

EC247

FINANCIAL INSTRUMENTS AND
CAPITAL MARKET

Term Paper



“LIBOR scandal”: How and why did banks manipulate the LIBOR? What has been done so far, and what can be done to prevent similar manipulation in the future? Are the reforms (implemented and proposed) likely to succeed or will they create new problems?

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Introduction

The London Interbank Offered Rate (LIBOR) is a daily reference interest rate at which large banks can acquire unsecured short term borrowing or lending in the international interbank market from each other. The purpose of LIBOR was first created as a reference rate for loan contracts. As time went by, the use of LIBOR gradually shifted to many banks and corporates using it to construct their financial products. In addition, LIBOR is also used as a barometer to measure the health of the banking system and market expectations (Roadmap for ICE LIBOR, 2016). Today, the dependence of LIBOR has increased tremendously in which according to IBA, there are millions of contracts worth more than \$350 trillion outstanding referenced to the LIBOR. LIBOR is used for 5 different currencies (CHF, EUR, GBP, JPY, USD) and seven tenors (Overnight/ Spot Next, 1 week, 1 month, 2 month, 3 months, 6 months and 12 months), which results in 35 published rates every London business day at 11:55 am (ICE LIBOR Evolution, 2018). This term paper will talk about the history of LIBOR, the methodology of producing LIBOR, the manipulation by panel banks in 2007, the reforms that have been proposed and the end of LIBOR in 2021.

History of LIBOR

LIBOR, the idea of an interest rate that serves both as a benchmark and reference rate, was first dubbed in 1969 by Minos Zombanakis. At that time, there was a cash-strapped Iranian company that needed \$80 million; the funding could not be possible by one bank, so Minos Zombanakis brought together banks to lend money to this company (Ridley and Jones, 2012). The Iranian unsecured loan was charged with a variable rate depending on market condition, where the rate was determined by daily submission of these banks. Through this success, LIBOR was born in which it serves as a daily reference interest rate to lend money to the syndicated-loan market. The revolutionary idea of charging variable rates depending on the market condition was a phenomenon, in which the syndicated-loan market could receive funding for investment and banks could be compensated with the right interest rate depending on the market environment. LIBOR served to bring efficiency and convenience to the interbank market. Through time, banks including panel banks started borrowing using LIBOR-based contracts in the interbank market, which then led to underreporting rates so that they could get cheaper funding. As a result, the BBA (British Banker's Association) took control over LIBOR in 1986 to ensure the reliability and accuracy of the rate, and established a panel of banks that would help determine the LIBOR for the day. BBA was responsible of publishing rates of LIBOR for various currencies at different maturities every London business day at approximately 11:30am. But the actual calculation and collection of data was performed by Thomson Reuters (Hou and Skeie, 2014). In early 2014, the ICE took over the control of the governance of LIBOR, in which a new methodology ("The Waterfall Methodology") was introduced. ICE (intercontinental Exchange) is an American company that holds many exchanges in the world. can be thought of as a risk spreads (Hou and Skeie, 2014):

$$LIBOR = \text{Overnight risk free rate} + \text{premium} + \text{Bank credit risk} + \text{liquidity risk} + \text{risk premium}$$

Methodology of Calculating LIBOR

During the crisis, the methodology of constructing the LIBOR by the BBA was to ask hypothetical questions to 20 panel banks, established in 1986; the hypothetical question asked to get quotes for the day was:

“At what rate could you borrow funds, were you to do so by asking for and then accepting interbank offers in a reasonable market size just prior to 11am?”

The rates were estimates of the lowest possible interest rate at which an institution can borrow money at different maturities from banks on the day. There are 5 panels for 5 different currencies that produce different maturities. Exhibit A shows an example of a US LIBOR panel with a 3-month maturity on July 29th. When the rates are gathered, the 4 highest and lowest rates will be discarded, and the remaining rates will be averaged and published as the rate LIBOR at 11:55am London business time. Rates at which these banks submit are a construction of hypothetical rates which banks do not have the obligation to base their transactions on. In contrast, the LIBOR rates served as a reference tool to financial products such as IRS and loans.

Exhibit A

The top and bottom quarter of submissions are discarded to avoid outliers. There were 16 contributors, so the highest and lowest four were cut.

RABOBANK	0.70000
JPMORGAN CHASE	0.70000
SOCIETE GENERALE	0.72000
ROYAL BANK OF CANADA	0.72000
CITIGROUP	0.72500
BANK OF AMERICA	0.73000
HSBC	0.73000
UBS	0.73100
BANK OF TOKYO-MITSUBISHI	0.76000
CREDIT SUISSE	0.76000
ROYAL BANK OF SCOTLAND	0.77500
BARCLAYS	0.78000
SUMITOMO MITSUI FINANCIAL GROUP	0.79000
NORINCHUKIN	0.81000
BNP PARIBAS	0.81000
LLOYDS	0.84000
CREDIT AGRICOLE	0.86250
DEUTSCHE BANK	0.90000

Source: Bloomberg, 2016

In 2014, the ICE took over the governance of the LIBOR, dedicating a team named IBA (ICE Benchmark Association) to make sure 35 LIBOR rates are published every London business day. IBA developed purpose-built surveillance tools and systems, as well as a dedicated team to examine trading activities and running millions of data pre and post publication of LIBOR to ensure that LIBOR submissions are not manipulated by banks (Roadmap of ICE LIBOR, 2016). IBA is regulated by FCA along with International Organization of Securities Commissions (IOSCO) and the Financial Stability Board (FSB). Every London business day, 20 panel banks are surveyed on the same question, where each reference rate is based on 11 to 16 banks. The panel bank used to determine the LIBOR rate for each currency is shown on Exhibit B (LIBOR Panel Composition). The methodology that IBA is currently adopting for LIBOR has not been

changed but a transition no later than the first quarter of 2019 to a new methodology called “The Waterfall Methodology” is in process, which ensures reliability in bank submission by conducting real-time validation. “The Waterfall Methodology” consists of 3 levels; Transaction based, Transaction-derived and Expert Judgement.

Exhibit B

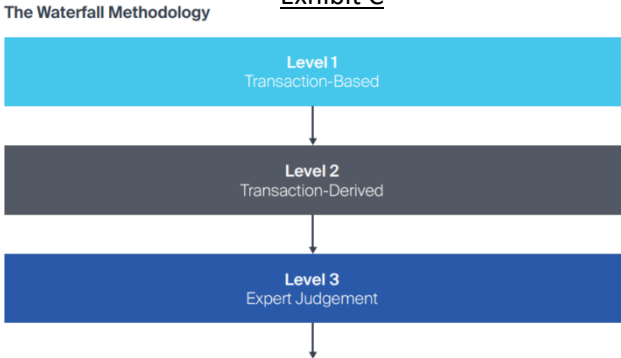
LIBOR panel composition

Bank/Currency	USD	GBP	EUR	CHF	JPY
Bank of America N.A. (London Branch)	•				
Barclays Bank plc	•	•	•	•	•
BNP Paribas SA, London Branch		•			
Citibank N.A. (London Branch)	•	•	•	•	
Cooperatieve Rabobank U.A.	•	•	•		
Crédit Agricole Corporate & Investment Bank	•	•			
Credit Suisse AG (London Branch)	•		•	•	
Deutsche Bank AG (London Branch)	•	•	•	•	•
HSBC Bank plc	•	•	•	•	•
JPMorgan Chase Bank, N.A. London Branch	•	•	•	•	•
Lloyds Bank plc	•	•	•	•	•
Mizuho Bank, Ltd.		•	•		•
MUFG Bank, Ltd	•	•	•	•	•
Royal Bank of Canada	•	•	•		
Santander UK Plc		•	•		
Société Générale (London Branch)		•	•	•	•
Sumitomo Mitsui Banking Corporation Europe Limited	•				•
The Norinchukin Bank	•				•
The Royal Bank of Scotland plc	•	•	•	•	•
UBS AG	•	•	•	•	•

Source: ICE LIBOR Evolution, 2018

Level 1 is Transaction-Based, where transaction data of unsecured deposits, commercial paper, and certificates of deposits are collected from panel banks and then conducting a volume weighted average price (VWAP) in which higher weighting is given to transactions closer to 11am. Level 2 is transaction driven; it is conducted when panel banks have insufficient data for a level 1 submission. IBA will try to predict a submission based on transaction driven data, including time-weighted historical eligible transactions adjusted to market movements, linear interpolation¹ and parallel shift. Level 3 is expert judgement; it is conducted when there are insufficient transactional data to support level 1 or 2 submissions. Expert judgement needs to be approved by IBA procedure. IBA will then publish rates following the ratio of inputs from these 3 levels (Roadmap of ICE LIBOR).

Exhibit C



Source: ICE LIBOR Evolution, 2018

¹ Linear interpolation is a method of fitting a curve using linear polynomials in order to construct new data points.

The Scandal of Prodigals and Projectors: Manipulation of LIBOR

During the financial crisis (2007-2009), staff at banks artificially submitted low rate figures, also known as low balling, to BBA to manipulate the LIBOR to delude the stakeholders of LIBOR. Since LIBOR was used globally and often referenced in derivatives, bonds and loan documentations, the fluctuation of LIBOR had an impact on the behaviour of the public and profitability in trading activities. There are two reasons as to why LIBOR was manipulated collusively and non-collusively. Firstly, by underreporting the cost of borrowing it can project financial strength even if there is risk in the market. The second reason was for a desire to earn abnormal profit from trading positions – including those in non-cash segments, especially in derivatives (Brousseau and Chaillou, 2013). Another interpretation could be that during the financial crisis there were subprime mortgages that were referenced with LIBOR and these loans were defaulting, thus by if LIBOR rates increased, not only were the subprime mortgage lenders less likely to pay their mortgages, but investment confidence will diminish due to a fear in bank credit or liquidity risk. Thus, banks had a conflict of interest by artificially lowering the rate to prolong the steadiness of the financial market for as long as possible. However, a financial crisis occurred at the end of 2007 because the market was at an unsustainable level, causing a full-blown collapse in the world financial system. Nevertheless, it was evident that there was a conflict of interest by the banks to underreport rates to make the banks appear creditworthy (Duffie and Stein, 2014). Many banks were involved in misreporting, such as Barclays, UBS, RBS, and Rabobank. In 2012, according to the department of justice of the United States of America, Barclays paid a fine of \$160 million for misconduct related to LIBOR. Overall, the regulators in UK, US and EU have fined banks more than \$9 billion for rigging the LIBOR rate (McBride, 2012).

Exhibit A will be used as an example to show how banks were able to manipulate the rate. The average of the rates minus the upper and lower quartile is: 0.7591. If UBS decides to artificially lower their rate from 0.731 to 0.69, then UBS rate will enter the lower quartile and be discarded and thus a previously low rate in the lower quartile will be included in the calculation of the LIBOR that leads to the rate being: 0.758. This shows that if one bank itself had a conflict of interest, it had the ability to manipulate the rate without colluding. If 5 banks colluded to artificially underreport the rate then one of the artificially low rates will be included in the calculation. According to Evans and Abrantes-Metz (2012), “It is well known from the economic literature and antitrust work on cartels that it is easier to coordinate either tacitly or explicitly when there are small several market participants.” There is large sum of derivatives indexed to LIBOR and what is surprising is that a small distortion by the bank, as small as one or two basis points, could be very profitable (Duffie and Stein, 2014). Thus, it was inevitable to prevent the manipulation of LIBOR because the inherent characteristic of LIBOR is designed for conflict of interests. Notably by William Dudley in his speech recently where he agrees that “the foundation of LIBOR had serious flaws”. Regulations tend to be reactive but not predictive, and this is the reason that many banks never hold back the opportunity of generating excessive profit.

Reforms Proposed for LIBOR

In 2012, Martin Wheatley, Chief Executive of FCA, announced that LIBOR should be reformed and not replaced. Since then, there have been a few papers on reform proposal in which needs attention from the government in order to be successfully implemented. Duffie and Stein (2014) proposed to reform LIBOR with a two-rate approach in which two distinct types of interest rate benchmark could be used; “LIBOR+” which uses transaction-based data and tougher monitoring regime, and a riskless rate that is

established in a deep market. The proposal eliminates the dependence of LIBOR tied to derivatives and at the same time shifts from judgement-based submissions to transaction-based submissions. This proposal is in line with Coulter and Shapiro (2013) who also proposed a similar reform in which LIBOR needs to be transaction-based. Evans and Abrantes-Mertz's (2012) proposal, suggested a CLIBOR and TRIBE idea. CLIBOR is the idea of committing to the survey submission rates so that panel banks are accountable for the rates they submit. At the same time, making banks submit transactions on the day to a data-clearing house (TRIBE) so that transaction can be verified with the rate. In addition, public release of panel banks submissions should be delayed by at least one month, which agrees with the Wheatley Review that "bank submissions should be published with a 3-month lag because delayed disclosure help repress rumour of changes in creditworthiness. As of July 1st, 2013, individual banks have experienced 3-month delay in publication" (Hou and Skeie, 2014). This is because prior to the change, submissions by panel banks were publicly available on the day, which the rates that panel banks submitted affected agent's perception on the bank's credit risk. This incentivised panel banks to misconduct to protect their reputation. Another proposal by Hou and Skeie (2014) is to convert LIBOR into a transaction-based rate where a weighted-average of actual rate is used to calculate the LIBOR. In the first quarter of 2019, the IBA will introduce "The Waterfall Methodology" in which transaction based rates will be implemented in level 1 of "The Waterfall Methodology".

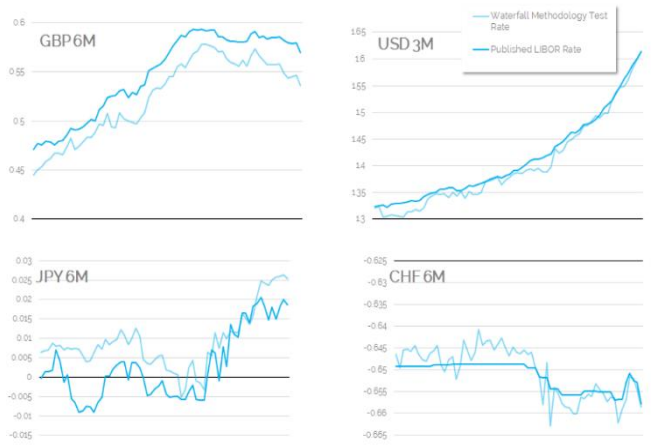
Exhibit D



Source: ICE LIBOR Evolution, 2018

On the other hand, through Exhibit D, it is evident that the methodology transition from LIBOR today to Evolved LIBOR, which will be transitioned in 2019, has only changed the submission stage where the collection, calculation, publication and users have remained the same; the question of whether the reform prevents conflict of interest will remain a concern. Exhibit E shows a comparison of both methodologies used to determine LIBOR in 4 different tenors that are the most traded in IRS (interest rate swaps). As you may have noticed, the implementation of waterfall methodology

Exhibit E

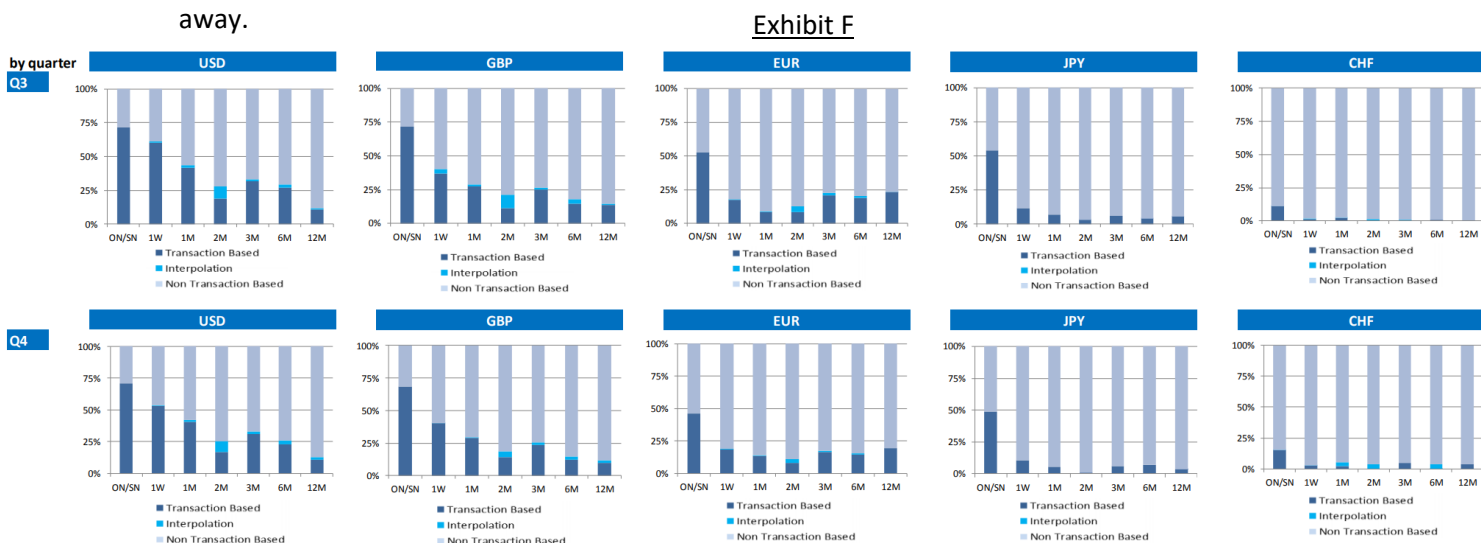


Source: Clarus Financial Technology, 2018

may not have much difference in determining the LIBOR rate as the previous methodology. Would a reform of transaction based data proposed be effective?

End of LIBOR in 2021

Since the transitioning of LIBOR to a new methodology has not shown evident improvements, an alternative future for LIBOR has been proposed by many policy makers and practitioners alike. Andrew Bailey, the Chief Executive in FCA, said “Panel bank support for current LIBOR until end-2021 will enable a transition that can be planned and can be executed smoothly. The planning and the transition must now begin.” This suggests that LIBOR, which is tied to contracts worth more than \$350 trillion, may cease to exist in 2021. The reason for this is because interbank lending is not as widely used in transaction in the interbank market for unsecured loan as before, which shows the fundamental function of LIBOR has no value anymore. Due to quantitative easing performed by central banks, it has given banks access to cheap credit where banks no longer need to borrow from each other anymore. Therefore if panel banks are not borrowing from each other using LIBOR, and we are pushing to a transaction based submissions, then the likelihood of transaction based methodology will slowly fade away.



Source: ICE LIBOR EVOLUTION, 2018

As shown on Exhibit F, transaction-based submission data is declining in different currency. There will need to be alternative rates for LIBOR to ensure reference rates are reliable. ISDA has recently launched consultation on the fall backs for derivative contracts that reference certain IBORs and aim to adjust these contracts with new reference rate. The reason for this transition is because FCA will discontinue permanently the use of IBORs. According to Gibbons and Neale, such discontinuation of LIBOR has been present in the past for currencies such as DKK, NZD, AUD, SEK and CAD following the Wheatley recommendation. There are some challenges that must be tackled to implement this transition. The first challenge is to ensure that more firms are issuing new debt and financial products based on new risk-free rates (RFRs), to improve on the liquidity in RFR-denominated hedging products. Construct a term structure for these RFRs such as the SOFR where more tenors are created so agents in the economy can use the RFRs as a leading indicator. Lastly, RFRs will need a word of mouth to people to spread the obvious benefits of switching from LIBOR to these robust alternative rates (Dias, 2018). Thus, if these criteria are met, it could be feasible to slowly shift to a new benchmark that is stronger and more

reliable than the current LIBOR. In Exhibit G, ARR has identified risk free rates that can replace LIBOR and that for Euro area, ESTER has been selected by ECB as an alternative for LIBOR.

Exhibit G

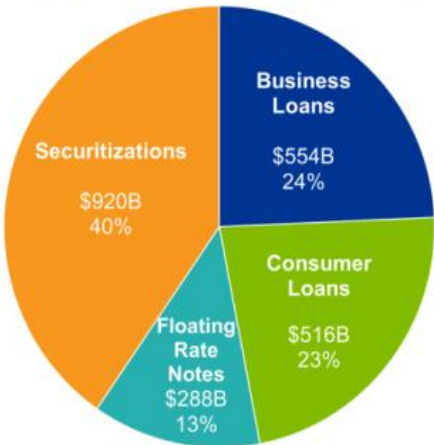
	ARR Identified	Description	Notes On Status
USD	SOFR <i>Secured Overnight Financing Rate</i>	Overnight Secured	NYFRB began publishing in Apr '18.
GBP	SONIA <i>Sterling Overnight Index Average</i>	Overnight Unsecured	Reforms in process.
EUR	Not Decided.	-	-
CHF	SARON <i>Swiss Average Rate Overnight</i>	Overnight Secured	CHF LIBOR transition to SARON in progress
JPY	TONAR <i>Tokyo Overnight Average Rate</i>	Overnight Unsecured	-

Source: ISDA, Oliver Wyman

In June 2017, ARRC (Alternative Reference Rate Committee) in the US has announced a selection of repo rates as benchmarks which have the benefit of being a rate that is more actively used in financial products than LIBOR. In addition, SONIA was being selected by the Risk-Free Rate Working Group as alternative benchmarks for LIBOR. Although the adoption of new benchmark may be a predicament, in which exhibit H shows a breakdown of the value in dollar terms of derivatives referencing US LIBOR not maturing in 2021, the reliance of LIBOR will need to be shifted to a more dependable and robust benchmark for the financial market to be trusted again. As Abrantes-Metz and Evans (2012) stated, despite the possibility of market disruption, it was shown historically that transitions can be managed, and it was evident with the introduction of Euro and that was extremely successful. Thus, the possibility of transitioning from LIBOR to alternative benchmarks should not be overlooked because the benefit of transitioning to an alternative benchmark outweighs its cost of keeping LIBOR as a reference rate.

Exhibit H

Breakdown of USD LIBOR Referencing Derivatives Not Maturing by 2022



Source: BlackRock, 2018

Conclusion

To summarize, history has shown us the path in which LIBOR became a conventional way to reference contracts and that the over reliance on these rates had brought panel banks to manipulate the rate in their favour. Although reforms have been made such as the evolved LIBOR, which uses the waterfall methodology, to tackle such issues, LIBOR could still be prone to manipulation. As William Dudley mentioned, the foundation of LIBOR had serious flaws and if panel banks are not using LIBOR in their transactions, then how reliable is transaction-based data? Thus, by replacing LIBOR to an alternative rate governed by a central body that can be trusted, should be the feasible way for these reference rates to fully represent its functions. The new chapter for a replacement of LIBOR is near; SOFR, SONIA, ESTER, SARON and TONAR could be potential alternatives in which these rates are tougher to manipulate by bankers. It may take a lot of work to implement such changes, but with dedication to improve on the system, the transition would be possible and without a doubt benefit all agents in the financial sector. Consequently, from the research conducted, reforms of the LIBOR are ineffective and policy makers should focus on implementing new reference rates that will protect the financial system from prodigals and projectors. As Andrew Bailey stated, “The discontinuation of LIBOR is not a possibility- it is a certainty”. I look forward to the implementation of “The Waterfall Methodology” by IBA and the transition from LIBOR to a more vigorous alternative rate in the upcoming years.

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