BANK OF ENGLAND

Quarterly Bulletin

2018 Q1

Topical article

Sterling money markets: beneath the surface

ISSN 2399-4568

Sterling money markets: beneath the surface

By Rob Harris and Tim Taylor of the Bank's Markets Directorate.[1]

- This article presents analysis based on the Bank's new Sterling Money Market data collection.
- The vast majority of unsecured money market activity is in the overnight market that underlies the SONIA benchmark. Longer-maturity trades are scarce and have volatile daily average interest rates.
- We present evidence that suggests the overnight unsecured market is dynamic and competitive, and show that average rates in the overnight gilt repo market vary according to the collateral used.
- These observations support market-led efforts to promote the use of SONIA in sterling markets.

Overview

The sterling money markets play a key role in the implementation and transmission of monetary policy. The Bank now collects granular data on sterling money market transactions, providing new insights into these markets. A subset of these Sterling Money Market (SMM) data will, from April, be used as the inputs to the sterling overnight index average (SONIA) benchmark, as planned reforms take effect.

To increase market transparency, the Bank intends to use the new data to publish summary statistics of activity in the broader sterling money markets on a regular basis. This article presents example statistics for the first time.

We also use this new, comprehensive data set to shed light on the market for term unsecured deposits. Transactions are overwhelmingly completed overnight. Beyond that maturity, the average daily value of term deposit transactions is generally low (**summary chart**), rarely exceeding £1 billion at maturities of one month or longer. Average rates at these terms are also highly volatile, albeit around a clear trend.

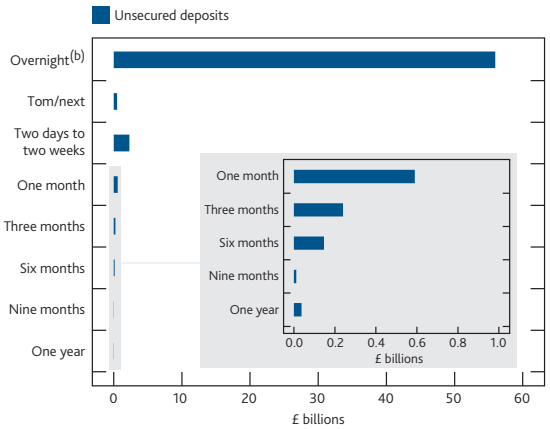
By comparison, the average value of transactions soon to underpin SONIA — capturing overnight unsecured deposits which are £25 million or larger — has been on average close to £50 billion per day, and the headline rate is very stable.

Underlying this stability, our analysis suggests that there is an active core of depositors in the overnight unsecured market measured by SONIA. We find evidence of a dynamic pattern of bank-depositor relationships, consistent with a competitive market environment where depositors can, and do, move their business around.

The SMM data also show strong levels of activity in the overnight gilt repo market. We show that rates vary according to the collateral used in these transactions, and that the distribution of rates varies considerably over time.

Our observations support the direction of ongoing market-led reforms to how interest rate benchmarks are used in sterling financial markets. A desire for benchmarks to be based on transactions implies a shift away from Libor towards overnight benchmarks. In sterling the market's preferred alternative, SONIA, provides a robust alternative to Libor without the additional complexities that can affect gilt repo rates.

Summary chart The vast majority of turnover in sterling unsecured deposits is overnight, with little activity at longer maturities[a]



Sources: SMM data collection and Bank calculations.

(a) Daily average from 1 September to 30 November 2017, by original maturity.
(b) With a minimum transaction size of £1 million. Transactions underpinning reformed SONIA are £25 million or greater.

(1) The authors would like to thank Imane Bakkar, Renée Horrell, Sarah John, Josh Jones, Joanna McLafferty, Edward Ocampo, Will Parry, Rishar Ramazanov and Iain Ramsay for their helpful contributions.

Introduction

The sterling money market, in which short-term wholesale borrowing and lending takes place, is used by banks and other institutions to manage the amount of cash they hold.

The market also plays a key role in the implementation and transmission of monetary policy: it is the market through which the Monetary Policy Committee (MPC) seeks to influence short-term interest rates when setting its policy rate, Bank Rate (Jackson and Sim (2013)).

As part of the Bank's Sterling Monetary Framework (SMF), commercial banks (and some other institutions) can deposit cash in accounts at the Bank of England. Paying Bank Rate on those cash deposits establishes a reference point for short-term market interest rates because it influences the rates SMF members are willing to charge or pay on short-term loans or borrowings in the market (Bank of England (2015)).

Benchmarks seek to provide a consistently measured reference point for interest rates in the money market. They are widely used as the variable rate input to longer-term financial contracts, such as interest rate swaps, floating-rate bonds and so on. In this way, actual or expected changes in money market rates are directly transmitted to a broader set of interest rates, and in turn, asset prices in the wider economy.

Therefore, it is important for the Bank to monitor and understand developments in the sterling money markets, the assessment of which informs its monetary and financial stability policy decisions. To improve this assessment, since July 2016 the Bank has been collecting comprehensive information on short-term money market activity via the Sterling Money Market (SMM) data collection.

The SMM data will be used to underpin SONIA, a critical sterling interest rate benchmark administered by the Bank. From 23 April 2018, a subset of the SMM data — namely overnight unsecured deposit transactions £25 million or larger — will be used as the input data for SONIA (Bank of England (2017)).

The Bank's daily publication of SONIA and the accompanying turnover value and percentile rates will give market participants a window into the overnight unsecured deposit market. To further support the transparency of sterling money markets, the Bank also plans to publish a broader set of summary statistics.

The first part of this article introduces the SMM data set, previews those summary statistics on market activity and explains our plans to publish these data regularly.

The second part of the article uses the SMM data to provide context for recent developments in sterling interest rate benchmark reform (see Box 1 for more detail). We focus on three issues.

First, how active are term unsecured deposit markets?

Libor is the predominant interest rate benchmark. The series gives an indication of the average rates at which contributor banks can obtain unsecured funding at different maturities. Rates are currently measured by collecting daily submissions from a panel of banks and efforts are under way to base those submissions more consistently on actual transactions, where available.

However, due to the limited number of transactions observed by panel banks each day, the majority of term Libor submissions continue to be based on the judgement of those banks.(2) The scarcity of transactions has prompted the Financial Conduct Authority to highlight concerns about the long-term sustainability of Libor (Bailey (2017)).

We use the SMM data — the most comprehensive source available — to provide a definitive description of the level of activity in sterling term unsecured deposit markets.

Second, how dynamic is the market underlying the SONIA benchmark?

As Box 1 explains, internationally co-ordinated work has sought to identify alternatives to Libor. In the UK, SONIA has been selected as the market's preferred alternative to sterling Libor.

In view of the likely growing importance of SONIA, we use the SMM data to explore beneath the surface of the overnight unsecured deposit market with the aim of better understanding the structure of the market and trading patterns within it.

Third, how do interest rates vary in the gilt repo market?

The gilt repo market — where cash is borrowed and lent, secured against UK government bonds — is used both for short-term cash management and for the sourcing of bond collateral. This, as well as the greater role of market infrastructure and the presence of inter-dealer trading, makes activity in the gilt repo market more varied, compared to the market for unsecured deposits.

We explore how the distribution of interest rates can vary across transactions which are secured against different types of collateral. There are three publicly available overnight gilt repo benchmarks, each measuring a slightly different market segment. We compare these to overnight gilt repo rates based on the SMM data.

(2) See ICE Libor weekly transparency of determinations report, example available at www.theice.com/iba/historical-data.

Box 1
International efforts to transition to risk-free rates from Libor

Benchmark interest rates provide a convenient publicly accepted measure of short-term interest rates and are widely used in financial contracts to determine interest rate payments.

For example, interest rate swaps are instruments where payments based on an agreed fixed rate of interest are exchanged for payments based on a variable-rate benchmark. Benchmarks are also used for the determination of variable-rate payments on loans or variable coupons on bonds.

Libor benchmark rates provide an indication of interest rates paid on short-term unsecured bank funding across different maturities and five currencies: sterling, US dollar, Japanese yen, Swiss franc and euro.

Taken together, it is estimated that Libor is used in well over US$200 trillion-worth of financial contracts, globally (Financial Stability Board (FSB) (2014a)).

In response to well-documented cases of attempted manipulation and false reporting, together with the decline in the liquidity of unsecured funding markets, the FSB published recommendations for the reform of interest rate benchmarks (FSB (2014b)).

The FSB's report concluded that certain financial transactions, including many derivatives, are better suited to using benchmark rates that are closer to risk free, rather than to rates which include a term bank credit risk component, such as Libor. Accordingly, it recommended that market participants identify and promote the use of nearly risk-free reference rates (RFRs) as robust alternatives to Libor-style benchmark rates.

In line with these recommendations, international working groups in the UK, US, Japan and Switzerland have chosen and are implementing alternatives to Libor. In the euro area, a working group has recently been launched with similar objectives for Euribor, the predominant benchmark in euro markets.

In sterling markets, the Working Group on Sterling Risk-Free Reference Rates — at that time, comprised of major sterling swap dealers — has recommended SONIA as its preferred alternative to sterling Libor.(1) SONIA is a benchmark which measures average interest rates paid by banks on overnight deposits from wholesale customers (for more information on SONIA see Box 2).

In June 2017, the Working Group published a White Paper detailing the key reasons for this choice (Working Group on Sterling Risk-Free Reference Rates (2017)):

- First, SONIA has robust daily turnover together with the ability to evolve, ensuring the rate is viable over the very long term.
- Second, the rate is relatively stable, well correlated with Bank Rate, and the overnight deposit market which it measures is conceptually straightforward.
- Third, SONIA is also the existing reference rate in sterling overnight indexed swap markets, which enables faster progress towards its adoption as an alternative to sterling Libor.

Gilt repo benchmarks — measuring the cost of borrowing secured against UK government bonds — were considered by the Working Group alongside SONIA as potential alternatives to sterling Libor.

Some members of the Working Group argued in favour of an RFR which measured conditions in gilt repo markets. That reflects the use of repo in short-term financing across a broad set of bank and non-bank participants, which in turn results in active two-way flow from these participants. But other members expressed concern that average rates in the gilt repo market might be subject to movements driven by factors such as collateral availability or the cost of balance sheet.

Weighing up these considerations, and taking into account the specific circumstances in the sterling markets, the Working Group recommended SONIA as its preferred RFR. This recommendation, aimed primarily at derivatives markets, was subject to a broad market consultation and received positive feedback.

In Summer 2017 the Financial Conduct Authority (FCA) raised questions regarding the long-term sustainability of Libor, in view of the absence of active underlying markets and the 'understandable discomfort' banks felt about providing submissions based on judgements (Bailey (2017)).

That implies the need for a broader transition away from Libor, in cash as well as derivatives markets. To provide time for transition to take place, in November 2017 the FCA confirmed panel bank support for Libor until the end of 2021.(2) However, markets cannot rely on Libor continuing to be available indefinitely.

(1) For more information, including the terms of reference of the Working Group, see www.bankofengland.co.uk/markets/benchmarks.
(2) For more information see www.fca.org.uk/news/statements/fca-statement-libor-panels.

The Sterling Money Market data and publication of summary statistics

The new Sterling Money Market (SMM) data collection captures negotiated transactions across two market segments.

- Unsecured cash deposits, denominated in sterling, between 'wholesale'(3) market participants, with maturities from overnight to one year;(4)

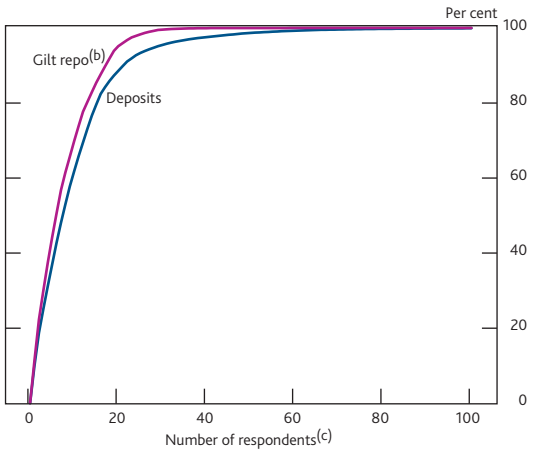
- Repurchase and reverse repurchase agreements,(5) where borrowing/lending of sterling cash is secured against UK government-issued securities(6) — known as 'gilt repo' and 'gilt reverse repo', respectively.

The Bank requires institutions to report transaction data if their activity is a significant proportion of total activity in the sterling money markets.

Total activity is measured by asking all banks and building societies in the UK and all major broker-dealers(7) — together close to 350 firms — to report their annual turnover in the unsecured deposit and gilt repo markets, over the past year. The annual survey covering activity in 2017 has just been completed.

The most active participants are selected to report their daily transactions: institutions covering 95% of total turnover at either overnight or up to one-year maturities are captured. The total size of the population which reported transaction data across both deposit and gilt repo markets in 2017 was 52, with activity in the gilt repo market more concentrated than the unsecured deposit market (**Chart 1**).

Chart 1 Activity in the sterling money markets is concentrated(a)



Sources: SMM data collection and Bank calculations.

(a) Data include all transactions with an original maturity between overnight and one year, inclusive.
(b) Gilt repo presented as a gross aggregate of repo and reverse repo.
(c) 344 institutions were required to complete the survey, 100% of all activity was undertaken by 100 of those.

We are confident that the daily SMM data collection captures 95% of relevant activity in the unsecured deposit market, since only banks and building societies are able to accept deposits. In contrast, some activity in the gilt repo market is not captured, specifically where neither party is a bank or major broker dealer — although we think this type of activity is currently not material.

There is currently little publicly available information about activity in sterling money markets. When the Bank commenced the SMM data collection it therefore committed to publishing aggregate summary statistics based on the information collected.

This will improve the transparency of money markets, increase understanding of market functioning and allow market participants to consider their own activity in the context of the broader money market. Respondents to the Bank's consultations proposing the introduction of SMM and the reform of SONIA were supportive of the plans to publish summary statistics for the same reasons.

Statistics compiled using the SMM data will be published quarterly, replacing those previously compiled by the Bank using regular market surveys.(8) Using SMM as the primary data source for the Bank's published statistics on money market activity will ensure a more accurate and complete picture of the market is presented.

The measures to be published will be:

- average daily number of transactions over the past three months;

- average daily value of turnover during the past three months, in pound sterling; and

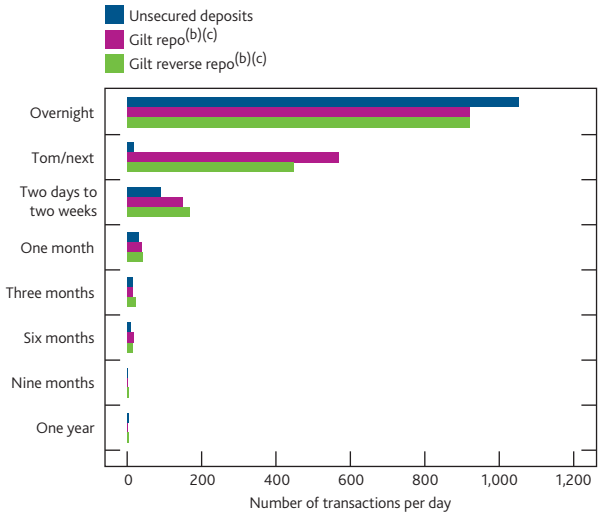
- average daily value of transactions outstanding over the past three months, in pound sterling.

Each measure will be published across both unsecured deposits and gilt repo — separated into repo and reverse repo — and broken down by the original maturity of the transactions. Examples of the compiled statistics to be published are presented here for the first time alongside a brief commentary.

(3) 'Wholesale' participants are defined as being neither retail nor small/medium-sized enterprises, as specified in the applicable implementation of the European Union's implementation of the Basel III Liquidity Coverage Ratio.
(4) Excluding money market securities, such as certificates of deposit or commercial paper.
(5) Also including sell/buyback and buy/sellback agreements, secured against UK government securities.
(6) Unstripped UK gilt securities (conventional and index-linked); sterling-denominated Treasury bills; and sterling-denominated Bank of England bills (when in issue).
(7) Specifically, all banks and building societies licensed to accept deposits in the UK, and all major investment firms regulated by the Prudential Regulation Authority.
(8) In particular, the biannual Sterling Money Market Survey of members of the Bank's Money Markets Liaison Committee and the data published in Bank of England *Bankstats* Table D3.1.

Charts 2 and **3** show that activity — both in terms of value of turnover and number of transactions — in both market segments is concentrated in one-day maturity trades. For deposits, 94% of total turnover is simply overnight transactions; for gilt repo and reverse repo, 84% of total turnover is a combination of overnight and 'tom/next' transactions (ie transactions agreed today, starting tomorrow, maturing the next day).

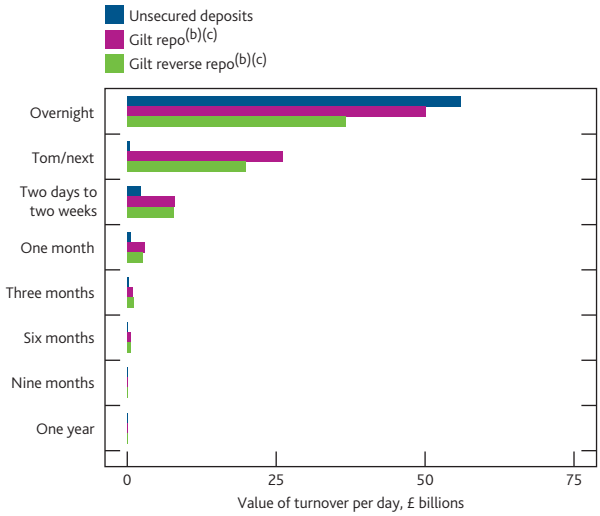
Chart 2 Transactions in the sterling money markets are overwhelmingly done at short maturities[a]



Sources: SMM data collection and Bank calculations.

(a) Daily average from 1 September to 30 November 2017, by original maturity.
(b) The total value of gilt repo and reverse repo in the SMM data do not perfectly match: some reverse repo is not captured. This is likely to be where SMM reporting institutions are reporting repo (cash borrowing) but the other side of the trade (cash lender) is not part of the reporting population.
(c) Note that total activity in the gilt repo market is likely to be higher than in the unsecured deposit market, despite the lower amounts when separated into repo and reverse repo. We have not attempted to combine into a total figure, because it would require removal of any double counting of the same transaction by two reporting institutions.

Chart 3 The daily value of turnover in the sterling money markets is also concentrated at short maturities[a]



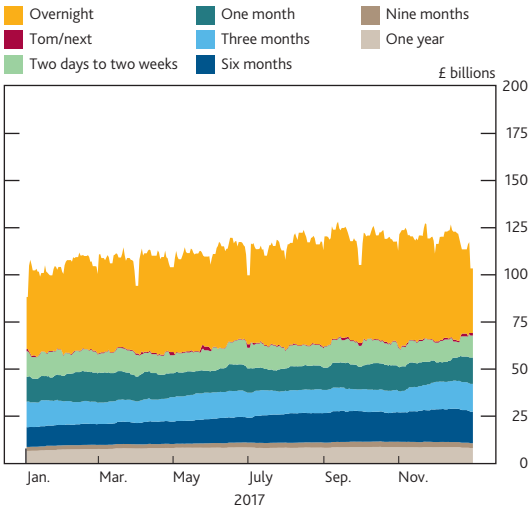
Sources: SMM data collection and Bank calculations.

(a) Daily average from 1 September to 30 November 2017, by original maturity.
(b) The total value of gilt repo and reverse repo in the SMM data do not perfectly match: some reverse repo is not captured. This is likely to be where SMM reporting institutions are reporting repo (cash borrowing) but the other side of the trade (cash lender) is not part of the reporting population.
(c) Note that total activity in the gilt repo market is likely to be higher than in the unsecured deposit market, despite the lower amounts when separated into repo and reverse repo. We have not attempted to combine into a total figure, because it would require removal of any double counting of the same transaction by two reporting institutions.

At longer maturities, activity falls significantly, especially in the unsecured deposit market. For example the average number of unsecured deposits with an original maturity of one month, in the quarter ending November 2017, was 31 with an average daily value of £590 million. The average amount of trading in one-month gilt repo is comparatively larger, with 39 repo and 41 reverse repo trades, totalling £3.0 billion and £2.6 billion over that same period.

The value of gilt repo transactions outstanding is just under double that of unsecured deposits (**Charts 4** and **5**). While we have shown that daily activity is concentrated at shorter maturities, the value of transactions outstanding is naturally

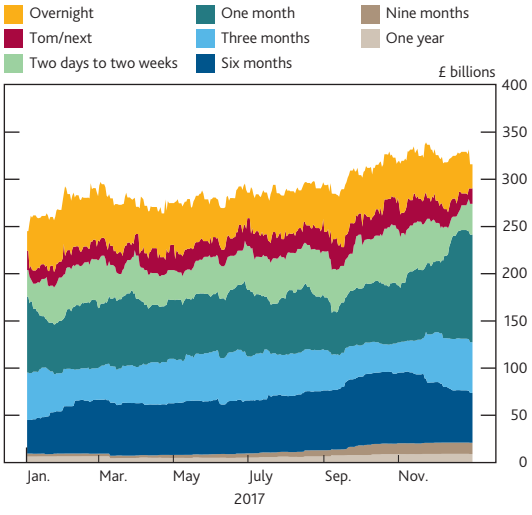
Chart 4 In unsecured deposits, the total value of trades outstanding is concentrated in overnight maturities[a][b]



Sources: SMM data collection and Bank calculations.

(a) By original maturity.
(b) Total amounts outstanding at maturities of six months or greater will not be complete before end-June 2017 since the data set was still growing.

Chart 5 The total value of gilt repo[a] outstanding is more evenly spread across other maturities[b][c]



Sources: SMM data collection and Bank calculations.

(a) Cash borrowing from the perspective of the reporting institution.
(b) By original maturity.
(c) Total amounts outstanding at maturities of six months or greater will not be complete before end-June 2017 since the data set was still growing.

less skewed towards shorter maturities. This is especially true of the gilt repo market, where for example the average value of one-day maturity trades outstanding (overnight, tom/next) is roughly equivalent to the amount of one-month maturity trades outstanding: £70 billion and £67 billion, respectively.

There is a rise in the value outstanding of one-month maturity trades in early December, and at the same time a fall in two-week maturity trades. In the run-up to the Christmas period, and importantly end-of-year reporting for banks, there is greater demand for certainty in trading activities. This demand for certainty encourages participants to extend their maturities over the year-end period, thereby reducing the need to roll over transactions during the seasonally quiet market conditions.

The summary statistics to be published regularly by the Bank focus on volume measures of activity, such as turnover and amounts outstanding, rather than price measures. This is because, beyond overnight maturities, there are insufficient transactions to produce robust and representative price measurements.(9)

These statistics, including a short back-history, will be made available on the Bank's database, in due course.(10) At the same time, the Bank will produce a *Bankstats* article explaining the construction of these measures, how to access them and how they compare to previously published statistics covering activity in the money markets.

Beneath the surface of the sterling money markets

In this section we use the transaction-level data available from the SMM data collection to explore the money markets in greater detail. We explore three key issues and place our findings in the context of ongoing benchmark reform initiatives — as set out in Box 1.

First, we present additional detailed information on activity and average interest rates in the sterling term unsecured deposit markets, in the market which sterling Libor seeks to measure.

Second, we explore the market dynamics underlying SONIA, which has been chosen as the market's preferred alternative to Libor.

Third, we show how average interest rates in the overnight gilt repo market can vary according to the collateral used, and consider the implications for the appeal of a gilt repo benchmark as an alternative to sterling Libor.

How active are term unsecured deposit markets?

The summary statistics of the SMM data collection clearly showed that daily activity in the deposit markets is typically low at maturities beyond overnight. This section explores that activity in greater detail and looks at what the SMM collection reveals about interest rates paid on term deposits.

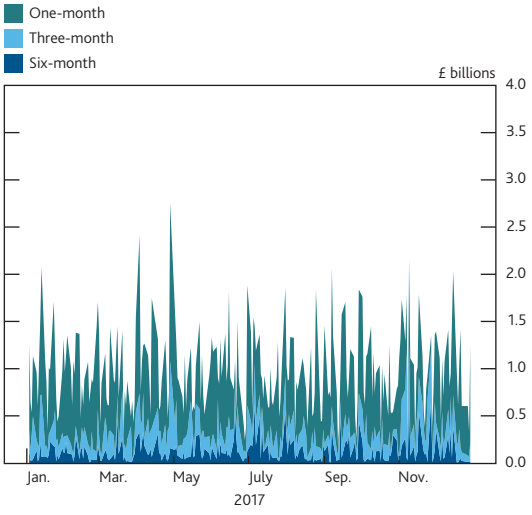
Published Libor rates — by giving an indication of interest rates paid on short-term unsecured funding across different maturities and in five currencies — can help market participants assess conditions in those markets. Libor rates are currently measured as an average of submitted daily interest rate estimates from a panel of banks. Considerable efforts have been made to incorporate transaction data within those submitted estimates (ICE Benchmark Administration (2017)).

By capturing all meaningful activity in the sterling deposit markets, the SMM collection gives us a unique insight into conditions in the market that sterling Libor seeks to measure.(11)

Frequency of term deposit trading

The SMM data collection gives the most comprehensive view of activity in term deposits, since it captures 95% of all trading. **Chart 6** plots the daily value of turnover in the unsecured deposit markets through 2017 across one, three and six-month maturities. **Table A** provides headline summary statistics.

Chart 6 The daily value of turnover in one, three and six-month deposits is low and volatile



Sources: SMM data collection and Bank calculations.

(9) There is also a risk that regularly published price measures could be used as reference rates in contracts, which would not be their intended purpose.
(10) To access the database, see www.bankofengland.co.uk/boeapps/database/default.asp.
(11) In contrast to the scope of eligible funding instruments used in determining submission to Libor, the scope of the SMM data collection does not include tradeable money market securities, such as commercial paper or certificates of deposit.

Table A Summary statistics for unsecured deposit activity, by maturity through 2017

	Deposit maturity			
	Overnight[a]	One-month[b]	Three-month[b]	Six-month[b]
Value of turnover				
Median (£ millions)	46,950	571	187	87
Standard deviation (£ millions)	4,969	338	145	126
Percentage of days ≤£100 million total	0.0	0.8	16.7	54.8
Percentage of days ≥£1,000 million total	100.0	14.3	0.4	0.0
Number of trades				
Median	363	32	15	10
Standard deviation	21	14	7	7
Percentage of days ≤10 trades	0.0	2.0	20.6	53.2
Percentage of days ≥50 trades	100.0	9.9	0.0	0.4

Sources: SMM data collection and Bank calculations.

(a) Transactions that would be eligible to be included in reformed SONIA; ie £25 million or greater.
(b) Minimum transaction size of £1 million.

The average daily value of turnover beyond overnight maturities is low and volatile: £571 million per day for one-month maturity deposits; £187 million per day for three-month deposits; and £87 million per day for six-month deposits. This compares with nearly £50,000 million in daily turnover in overnight deposits.

While there are some days on which the value of term deposits is high, this is rare: on only 0.4% of London business days in 2017 does the total value of three-month deposits exceed £1 billion. Moreover, on 21% of days, there are 10 or fewer trades with a three-month maturity.

Measuring term deposit rates

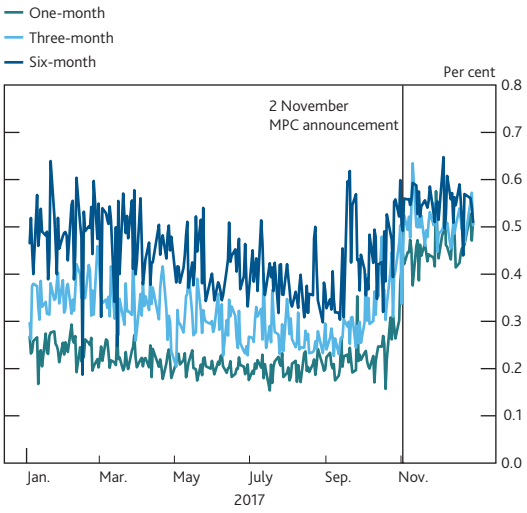
The low and volatile turnover in term unsecured deposits has implications for the extent to which the average interest rate on a given day is representative of overall short-term bank funding conditions.

Since at least one deposit was transacted every day in one, three and six-month maturities throughout 2017, value-weighted average interest rates can be calculated (**Chart 7**).

These rates are highly volatile day to day, especially at maturities of three and six month, where the standard deviation of daily changes is 5 and 9 basis points, respectively. This volatility in rates is likely to be a consequence of the low and variable value of business transacted. For example, differences in average transaction size, or in the characteristics of borrowers and lenders active on any given day, may affect the rate.

Despite the volatility, the general trend of interest rates on term deposits is clear: having gradually fallen for most of 2017, average rates rose in anticipation of the MPC meeting on

Chart 7 Interest rates on SMM term deposits are volatile around a clear trend[a]



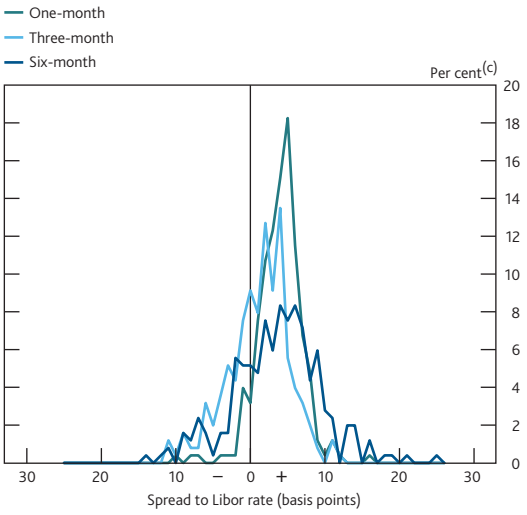
Sources: SMM data collection and Bank calculations.

(a) Calculated as a simple weighted average based on transaction size.

2 November 2017 at which Bank Rate was increased to 0.50% — although other market-based measures of policy rate expectations (such as sterling overnight indexed swaps (OIS)) appear to have anticipated the change somewhat earlier.

Libor rates reflect the overall trend in transacted rates fairly well. However, the average levels differ somewhat, and there are significant day-to-day divergences (**Chart 8**). These could reflect differences in the set of contributing banks (Libor panel versus SMM reporters), and differences in the scope of eligible transactions (see ICE Benchmark Administration (2017) and

Chart 8 Distribution of differences between SMM deposit rates[a] and sterling Libor rates[b]



Sources: Bloomberg, SMM data collection and Bank calculations.

(a) Calculated as a simple weighted average based on transaction size.
(b) Equivalent-maturity Libor rates.
(c) Probability of spread between SMM rates and Libor being within ±0.5 basis point of any given interest rate, specified to one decimal place. For example, the probability of the spread being +10 basis points (greater than or equal to 9.5 basis points and less than 10.5 basis points) is 0.4% for one-month deposits.

Bank of England (2018)) — as well as the volatility in SMM rates based on limited transactions.

Our data illustrate the likely limitations of a fully transactions-based sterling term deposit benchmark. Even with the benefit of our comprehensive data set, low daily turnover casts doubt on the robustness and representativeness of measured term deposit rates; and the volatility of such rates would likely pose problems for users.

It follows that term Libor rates in sterling will continue to rely on the judgement of contributor banks in making their submissions, albeit informed by transactions where possible. However, authorities have made clear that continued use of judgement in Libor submissions is neither desirable (Salmon (2017)), nor sustainable (see Bailey (2017) and Powell (2017)). This emphasises the need for transition to alternative benchmarks.

How dynamic is the market underlying the SONIA benchmark?

Monitoring movements in SONIA is one snapshot into the effectiveness of the Bank's implementation of monetary policy under the Sterling Monetary Framework. SONIA is also very widely used as the variable rate reference for sterling OIS, which can be used to infer market expectations of monetary policy developments.

The Bank is in the process of reforming SONIA so that it captures a broader set of transactions. Box 2 briefly sets out these reforms, which will be implemented on 23 April 2018.

In addition, as explained in Box 1, SONIA has been chosen as the market's preferred alternative to sterling Libor. As a result, usage of the SONIA benchmark is likely to increase in the coming years.

In view of the forthcoming reforms to the SONIA benchmark, and the likely increase in its usage, this section presents some additional information to help users better understand the market which underpins the benchmark. We present data and analysis on the sterling overnight deposit market, and focus in particular on the structure and trading patterns of the part of the market which will underpin the SONIA benchmark.

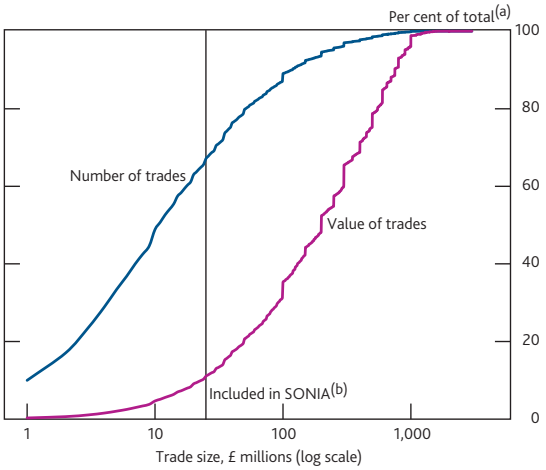
Structure of the overnight deposit market

SONIA includes only transactions of £25 million or more. Two thirds of overnight deposit transactions are smaller than the £25 million threshold and will therefore not be included. But, when weighted by the value of deposits, only 10% of all overnight transactions are excluded (**Chart 9**).

The primary reason that the transaction size threshold for SONIA was set at £25 million was to maintain consistency of methodology with current SONIA. That is important because smaller transactions tend to have a lower rate (**Chart 10**). This could reflect better bargaining power on the part of depositors with larger amounts. Transaction size is likely to be just one of many contributing factors determining deposit rates and the SMM collection could be used to explore other factors.

For the remainder of this section we focus on those transactions that would be eligible to be included in SONIA once the reforms have been implemented.

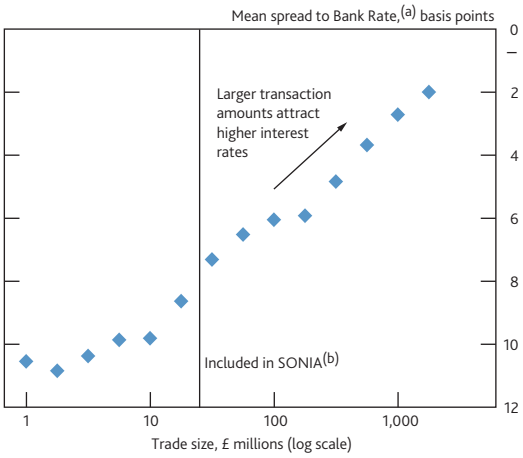
Chart 9 By value, the majority of transactions are included in SONIA



Sources: SMM data collection and Bank calculations.

(a) Calculated as the cumulative number of trades, and sum of nominal values for those trades, which have a nominal size at least as large as value on the horizontal axis.
(b) Transactions eligible to be included in SONIA are £25 million or greater.

Chart 10 Larger transactions tend to attract higher interest rates



Sources: SMM data collection and Bank calculations.

(a) Calculated as the simple mean interest rate of all transactions with a nominal size within a specified range, where the range bounds increase logarithmically. Each point represents a large number of transactions of varying size and rate.
(b) Transactions eligible to be included in SONIA are £25 million or greater.

Box 2
The reform of SONIA

SONIA is a benchmark which measures average interest rates paid by banks on overnight deposits from wholesale customers.

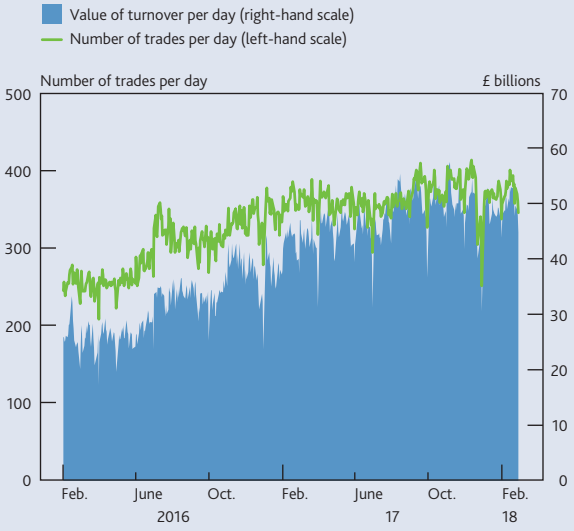
SONIA is a critical benchmark in sterling markets. It is widely used as the variable-rate reference for sterling overnight indexed swaps (OIS), which are used by market participants to hedge or speculate on changes in future short-term interest rates. Rates on these swaps can be used to infer market expectations of future overnight interest rates and are widely used to construct risk-free curves for the purpose of valuing investment portfolios.

SONIA is administered by the Bank of England and on 23 April 2018 the benchmark will be reformed following several rounds of consultation.(1)

As well as the Bank taking on the end-to-end administration, including the calculation and publication of SONIA, these reforms will broaden the coverage of SONIA to include overnight unsecured transactions negotiated bilaterally as well as those arranged via brokers. The SMM data collection will be used for the data inputs and the averaging methodology for calculating SONIA will become a volume-weighted trimmed mean. More information is available in 'SONIA: Key features and policies' (Bank of England (2017)).

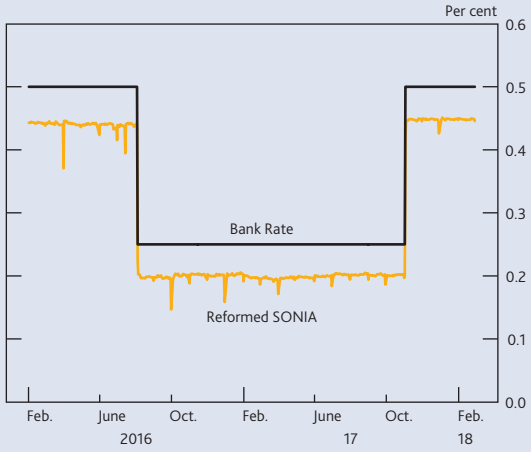
Chart A shows the indicative value of daily turnover and number of trades underpinning reformed SONIA; **Chart B** shows an indication of the evolution of the rate compared to Bank Rate.

Chart A Reformed SONIA: value of turnover and number of trades, per day



Sources: SMM data collection and Bank calculations.

Chart B Reformed SONIA: rate evolution



Sources: SMM data collection and Bank calculations.

(1) For more information, see www.bankofengland.co.uk/markets/benchmarks.

The SMM data allow us to look at the concentration of borrowing banks and depositors in the SONIA market (**Chart 11**).(12) While there are a relatively small number of dominant borrowers and depositors, there are a broader set of active participants. Concentration is considerably lower on the depositor side.

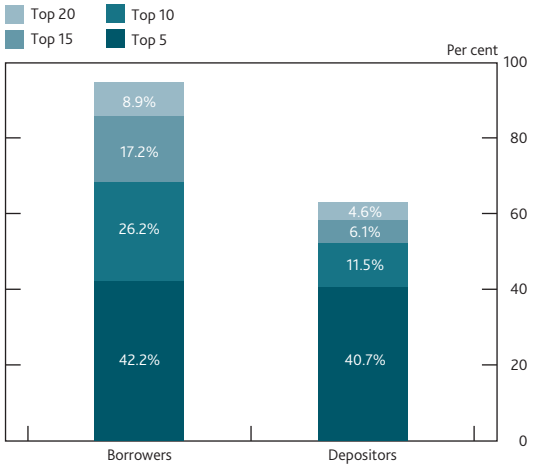
Table B shows the sectoral composition of depositors. The market is dominated by deposits from a combination of money market funds and other investment funds, which comprise 71% of the total. Instead of depositing directly to a bank, investors can choose to place their cash in money market funds — collective investment schemes which invest exclusively in short-term cash-like assets (Bank for International Settlements (2009)).

Some non-financial corporates choose to place overnight deposits directly with banks, rather than through money market funds. This activity comprises just 6% of the total market, but on average tends to attract a slightly lower interest rate than investing through money market funds. This difference may reflect improved bargaining power of funds

(12) While reporters will eventually be required to provide unique Legal Entity Identifiers (LEIs) for their counterparties where possible, this information is not yet complete. In the absence of LEIs, counterparty names are not necessarily reported on a consistent basis. Our counterparty analysis therefore relies to a degree on judgements of two types:
- Where, in our judgement, the same legal entity has transacted with different banks we have imposed consistent naming in order to accurately track the behaviour of the counterparty.
- In some cases where there are a number of legal entities which we judge have a common corporate parent or fund management firm, we have treated them as a single counterparty.

While our results are inevitably somewhat sensitive to these judgements, they do not appear to be too sensitive to the second, which is the more speculative.

Chart 11 The concentration of the 20 largest depositors is lower than it is for borrowers in SONIA[(a)]



Sources: SMM data collection and Bank calculations.

(a) Transactions that would be eligible to be included in reformed SONIA; ie £25 million or greater.

Table B Sectoral breakdown of depositors in the SONIA market

Sector group[(a)]	Share of SONIA[(b)] (per cent)	Average spread[(c)] to Bank Rate (basis points)
Other investment funds	43.0	-5.9
Money market funds	28.2	-4.1
Banks and building societies	8.6	-5.8
Non-financial corporations	6.1	-7.0
Intermediaries, dealers and brokers	6.0	-7.6
Central banks	2.4	-3.1
Government and non-profit institutions	0.3	-5.5
Other sectors	1.7	-8.2
Unknown sector	3.7	-4.5

Sources: SMM data collection and Bank calculations.

(a) Sector classifications have been allocated by the authors, based on the counterparty names reported.
(b) Transactions that would be eligible to be included in reformed SONIA; ie £25 million or greater.
(c) Rates calculated as a simple weighted average based on transaction size.

— this time through collective investments — although any difference would be set against fund management fees.

Fewer than 10% of overnight deposits are between banks — and of these the vast majority are deposits from banks (or subsidiaries) that do not have deposit accounts at the Bank of England, to those that do. This is consistent with the view of Jackson and Sim (2013): banks or other institutions without reserve accounts will place any excess cash balances as deposits, via the money market, to banks with reserve accounts.

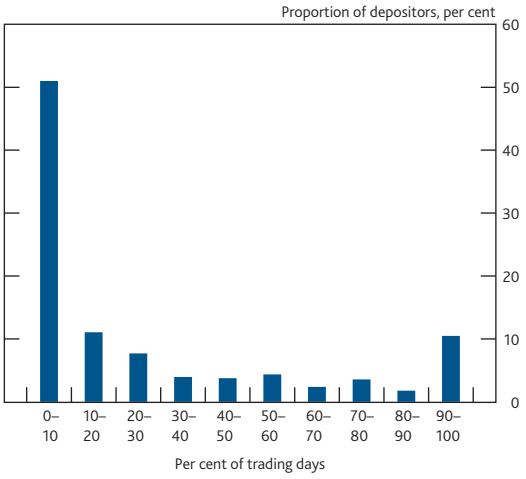
Analysis of trading relationships

The counterparty information collected as part of the SMM data allow us to explore the pattern of trading relationships between depositors and banks in the SONIA market over time. We focus our analysis on 2017, during which there were over 500 different depositors in the SONIA market, and 39 active banks.

There is a moderate degree of persistence to bank-depositor interactions. If a lender placed a deposit with a bank on one day, there was on average an 87% chance the same depositor placed a deposit with the same bank the following day.

But there is also a considerable degree of variation in the behaviour of depositors. There are significant differences in the frequency with which depositors are active. Some are very active, making deposits on every day of the sample; the majority are much less active (**Chart 12**). Around one quarter of depositors were active on more than half the days in the year.

Chart 12 There is variation in the number of days that each depositor is active in the SONIA market[(a)]

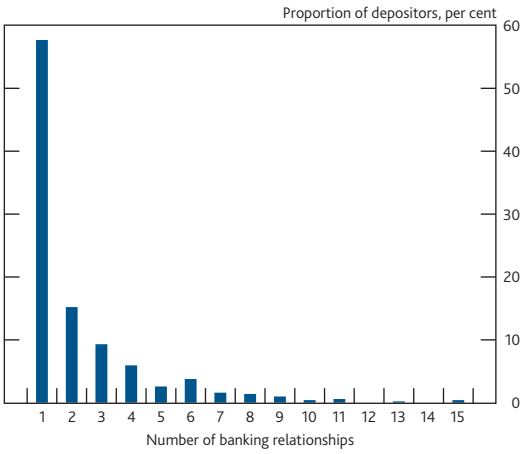


Sources: SMM data collection and Bank calculations.

(a) Transactions that would be eligible to be included in reformed SONIA; ie £25 million or greater.

The majority of depositors are only seen to use a single bank for depositing overnight cash during the period, while around two fifths place deposits with more than one different bank, whether on different days or on the same day (**Chart 13**).

Chart 13 Most depositors in the SONIA market[(a)] have only one banking relationship



Sources: SMM data collection and Bank calculations.

(a) Transactions that would be eligible to be included in reformed SONIA; ie £25 million or greater.

In value terms, the SONIA market is dominated by a core of active depositors who used multiple banks over the year. In 2017 there were 79 depositors who were both active on a majority of days, and used more than one bank over the year; and they accounted for an average of around four fifths of transaction values.

The fact that these active depositors appear to have the option of switching their business to other banks is consistent with their being able to negotiate competitive market rates. We can further analyse the frequency with which these depositors switch business between banks.

First we define what we mean by 'switching business between banks'. While there are many possible definitions, we consider a depositor to have made an active decision to switch business between banks on a given day if the share of business placed with one bank on that day has increased (or decreased) by more than 10 percentage points compared to the previous day.

We find that around a fifth of these most active depositors, constituting on average around a fifth of total daily overnight volumes, reallocate their business between banks from day to day.

Further investigation of this topic could explore the propensity to shift business in response to other factors, for example overnight deposit rates paid by banks, ability or willingness to extend maturities beyond overnight and even to place cash in the gilt reverse repo market.

In summary, we have shown that: larger deposits tend to attract higher rates; there are a large number of participants on both sides of the market, with concentration lower on the depositors side; an active core of depositors transacts with more than one bank; and — of those depositors who are frequently active — there is some evidence of active switching of deposits between banks. We view this evidence as consistent with there being a dynamic and competitive market underpinning the SONIA benchmark, despite the stability of the headline rate (as shown in **Chart B** in Box 2).

How do interest rates vary in the gilt repo market?

So far we have presented detailed analysis on conditions in the unsecured deposit market — both overnight and at longer maturities. The SMM data also capture activity in the gilt repo and reverse repo market.

As with SONIA, the Bank monitors developments in gilt repo rates in order to assess the effectiveness of its monetary policy implementation under the Sterling Monetary Framework. Gilt repo benchmarks were also considered alongside SONIA as potential risk-free rate alternatives to sterling Libor.

A key difference between the unsecured and repo markets is that the latter is a market not just for money, but for collateral too. Market participants use gilt repo as a means to borrow and lend sterling cash while reducing potential credit risk by using gilts as security to the transaction. At the same time, the repo market enables participants to source or finance gilt collateral.

This has implications for market structure. Whereas the unsecured deposit market mainly consists of non-banks lending to (that is, depositing with) banks, there are a more complex set of interactions in the repo market.

For example, some banks and dealers are active cash lenders (as well as borrowers) in the repo market, as they borrow gilt collateral to support their market-making activities. As a result there is an active interbank/interdealer repo market. At the same time, non-banks are active cash borrowers (gilt lenders). For example, investment funds may borrow cash secured against their holdings of gilts, in order to buy other assets, thereby obtaining leverage.

The varying types of activity in gilt repo makes interpreting movements in rates more complex.

We explore how the distribution of underlying repo rates varies by collateral type and briefly discuss possible drivers. We also compare average interest rates captured by the SMM against other publicly available gilt repo benchmarks.

Understanding the distribution of gilt repo rates

The SMM data allow us to review the value-weighted distribution of interest rates (as a spread to Bank Rate) between trades secured against two different categories of gilt collateral: general collateral (GC) and gilt-specific collateral.

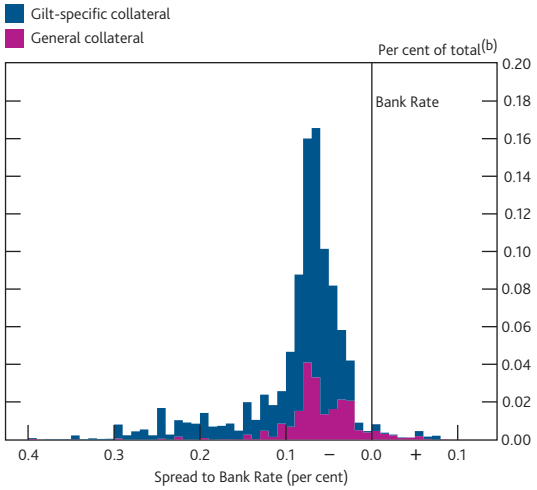
A GC transaction means that neither party to the trade minds which security is used as collateral. Instead, they will agree in advance a set of securities, from which any can be used. In the gilt repo market that set is usually just British government stock (ie any 'gilt'). The rates on these types of trades should be driven purely by the supply and demand for secured cash; in that sense they can be considered 'cash-driven' transactions (International Capital Market Association (2015)).

In contrast, where the transaction is secured against gilt-specific collateral, the specific security to be transferred is pre-agreed between the parties at the time of the trade (eg 'UK Treasury Stock 2% 2025'). Unlike GC repo — where rates are driven primarily by the supply and demand for cash — rates on gilt-specific trades may be lower because of changes in the demand for, or supply of, a specific security. As demand for a security increases relative to supply, borrowers must compete for the asset by offering cheaper cash in exchange; they have lower bargaining power to place their cash in the

repo market. In-demand collateral is described as trading 'special' and typically only a few securities trade 'special' (ie at lower rates) at any time.

We find that repo rates on GC transactions have a tighter distribution around the central average, compared to specific collateral transactions (**Chart 14**). The interest rates on some trades secured against specific repo are lower (trading 'special'), leading to a slightly negative skew in the overall distribution of rates. The daily value of turnover for GC repo in the sterling markets is around one fifth of that for gilt-specific repo.

Chart 14 The aggregate distribution of overnight gilt repo rates[a] relative to Bank Rate, is negatively skewed due to lower rates on some gilt-specific repo trades



Sources: SMM data collection and Bank calculations.

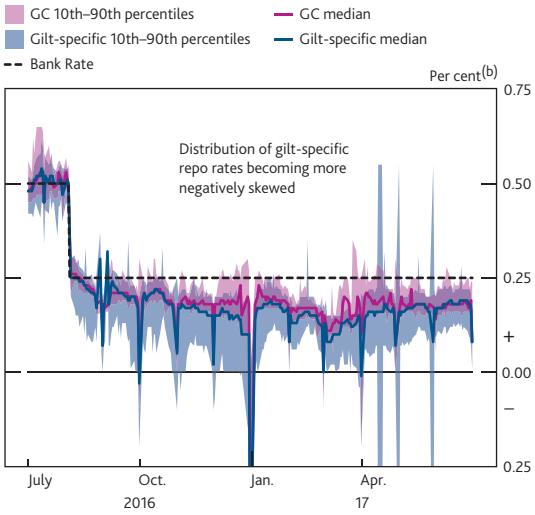
(a) Calculated as a simple weighted average based on transaction size.
(b) Calculated as the total value of transactions between two interest rates, at whole basis point increments (eg greater than or equal to 9.5 basis points and less than 10.5 basis points), divided by the total value of all transactions.

Average rates on both GC and gilt-specific repo tend to move around relative to Bank Rate, and are usually close together. But the distributions of rates on these two types of collateral can diverge over time. Towards the end of 2016, the distribution of rates on gilt-specific repo became more negatively skewed, relative to GC rates (**Chart 15**). During this period there was market uncertainty following the UK's vote to leave the European Union and increased expectations of monetary policy tightening in the US. This was happening against a backdrop of ongoing gilt purchases as part of the Bank's quantitative easing programme.

Measuring average interest rates in the overnight gilt repo market

Published benchmarks give market participants a measure of average overnight repo rates. But as we have shown there are times when the distribution of rates around that average can vary considerably. Three gilt repo benchmarks are currently produced, each one measuring a slightly different segment of the gilt repo market — the key features of which are described in **Table C**.

Chart 15 Gilt-specific repo rates can fall significantly during periods of market stress, relative to GC repo rates[a]



Sources: SMM data collection and Bank calculations.

(a) Volume-weighted percentiles and median are calculated by sorting all the eligible transactions in rate order, lowest to highest; the rate is then taken on the transaction associated with the 10th, 90th and 50th (ie median) percentiles of the cumulative volume.
(b) Vertical axis is truncated to -0.25%, for clarity. Median rates fell below 0% on the final business day of 2017.

- Repo Index Rate (£RIR), produced by NEX, measures rates on all gilt repo transactions between banks and dealers which are executed through the Brokertec trading platform and cleared through LCH's Repoclear service.

- RONIA, produced by WMBA Ltd, measures rates on GC repo trades that are arranged by brokerage firms.

- £SONET, produced by FTSE Russell, measures rates on all gilt repo trades which are cleared by LCH Repoclear and those GC trades which are settled in the CREST system.

Average overnight repo rates in the SMM data are very similar and highly correlated with two of the published benchmarks: £RIR and £SONET (**Chart 16**). RONIA, which measures GC repo rates in the smallest subset of the market, is much more volatile and less well correlated with the other measures. RONIA only captures a relatively small part of the gilt repo market — GC trades which are brokered — and low turnover is likely to contribute to its volatility.

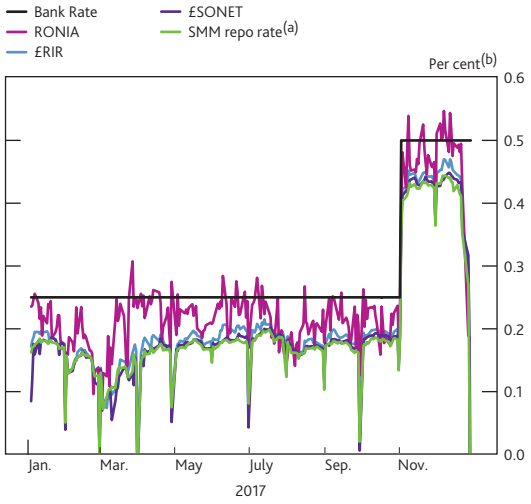
£RIR and £SONET get around the problem of low turnover by including gilt-specific repo transactions alongside GC transactions in the calculation of average rates. The daily value of turnover is therefore many multiples larger. But measured average rates may be affected by any skew in the distribution of specific repo rates driven by changes in demand or supply of collateral. Both the £RIR and £SONET use calculation methodologies which attempt to reduce the impact of skew on average published rates.

Table C Comparison of available overnight gilt repo benchmarks with results using SMM data

	SMM data	RONIA[a]	£ Repo Index Rate[b]	£SONET[c]	
Benchmark administrator	n.a.	WMBA Ltd, Part of EVIA	NEX Information Services	FTSE Russell (indicative form only)	
Trades captured	All trades by 95% most active banks and broker-dealers	Arranged by brokers	Executed on Brokertec and cleared through Repoclear	Cleared through Repoclear	Settled in Euroclear CREST
Participant-types captured	All trades where a bank or dealer is involved	Any	Banks and dealers only	Banks and dealers only	Any
UK government debt collateral type	Specific and general collateral	General collateral only	Specific and general collateral	Specific and general collateral	General collateral only
Averaging methodology	Static trimmed value-weighted mean	Value-weighted mean	Iteratively trimmed value-weighted mean	Iteratively trimmed value-weighted mean	
Average daily volumes[d]	£48.9 billion repo £35.0 billion reverse repo	£4.4 billion	£34.0 billion	£80.5 billion	
Average spread to Bank Rate, basis points[d]	-9.4	-4.4	-8.1	-9.1	
Standard deviation of daily changes, basis points[d][e]	5.5	5.3	7.4	6.6	

(a) For more information see www.wmbaltd.com/.
(b) For more information see www.nexdata.com/indices/money-markets/sterling-repo-index-rate-rir/.
(c) For more information see www.ftse.com/products/indices/gbp-sonet.
(d) Data refer to 2017.
(e) Excluding 2 November 2017, when Bank Rate was increased to 0.50%; including last business day of 2017.

Chart 16 Broad gilt repo benchmark rates are well correlated with SMM gilt repo rates



Sources: Bloomberg, FTSE Russell, SMM data collection and Bank calculations.

(a) SMM gilt repo rate; calculated using the same method as reformed SONIA (ie a trimmed value-weighted mean).
(b) Vertical axis is truncated to -0.25%, for clarity. Rates fell below 0% on the last business day of 2017.

The SMM data show how average gilt repo rates depend in part on the type of collateral used, in a way that can vary over time. That is to a degree reflected in the movements of repo indices which have broad market coverage.

These broad repo indices were considered, alongside SONIA, as alternatives to sterling Libor by the Working Group on Sterling Risk-Free Reference Rates.

Some participants preferred a rate that reflects conditions in the secured money market — including any influence of collateral demand and supply — perhaps because it is an important funding market for them. Others preferred a rate which did not include these influences, emphasising the importance of stability and correlation with Bank Rate, and that movements in repo indices are harder to interpret for those not active in the repo markets.

While the debate was finely balanced, overall participants preferred SONIA, in part because it is well established as a benchmark in sterling markets — making transition from Libor somewhat easier (Working Group on Sterling Risk-Free Reference Rates (2017)).

Conclusion

This article has used the Bank's new data collection to look beneath the surface of the sterling money markets. We presented detailed data on activity in the money markets, showing that trading is heavily concentrated in one-day maturities for both unsecured deposits and gilt repo.

In addition, we showed that the daily value of trading of unsecured deposits at one, three and six-month maturities is typically very low, rarely exceeding £1 billion. This also contributes to significant volatility in calculated average rates on term deposits.

This casts significant doubt on the feasibility and usability of a fully transactions-based sterling term deposit rate. But policymakers have made clear the undesirability in the long term of the continued use of judgement in setting interest rate benchmarks.

In contrast, robust transaction-based benchmarks can be produced measuring rates in the overnight deposit and gilt repo markets. For example, the average value of transactions

in the indicative reformed SONIA data was close to £50 billion per day throughout 2017.

Our analysis of the detailed SMM data suggests that, underlying the stability of the headline SONIA rate, there is evidence of a competitive and dynamic market environment where depositors can, and do, move their business around. We also highlighted that benchmark rates measuring gilt repo markets can be subject to additional complexities.

These observations lend support to the direction of ongoing market-led efforts to promote the use of SONIA in sterling markets.

References

Bailey, A (2017), 'The future of Libor', available at www.fca.org.uk/news/speeches/the-future-of-libor.

Bank for International Settlements (2009), 'Money market funds', *Quarterly Review*, March, pages 65–81; www.bis.org/publ/qtrpdf/r_qt0903g.pdf.

Bank of England (2015), 'The Bank of England's Sterling Monetary Framework' (the 'Red Book'); www.bankofengland.co.uk/markets/the-sterling-monetary-framework.

Bank of England (2017), 'SONIA: Key features and policies'; www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/sonia-key-features-and-policies.pdf.

Bank of England (2018), 'Sterling Money Market Data Collection, reporting instructions, for Form SMMD', Version 3.6; www.bankofengland.co.uk/statistics/data-collection.

Financial Stability Board (2014a), 'Final Report of the Market Participants Group on reforming interest rate benchmarks'; www.fsb.org/2014/07/r_140722b/.

Financial Stability Board (2014b), 'Reforming major interest rate benchmarks'; www.fsb.org/wp-content/uploads/r_140722.pdf?page_moved=1.

ICE Benchmark Administration (2017), 'Summary of ICE Libor evolution'; www.theice.com/publicdocs/LIBOR_evo_summary.pdf.

International Capital Market Association (2015), 'Frequently asked questions on repo'; www.icmagroup.org/assets/documents/Regulatory/Repo/Repo-FAQs-4-December-2015.pdf.

Jackson, C and Sim, M (2013), 'Recent developments in the sterling overnight money market', *Bank of England Quarterly Bulletin*, Vol. 53, No. 3, pages 223–32; www.bankofengland.co.uk/quarterly-bulletin/2013/q3/recent-developments-in-the-sterling-overnight-money-market.

Powell, J H (2017), 'Introductory remarks at the Roundtable of the Alternative Reference Rates Committee'; www.federalreserve.gov/newsevents/speech/powell20171102a.htm.

Salmon, C (2017), 'The Bank and benchmark reform'; www.bankofengland.co.uk/speech/2017/the-bank-and-benchmark-reform-speech-by-chris-salmon.

Working Group on Sterling Risk-Free Reference Rates (2017), 'SONIA as the RFR and approaches to adoption'; www.bankofengland.co.uk/markets/benchmarks.