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Rise and Fall of London Interbank Offered Rate (LIBOR)

A Transition in Global Financial System

Praveen Menon



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Vivekananda International Foundation
3, San Martin Marg | Chanakyapuri | New Delhi - 110021
Tel: 011-24121764 | Fax: 011-66173415

E-mail: info@vifindia.org

Website: www.vifindia.org

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Praveen Menon worked with Office of Advisor to Chief Minister of Maharashtra in 2018-19 and is also a published columnist in several publications/portals like Entrepreneur & People Matters.

Praveen Menon left his Corporate Job in Finance after being handpicked to join the team of Advisor to Chief Minister. In 2019 Lok Sabha elections and Maharashtra Vidhan Sabha elections, he led Prachar Prasiddhi Team and EC approval team on behalf of BJP Maharashtra.

In mid-2023, Praveen Menon resumed his role at State Headquarters of BJP Maharashtra in a Research role. Since 2020, he has also been occasionally contributing to Vivekananda International Foundation (VIF), a New Delhi based Think-Tank.

Rise and Fall of London Interbank Offered Rate (LIBOR)

A Transition in Global Financial System

“Perfect numbers like perfect men are very rare”

wrote French philosopher Rene Descartes¹

Man’s fascination for numbers is as old as mankind itself. When the earliest humans settled together as tribal societies, a man with a sense for numeric alone could successfully calculate strength of rival tribes. The relative numbers in battlefield determinants of which tribe survived and who got annihilated. As civilization advanced, structured number system developed along with greater application of arithmetic’s and geometry. Usage of numbers and shapes moved beyond calculating the odds of battle-victory. Ambitious construction projects by various kingdoms necessitated immaculate understanding of numbers. Archimedes, the Greek mathematician in 3rd century BCE devised the key constant π – the ratio of circumference of circle to the diameter.² The importance of numbers grew with every onward leap of human civilization and continues to this day. It is not just humans but Gods themselves who have keen instincts for numbers. The golden ratio, also known as divine proportion, is a commonly found ratio in nature right from flower petals, shells to even human body. Among many important numbers which aid discovery, pique curiosity and impact the modern day man, the London Interbank Offered Rate (LIBOR) is the most prominent one in the global economy.

The LIBOR is the reference rate at which largest banks in the world indicate the interest rate at which they can borrow short-term wholesale funds from one another

on an unsecured basis in the interbank market. Jerome Powell, the chairman of the Federal Reserve System Boards of Governors once aptly described LIBOR as “part of the global financial system’s critical infrastructure”.³ In 2014, LIBOR was referenced in roughly \$300 trillion worth of contracts globally.⁴ In mid-2018 even after the impending sunset of LIBOR on the backdrop of rigging scandals, about \$400 trillion worth of contracts referenced LIBOR in one of the major currencies.⁵ Over the past half-a-century, LIBOR was the critical number which had an all-pervading impact on the financial system. Historically, the two most widely used reference rates for financial contracts have been the prime rate and LIBOR. When the prime rate was the reference rate, the Wall Street Journal published it daily. Over time, LIBOR eclipsed prime rate and became the most prominent number. Its peak as benchmark coincided with increased globalization due to liberalization in emerging economies like China and India. LIBOR sustained through the advent of internet era when capital markets adopted modern technology for trading in financial instruments. Benchmarks are important as it can increase social surplus by improving financial markets through reducing opacity and reducing information asymmetries, which increases investor participation. ⁶ LIBOR as a benchmark became super-important and earned its nick name “the most important number in the world.”

The LIBOR era ended on Jan 1, 2022 (with minor exceptions being certain US dollar settings which ended on June 30, 2023). The benchmark often dubbed “the world’s most important number” walked into sunset after decades of being the rate underpinning trillions of dollars of financial products. Starting January 2022, the Intercontinental Exchange (ICE) Benchmark Administration Limited (IBA) which previously published LIBOR at 11.30 am GMT (6.30 AM EST) each day was publishing rates using the “synthetic methodology”.⁷ The Post LIBOR era is here and new numbers have slid in to fill the void which LIBOR created.

How did LIBOR originate and go on to wield enormous economic clout in the modern global economy? How and when did it falter and start losing credibility? How did LIBOR evolve from *the world’s most important number* to *the world’s*

most important headache ultimately leading to discontinuation and search for new benchmark?⁸ How is LIBOR getting replaced and which number is taking its dominant position in the financial framework of the world? This paper is a brief overview of the origins, rise and fall of LIBOR after getting embroiled in the manipulation scandal leading to its discontinuation in 2022.

The Half-a-century of LIBOR

The origin of LIBOR is credited to a Greek banker named Minos Zombanakis who in 1969 arranged an \$80 million syndicated loan from Manufacturer's Hanover to the Shah of Iran based on reported funding costs of a set of referenced banks.⁹ The question of charging a sovereign ruler was tricky one. That's how the Greek banker zeroed in on the rate which other credible borrowers namely London Banks would pay to borrow from one another.¹⁰ LIBOR emerged as a reference rate to support the burgeoning syndicated loan market. In the beginning, a loose coalition would ask financial institutions for their borrowing costs. The average rate of those estimates was used for lending and the incentive to manipulate it was little. Over time, LIBOR acquired critical role in the financial system by ensuring contractual stability. Many contracts in the financial system were based on a premise of availability of LIBOR as a ubiquitous base number. The risk premium was the defined aspect while LIBOR was a floating market-determined constant which adjusted for current economic conditions. Thus, a typical contract would be "LIBOR + x" rate of interest where x stands for a specified premium over and above prevailing LIBOR rate. LIBOR was the floating component which was considered a product of efficient price discovery and hence fair. As LIBOR was considered as representative of rates at which the world's largest and most financially sound institutions are able to obtain short term funds, it served as lower bound for borrowing rate of less creditworthy institutions and individuals.¹¹ For example, a loan contract may specify interest rate at "LIBOR plus x" where it is to be adjusted every six months with the six-month LIBOR rate prevailing at the time. The effective interest rate would thus automatically reflect changing economic conditions giving neither borrower nor lender an advantage.

LIBOR was also important for lending banks in hedging risks. For lending

activities that appear on balance sheet of banks, an interest-rate benchmark like LIBOR successfully factors the element of bank credit risk. If a commercial bank is lending to customers at long-term floating rate by funding it by borrowing in the short-term unsecured loan market, banks profitability is vulnerable to movements in both general interest rates and banks credit spread. Thus, a floating rate loan tied to riskless rate instrument like Government bonds factors in only part of the risk. If the credit spread for the industry as a whole widens in relation to riskless rate of return, the bank's net interest margin will suffer which will directly hit profits. By linking the loans to a rate like LIBOR, banks will be hedged with respect to market-wide components which can inflict its profitability. Thus banks naturally gravitated towards LIBOR.¹²

Once LIBOR was established as a benchmark, it became a potent force for related trades. There are two types of agglomeration effects which makes the benchmark increasingly important. The first type of agglomeration effect is owing to incentive of market-participants to reap the information-related-benefits of a benchmark. In essence, the LIBOR was assumed to be the rate which had all available economic information built-in to itself at any time. The market participants not just had a ready rate which included impact of current market conditions but also lowered search costs, fueled higher market participation, better matching efficiency and lower moral hazard in delegated execution.¹³ The second type of agglomeration is due to desire to lower trading costs associated with illiquidity. A high volume of trade in a financial instrument typically results in smaller bid-ask spread, lower execution delays and lower price impacts even for large trades. Once trading in a benchmark-related instrument is active, there is an incentive to substitute from less-actively traded instruments towards instruments that reference the benchmark.¹⁴

In 1986, the British Bankers Association (BBA) assumed control of the LIBOR rate taking responsibility for its publication. That year, LIBOR fixings were calculated for US Dollar, British Pound and Japanese Yen. The BBA collected inter-bank quote rates from a panel of banks reflecting rates at which they could borrow funds from other banks just prior to 11.00 am (London time). The widespread use of

LIBOR can be attributed to the fact that LIBOR was perceived as representing the rate at which the world's largest and most financially sound institutions are able to obtain funding. It served as a lower bound and rates of many financial products were expressed as "LIBOR + x" where x stands for the extra basis points (risk premium) charged to borrower for the extra risk incurred. Ever since the first interest rate swap was agreed between IBM and World Bank in 1981, the market for such contracts grew to over US\$300 trillion by 2011. For every currency, there is a panel of contributing banks. Over time, BBA was publishing LIBOR for 10 major currencies including widely circulated reserve currency US Dollar. The most important and preferred reserve currency was the US dollar and the most important number was thus LIBOR.¹⁵ LIBOR became the very fabric of international financial markets and a cornerstone of day-to-day business. Other financial centres like Hong Kong, Mumbai, Singapore and Tokyo had their own variants with rhyming names like HIBOR, MIBOR, SIBOR and TIBOR respectively. Their influence and acceptance was miniscule compared to the rates published out of London. In essence, Corporations and banks across the world which paid floating rate of interest based on LIBOR essentially paid higher rates when LIBOR rose and vice versa. London became the de facto power center influencing everything right from mortgages in Alabama to business loans in Manchester to derivatives in Mumbai.

The BBA's methodology for collating data to publish LIBOR wasn't always reflective of real economic conditions as has been assumed. The submissions made to BBA by the convened panel of financial institutions didn't need to be on readily identifiable data. The banks without sufficient information on borrowing costs could instead submit estimated rates based on "expert judgment". The question asked by BBA 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 11 am London time?"

BBA collated the rates submitted by panel banks to calculate the average. The banks submission was ranked after throwing out the highest and lowest twenty five percent of submissions. By thus negating extreme submissions at both ends,

LIBOR was a remarkably stable benchmark even in volatile market conditions. While the common perception was that LIBOR is actual rate that banks borrowed funds, it was in reality the perceived rate at which *bank could borrow*. It was a benchmark merely based on “perception of cost”.¹⁶

Despite its evident flaws, the positive feedback effects of informational transparency and liquidity led to larger attraction to the established benchmark. Once LIBOR-linked contracts became firmly established in the 1980s and offered a liquid market, dealers and derivatives exchanges had the incentive to introduce a wide range of LIBOR-based hedging instruments, including exchange-traded euro-dollar futures and options available from Chicago Mercantile Exchange Group, and over-the-counter derivatives including caps, floors, and swaptions (that is, an option to engage in a swap contract). The market participants’ preference for LIBOR linked financial instruments compounded over time to make it the dominant number in the international financial system. A Bank for International Settlements (BIS) working group noted that these rates were the first to be introduced and have evolved over time into the industry standard because of early adoption by market participants (BIS 2013).¹⁷ The availability of risk transfer in these related instruments further increased the magnetic qualities of LIBOR-based trading.¹⁸

As per the BIS 2013, reference rates based on unsecured interbank term lending and borrowing were the dominant types of reference rates used in the world. BIS found¹⁹ that:-

- More than 50 percent of all syndicated loans signed in 2011 were linked to either the LIBOR or the Euro Interbank Offered Rate (EURIBOR).
- A large portion of bonds in the world—to the tune of at least \$10 trillion—were referenced to one of these two rates.
- A significant share of mortgages and other retail loans were linked to them, and the use of these reference rates in derivatives markets was also widespread.

The LIBOR Scandal

Prior to 2007, LIBOR tended to move closely with other short-term interest rates such as Treasury yields and Overnight Index Swap (OIS) Rate.²⁰ A setback to credibility of LIBOR came at the height of subprime crisis in USA. The Wall Street Journal analysts in a much cited article compared changes in LIBOR rates with another measure namely bank's creditworthiness reflected in credit default swap rates and concluded that it didn't correlate with LIBOR (which it should).²¹ The collapse of financial institutions like Freddie Mac, Fannie Mae and bankruptcy filings of Lehmann Brothers led many to conclude that banks were reporting "significantly lower borrowing costs for LIBOR rate" than what market factors suggest. While credit rating agencies faced loss of credibility when triple-A rated bonds turned worthless in the financial meltdown, LIBOR contributing banks who determine the benchmark rates faced tough questions too because banks with highest exposures had highest incentives to push LIBOR in certain direction and seemed to be doing so.

In June 2012, LIBOR came under increasing public scrutiny over controversy over individual panel bank submissions at the height of crisis. Allegations of purposefully keeping borrowing costs low in order to project financial strength was made on banks. The Commodity Futures Trading Commission (CFTC) which probed the allegations concluded that several firms had acted in violation of Commodity Exchange Act's false reporting provision. Under pressure, Barclays which was at the center of the allegations saw CEO Robert Diamond resign on July 3, 2012. The firm paid a settlement of \$453.6 million to US and British financial authorities.²² The investigation unearthed in intricate details, the purposeful internal communication of senior management instructing "LIBOR submitters and their supervisor to lower LIBOR submissions, so that they were closer in range to submitted rates by other banks but not so high as to attract media attention". Banks like UBS, RBS and Rabo bank also paid settlements.²³

In an audit by Federal Housing Finance Agency (FHFA), it was estimated that Freddie Mac and Fannie Mae two large US housing agencies which failed in GFC

had lost US\$ 3 billion due to LIBOR manipulation. In March 2013, Freddie Mac sued a dozen banks and also the BBA for damages in respect of losses incurred as a result of unlawful conduct in manipulating LIBOR. The structural failures and conflict of interests inherent in the LIBOR computation combined with high stakes in manipulating had come to the fore. Following sweeping reforms to help restore trust ICE Benchmark Administration, a unit of Intercontinental Exchange has been running LIBOR after taking over from BBA Libor in February 2014.²⁴

The BBA which foresaw publication of LIBOR since 1986 was an unregulated private trade association who also lobbied on behalf of member banks.²⁵ The BBA was relatively small and dwarfed by the giant financial institutions who submitted the estimates as panel banks. The supervision or authentication of submitted numbers wasn't practical for BBA whose ability or scope of work didn't require ascertainment of accuracy. The BBA didn't ask for exact data on unsecured inter-bank lending. The question itself posed as a hypothetical question of what "could" be the rate than a collation of historical data of actual lending rate. As the height of the GFC in 2008, unsecured lending between banks had dried up. In the ensuing period which saw a banking giant like Lehmann Brothers collapse, banks increasingly lent money only after securing collaterals. As LIBOR reflected rates on hypothetical unsecured lending only, these secured lending and prevailing lack of confidence didn't reflect on LIBOR rates. Submitters from panel banks who previously relied on hard numbers while sending estimates were now fumbling in the dark. This led to submitters attempting to simply guess.²⁶

Another factor which compromised the integrity of LIBOR was competitive pressures from traders looking to gain an edge in the market. Unlike the traditional banking sector, most banks double up as investment banks which serve governments, corporations and other entities with Asset management services, advisory, trading etc. As most of these financial contracts had LIBOR as an underlying component, even slight changes in LIBOR can lead to gains or losses in their speculative trades. The investment banks therefore had monetary incentive in influencing the LIBOR so as to maximize their portfolio gains. Traders at investment banks worked together

with submitters in their own bank and other institutions to influence multiple submissions of LIBOR.

Tom Hayes, a trader working at one of the largest investments banks Switzerland's UBS gained notoriety and infamy during the investigations on LIBOR scandal. Hayes worked almost exclusively with financial contracts known as "interest-rate swaps" which generally involved two parties trading interest payment on loans which were based upon some form of LIBOR. The stakes of Hayes' trading decisions sometimes went into tens of millions of dollars of investments which meant even small swings in LIBOR could have high impact on his massive holdings. High stake traders like Hayes had built computer models to predict how much a one-basis-point change in LIBOR would affect their bottom line.²⁷ The incentive and ability to influence LIBOR was outsized and many traders clearly made efforts towards it thus eroding the LIBOR's credibility. Hayes argued in the trial that "his conduct wasn't dishonest but 'standard practice' among bankers, and encouraged by his bosses." He blew off the lid after being convicted of conspiracy to defraud by arguing that he "had been made a scapegoat for his managers and the banks themselves".²⁸

Brokers who earn commissions on each trade were at the mercy of big traders like Hayes on whether they would use their services or choose their competitors. A trader with massive portfolio can pressurize brokers to use their networks to ensure submitters estimate would lead to LIBOR rates which would translate favorably in their portfolio. Investigations on LIBOR revealed that systematic organized efforts were made. Collin Goodman a broker at global brokerage firm ICAP would send out a "run thru", a mass email predicting LIBOR rates. As many as thirteen of the sixteen panel bank submitters received this daily email and data shows many submitters would submit the same number for weeks. While traders like Hayes directly influenced LIBOR, Collin Goodman tried it indirectly. The fact that Goodman as a broker supposedly had a grasp of current market trends actually ended up influencing the market trends through LIBOR submitters.

Apart from traders and brokers, banks themselves at institutional level had incentives to intentionally submit biased numbers. During the GFC of 2007-09, all banks desired to appear creditworthy as concerns over creditworthiness would have raised their costs of funding or in extreme case even caused a bank run. When banks submit their estimated interbank rate, the rates of each bank were listed individually. Understating their borrowing costs in LIBOR submissions enabled banks to counter concerns of market regarding creditworthiness. Research reveals a persistent downward bias in LIBOR submissions compared to actual bank borrowing costs.²⁹

During the course of investigations over rate fixing during the peak of GFC, Barclays pointed out that its submission were often in top quartile of submissions which was therefore omitted for calculation of the mean. The system's design in which rates are provided by market participants who hold large positions in financial instruments indexed in LIBOR makes it inherently a conflict of interest. Net creditors benefit from higher fixing while net debtors benefit from lower rate.³⁰ Even with inherent conflict of interests, *Brousseau et al.* (2009) show that strong statistical relationships among various rates that existed prior to the Lehman collapse disappeared in the aftermath of the failure.

How much of it is attributable to intentional misrepresentation is difficult to calculate. However, the intention to mislead was uncovered by an investigation by CFTC where management directive read "Keep LIBOR submissions lower to protect Barclay's reputation". Investigation revealed the rationale and fears which led to such directive. The ousted CEO Bob Diamond of Barclays in his testimony to British MP's stated that he feared a possible nationalization of Barclays after talking to Bank of England deputy governor Paul Tucker. Diamond said Tucker had told him there were concerns among "senior figures within Whitehall" - Whitehall referring to the British government or, more specifically, its civil service - about Barclays' Libor rate, which was at the "top end." If Barclays looked weak enough to need a bailout like RBS, HBOS & Lloyds TSB, restrictions will follow. Barclays wanted to avoid the government bailout and corresponding restrictions.

If Barclays had the highest LIBOR, the conclusion follows that Barclays is facing funding crunch and hence in need of nationalization.³¹ Barclays instead resorted to misstatement by understating the LIBOR and the deception worked.

In 2019, a senior New York judge, Colleen McMahon noted after finding evidence of Bank of England involvement in manipulating Libor gave former Deutsche Bank traders Gavin Black and supervisor Matt Connolly light sentences of “home confinement”. Judge McMahon in her sentencing remarks concluded that “At certain times, such as during the height of the 2008 financial crisis, submissions were actually being manipulated at the request of the Bank of England.”³² While banks manipulated rates is proven beyond doubts as litigations still linger, fresh evidence emerged in 2022 when BBC uncovered leaked audio implicating Bank of England and government in pressurizing bank to rig rates.³³

There is however no unanimity on the extent to which this rigging affected the LIBOR rates. Some of the papers on the subject have revealed estimates of LIBOR manipulation³⁴ as under:-

Title	Author	Estimated manipulation at peak of crisis
How much did manipulation distort the LIBOR	Youle, 2014	-8 basis points
Modelling the lowballing of the LIBOR fixing	Poskitt and Dassanayake, 2015	-30 to -40 basis points
Motives and Consequences of LIBOR Misreporting: How much can we learn from banks self-reported borrowing rates	Bonaldi, 2017	-30 basis points
Credit Risk, Liquidity and Lies	King and Lewis 2019	-35 basis points

While the Barclays’ was the first one to be fined a record \$450 million for LIBOR rate rigging, Deutsche Bank’s fine of \$3.5 billion stands out as the biggest fine. Banks right from UBS, RBS, Societe Generale & JP Morgan finds itself with the dubious

distinction of being fine payers due to misstatement of LIBOR submissions.³⁵ Among the first traders to be jailed for allegations of rigging of LIBOR and Euribor, Colin Bermingham and Peter Johnson were whistleblowers themselves. In the trials of Bermingham, the judge and jury were played phone conversations where those convicted reported their concerns over abuse of Libor and Euribor, including calls made to senior officers at the US Treasury.³⁶ It established that trading in this way was the norm and common practice; it was well-known in most circles and traders faced pressures from senior figures in both the UK and US banking industries to adjust the rate. As the extent of the fraud emerged, more than one hundred traders or brokers were fired or suspended. A number of CEO's like Bob Diamond of Barclays and Piet Moerland of Rabo Bank were forced out.³⁷ The rot within the LIBOR setting mechanism can be numerically encapsulated in the table³⁸ of LIBOR fines big banks paid.

Libor fines

Deutsche Bank was fined a record \$2.5 billion for its role in a scam to manipulate the London Interbank Offered Rate (Libor)

	Fines	Regulators						
		FCA	DOJ	CFTC	NYDFS	EC	FINMA	DPP
Deutsche Bank (2013, '15)	\$3.5 bln	✓	✓	✓	✓	✓		
UBS (2012)	1.5	✓	✓	✓				✓
RBS (2013)	1.1	✓	✓	✓		✓		
Rabobank (2013)	1.0	✓	✓	✓				✓
Societe Generale (2013)	0.603					✓		
Barclays (2012)	0.453	✓	✓	✓				
Lloyds* (2014)	0.370	✓	✓	✓				
JPMorgan (2013)	0.108					✓		
ICAP (2013, 2015)	0.104	✓		✓		✓		
Citigroup (2013)	0.095					✓		
RP Martin (2013, 2014)	0.003	✓		✓		✓		

FCA: Financial Conduct Authority, DOJ: U.S. Department of Justice, CFTC: U.S. Commodity Futures Trading Commission, NYDFS: New York State Department of Financial Services, EC: European Commission, FINMA: Swiss Financial Market Supervisory Authority, DPP: Dutch Public Prosecutor.

Source: Reuters *Part of the Lloyds' fine related to attempted manipulation so-called "repo" rates

Choosing Successor to LIBOR

As LIBOR lost credibility embroiled in the scandal, the International Organization of Securities Commissions (IOSCO) in 2013 proposed a set of principles that reference rates should satisfy. Separately, the Financial Stability Board (FSB) in 2014 considered two reform approaches- the first focused on strengthening existing rates including LIBOR while second aimed at developing alternative reference rate. For the second purpose FSB (2014) was considering near risk-free reference rate as market participants had expressed an interest in using reference rates not containing a credit risk component.³⁹

New York became the center of action in identifying the risk-free alternative reference rates to enable its publishing and adoption as a replacement to LIBOR. The Alternative Reference Rates Committee (ARCC) was convened in 2014 by a group of private-market participants including the Federal Reserve Board and Federal Reserve Bank of New York.⁴⁰ The primary purpose of the ARCC was to “to identify best practices for alternative reference rates, identify best practices for contract robustness, develop an adoption plan, and create an implementation plan with metrics of success and a timeline.”

The ARCC describes reference rates as benchmarks for financial contracts and products. The following criteria of reference rates are provided in the 2016⁴¹ and 2018⁴² interim reports of the ARCC:-

- *Benchmark Quality*- The degree to which the benchmark design ensured the integrity and continuity of the rate. The underlying market was evaluated according to its:
 - Liquidity
 - Transaction Volume
 - Resilience through periods of Illiquidity

- Resilience through changes in regulatory approach
- Potential that the benchmark may constrain or be adversely affected by changes in monetary policy framework

- *Methodological Quality* The degree to which the benchmark construction could satisfy the IOSCO Principles for soundness and robustness. Rates were also evaluated according to:
 - Standardized terms for data inclusion
 - Transparency of data
 - Availability of historical data

- *Accountability* Evidence of a process that ensures compliance with the IOSCO Principles

- *Governance* Evidence of governance structures that promote the integrity of the benchmark

- *Ease of Interpretation* Assessed ease of transitioning to the rate, including:
 - Anticipated demand for and relevance to hedging/trading
 - Existence of or potential for a term market in the underlying rate”

The first interim report of the ARRC generally discusses the suitability of some of the important existing money market rates (e.g., effective federal funds rate, treasury securities rates, OIS rates etc.) against their criteria of a reference rates. However, they concluded that none of the existing alternatives fulfills all of their criteria. Hence, they proposed two new overnight rates that have the potential of fulfilling the criteria in their first interim report. The two proposed rates are a new overnight-unsecured lending rate (OBFR) and an overnight-secured lending rate (SOFR). Later, in June 2017, ARRC identified the secured overnight funding rate (SOFR) as

their preferred alternative reference rate. The rate was chosen after getting feedback from both the market participants and the official sector. The regulators provide the following statement to support their recommendation: “Using the Treasury repo rate resolves the central problem with LIBOR, because it will be based on actual market transactions currently reflecting roughly \$800 billion in daily activity. That will make it far more robust than LIBOR”- Jerome Powell and Christopher Giancarlo.

As trading volumes in the unsecured segment of interbank money markets didn't recover, it was considered expedite to discontinue the LIBOR which remained merely an estimate devoid of high trading volumes. Libor's regulator, the Financial Conduct Authority (FCA), announced in July 2017 that it would no longer require banks to provide the underlying data needed to calculate Libor after the end of 2021.⁴³ In 2018, the ARCC committee was reconstituted in New York for successful implementation of the Paced Transition plan as LIBOR won't exist beyond 2021. The weaning away of the global financial markets from LIBOR to alternate rates had started.

The US Federal reserve proposed the Secured Overnight Funding Rate (SOFR) to replace LIBOR. Many other economies followed suit in developing their own replacement to LIBOR. The “Working Group on Sterling Risk-Free Rate” administered by the Bank of England started working on transitioning to the reformed Sterling Overnight Index Average (SONIA) which unlike the SOFR is an unsecured transaction-based rate. The “Cross Industry Committee on JPY Interest Rate Benchmarks” working under the Bank of Japan started moving towards Tokyo Overnight Average Rate (TONA) which is also an unsecured transaction-based rate. The “SIX Swiss Exchange” is managing the National Working Group on Swiss Franc Reference Rates (NWG) to transition towards the Swiss Average Rate Overnight (SARON) which like the SOFR is a secured rate but is based on transactions and binding quotes. The European Central Bank also convened a “Working Group on Euro RFR” to transition towards Euro Short-Term Rate (€STR) as a replacement to LIBOR. €STR is also a transaction based unsecured rate.⁴⁴

In the aftermath of LIBOR scandal, RBI constituted a committee in 2013 chaired

by P Vijaya Bhaskar, then executive director to recommend sturdy practices for financial benchmarks. The committee made several important recommendations including creating an independent structure, separate from Fixed Income Money Market & Derivatives Association (FIMMDA) and Foreign Exchange Dealers Association of India (FEDAI), the then benchmark administrators for the Indian Rupee interest rates and forex benchmarks respectively, for administration of the benchmarks.⁴⁵ This led to formation of Financial Benchmarks India Pvt Ltd (FBIL). As the transition towards new benchmark gained momentum after announcement of end of LIBOR, the Reserve Bank of India encouraged banks to cease using the Mumbai Interbank Forward Outright Rate (MIFOR) published by the Financial Benchmarks India Pvt Ltd (FBIL), which references the LIBOR.⁴⁶ The FBIL announced the benchmark rate for Overnight (MIBOR) daily, except Saturdays, Sundays, and local holidays. The benchmark rate was later calculated based on the actual call money transactions data obtained from the NDS-call platform of Clearing Corporation of India Ltd (CCIL). The rate is announced at 10.45 AM (IST) every day.⁴⁷ The benchmark rate for foreign currency external commercial borrowing (FCY ECBs) / trade credit (TC) which was previously pegged to 6-months LIBOR rate of different currencies or any other 6-month interbank interest rate applicable to the currency of borrowing was changed by the RBI to “any widely accepted interbank rate or the ARR of 6-month tenor, applicable to the currency of borrowing”. There was no change to the benchmark rate in case of Indian Rupees (INR) denominated ECB/TC which continued to be linked to the prevailing yield of the Government of India securities of corresponding maturity.⁴⁸ India transitioned to “accepted Alternative Reference Rates (ARRs)” which included rates like SOFR, SONIA etc. used in various international jurisdictions.

In 2020, the People’s Bank of China (PBOC) announced plans to replace LIBOR with depository-institutions repo rate, a key reference indicator for monetary policy management. Depository-institutions Repo Rate, or DR, is the weighted average interest rate of interest rate bond pledged repo transactions conducted among depository financial institutions, according to a white paper published in August. Since 2020, the daily trading base for DR, which covers 11 tenors, has exceeded 1.8

trillion Yuan accounting for 48 percent of the interbank repo market in China. The central bank also added that new DR “best reflects” the banking sectors level of liquidity and funding rates, enjoys relatively high market recognition and mostly resembles risk-free rates or new international benchmark interest rates.⁴⁹ Chinese banks were permitted to use SOFR.⁵⁰ The Macau branch of Bank of China took the first step when it issued Asia’s first public bond benchmarked against the secured overnight financing rate SOFR in October 2020.⁵¹ Hong Kong being an international open economy and world’s third largest US dollar forex trading centre has most debts and bank exposures denominated in foreign currencies particularly US dollars which are largely LIBOR-based.⁵² As per estimates from Hong Kong Monetary Authority(HKMA) on September 2020, about 30 per cent of banking systems assets and about 10 percent of liabilities were denominated in foreign currencies. The notional value of derivative contracts referencing LIBOR aggregates to HK\$31.6 trillion. More than 40 percent of LIBOR-linked assets and liabilities and about 60 percent of these derivatives contracts mature after 2021 and did not have adequate fallback provisions to transition to a post-LIBOR era.⁵³ The banks in Mainland China were no more prepared for LIBOR discontinuation. Notably, the bulk of overseas lending by China was in US dollars with maturity typically between 3 and 7 years and interest rates mostly between 1-2 per cent above LIBOR which also should transition to new rate.⁵⁴

The FCA in the UK had announced on March 5, 2021 that LIBOR will cease to be provided by any administrator or no longer be a representative rate. Accordingly, ICE Libor Data shows only a synthetic rate after Jan 1, 2022.⁵⁵ ICE Libor stopped publishing the LIBOR rates from 31 Dec 2021 and a LIBOR calculated using synthetic methodology rate for legacy contracts would also cease to exist. The post LIBOR era is already here with SOFR pre-eminently positioned to take its role. New York is thus replacing London in this influential sphere. The ARCC had recommended the use of SOFR easing the transition from London based rate to a New York based benchmark.⁵⁶ An estimated 80 per cent or more of the interdealer linear swaps risk was linked to SOFR in Oct 2021, a notable shift in a market that was previously almost entirely USD LIBOR-based.⁵⁷ While New York is

increasingly gaining traction as the new home to the influential benchmark rates, the legal framework to enable the transition is already in place.

In April 2021, New York State became the first state to adopt legislation addressing “legacy LIBOR” contracts maturing after termination of LIBOR which lacks effective fallback provisions.⁵⁸ In the run-up to the end, several Banks in USA had also underpinned their financial products with Bloomberg Short Term Bank Yield Index (BSBY).⁵⁹ However, regulators citing the same flaws in BSBY as in LIBOR have proposed SOFR as a “preferable alternative rate”. AMERIBOR published by American Financial Exchange is also gaining popularity. Whether it would be SOFR, AMERIBOR or BSBY or a slew of local reference rates which will dominate the global markets was difficult to accurately predict. The US Securities & Exchanges Commission (SEC) chair Gary Gensler in speeches remarked that BSBY had many of the same weaknesses and susceptibilities to manipulation as LIBOR.⁶⁰ Banks had a preference for other rates while regulators have been critical of rates like BSBY. In times of crisis, SOFR doesn’t offer the cushion they got from LIBOR to price the additional risk they take on.⁶¹

A study covering period between July 2007 and June 2009 showed that during the 2008 financial crisis, LIBOR allowed banks to receive additional interest of up to \$30 billion on loans of about \$2 trillion that they would not have received under SOFR.⁶² In a letter to the Federal Reserve and other regulators, a group of 10 banks had asked for the ability to use alternatives to SOFR. “We object ... to the use of SOFR as ‘the one alternative’ index,” they had said.⁶³ “A one-size-fits-all approach may not be the most appropriate.” Senator Pat Toomey (R-Pa.) expressed similar sentiments in a Congressional testimony.⁶⁴ Despite these apprehensions, SOFR still being the overwhelming choice of regulators emerged as a strong candidate most likely to play the role of LIBOR. However, the end of nearly all \$400 trillion worth of LIBOR financial products after 2021 is an epoch with no equal in history. The front-runner to replicate London in this epoch-making feat appears to be New York. The SOFR is calculated as a volume-weighted median of transaction-level tri-party repo data collected from the Bank of New York Mellon as well as GCF

repo- transaction data and data on bilateral Treasury repo transactions cleared through FICC's DVP service, which are obtained from the U.S. Department of the Treasury's Office of Financial Research (OFR). Each business day, the New York Fed publishes the SOFR on the New York Fed website at approximately 8:00 a.m. ET.⁶⁵

In 2017, the Financial Conduct Authority (FCA) had announced that market participants should have replaced LIBOR by an alternative rate by the end of 2021. LIBOR was phased out to enable an alternative rate which would be less vulnerable to manipulation being based on transactions-based determination of benchmark. As the wholesale bank funding markets aren't active enough in LIBOR, the Secured Overnight Financing Rate (SOFR) was the recommended alternative. Accordingly, SOFR had replaced majority of new financial contracts at the end of 2021.⁶⁶

SOFR is based on Treasury repo transactions and supported by liquid markets which has shown resilience in the financial crisis. SOFR differs from LIBOR as it is fundamentally an overnight rate which may not be suitable replacement for term LIBOR rates for cash products and derivative contracts. SOFR is based on secured borrowing cost while LIBOR was based on unsecured loans. LIBOR provided a hedge against lenders fluctuating floating costs while SOFR doesn't. LIBOR was based on estimates by panel banks who had inherent conflict of interests while SOFR is based on transactions.⁶⁷ Moreover, SOFR won't face the challenge which LIBOR faced when actual unsecured loans dried up at the height of crisis and panel banks had no option but to submit mere guess work as their LIBOR estimate. SOFR has to face certain challenges which LIBOR didn't. Guggenheim and Schrimpf (2020) argued that many end-users of contracts prefer a pre-determined rate, especially small-to-medium sized corporations and retail clients. A predetermined rate for their interest rate contracts gives cash flow management certainty which some corporations preferred over a market-based ARR. The switch to ARRs like SOFR will increase cost of borrowing due to the uncertainty added to the ultimate rate paid. Furthermore, most IT systems and hedging instruments used by corporations, financial institutions, and retail clients alike use the cash flow certainty of pre-

determined rates to determine funding costs, among other things. Due to the in-arrears calculation of most ARR, these legacy systems must be switched to systems more compatible with in-arrears calculation.⁶⁸

In Albanese, Iabichino, and Mammola (2021), practitioners at JP Morgan and Citigroup, noted that SOFR has opposite cyclicalities to banks' true funding costs. During crisis, the rates will go down because of the "flight to Treasury" even as financial markets becoming less liquid and banks' funding costs soar. The underlying treasuries that form the collateral in repo markets become much more valuable during crisis. This makes overnight lending in repo markets basically riskless, which means that, even though true funding costs soar during times of high risk in financial markets, overnight repo rates move in the opposite direction.⁶⁹

The transition from credit-sensitive reference like LIBOR to risk-free reference rate it was argued increases expected borrowing costs on revolving lines of credit. In the US, most commercial and industrial (C&I) lending takes the form of revolving lines of credit known as revolves or credit lines. For decades, like other U.S. C&I loans, credit lines were mostly indexed to the LIBOR rate. As of January 10, 2021, the twenty largest U.S. bank holding companies had around \$2 trillion of credit line commitments, of which approximately \$1.5 trillion were committed but remained undrawn. When borrowers draw on this remaining credit lines, banks need to source cash to meet the commitment. Credit line drawdowns are larger when funding markets are stressed; Instances being: Corporate lending increase by 20 percent at the beginning of the COVID pandemic in March 2020 and by about 6 percent following the failure of Lehmann Brothers in the GFC. In both periods, the increase in C&I lending was almost entirely caused by drawdowns of existing credit lines. LIBOR is considered a benchmark which protects bank shareholder interests due to higher correlation between line draws and bank funding costs.⁷⁰

A central problem to solve apart from rates being immune to attempted manipulation was ability of benchmark to correlate with the cost of funding. Whatever the replacement for LIBOR was, it was argued that a benchmark was required "that behaves not too differently from the rates at which banks raise funding"? LIBOR

was perceived as the benchmark which did that. As LIBOR was embroiled in scandal, a deeper analysis revealed that better options can be available for this purpose.

Wholesale unsecured borrowing made up only a small part of US banks liabilities and therefore small part of their cost of funding. Importantly, Banks cost of funding did not have a higher correlation with LIBOR compared to other rates like SOFR or the term Overnight Index Swap (OIS) rates.⁷¹ The results were consistent when examining both average correlations or volume-weighted correlations and remained the same even in crisis period.⁷² In the vast majority of cases, a compound average SOFR rate was found more correlated with funding costs than LIBOR was. Risk-free overnight rates were thus the chosen successor of LIBOR - a forward-looking term reference rate.

The Concluding Phase of Transition

2023 saw the culmination of the complete end of LIBOR (well, almost). The end which began in 2018—a year after the Federal Reserve Bank of New York—chaired Alternative Reference Rate Committee selected SOFR to replace dollar-denominated Libor rates. Throughout 2021, there was a push to adopt SOFR, including the US Commodity Futures Trading Commission’s “SOFR First” initiative in the derivatives market. The rest of the world was working on their alternatives while countries like India were adopting accepted Alternative rates into their operation primarily SOFR. The year 2021 ended with the ICE ceasing to publish Libor rates for the euro, Swiss franc, British pound and Japanese yen in the one-day, one-week, two-month, three-month, six-month, and 12-month tenors, as well as the one-week and two-month tenors for USD-denominated rates.⁷³ On July 2022, the Board of Governors of Federal Reserve System(Board) had published a “Proposed rule” inviting comments for rules governing legacy LIBOR contracts.⁷⁴ When the “Final Rule” to implement “Adjustable Interest Rate(LIBOR) Act” was adopted in 16 December, 2022, the LIBOR contracts was categorized as 1) contracts containing fallback provisions 2) contracts that do not contain fallback provisions 3)contracts that contain fallback provisions authorizing a determining person to

determine a benchmark replacement.⁷⁵ The implications for all three categories of legacy LIBOR contracts are provided for which will act as the legal framework enabling the smooth transition.⁷⁶

The Reserve Bank of India (RBI) had amended its guidelines on export credit in foreign currency and restructuring of derivative contracts to ensure a smooth transition from Libor to alternative interest rate. India's exposure to borrowings linked to the benchmark was estimated at about \$331 billion in January 2021.⁷⁷ The RBI had stated that authorized dealers were allowed to extend pre-shipment credit in foreign currency to exporters for financing the purchase, processing, manufacturing or packing of goods prior to shipment at Libor, Euro-Libor and Euribor related rates of interest. RBI included the other widely accepted alternative reference rate like SOFR, SONIA etc. and clarified that banks can now extend export credit using those rates. Secondly, the impending change in reference rate from LIBOR to alternative rate was considered a force majeure event which "will not be treated as restructuring".⁷⁸ The State Bank of India arguably the most important bank in the country listed out the probable LIBOR alternatives in its LIBOR Transition compendium⁷⁹ as follows:-

LIBOR Currencies	Proposed Replacement	Transaction Types
USD	Secured Overnight Funding Rate (SOFR)	Secured
GBP	Sterling Overnight Index Average (SONIA)	Unsecured
Euro	Euro Short-term rates (ESTR)	Unsecured
CHF	Swiss Average Rate Overnight (SARON)	Secured
JPY	Tokya Overnight Average Rate (TONAR)	Unsecured

Major Indian banks like State Bank of India and ICICI Bank had already started transitioning when it made the first interbank short-term money market deals with pricing linked to SOFR starting January 2021.⁸⁰ In October 2021, Axis Bank announced that it has become the first Indian private sector bank to arrange a term

SOFR linked trade financing deal⁸¹, joining a select group of banks and financial institutions globally who have executed similar transactions.⁸² The World Bank in September 2022 announced that it raised \$4.5 billion with 4-Year SOFR-linked and 7-Year fixed rate bonds.⁸³

As the world transitioned to the LIBOR-less era, companies were typically proposing a change in their loan agreement with lenders in order to adjust the price difference between SOFR and LIBOR. The adjustment adds basis points to the interest rate to make up for the fact that SOFR typically trades lower than LIBOR. While LIBOR carries an element of credit risk which gets at least partially offset by the higher rate, SOFR doesn't. The Alternative Reference Rates Committee, a group of financial firms handling the phaseout of LIBOR in the USA alongside the Federal Reserve Bank of New York, in 2021 recommended companies to use a spread of 11 basis points for one-month SOFR, 26 basis points for three-month and 42 basis points for six-month SOFR to ensure the new rates aligns with its predecessor rate.⁸⁴ As per a report by Nomura Holdings, 47 percent of U.S. leveraged loans that switched to SOFR in the fourth quarter of 2021 included a positive credit spread adjustment, up from 15 percent the previous quarter. The renegotiation of the interest rates is happening with borrowers aiming to reduce their interest burden and protect their profits while lenders are pushing back to protect their Net interest margins. The ARRC wants borrowers and lenders to “negotiate sooner rather than later to determine the appropriate spread” but won't comment on individual talks, according to Tom Wipf, chairman of the committee. Meanwhile LIBOR rate itself in January 2023 eclipsed the peak it reached in the aftermath of collapse of Lehmann Brothers in 2008. The surge was attributed to expectations of policy tightening on the part of Federal Reserve as the complete phase out date was barely few months away.⁸⁵

The task of converting legacy LIBOR loans to a new benchmark wasn't accomplished even though the deadline of 30th June 2023 was nearing.⁸⁶ As of December 31, 2022, about 21 percent of syndicated loan market had transitioned to SOFR, including 36 percent of credits trading at par or better with a weighted average rating of BB- and 22 percent of credits trading between \$95–\$100 at a

weighted average rating of B+.⁸⁷ Lower-rated loans have been lagging behind. The Financial Stability Board (FSB) had reiterated fears of “pile-up situation” of outstanding USD Libor exposure beyond June 2023.⁸⁸ Of this exposure, It was estimated that around 80 percent of the \$1.4 trillion US leverage loan market still needs to pivot to SOFR.⁸⁹ Barclays estimated that as on 24 January, 2023, about 78 per cent or \$1.09 trillion of US leveraged loans based on dollar volume remained tied to LIBOR.⁹⁰ Meanwhile, the regulator U.K. Financial Conduct Authority was considering requiring the LIBOR’s publisher, the ICE Benchmark Administration, to issue a synthetic version of U.S. Libor that companies could use for 15 months more, i.e. up to Sept. 30, 2024.⁹¹ Later, The FCA responded to the feedback on their consultation and announced on 3rd April 2023 that 1-, 3- and 6-month synthetic US dollar LIBOR settings will cease only on 30 September 2024. It also decided to permit the use of these synthetic US dollar LIBOR in all legacy contracts except cleared derivatives.⁹²

While SOFR was gaining traction in the run up to LIBOR discontinuation, the financial market wasn’t fully weaned away. The end of 2021 brought to close the first big phase of LIBOR cessation with 24 of the 35 LIBOR tenors ceasing. SOFR became the dominant index used for new transactions in trading and lending markets. In March, the notional value of SOFR swaps traded in the market was higher than that of LIBOR for the first time.⁹³ As per the exchange operator CME Group Inc, In December 2022, roughly \$3.14 trillion globally of futures and options contracts tied to SOFR traded each day, up from \$399.17 billion in the same month a year ago. In contrast, about \$877.35 billion in Libor-based derivatives were traded a day in December, down from \$2.91 trillion a year earlier.⁹⁴ It shows how LIBOR still persists and continues to linger even though declining due to regulatory push to replace it. In India, The Reserve Bank has expressed concern over lenders not fully complying with its advisory about robust “fallback clauses” in all financial contracts that reference Libor.⁹⁵ Some lenders are still continuing with LIBOR contracts showing how the credibility of the five decade old rate isn’t completely extinguished.

As LIBOR proves to be a deeply entrenched number in the financial system, calls for further extension or continuation of synthetic LIBOR was gaining credibility not just in India but across the globe.⁹⁶ However, as the month neared, regulators pushed ahead into Post-LIBOR era. On May 2023 the RBI asked banks and other regulated entities to take steps to ensure a complete transition away from the LIBOR from July 01, 2023.⁹⁷ In the case of international markets, it was commented even in June 2023 that about 8 per cent of remaining LIBOR loans have no fall-back language.⁹⁸ The Wall Street Journal in June 1, 2023 admitted that “LIBOR’s last users face challenges as the deadline for its demise nears.”. It also remarked that some US companies are still contemplating transition work and options for extending its use.⁹⁹

While regulators have already proven beyond doubt that “LIBOR was far from irreplaceable”, it’s apt time a brief obituary is written for the 50 year old important number. This paper is one such obituary by recounting the history of LIBOR, the rise and fall from grace.¹⁰⁰ The dubious scandal associated with LIBOR doesn’t seem to be going away even in its death. As one Bloomberg opinion piece headlined – “LIBOR’s demise means no more rigging, but less flexibility.”¹⁰¹ The New York Times was more hard-hitting when a published piece on 30th June read “It has been an arduous process to get the financial system to stop relying on the tarnished interest-rate benchmark.”¹⁰² Bank of America representative noted that the “herculean task” and considered it “remarkable that LIBOR will go out with more of a whimper than a bang. That was unthinkable years ago.”¹⁰³ A director at investment firm KKR was more charitable when he said “Rest in peace, LIBOR.”¹⁰⁴

Tom Hayes, the trader who was at the center of LIBOR scandal in an interview with the Serious Fraud Office in 2013 had said “I used to dream about LIBORS. They were my bread and butter, you know. That was the thing. They were the instrument that underlined everything that I traded.”¹⁰⁵ The obsession of the market with LIBOR isn’t dying easily as existence of synthetic LIBOR data proves. Rene Descartes rightly noted that Perfect numbers are rare. Numbers like LIBOR are proving rarer still. The “most important number” LIBOR retains a certain aura even

in synthetic form even if LIBOR receded to the background. The rise and fall of LIBOR is the biggest transition in global financial system. SOFR has ascended the throne and the new benchmark is the beginning of a new era.

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The Vivekananda International Foundation is an independent non-partisan institution that conducts research and analysis on domestic and international issues, and offers a platform for dialogue and conflict resolution. Some of India's leading practitioners from the fields of security, military, diplomacy, government, academia and media have come together to generate ideas and stimulate action on national security issues.

The defining feature of VIF lies in its provision of core institutional support which enables the organisation to be flexible in its approach and proactive in changing circumstances, with a long-term focus on India's strategic, developmental and civilisational interests. The VIF aims to channelise fresh insights and decades of experience harnessed from its faculty into fostering actionable ideas for the nation's stakeholders.

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VIVEKANANDA INTERNATIONAL FOUNDATION

3, San Martin Marg, Chanakyapuri, New Delhi – 110021

Phone: +91-11-24121764, 24106698

Email: info@vifindia.org,

Website: <https://www.vifindia.org>

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