has proposed a new framework for CCP supervisory stress testing.** Following the exit of the United Kingdom from the EU, the BOE has developed a framework for supervisory CCP stress testing. Supervisory CCP stress testing is practiced in the biggest jurisdictions with the publication of the results from the tests providing a measure of CCP resilience under stress.<sup>26</sup>

**46. The proposed stress testing framework is robust.** The framework borrows the best elements of existing international frameworks, and improves international practice in some areas, for example, in the modeling approach to default scenarios. Table 4 presents the 8 areas in the supervisory stress testing framework and evaluates them against international practice.

**47. Nevertheless, some room for improvement remains.** One area of potential improvement is to look beyond CCP resilience and use the supervisory stress test to evaluate the impact of the actions of CCPs on clearing members, clients, and markets. Reporting aggregate liquidity demands of CCPs under the stress test would improve transparency and help market participants better prepare to meet these demands. In addition, results from the test can inform stress tests on clearing members and clients, and vice versa.

## C. Recommendations

**48. The authorities are encouraged to increase transparency of CCP stressed liquidity demands towards clearing members and clients:**

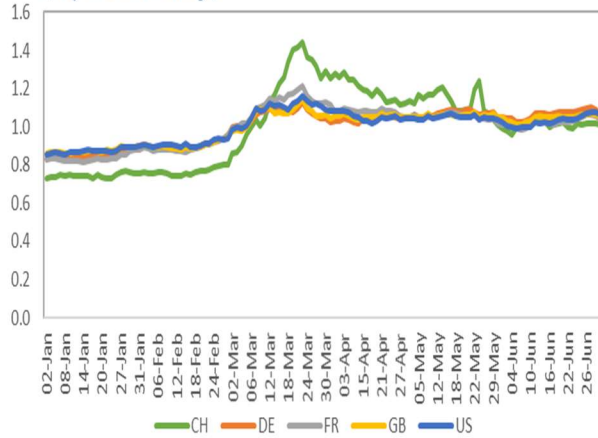
- Coordinate supervisory stress testing of CCPs with stress tests on CCP clearing members and clients so that the results of each test can inform the other tests.
- Report aggregate measures of CCP stressed liquidity demands on clearing members and clients as part of the output of the stress tests.
- Augment transparency of CCP stressed liquidity demands towards clearing members and clients.

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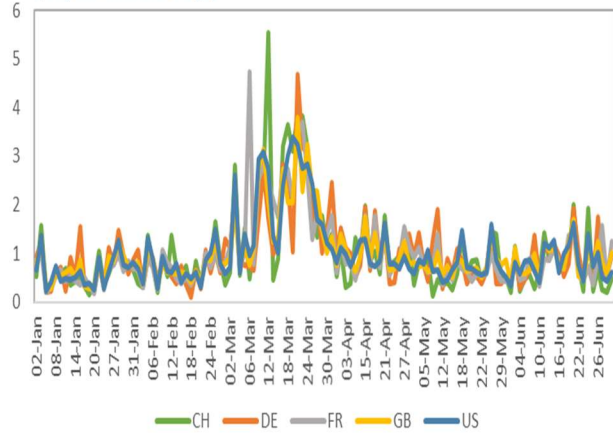
<sup>26</sup> See the “Framework for supervisory stress testing of central counterparties” by the Committee on Payments and Market Infrastructures (CPMI) and the Board of the International Organization of Securities Commissions (IOSCO), 2018, available at <http://bis.org/cpmi/publ/d176/pdf>, and the information on the supervisory stress tests performed by the Commodity Futures Trading Commission (CFTC) in 2016, 2017, and 2019, as well as by the European Securities Markets Authority (ESMA) in 2016, 2018, 2020, and the one launched in 2021 – information available at <https://www.cftc.gov> and <https://www.esma.europa.eu>.

**Figure 14. United Kingdom: IM and VM Calls by U.K. CCP Clearing Member Domicile**

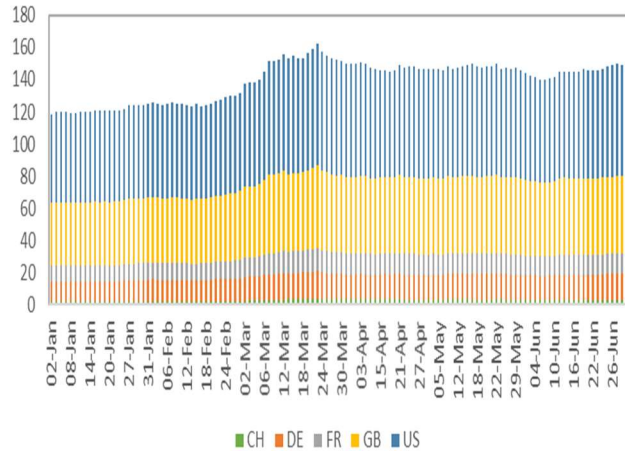
**CCP IM across Clearing Members (CDS & Interest Rates)**  
(Daily IM relative to average)



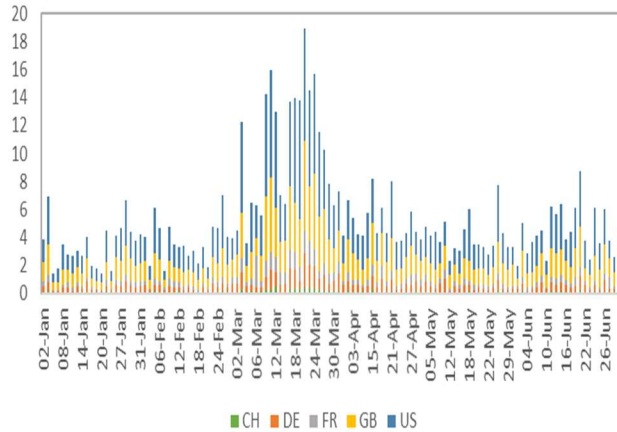
**CCP VM across Clearing Members (CDS & Interest Rates)**  
(Daily VM relative to average)



**CCP IM (£) across Clearing Members (CDS & Interest Rates)**  
(Billions)



**CCP VM (£) across Clearing Members (CDS & Interest Rates)**  
(Billions)



Sources: LCH Ltd., ICEU PQDs, staff calculations.

Note: Max VM, Max IM right axis; IM house, IM client left axis, all values in billions. Margin calls reported across U.K. CCPs clearing members, by clearing member jurisdiction.

**Table 4. United Kingdom: Evaluation of the BOE's Proposed Framework for CCP Stress-Testing**

<p><b>Risk coverage and participation</b></p> <ul style="list-style-type: none"> <li>covers both credit and liquidity risk to assess CCP resilience (including impact of concentrated positions); potentially also include operational risk associated with default</li> <li>evaluation of the clearing services of the three U.K. CCPs; potentially include non-U.K. CCPs in the future</li> </ul>	<p>The proposed risk coverage and participation are standard in supervisory CCP stress testing. Potential ways to improve the stress test would be to combine it with regulatory and other constraints on clearing members and clients. A goal would be to go beyond CCP resilience and evaluate resilience of the financial system.</p>
<p><b>Frequency</b></p> <ul style="list-style-type: none"> <li>annual frequency</li> <li>launched during Q4 and ending by end-Q2 of following year</li> </ul>	<p>The annual frequency enhances international practice. The regular schedule is an improvement – other jurisdictions have followed an irregular schedule.</p>
<p><b>Methodology</b></p> <ul style="list-style-type: none"> <li>credit stress testing is based on a combination of market shocks and member default scenarios, with additional concentration costs</li> <li>liquidity stress testing is performed on a similar basis to credit stress testing, with additional disruption to service providers and challenges to mobilize liquid resources.</li> <li>The BOE prescribed the key market stress shocks which CCPs will extrapolate to ensure full coverage of products cleared. CCPs will then calculate profit and loss at the account level.</li> <li>the Bank of England will apply various default scenarios on clearing members and providers of liquidity services, and porting assumptions.</li> <li>the Bank run validations and plausibility checks on CCPs' submissions, including the profit and loss values provided by the CCPs</li> </ul>	<p>This methodology is in line with international practice. It ensures consistency across scenarios and provides flexibility to incorporate default assumptions. It would be unrealistic for the Bank of England to develop separate tools to value portfolios at the account level due to the complexity of such a calculation, especially for severe market shocks. The BOE can sense-check the profit and loss numbers provided by CCPs with reference to risk exposures provided as part of the stress test as well as results of internal CCP stress testing.</p>
<p><b>Market shock scenarios</b></p> <ul style="list-style-type: none"> <li>considers several approaches for building market shocks: historical; CCPs' own scenarios; hypothetical; empirical</li> <li>balances number of scenarios with the cost of performing the test; one-to-three scenarios mentioned. In the actual test there are four scenarios that are linear functions of one another and are increasing in severity</li> <li>considers the possibility of standardized vs. distinct scenarios</li> <li>considers a range of risk factors relevant to CCPs' business</li> </ul>	<p>The methodology proposed for market shock scenarios encompasses the methodologies used in international practice. A potential way to improve would be to increase the number of scenarios – if possible, without increasing the burden on market participants. Including scenarios that are linear functions of each other and are increasing in severity is also international practice. However, it is difficult to determine whether the scenarios used are severe yet plausible.</p>
<p><b>Reference dates</b></p> <ul style="list-style-type: none"> <li>considers several possible criteria for reference dates and the potential benefits of using multiple reference dates</li> </ul>	<p>The methodology is consistent with international practice. The Bank's 2021–22 exercise uses a reference date of September 17, 2021.</p>
<p><b>Defaulter assumptions</b></p> <ul style="list-style-type: none"> <li>considers several approaches: <ul style="list-style-type: none"> <li>extensions of cover 2.</li> <li>system-wide approaches where common clearing members default across CCPs.</li> <li>characteristic based approaches; and statistical-based approaches</li> </ul> </li> </ul>	<p>The methodology is consistent and extends international practice. Using characteristic-based or statistical-based approaches can also serve to evaluate whether alternative default combinations can be useful in supplementing the Cover-2 standard.</p>
<p><b>Sensitivity and reverse stress testing</b></p> <ul style="list-style-type: none"> <li>sensitivity analysis considers a range of default assumptions across the credit and liquidity components</li> <li>reverse stress testing considers the impact of increasingly severe assumptions regarding market stress, concentration, and number of defaulters on CCP resilience</li> </ul>	<p>The methodology is consistent with international practice and is thorough. The analysis is meant to provide a view of CCP resilience under increasingly severe assumptions and does not provide an estimate of the plausibility of the assumptions.</p>
<p><b>Disclosure</b></p> <ul style="list-style-type: none"> <li>explanation of the approach used in the stress test</li> <li>presentation of the results. Potential metrics include: <ul style="list-style-type: none"> <li>drawdown of CCP resources</li> <li>source of losses and outflows</li> <li>diversification of stress losses and liquidity inflows</li> <li>scenario comparison</li> <li>qualitative measures</li> </ul> </li> <li>granularity of disclosures: transparency vs. sensitivity of granular disclosures</li> </ul>	<p>The suggested disclosures are consistent with international practice and focus on the resilience of CCPs. A potential improvement would be to also provide information regarding the stress that CCPs may impose on their clearing members and their clients through increased demand on clearing member/client resources – for example in terms of levels of variation and initial margin, and in terms of impact on the pre-funded and assessment portions of the CCPs' guarantee funds.</p>
<p><b>Sources:</b> "Supervisory Stress Testing of Central Counterparties," Bank of England, Discussion paper, June 21, 2021, available at <a href="https://www.bankofengland.co.uk/paper/2021/supervisory-stress-testing-of-central-counterparties">https://www.bankofengland.co.uk/paper/2021/supervisory-stress-testing-of-central-counterparties</a>, and "Bank of England launches first public CCP supervisory stress test," news release, October 19, 2021, available at <a href="https://www.bankofengland.co.uk/news/2021/october/BOE-launches-first-public-ccp-supervisory-stress-test">https://www.bankofengland.co.uk/news/2021/october/BOE-launches-first-public-ccp-supervisory-stress-test</a>.</p>	

## SYSTEMIC LIQUIDITY VULNERABILITIES BACKGROUND

### A. Key Developments in the BOE's Operational Framework Since the 2016 FSAP

**49. The BOE's operational framework is relatively broad-based and available to a wide range of market participants and financial market infrastructures.** As of February 2021, the BOE's Sterling Monetary Framework (SMF) was available to around 218 participants. Eligible participants include banks and building societies, broker-dealers, central counterparties, and international central securities depositories. Banks, building societies and broker dealers have access to the full range of SMF facilities whereas financial market infrastructures can access a narrower set of facilities (reserves accounts, operational standing facilities, the Discount Window Facility in some cases) reflecting their different business profile.<sup>27</sup> The key criteria governing access to the SMF reflects firms: level of importance to the U.K. financial system; their level of liquidity risk and whether firms are subject to appropriate regulatory scrutiny.

**50. Since the GFC period the BOE has operated a floor implementation system with ample reserves.** Successive rounds of Quantitative Easing since the GFC period have expanded the BOE balance sheet, leaving the banking system with significant excess reserves (905 billion GBP or around 45 percent of GDP). These reserve balances are absorbed in the deposit accounts of SMF participants and attract the BOE policy rate – Bank Rate – which effectively keeps overnight money market rates close to Bank Rate in normal circumstances. These significant excess reserves underpin the liquidity positions of SMF participants.

**51. The BOE offers liquidity through standing facilities, regular term repo operations, the discount window, Emergency Liquidity Assistance, and a Resolution Liquidity Funding framework.** The BOE's overnight standing facilities (an overnight deposit facility priced at Bank Rate, and a standing repo facility priced at 25 basis points above Bank Rate) are at the core of the SMF and provide liquidity certainty and anchor the overnight rate to Bank Rate. Regular weekly Indexed Long-Term Repo (ILTR) operations provide regular access to six-month repo funding against a broad collateral pool. Asset Purchase Facility (APF) operations are available to the Bank for long term liquidity provision and monetary accommodation. The Discount Window Facility (DWF) provides scalable backstop funding to SMF firms facing idiosyncratic liquidity difficulties secured on a broad range of collateral priced on a sliding scale over Bank Rate depending on the volume of funding required. FX lending operations are available to meet market-wide FX liquidity needs supported by the BOE's participation in FX swap-lines with other central banks. Emergency Liquidity Assistance (ELA) is available to solvent but illiquid firms whose needs cannot easily be satisfied by the SMF.

<sup>27</sup> Table A in <https://www.bankofengland.co.uk/sterling-monetary-framework/report-2019-21> concisely summarizes the types of facilities SMF firms can use. The 2016 FSAP technical note discusses the SMF in more detail and the rationale for its design – see <https://www.imf.org/external/pubs/ft/scr/2016/cr16159.pdf>

**52. The BOE’s operational framework has been stable since the last FSAP.** The period from the GFC to the 2016 FSAP was a period of significant change and reform for the SMF.<sup>28</sup> Since 2016, the SMF has matured and relatively few changes have been made reflecting the substantial futureproofing that occurred via the reforms taken between the GFC period and 2016.

**53. Key developments have been increased SMF participation and the development of the Resolution Liquidity framework.** The number of SMF participants has continued to grow (up from 175 participants in 2016 to around 219 in 2021). The growth since 2016 mainly reflects the entrance of new banks and building societies into the SMF (no new broker dealers have been admitted) although in June 2021 the BOE announced the eligibility of international central securities depositories reflecting their importance as custodians and in securities settlements. A more significant development (in line with a recommendation of the 2016 FSAP) was the establishment of the Resolution Liquidity Framework (RLF) in October 2017.<sup>29</sup> The RLF established a flexible, scalable framework which allows the BOE to provide temporary liquidity support to firms in resolution. The BOE’s balance sheet is protected by adequate collateral, a potential HMT indemnity (especially for large exposures) and with losses recovered from industry in line with Financial Stability Board (FSB) guidance.

**54. A 2018 review of the financial arrangements between the government and the BOE clarified the BOEs dividend and capital framework.** This review set out a mutual understanding between HMT and the BOE on the types of operation that would be backed by the BOE’s capital and the nature of the indemnities the BOE might seek in carrying out its policy functions as well as defining a framework for the level of the BOE’s capital and consequently its dividend policy.<sup>30</sup>

**55. The U.K. authorities have acted on the recommendations of the 2016 FSAP.** Appendix I discusses progress which has been in line with the 2016 FSAP recommendations.

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<sup>28</sup> The BOE commissioned a root to branch review of its operational framework in light of its experience of the GFC period. This culminated in the Winters and Plenderleith reviews – see <https://www.bankofengland.co.uk/-/media/BOE/files/news/2012/november/the-banks-framework-for-providing-liquidity-to-the-banking> and <https://www.bankofengland.co.uk/-/media/BOE/files/news/2012/november/the-provision-of-emergency-liquidity-assistance-in-2008-9>. The 2016 FSAP reviewed the BOE’s SMF including changes taken in response to the reviews. The BOE Independent Evaluation Office reviewed the SMF in 2018 – see <https://www.bankofengland.co.uk/-/media/BOE/files/independent-evaluation-office/2018/evaluation-of-the-bank-of-englands-approach-to-providing-sterling-liquidity.pdf> - and concluded that reforms have been effectively implemented and positive progress made across multiple dimensions.

<sup>29</sup> See <https://www.bankofengland.co.uk/-/media/BOE/files/news/2017/october/the-bank-of-england-approach-to-resolution> Box 2 for details on the RLF and as associated assessment in this FSAP.

<sup>30</sup> See <https://www.gov.uk/government/publications/financial-relationship-between-the-treasury-and-the-bank-of-england>

# THE IMPACT OF THE COVID CRISIS ON CORE LIQUIDITY MARKETS

## A. The Performance of Key Liquidity and Funding Markets in the United Kingdom During the Covid-19 Crisis

**56. Increased global financial market volatility quickly translated to liquidity stress in U.K. core markets in early March 2020.** Pressures built globally over early March 2020 and translated into rising bond and equity market volatility that flowed quickly through the United Kingdom's highly interconnected core markets. Central banks, including the BOE, responded with reduced policy rates (figure 15, top right panel) but liquidity pressures continued to build through the first half of March 2020.

**57. Sterling interbank market liquidity reduced, and U.K. money markets exhibited moderate stress.** U.K. short-term interest rates moved above Bank rate and intraday volatility increased (figure 15, top left panel). Pressures were most obvious in the sterling repo market where prices were more elevated and for longer than in the unsecured Sterling Overnight Index Average (SONIA) market. Nonetheless, the Sterling money markets performed relatively well compared to the U.S. markets where short term interest rate volatility was noticeably more volatile (Figure 15, top right panel).

**58. Sterling government bond, commercial paper and corporate bond markets were more severely affected.** Credit spreads widened significantly, traded volumes in credit markets dried up. The U.K. Gilts market became the epicenter of the "Dash for Cash" as a range of investors all rushed to liquidate Gilts. Bid-offer spreads widened significantly in line with similar trends in other major government bond markets (figure 15, middle right panel). Volatility spiked but traded volumes generally remained robust (figure 15, bottom right panel) and measures of Gilt market resiliency showed signs of liquidity strain (figure 15, middle right panel). These trends reflected a significant imbalance of supply and demand in Gilts that market makers could not effectively satisfy despite dealers accumulating significant inventories.<sup>31</sup> Pressures in the Gilts market appeared to have significant flow on effects to other markets as it seems many investors were not well prepared for Gilt market illiquidity at the same time as stress in other markets. Anecdotally, market participants noted that liquidity pressures noticeably intensified from mid-March 2020 as Gilts yields started to rise significantly.

**59. U.K. FX markets reflected significant USD liquidity pressures.** The Spot U.K. sterling – U.S. dollar exchange rate came under pressure reflecting the impact of the macroeconomic shock

<sup>31</sup> The BOE reported in Czech, Gual-Ricart, Lillis and Worlidge (2021) that turnover trends across the financial system was very large during the "Dash for cash" period. Weekly average traded volumes by the NBF sector were more than double their average weekly trading volumes in 2019 while Gilt Edged Market Makers accumulated a net GBP 10 billion of Gilts (0.9 percent of Gilts outstanding). See BOE Financial Stability Paper No. 47 <https://www.bankofengland.co.uk/financial-stability-paper/2021/the-role-of-non-bank-financial-intermediaries-in-the-dash-for-cash-in-sterling-markets>

and the market's general desire to accumulate US dollars. USD liquidity shortages were also reflected in the U.K. sterling – USD cross currency swap margin in line with those seen in other cross currency markets (figure 15, bottom right panel).

## B. The Main Channels of Liquidity Dysfunction in Sterling Markets

### 60. **Sharply rising global market volatility and increased precautionary liquidity demand in foreign jurisdictions were transmitted to the United Kingdom through its global trading hub.**

Financial market volatility spiked in all jurisdictions as investors and firm's precautionary liquidity demand increased in the face of the unprecedented large and broad global shock. The United Kingdom was not immune to these pressures given its global financial sector hub was an important conduit for international firms search for liquidity and attempts to deleverage.

**61. An important channel was the flow-through of increased market volatility to derivatives portfolios resulting in increased margin requirements.** Both banks and their NBFIs customers needed to find additional margin to support their significant derivatives positions. These increased margins reflected both the impact of asset price volatility on existing portfolios (variation margins) as well as higher margins for newly added positions (initial margins) as market participants traded more in response to the new risks emanating from the Covid-19 shock. Much of these new margins needed to be covered in cash (especially variation margins). Banks and core intermediaries were relatively well placed to meet these new cash needs given they hold significant sterling reserve balances with the BOE. But it was more challenging for the NBFIs sector, who were less prepared for this type of shock. While NBFIs generally had assets available to liquidate, they found it difficult to do so in as market conditions deteriorated. This was especially the case for Money Market Funds (MMF) and Open-Ended Funds invested in less liquid asset classes such as commercial paper and corporate bonds. But there were even problems in liquidating Gilt holdings—especially as the value of Gilts unexpectedly started to fall from mid-March 2020. Some NBFIs, facing an uncertain future volatility environment, tried to accumulate even more cash than they needed right away to prepare for potential future margin calls if volatility did not abate. Some types of NBFIs needed to maintain a relatively even portfolio composition as they raised cash. This meant that as the most liquid elements of their portfolios were sold (for example short term government securities) they needed to sell illiquid assets such as corporate bonds or very long-term Gilts. Hence selling pressures were very broad based. In aggregate, margin-related demand for liquidity was significant and has been estimated by the U.K. authorities at around GBP 15 billion over the “dash for cash” period.<sup>32</sup> Daily variation margin calls on the NBFIs sector reached as high as 5.6 times the January 2020 average.

**62. The “dash for cash” exposed underlying liquidity mismatches in some NBFIs active in the U.K. markets.** Money Market Funds, who offer daily liquidity to investors but who hold assets of uncertain liquidity in stress situations were particularly impacted. So also, were other Liability Driven Investors (LDI) such as insurance companies, pension funds and asset management firms that manage portfolios on behalf of LDI investors. The LDI community's needs for cash were particularly

<sup>32</sup> See <https://www.bankofengland.co.uk/financial-stability-paper/2021/the-role-of-non-bank-financial-intermediaries-in-the-dash-for-cash-in-sterling-markets> for some estimates.

prominent in the United Kingdom's experience of the Covid-19 and were an important element of the decline in liquidity of the commercial paper, sterling repo and Gilts markets. Estimates from the U.K. authorities indicate MMFs saw a total of GBP 25 billion in redemptions in mid-March 2020. These redemptions were financed by sales of Gilts, reduced Gilt repo market investments, and reduced commercial paper and certificates of deposit investments. NBFIs investors held significant liquidity in MMFs themselves, hence strong interconnections within the NBFIs sector were exposed. Redemptions from open-ended funds were also significant and resulted in selling pressure in Gilts and corporate bonds by asset managers.

**63. Official sector reserve managers and leveraged entities added to liquidity pressures but were not as prominent as in the US markets.** Official sector investors were sellers of Gilts but their footprint in the United Kingdom is relatively small compared to other markets such as the US where their actions were more important.<sup>33</sup> Similarly there is less evidence of large-scale liquidation of leveraged positions in the U.K. Gilts market compared to the U.S. market where pressures on investors futures basis positions were a notable feature of the U.S. Treasury market pressures seen in the Covid-19 shock.<sup>34</sup> Indeed, market participants indicated that some leveraged investors sought to enter the U.K. market to take advantage of investment opportunities presented by the pressures in the U.K. fixed income markets.

**64. Dealer balance sheet constraints came to the fore in the face of exceptional demands from customers.** As core intermediaries such as banks and broker-dealers came into the crisis with substantial liquidity and capital buffers there was sufficient cash available to meet customer demand without unduly depleting intermediaries cash buffers. The availability of balance sheet space at intermediaries was a much more significant issue. Loans to, or purchases of asset from customers requires capital at banks and broker dealers who have regulatory leverage and capital constraints. Dealer balance sheets only have a finite capacity to expand in the short run and the Covid-19 shock tested constraints and required intermediaries to ration liquidity to NBFIs. Market participants noted that larger regular customers of intermediaries were more able to have needs satisfied whereas more marginal customers were offered poorer terms to encourage them to seek liquidity elsewhere. Dealers did use their available capacity to significantly expand Gilt holdings as the stress unfolded.<sup>35</sup> These constraints were reflected in market prices. Cleared nettable derivatives prices (that attract much lower capital requirements) were significantly lower than their non-nettable counterparts of equivalent risk.

<sup>33</sup> The IMF COFER survey indicates that sterling reserves were around 4.5 percent of allocated reserve holdings in Q1 2020 compared to over 60 percent for US dollar reserves holdings – see <https://data.imf.org/regular.aspx?key=41175>

<sup>34</sup> Barth and Kahn (2021) discusses the role hedge funds played in the US Treasury market via the Treasury Cash-Futures basis trade – see <https://www.financialresearch.gov/working-papers/files/OFRwp-21-01-hedge-funds-and-the-treasury-cash-futures-disconnect.pdf>

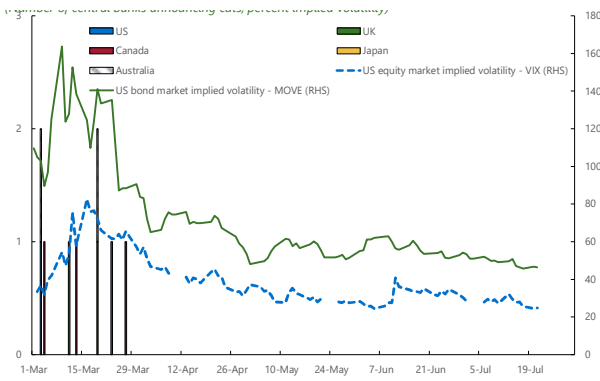
<sup>35</sup> The UK authorities estimate that dealers accumulated GBP 10 billion of Gilts over the Covid-19 shock period (0.9 percent of conventional Gilts outstanding).

**Figure 15. United Kingdom: Liquidity of U.K. Core Markets Around the COVID-19 Shock Period**

*Increased global volatility undermined UK market liquidity*

**Implied Bond and Equity Market Volatility vs. Central Bank Policy Rate Cuts, March-July 2020**

*(Number of central banks announcing cuts, percent implied volatility)*

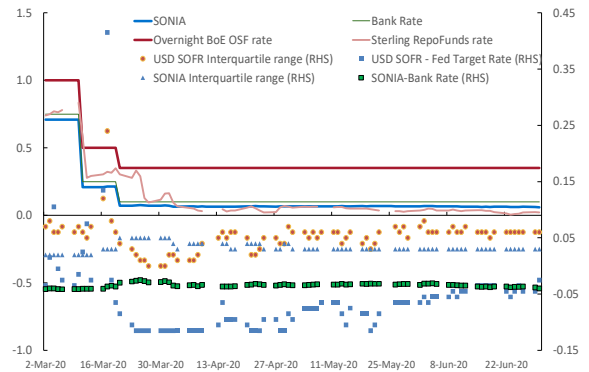


Sources: Central bank websites, Bloomberg, FRED database

*Sterling money markets showed only moderate stresses*

**UK vs. US Overnight Money Market Rates During COVID-19**

*(Percent, March-June 2020)*

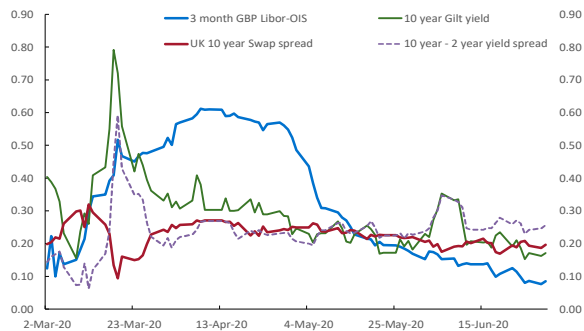


Sources: Bank of England, Bloomberg, IMF Staff calculations

*But pressures in the Gilts and corporate credit markets were more significant and persistent*

**U.K. Gilt and Credit Market Interest Rates During the COVID-19 Shock**

*(Percent, March-June 2020)*

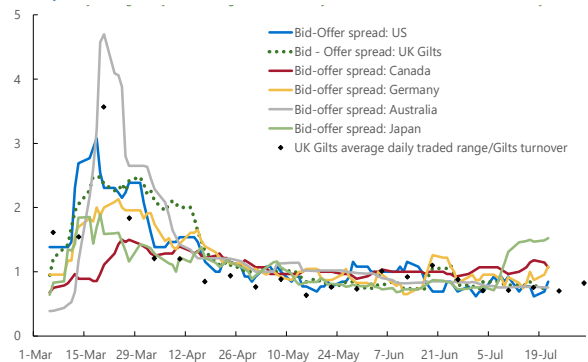


Sources: Bloomberg

*Gilts market liquidity deteriorated significantly in line with trends in other major bond markets*

**10-year Government Bond Bid-Offer Spreads vs. UK Gilt Market Resilience March-July 2020**

*(Percent, weekly average daily traded range relative to daily turnover, all normalized = 1 March-July 2020)*

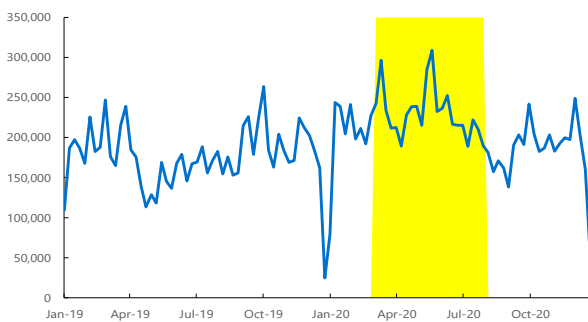


Sources: Central banks, Bloomberg

*And Gilts traded volumes held up through the stress period.*

**Daily Average UK Gilts Market Turnover 2019-2020**

*(GBP millions, daily average)*

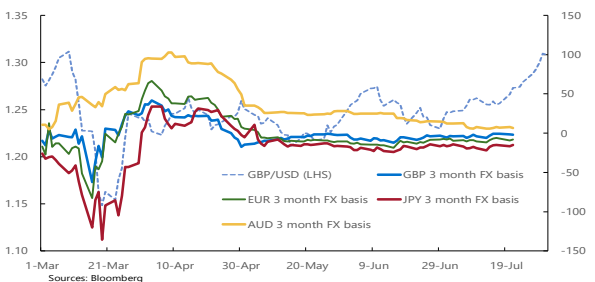


Sources: UK Debt Management Office

*USD liquidity demand was reflected in the UK spot and FX funding markets*

**3-Month Cross Currency FX Swap Premia and GBP/USD Spot Exchange Rate March-July 2020**

*(GBP/USD, Basis Points)*



Sources: Bloomberg

## THE BANK OF ENGLAND'S RESPONSE

### A. Support of Sterling Money Markets

**65. The BOE was able to quickly scale up existing tools and deploy new operations to support sterling money market liquidity.** Since 2014, the BOE has offered regular monthly indexed long-term repo (ILTR) operations of a six month with broad collateral eligibility, as part of its liquidity insurance framework. The ILTR moved to a weekly frequency from 2019, initially as a precaution against unexpected liquidity pressures from the United Kingdom's exit from the EU, but then on an ongoing basis to aid market participants balance sheet liquidity management. The weekly ILTR meant the BOE was well placed to quickly respond to the emerging liquidity pressures in late February and March 2020. ILTR volumes increased significantly (figure 16, top left panel), backstopping the U.K. short term money markets. The ILTR was supplemented with Contingent Term Repo Facility (CTRF) operations from 24 March 2020 as pressures mounted—reflected in sharply rising demand for the ILTR. CTRF repos were shorter term (3 months) at a fixed price (15 basis points over Bank Rate), providing liquidity certainty to SMF participants. The demand for repos of the highest quality "Level A" collateral (primarily Gilts but also other sovereign and central bank debt securities) was elevated during the Covid-19 shock period reflecting increased demand for cash from a range of NBFIs in repo markets where Level A collateral is most traded.<sup>36</sup> The BOE's operational standing facility (OSF) was available to provide overnight liquidity on demand against Level A collateral but was not significantly used.

**66. The BOE and HMT jointly introduced new facilities to support non-financial firms.** Precautionary liquidity demand increased sharply relatively early in March 2020 as concerns on the Covid-19 situation built. Firms reacted by drawing down liquidity from their banks with flow on impacts on SMF participants' liquidity. The U.K. authorities moved quickly to backstop U.K. firms through establishment of the joint HMT/BOE Covid Corporate Financing Facility (CCFF) which purchased corporate paper from U.K. firms and through the Term Funding Scheme with SME incentives (TFSME) which provided longer-term four, and then six-year funding to SMF participants who were incentivized to continue lending to U.K. firms to encourage transmission of the cut in Bank Rate from 0.75 to 0.25 percent to firms. Demand for these facilities was significant for the period they were open (March 2021 for the CCFF, October 2021 for the TFSME (Figure 16 – top right panel). While these facilities were primarily aimed at end-users of sterling money markets, they indirectly supported the functioning of markets by backstopping primary corporate paper issuance and providing liquidity certainty to SMF participants lending to U.K. customers.

<sup>36</sup> Section 5.2 of the Bank of England's "Report on the Bank's official market operations 2019-21" discusses these trends <https://www.bankofengland.co.uk/sterling-monetary-framework/report-2019-21>

**67. The BOE’s response effectively backstopped the liquidity needs of key intermediaries with direct access to the Bank’s facilities.** For core intermediaries—Banks, Credit Unions, and other Gilt Edged Market Makers (GEMMs)—cash and funding needs were well met by the BOE’s Sterling Monetary Framework facilities. Open Market Operations (OMOs) were well supported and there was no usage of the BOE’s standing repo facility or Discount Window facility. While the BOE continued to make available a back-up liquidity line to HMT in the form of the longstanding Ways and Means Facility, this facility was not drawn upon at all as HMT was able to secure financing in the market on adequate terms. The BOE’s SMF performed well against its objective of backstopping the needs of SMF participants compared to the experience of the GFC period where significant liquidity stresses among banks and designated investment firms was seen. Short term interbank market rates remained well anchored. SONIA remained particularly well anchored and even repo rates, where funding pressures were acute at times, remained within the BOE’s interest rate corridor (figure 15, top right panel). Pressures in the less liquid commercial paper and sterling Libor segments took longer to subside—to some extent reflecting their lack of robustness even in non-stressed periods (figure 16, top left panel).

## B. Support of Gilts and Corporate Bond Markets

**68. Pressures in the Gilts market were acute and aggressively counteracted with BOE asset purchases.** A defining feature of the “Dash for Cash” was the need for a range of investors to liquidate Gilts beyond the capacity of dealers to absorb the flows. The BOE quickly and effectively responded to these pressures by deploying asset purchases, mainly for the objective of providing monetary accommodation in the face of the Covid-19 shock, but in a manner, which counteracted emerging bond market dysfunction. The Monetary Policy Committee (MPC) announced an additional GBP 200 billion of Gilts and corporate bond purchases, increasing the target stock of the BOE’s bond holdings to GBP 645 billion.<sup>37</sup> Importantly, the BOE front loaded these bond purchases to help relieve Gilts and corporate bond market liquidity pressures (figure 16 – middle right panel). The weekly pace of QE asset purchases peaked at around GBP 15 billion in nominal terms— over twice the rate seen during the GFC period. The frequency of asset purchase operations jumped markedly through the March-September 2020 period.<sup>38</sup>

**69. Gilts market liquidity pressures subsided relatively swiftly.** Indicators of Gilt market illiquidity, which had deteriorated in line with that seen in most other major markets through March 2020, improved relatively quickly through April and May 2020 and had normalized by mid-2020. To a significant extent, improved liquidity in the U.K. markets reflected improved liquidity globally and the interventions of foreign central banks. Nevertheless, the BOE’s interventions played an important and effective role. The BOE was able to scale back the size and frequency of Gilts purchases in the September quarter of 2020 without any consequent deterioration in market functioning.

<sup>37</sup> Subsequent rounds of additional QE asset purchases were announced by the MPC later in 2020 that have subsequently expanded the target stock of securities holdings to GBP 895 billion.

<sup>38</sup> See Chart 4 in the “Report on the Bank’s official market operations 2019-21 <https://www.bankofengland.co.uk/sterling-monetary-framework/report-2019-21>

## C. FX Swap Lines and Support of FX Funding Markets

**70. The BOE played an important role in coordinated central bank actions to support FX funding markets.** The BOE, in concert with the US Federal Reserve and other major central banks scaled up and enhanced FX swap line operations which provided ample USD funding helping calm pressures (figure 16 – bottom right panel). Demand for USD was significant but not protracted – U.K. demand for FX was noticeably lower than other jurisdictions such as Japan and Europe. Nevertheless, market participants noted the importance of these operations in calming market pressures and reducing the stress on USD funding markets which in turn relieved pressures elsewhere.

**71. Cross currency swap premia ultimately fell below the cost of access allowing a smooth exit from USD liquidity provision.** U.K. FX funding markets exhibited pressures in line with most other major markets, but these eased by mid-2020 such that it was no longer economical for markets to access FX funding from the BOE compared to the market.<sup>39</sup> This allowed the BOE, in coordination with other central banks to scale back the frequency and maturity of FX funding operations from July 2020.

## D. Regulatory Support Aimed at Increasing the Bank's Leverage on Market Liquidity

**72. Capital and leverage regulations in the United Kingdom already provided firms greater flexibility than in some other jurisdictions coming into the Covid-19 shock.** In 2016, the U.K. leverage ratio rules were adjusted to exclude from the calculation deposits with central banks where those reserves holdings were matched with liabilities in the same currency and of a maturity identical or longer than the maturities of central bank deposits.<sup>40</sup> Hence the United Kingdom did not need to make the adjustments made in other jurisdictions in March 2020 to provide greater flexibility. Further, the U.K. framework included material capital buffers that can be built up in normal conditions and then released in time of the stress such as the countercyclical capital buffer and an additional buffer for systemically important banks.<sup>41</sup> The U.K. authorities encouraged firms through several channels to deploy these buffers in the Covid-19 period.

**73. Capital and leverage ratio relief was offered to increase bank balance sheet capacity.** Firms were permitted to exclude loans extended under the Government's Bounce Back Loan Scheme (BBLs) from the total exposure measure of the United Kingdom's Leverage Ratio requirement to encourage banks to make such loans.<sup>42</sup> Firms were also offered a "rule modification by consent" to bring forward changes to reporting of pending settlements which helped mitigate any effects the

<sup>39</sup> See chart 10 "USD funding conditions" in <https://www.bankofengland.co.uk/sterling-monetary-framework/report-2019-21>

<sup>40</sup> See <https://www.bankofengland.co.uk/statement/fpc/2016/financial-policy-committee-statement-july-2016>

<sup>41</sup> Pages 35-43 of <https://www.bankofengland.co.uk/-/media/BOE/files/financial-stability-report/2019/december-2019.pdf>. provide an overview of the UK Bank capital framework.

<sup>42</sup> See page 3 of <https://www.bankofengland.co.uk/-/media/BOE/files/financial-policy-summary-and-record/2020/may-2020.pdf>. The BIS estimated this adjustment had just a small impact on U.K. bank leverage ratios – see page 59 of "Early lessons from the Covid-19 pandemic on the Basel reforms." BIS. July 2021, for details).

reporting treatment might have had on discouraging market making activity. These changes were in line with the FPCs longstanding view on the appropriate treatment of unsettled sales against cash payables relating to unsettled purchases. No other capital or leverage ratio relief was offered to firms to encourage firms to lend in markets (for example the U.K. authorities did not allow firms to exclude the U.K. government securities holdings from the calculation of the leverage ratio as occurred in the U.S. for holdings of U.S. treasuries).<sup>43</sup>

## CHALLENGES IN SUPPORTING THE LIQUIDITY NEEDS OF INTERMEDIARIES AND THEIR CUSTOMERS

### A. The Transmission of Central Bank Liquidity Support to Wider Market Liquidity

**74. Central bank liquidity support impacts factors that drive intermediaries' willingness and capacity to provide liquidity to customers.** Central bank liquidity support flows through intermediaries whose efficiency in passing liquidity on depends on their willingness and capacity to provide liquidity. Many of the factors driving dealers' willingness/capacity are common so there is a significant overlap in these important attenuators of the efficacy of a central bank's operational framework. Figure 17 provides a stylized view of some key drivers of intermediaries' liquidity transmission efficiency.

**75. The willingness to provide liquidity primarily reflects firms risk/return tradeoffs.** Firms are especially focused on preserving their own solvency and liquidity and are sensitive to engaging in activities (such as lending to customers or accessing central bank facilities) if there are risks that markets might perceive them as weak and reduce their access to funding or increase the cost of funding. Beyond the goal of self-preservation, the focus is on improving risk adjusted returns. Stress situations generally mean heightened risks and volatility which constrains willingness to take risks. Firms need to take a long-term view when dealing with customers. Large regular customers (for example asset managers, other NBFIs) generate a regular income stream which could be compromised if a firm suddenly ceases to provide services in a stress situation. Hence the observation seen in the Covid-19 shock period where better customers continued to be well catered for by their counterparties whereas more marginal customers struggled.

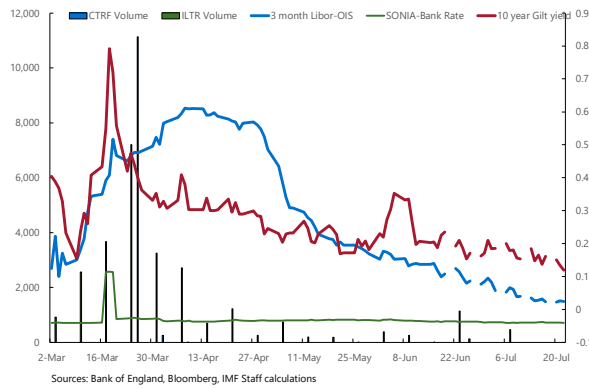
<sup>43</sup> See <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm> for the temporary changes to the US supplementary leverage ratio on 1 April 2020.

**Figure 16. United Kingdom: Bank of England Operational Response to the Covid-19 Shock**

The BOE quickly employed repo operations to combat market liquidity strains...

**Bank of England Money Market Operations vs. money market and Gilt rates March-July 2020**

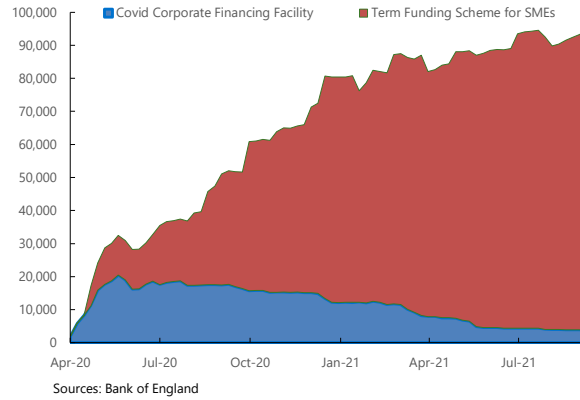
(Operation volumes, GBP millions, percents)



.. and backstopped the liquidity needs of U.K. non-financial firms via the Corporate Covid and Term Funding Schemes

**Volumes outstanding in the CCFF and TFSME Facilities, 2020-21**

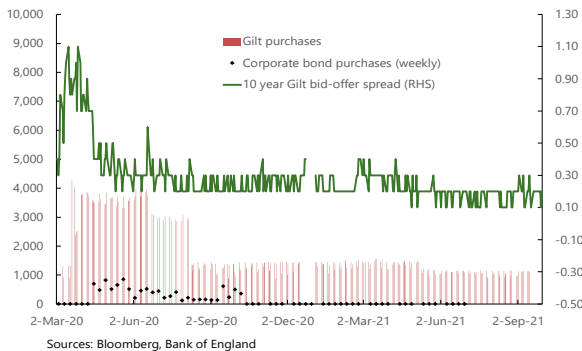
(Sterling millions)



Gilts and corporate bond purchases were important in providing accommodation and easing market dysfunction

**Bank of England Asset Purchases versus Gilt bid-offer spreads**

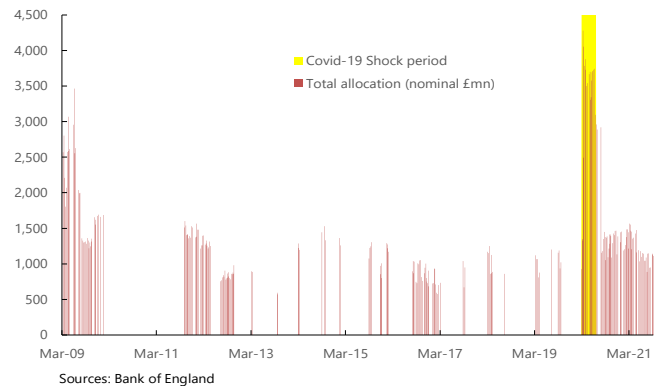
(Daily or weekly purchases in Sterling millions, basis points)



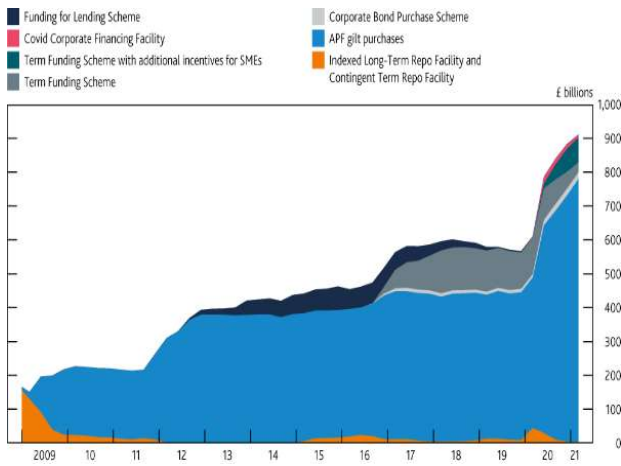
QE asset purchases were front-loaded to combat Gilt market dysfunction

**Daily Volume of Bank of England Gilt Purchases, 2009-2021**

(Normal value, sterling millions)



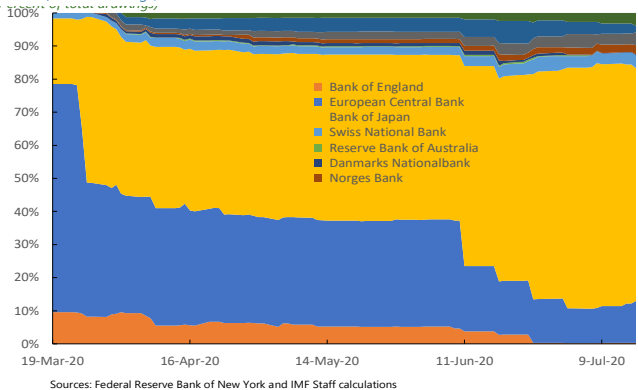
The BOE balance sheet has expanded mainly reflecting accumulation of Gilts



The BOE provided FX via expanded and enhanced FX swaps lines in concert with other central banks

**Proportion of total FX swap line drawdowns against the US Federal Reserve – March-July 2020**

(Percent of total drawings)



**76. The capacity to provide liquidity reflects regulatory constraints and funding and credit risk management considerations.** Firms can only provide funding if their own funding is secure. Hence market liquidity is important in allowing firms capacity to support customers as is the availability of central bank liquidity backstops. Firms can only lend to or trade with customers if the credit risks are adequately managed. Collateral availability of clients, and the capacity to trade using cleared instruments greatly reduces risks of client trading and increases firms' capacity to provide liquidity. Capital, liquidity, and leverage constraints are important determinants of firms' capacity to provide liquidity. Most of these are regulatory constraints laid down by the United Kingdom and/or foreign regulators. Firms can't breach these requirements out of concern of supervisory action but, at least as importantly, because of what being seen to be in breach of regulatory requirements might mean for their position in the market and their ability to raise funding (as well as the value of the firms' equity). Hence, there is a strong overlap in firms' willingness and capacity to provide liquidity. Regulators generally impose high level regulatory constraints that don't specifically apply at the business line level of firms. The firm's risk management framework translates aggregate regulatory requirements into specific business-line limits – generally in the form of balance sheet limits. The flexibility and buffers built into firms' risk management frameworks are important drivers of the capacity of firms to provide liquidity when customer demand unexpectedly rises. If capital can't quickly flow to a business unit experiencing a spike in customer demand, then rationing occurs. The probability of constraints becoming binding can be reduced if firms can clear and net customer trades as more volume can be dealt within a given leverage/capital envelope.

## B. Supporting Liquidity Among Core Intermediaries

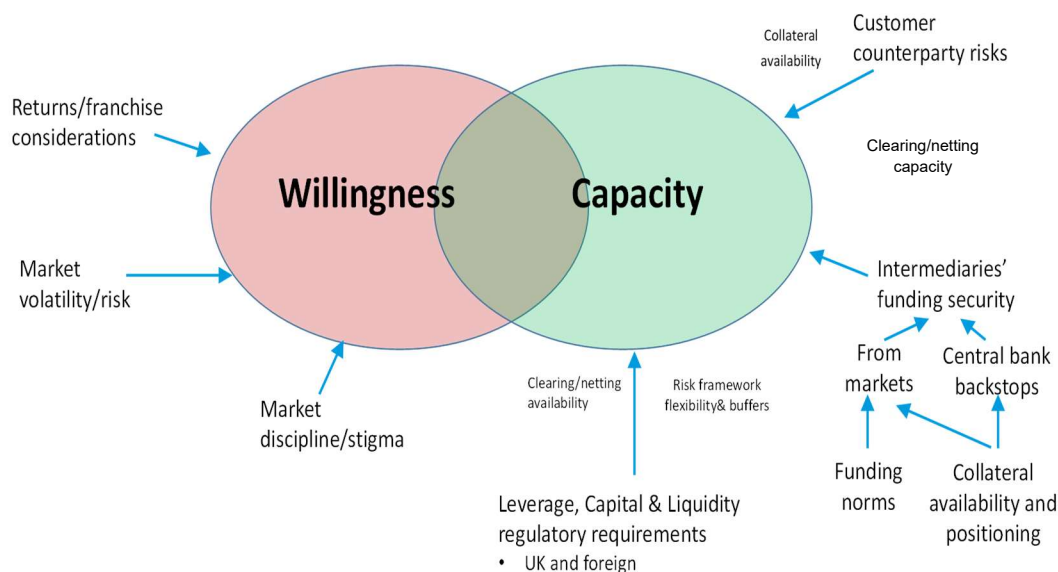
**77. The experience of the Covid-19 shock shows that the BOE's SMF caters well to the needs of banks and core intermediaries.** Covid-19 was an unprecedented global shock that, while not financial-sector centric as in the GFC, still severely disturbed balance sheets of a broad range of financial and non-financial firms. Such large shocks will naturally test central bank operational frameworks and require some level of discretionary intervention. The SMF held up well to the "dash for cash" episode and the design of the SMF itself wasn't a constraint on banks and large investment firms. U.K. money markets were well backstopped by the regular scalable repo operations the BOE routinely provides and there seems little evidence of stigma around the Banks operations as the key ILTR and CTRF operations were well supported by a full range of core intermediaries.

**A key challenge for the BOE is how to improve the leverage of its facilities on the wider markets.** The BOE (and central banks generally) need to find ways to relax the constraints banks and core intermediaries face when channeling funding from the BOE to the wider market in periods of stress. As summarized in figure 17, these constraints reflect factors that drive the willingness of intermediaries to take risk and extend funding in times of stress as well as factors around their capacity to provide financing to customers. The BOE has contributed to developing thinking and policy responses in the area through its participation in FSB and BIS working groups.<sup>44</sup>

<sup>44</sup> The BOE has contributed to the FSB's work program as discussed in the FSB work program for 2021 – see <https://www.fsb.org/wp-content/uploads/P200121.pdf>

**Figure 17. United Kingdom: Factors Impacting the Willingness and Capacity of Intermediaries to Provide Liquidity**

*Factors driving Intermediaries Willingness and Capacity to provide liquidity heavily overlap*



Source: IMF Staff.

**78. The U.K. authorities have only limited leverage on intermediaries' willingness to provide funding.** Individual firms set their own risk tolerance and times of stress will naturally see conservatism figure into bank trading and risk management decisions. The best contribution the authorities can make is to backstop the system as effectively as possible and take prompt action to bring down market volatility and hence bolster firms' willingness to provide financing. This was effectively done in the "dash for cash" period.

**79. There could be fruitful options for the authorities to explore to reduce dealer balance sheet bottlenecks.** Intermediaries' capacity to lend is attenuated by regulatory leverage constraints imposed by domestic and foreign regulators and the way that individual firms internalize these constraints in their risk management frameworks. Supervisors could consider examine the flexibility of the capital allocation frameworks of core intermediaries to try and ensure that usable buffers are available for use in the business units where intermediaries provide funding in markets and make markets in securities. This could help improve the liquidity of core markets which would in turn improve the liquidity profile of regulated firms themselves.

**80. The use of cleared repo transactions in the BOE's repo facilities could ease constraints.** The BOE should consider the optional use of clearing in its repo operations (the OSF, ILTR and CTRF), thus allowing firms to net repo transactions with the BOE against repo lending in the market.

The sterling cleared gilt repo market proved to be more robust in the “dash for cash” episode.<sup>45</sup> To some extent, this resilience reflects the balance sheet benefits of cleared repos given the increased ability for netting. If the BOE offered the option of cleared repo then this could allow core intermediaries greater ability to reduce the balance sheet impact of passing repo funding received from the Bank on to other market participants. There are operational challenges for the BOE to overcome which would require a careful cost-benefit analysis.<sup>46</sup> Some lessons may be available from the U.K. DMO’s use repo clearing in its cash management operations. Other central banks (for example the Federal Reserve) face similar challenges and are looking into using clearing or already use cleared repo transactions (for example the Brazilian Central Bank’s SELIC system). Currently, cleared sterling repo is not a dominant part of the market (20-30 percent of U.K. counterparties repo transactions in all currencies are cleared) and is mainly used for short term interbank transactions. BOE cleared repos could at least backstop these short-term interbank markets and could encourage/facilitate wider use of repo clearing longer term gilt repos most used in the customer market in the United Kingdom.<sup>47</sup>

**81. Regular repo operations help provide liquidity certainty, even in an ample reserve’s framework, and are useful in managing unexpected stresses.** A strength of the BOE’s operational framework is its regular term repo ILTR operations. The ILTR proved to be a useful pressure valve for markets in March 2020 as liquidity pressures built and provided the BOE a useful steer on the magnitude of emerging stresses and should continue as they help provide liquidity certainty to SMF participants that supports their capacity to provide repo funding to the wider market.<sup>48</sup> The 6-month ILTR operations could be supplemented with regular shorter term repo operations (for example repos of less than a month to maturity) to further support intermediaries’ capacity to channel relatively short-term repo funding to the wider market thus aiding interbank money market functioning. Such short-term repo operations can easily be scaled up and down in response to sudden changes in precautionary liquidity demand. Such operations could be especially important as the BOE exits from asset purchases as the market adjusts to the reduced liquidity being provided in Gilts markets by the BOE. It will be important to clearly communicate how the BOE’s operational framework will be implemented through the Quantitative Tightening process as the withdrawal of liquidity support has the potential to disturb market expectations and conditions.

**82. The BOE’s market intelligence toolkit could usefully be supplemented with more frequent data on Gilts and sterling corporate bond trading.** The BOE has access to an impressive

<sup>45</sup> See for example Huser, Lepore and Veraart (2021) which depicts the growth of the cleared repo market during Covid-19 period <https://www.bankofengland.co.uk/-/media/BOE/files/working-paper/2021/how-do-secured-funding-markets-behave-under-stress-evidence-from%20the-gilt-repo-market.pdf>

<sup>46</sup> The BOE may need to either become a clearing member of LCH RepoClear with associated costs and risk implications from contributing to the default fund. Governance and conflict of interest issues would need to be managed given the BOE is supervisor of UK CCPs. Clearing through an existing member through sponsored repo arrangements also present risk and governance issues.

<sup>47</sup> Longer term Gilt repos are not cleared in the UK as clearing requires a portfolio of offsetting Gilt repo transactions of similar maturities in LCH RepoClear.

<sup>48</sup> The Federal Reserve’s regular short term repo operations in March 2020 had a similar useful impact in calming markets in the U.S.

database on money market trading which is invaluable in supplementing the qualitative information gained from its market intelligence discussions with market participants. Comparable, information on sterling bond trading is less comprehensive on a high frequency basis. The FCA has an extensive database on bond market trading that it uses for market conduct oversight. This data is made available to the BOE periodically – typically for analytical purposes- but it is difficult to leverage these data for market intelligence as it takes considerable time and resources to transform the information into a useful form. It would be useful for the BOE and FCA to work together and invest resources to make these data available in a useful form on a frequent (daily) basis. Such information would better inform decision making in stress situations.

### C. Supporting Liquidity Needs of the Non-Bank Sector

**83. The “dash for cash” episode showed that the transmission of liquidity to the wider NBFi sector was inefficient and exacerbated liquidity stress.** Notwithstanding the strong position of core intermediaries, intermediaries’ NBFi customers were less well backstopped. The rationing of liquidity to the NBFi sector meant that liquidity provided to intermediaries was not efficiently channeled to the wider market. The BOE’s interventions – especially large front loaded asset purchases – eventually flowed through to NBFis. But the inefficiency of the process meant that it’s possible that the BOE needed to make larger and more protracted interventions than what might have been possible if intermediaries had been better able to provide liquidity more efficiently.

**84. Questions remain over the adequacy of the BOE’s toolkit given the role of NBFis.** As the bulk of the U.K.’s large NBFi sector can’t directly access BOE liquidity, liquidity problems at large interconnected NBFis will manifest in market stress as they must try and sell assets in markets or find lenders with available balance sheet capacity.<sup>49</sup> If intermediation is impaired, the BOE only has the option of asset purchases to forestall market stress. While asset purchases are very effective, they are a blunt, indiscriminate tool that provide liquidity to the entire market and result in significant long-term expansion of the BOE’s balance sheet – despite liquidity stress usually being transitory and sometimes specific to individual market segments.

**85. BOE liquidity support should complement and not replace stronger regulation of NBFi liquidity management with the objective of ensuring better functioning of core markets.** Well-functioning core markets for funding and hedging are a key pillar for the maintenance of financial stability as market-based finance is important in the U.K.s globally systemically important financial sector. NBFi’s are important participants in those markets and the Covid-19 shock illustrates how liquidity pressures among NBFis can spillover to markets and the wider financial system. The objective of providing liquidity support to NBFis should be to backstop market functioning as opposed to NBFi investors. BOE liquidity support to NBFis should complement regulatory oversight of NBFis to try and reduce the emergence of liquidity stress that might require BOE support. Core market liquidity is best preserved when backstops are focused on the largest benchmark

<sup>49</sup> The 2016 UK FSAP Technical note <https://www.imf.org/external/pubs/ft/scr/2016/cr16159.pdf> para 26 noted that asset managers didn’t have access to the BOE SMF and that this could create problems in a stress situation should core intermediaries find themselves balance sheet constrained. The only NBFis with direct access to BOE liquidity are CCPs via the Discount Window Facility.

interconnected markets (Gilts and gilt repo markets in the U.K. context) and operates via the participants who are most critical in the functioning of those core markets. This implies that not all NBFIs should be eligible for BOE backstops and that only the largest and most interconnected entities with a significant presence in the core sterling markets be considered for access. As the NBF sector is diverse, the framework governing liquidity backstops will need to be flexible.

**86. The first-best policy option for mitigating the impact of NBF stress on markets is to beef up regulation and supervision.** Regulators should take steps to reduce liquidity mismatches and improve the preparedness of NBFs liquidity risk management frameworks. NBFs are generally not subject to as prescriptive liquidity risk management regulations as banks, despite having considerable liquidity risk mismatches. A more prescriptive approach is warranted to reduce risks that future liquidity distress in NBFs, unduly pressures wider market liquidity.<sup>50</sup> The significant task of improving NBF supervision and regulation is an important element of the global policy agenda and is not solely a responsibility of the U.K. authorities. Many of the NBFs that operate in the sterling markets are domiciled and regulated elsewhere (particularly in the MMF sector which is dominated by Irish and Luxembourg funds). The IMF has called for improved regulation of investment funds, and this is an important part of the FSB's work program.<sup>51</sup> The U.K. authorities are playing a key role in advancing the global policy agenda and can continue to assist through their participation in global standard setting bodies and through showing leadership in developing the regulatory framework that applies to the U.K. NBFs they regulate.<sup>52</sup>

**87. Incorporating NBFs into the BOE's operational framework would broaden the BOE's options to manage future liquidity stress.** Even if bolstered regulations can reduce NBF liquidity risks, NBFs will continue to play a key role in the U.K. markets and could still come under pressure in future stress with spillovers to dysfunction in core sterling markets. Allowing appropriately regulated and systemically interconnected domestic NBFs such as insurance companies, asset managers and pension funds access to at least some of the BOE's facilities would widen the range of options available to counteract future stresses.

**88. The objective of providing direct liquidity support to some NBFs is to supporting markets and not idiosyncratic problems.** It is important to be clear on the objectives of providing liquidity support to NBFs. The concern is not on backstopping idiosyncratic NBF liquidity problems - other regulatory and resolution tools are more appropriate to deal with firm-specific problems.

<sup>50</sup> For example, the October 2021 BCBS/CPMI-IOSCO Consultative Report "Review of margining practices" <https://www.bis.org/bcbs/publ/d526.pdf> notes the need for efforts to improve the preparedness of market participants including NBFs to meet margin requirements in periods of liquidity stress.

<sup>51</sup> See Pascual, Singh and Surti (2021) for views on how global regulations can be improved on investment funds to bolster financial stability - <https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2021/09/13/Investment-Funds-and-Financial-Stability-Policy-Considerations-464654> and the FSB's October 2021 final report with policy proposals to enhance money market fund resilience <https://www.fsb.org/2021/10/fsb-publishes-final-report-with-policy-proposals-to-enhance-money-market-fund-resilience/>. Quarles (2021) discusses the FSB's workplan aimed at addressing the impact of NBFs on financial stability - <https://www.federalreserve.gov/newsevents/speech/quarles20210330a.htm>

<sup>52</sup> Chapter V of the IMF's Policy Paper on Investment Funds deals with cross-border issues and suggests policy options which may be considered.

Rather, NBF1 liquidity support is better justified to limit market dysfunction from liquidity shortfalls across classes of NBF1s in a market stress situation that could challenge financial stability. Support should be focused on instruments traded in the United Kingdom's most interconnected financial stability relevant markets (Gilts, Gilt repos, perhaps FX swaps).

**89. As the NBF1 sector is diverse, both asset purchase operations and lending facilities are needed.** Some NBF1's can't use leverage and hence a repo facility. Central banks have used both lending facilities (for example the Primary Dealer Credit Facility in the United States) and asset purchase facilities (the U.S. Money Market Mutual Fund Liquidity facility) to good effect in other jurisdictions. The BOE is co-leading international work to develop a framework and tools to provide liquidity to the NBF1 sector. The BOE needs to continue to be at the forefront of developments in this area given the United Kingdom's financial hub status and should develop both lending (through a Market Liquidity Facility (MLF)) and asset purchase operational tools that could be made available to backstop some appropriately regulated, large interconnected NBF1s. Not all NBF1s would necessarily have access to such backstops and the BOE should retain discretion on to whom in what circumstances backstop liquidity might be made available with a focus on ensuring markets remain functional.

**90. The significant role of foreign NBF1s in core Sterling markets needs to be factored into the BOE's operational framework.** Some important classes of NBF1s (especially Sterling MMFs) with significant holdings of core sterling instruments are not U.K. based or regulated, so the BOE should be mindful of the important role played by these firms in considering its approach to backstopping these markets. The BOE should investigate options to provide support to such entities, provided they are adequately regulated.

## D. Challenges in Managing Moral Hazard

**91. There is considerable moral hazard in the status quo.** A traditional concern governing the design of central bank operational frameworks is managing risks of over-reliance on the central bank. Traditionally, access to central bank liquidity has been limited to banks, deposit taking firms, financial market infrastructures and large broker-dealers as they are usually relatively tightly regulated by the central bank or some other competent domestic regulator to manage moral hazard. The adequacy of this approach is increasingly coming into question as the role of market-based finance has increased, and with it the role of NBF1s. Central banks, including the BOE, have been drawn more regularly into providing support to markets via asset purchases. Discretionary asset purchases, while very effective and easily tailored to the vagaries of the stress at hand, have been frequently used which has increased market expectations of their deployment in stress situations. Such expectations will be impounded into the ex-ante decisions of market participants encouraging reliance and creating moral hazard.

**92. A more specific liquidity support framework for markets and NBF1s could help circumscribe expectations of BOE support and improve ex ante risk management decisions.** The BOE has an articulated market support role and has deployed operations in the GFC and the recent Covid-19 crises. To date the BOE has espoused a flexible discretionary approach where it

articulates its broad policy objective but is not specific on the modalities of interventions (instruments, markets, maturities of instruments, counterparty access, pricing arrangements, collateral arrangements). This discretionary approach gives the BOE valuable operational flexibility but doesn't influence the ex-ante risk management choices of market participants as strongly as it could. As there are no limits communicated on what the BOE could support and how support might be provided, market participants could possibly anticipate a very broad range of options being contemplated.

**93. Reducing discretion on the nature of the BOE's support, particularly to the large interconnected NBFIs sector, could provide stronger guidance to market participants and regulators.** The SMF is currently very specific on the terms of support available to SMF participants which aids their liquidity planning and provides solid assumptions regulators can use when assessing their liquidity preparedness. Introducing some of this specificity into the way market liquidity support is provided could also better anchor ex-ante risk taking/management and allow for a faster smoother exit from liquidity support, reducing moral hazard. Some key aspects where clarity could be useful include:

- The markets and instruments included in support
- The counterparties covered
- The maturities of instruments eligible for support
- The criteria and approach that will be used to exit from providing support.

**94. Market support should be focused on the most central, critical benchmark liquidity and funding markets used to raise funding and manage risks.** Suitable candidates should be liquid in normal times, be of high credit quality and be large benchmark markets.<sup>53</sup> Focusing support on markets with such characteristics (in the U.K. context, the Gilt repo and Gilts markets are the key markets of focus), and on shorter term instruments, would concentrate market (and regulator) expectations of support more clearly on instruments that are more likely to be resilient to stress ex ante. Clearly defined exit criteria should be developed and communicated ex ante to help better align market expectations of support with the BOEs short-term backstop role. This could reduce risks of liquidity mismatches arising and make it easier and safer for the BOE to provide any support required, withdraw support in a timely manner, and without unduly permanently expanding its balance sheet and market footprint.

**95. The design of instruments and facilities should reflect moral hazard mitigation concerns.** SMF facilities already embody this important principle. Importantly, as noted earlier, backstops should only be provided to entities that are adequately supervised such that a low risk of liquidity mismatches may be expected to arise. NBFIs eligible for access could be subject to more prescriptive liquidity requirements than is currently the case as a quid pro quo for BOE support to

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<sup>53</sup> King, Brandao-Marques, Eckhold, Lindner and Murphy (2017) provide a framework that can be employed to guide central bank liquidity support to securities markets that is relevant for core markets more broadly – see <https://www.imf.org/~media/Files/Publications/WP/2017/wp17152.ashx>

manage over-reliance concerns. Ex ante access fees could be one option to help make a stronger link between ex post support and ex ante risk taking and should be considered.<sup>54</sup> While the optimal cost of ex-ante access fees might be hard to precisely define, any cost would help tangibly crystalize the costs of providing the liquidity insurance NBFIs already implicitly receive which would influence risk taking. Costs can be reviewed as experience accumulates. Principles and experience already exist for pricing Committed Liquidity Facilities (CLFs) within the Basel III LCR framework in jurisdictions with a shortage of HQLA.<sup>55</sup> These principles, and the experience of central banks which have implemented CLFs could be leveraged to help the BOE develop its own ex-ante access fees if they determine such fees beneficial. Lending facilities should be priced above normal market rates, but not so high as to discourage use in stressed conditions, to balance the need to encourage firms to use BOE liquidity as a backstop but not to engage in fire-sales of assets.

## DEVELOPMENTS IN THE EMERGENCY LIQUIDITY ASSISTANCE AND RESOLUTION LIQUIDITY FRAMEWORKS

**96. The main development since the 2016 FSAP is the introduction of the RLF.** The RLF is separate from but sits alongside the ELA framework and outside the SMF. The RLF provides the authorities with a broad, scalable, and flexible tool to support the liquidity of a firm going through resolution. The BOE can provide liquidity in sterling and FX, secured on a wide range of collateral, building on the collateral eligible in SMF operations.<sup>56</sup> Provisions are in place for the BOE to request an indemnity from HMT against any losses that might accrue. The policy guiding RLF lending is flexible to be tailored to the quite diverse range of circumstances in which resolution lending might be required and is consistent with encouraging funding recipients to return to using market funding as soon as practical.<sup>57</sup> The objective of the resolution process is to encourage the firm to return to using market funding as quickly as feasible and the pricing approach embodies that objective. Funding in FX is available.

<sup>54</sup> The Brookings Task Force on Financial Stability June 2021 repo <https://www.brookings.edu/wp-content/uploads/2021/06/financial-stability-report.pdf> discusses the possibility of subjecting NBFIs to an upfront fee for access to their recommended Federal Reserve standing repo facility and the 2013 BOE Winters review <https://www.bankofengland.co.uk/-/media/BOE/files/news/2012/november/the-banks-framework-for-providing-liquidity-to-the-banking> also recommends consideration of up-front access fees in the BOE's liquidity insurance framework.

<sup>55</sup> See <https://www.bis.org/publ/bcbs274.pdf> for the CLF framework incorporated into the LCR.

<sup>56</sup> Box 2 "The Bank's approach to providing liquidity in resolution" discusses the BOE's funding approach. See <https://www.bankofengland.co.uk/-/media/BOE/files/news/2017/october/the-bank-of-england-approach-to-resolution>

<sup>57</sup> Consistent with the FSB Guiding principles on the temporary funding needed to support the orderly resolution of a global systemically important bank ("G-SIB") - see <https://www.fsb.org/wp-content/uploads/Guiding-principles-on-the-temporary-funding-needed-to-support-the-orderly-resolution-of-a-global-systemically-important-bank-%E2%80%99CG-SIB%E2%80%9D.pdf>

**97. The RLF embodies most best practice principles that apply to ELA.** The RLF is robustly designed to provide a flexible liquidity source while managing the significant risks. Governance arrangements are extensive, and the resolution planning process provides the authorities significant information on the viability of the firm and the timeline over which BOE liquidity might be required.

## Appendix I. Status of the Recommendations of the 2016 FSAP

CP	Recommendations of the U.K. FSAP 2016 for NBFIs	Status and Staff View
1.	Develop a set of cross-sector interconnectedness indicators using flow of funds data, cross sector exposures, market-based indicators, and information produced by thematic analyses. [BOE, FCA] (¶115)	<b>Partly implemented.</b> Experimental statistics for flow of funds data have been produced, however; most of the flows for investment funds are coming from or going to unidentified “unknown” sectors.
2.	Extend, if legally possible, the scope of transparency reporting under the Alternative Investment Fund Managers Directive (AIFMD) to cover non-European Economic Area (EEA) managers and funds, where relevant for systemic risk monitoring, and strive for enhanced international exchange of information. [HMT and FCA] (¶134)	<b>Implemented.</b> The U.K. authorities have extended AIFMD to non-EEA managers and funds that are marketed in the U.K. (or have feeder funds that are marketed in the United Kingdom). In addition, the U.K. shares information within IOSCO. FCA shares data with the BOE for financial stability purposes.
3.	Ensure that Broker Crossing Networks’ (BCNs) activities are sufficiently supervised and monitored. [FCA] (¶133)	<b>Implemented.</b> According to reports, the FCA supervises Systemic Internalizers (including investment banks) that previously operated BCNs according to the FCA supervision model.
4.	Continue with the de-tiering project for payment systems and EUI and consider, as part of the RTGS review, increasing settlement in central bank money for CCP-embedded payment system transactions by increasing the number of CCP members that are also members of the HVPS. [BOE] (¶137)	<b>Implemented.</b> Several CCP members have become HVPS members. Furthermore, following completion of the ongoing RTGS renewal project, a further review will be undertaken to assess the case for even more de-tiering.
5.	Establish an approach for engaging with countries that are not members of CMGs but where U.K. bbanks and CCPs have a systemic presence. [BOE] (¶139, ¶152)	<b>Implemented.</b> The United Kingdom has established CMGs for LCH and ICEU. These CMGs do not necessarily engage all countries that rely on U.K. CCPs for clearing. The BOE does engage with jurisdictions not represented in the CMG through other channels, such as FSB fmiCBCM. Remaining planned steps include finalizing resolution planning and a more regular engagement with jurisdictions that rely on U.K. CCPs for clearing that are not represented in the CMGs. For systemic CCPs, the CPMI-IOSCO ‘SI>1’ process helps the U.K. authorities identify host jurisdictions where the two U.K. global systemically important CCPs have a systemic presence. Over three-quarters of these jurisdictions are members of the CCPs’ CMGs; all jurisdictions are represented at the FSB fmiCBCM, which provides a platform for the authorities to engage with non-CMG jurisdictions.
6.	Assess the incentives created for CCPs in managing their liquidity risk and ensure, both via supervision of CCPs and management of the SMF, that appropriate arrangements and incentives are in place.	<b>Implemented.</b> The BOE conducted a liquidity risk assessment for CCPs in 2019 and followed up on findings of that assessment.

CP	Recommendations of the U.K. FSAP 2016 for NBFIs	Status and Staff View
7.	Ensure that the level of PRA supervisory scrutiny over small and medium-size firms does not have an adverse impact on SMF risk management and ELA horizon scanning.	<b>Implemented.</b> The BOE proactively assesses firms and groups potential liquidity support needs including small firms. The PRA regularly assesses all banks liquidity risk management regularly through the L-SREP process.
8.	Complete a broad financial sector stress scenario to assess the aggregate exposure to liquidity insurance across the full range of SMF facilities.	<b>Implemented.</b> The BOE reviews its capital setting scenarios annually and assesses forward looking risks to its balance sheet and operations on a quarterly basis. The BOE also initiated work in 2019 on a liquidity biennial exploratory scenario to review the resilience of firms in this space. These scenario analyses consider the full spectrum of operations (including SMF facilities) involving the Bank's balance sheet, and are used to test the Bank's broader readiness, as well as for risk management and capital purposes.