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1. Introduction

The London Interbank Offered Rate (LIBOR) is considered to be the most important interest rate in finance upon which trillions in financial contracts are decided. The LIBOR rates are regarded as the primary benchmark for short-term interest rates with transactions that are estimated to be over $300 trillion in derivatives and other financial products (see BBC, 2012). The advent of the LIBOR can be traced back to 1986, when the British Bankers Association (BBA) released the first LIBOR rates (Monticini & Thornton, 2013, p. 1). At present, "LIBOR rates are calculated by Thomson Reuters for ten currencies with 15 maturities ranging from overnight to 12 months" (p. 1). What LIBOR "does is formally measure the cost of this inter-bank lending, setting out the average rate banks pay to borrow from one another" (Bischoff & McGagh, 2013, para. 5). The LIBOR rates are not based on transactions data, but rather are calculated from the responses of contributing banks to the following question: *"At what rate could you borrow funds, were you to do so by asking for and then accepting inter-bank offers in a reasonable market size just prior to 11am?"* (Monticini & Thornton, 2013, p. 1). In other words, how much would your fellow banker charge you to borrow cash from his or her bank? In order to set the rate, a panel of leading banks would submit their rates on a daily basis. The rates submitted are the rates upon which the banks will pay other banks to borrow money in the short term (usually three months). Once the rates are submitted, the lowest and highest quartiles are ignored. The remainder is then used to calculate the average interest rate, otherwise known as the LIBOR rate, and is published daily by the British Bankers Association (BBA) at noon.

Beginning in 2007, accusations began to surface that the banks were rigging the LIBOR rates (see *The Telegraph*, 2012). As the collapse of the global financial crisis (GFC) drew closer in 2007, liquidity concerns drew public scrutiny toward banks (BBC 2013, para. 8). In late 2007, "many banks stopped lending to each other over concerns about their financial health with some banks submitting much higher rates than others" (BBC, 2012, section 4). This prompted commentators to declare that the banks were in financial trouble (BBC, 2012, 2013). In 2008, a *Wall Street Journal* (WSJ) article reinforced these accusations by reporting a marked difference in the LIBOR and the WSJ's calculation of the average interest rates (see Mollenkamp, 2008). The entire LIBOR fraud came to light at the height of the GFC when, in 2008, a Barclays' employee queried by a New York Federal official explained that Barclays was underreporting its rates (BBC, 2013, para. 23). News of the scandal "left the financial markets reeling" and, once again, called into question the role of financial reporting in the banking industry (Bischoff & McGagh, 2013, para. 2). In the aftermath, regulators attempted to shed light on the fraud by noting that they were too "focused on containing the financial crisis to analyze information connected with the potential rate-rigging" (Scott, 2013, para. 3). Some banking officials even noted that "regulators approved the actions" (Protess & Scott, 2012, para. 12). Yet there is an unsolved question that regulators and banking officials did not address in their quest to seek answers to the fraud: Were the banks under financial strain when they underreported their LIBOR rates? To answer this question, I argue that the pressure to meet market expectations led the banks to experience financial strain (see Donegan & Ganon, 2008, p. 5). Financial strain created stressors, which, when interacted with other contextual factors, contributed to the LIBOR fraud (also see Agnew, Piquero, & Cullen, 2009; Lokanan, 2017).

In order to examine this position, the paper is anchored with Merton's (1938) strain theory from the criminology literature. Strain theory posits that individuals are pressured into

crime when they are prevented from achieving monetary success through legitimate means (Wang & Holtfreter, 2012, p. 154). In a similar manner, the LIBOR fraud is viewed as a category of white-collar crime whereby financial strain results from an organisation and industry-wide ethos that focuses on profit maximisation through illegitimate means (see Agnew et al., 2009, p. 35; Donegan & Ganon, 2008, pp. 4-6).[1] The fraud that this paper deals with is financial reporting fraud, which is unusual in that it does not directly involve theft of assets. It is a sub-set of fraud with unique characteristics. For example, often the individual fraudsters make no (or only small monetary) gain from the fraud, which mostly benefits organisational interests. In this regard, the fraudster is the banks and, as such, the individuals (CEOs, Directors, and Managers) will be used synonymously with organisation/bank throughout the manuscript. Two propositions are put forward in relation to financial strain and the fraud: (1) the crimes committed by the banks were because they were blocked from achieving their financial goals through legitimate channels; and (2) banks are more likely to be involved in criminal activities when they experience actual and perceived industry-wide threat of impending financial loss.

Examining the LIBOR fraud through strain theory shifts the discussion from the immediate causes (i.e., corporate greed and weak internal controls) to the more finite context in which the fraud occurred, how it was allowed to occur, as well as the institutionalised and seemingly innocuous practices that sustained it. It is hoped that, by charting this course, the paper will not only provide a more nuanced understanding of the LIBOR fraud, but also a glimpse into the more veiled and subterranean cluster of the international money market. Here, the paper mobilises evidence and deploys it to peer into the substratum of financial markets' operation and make sense of the scandal. In so doing, the paper answers calls for

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[1] There are few concepts that have been as hotly debated as to the meaning of the term "white-collar crime" (see Agnew et al., 2009, pp. 36-38). The purpose is not to join this debate, but to simply position the scandal within the category of white-collar crime and argue that Merton's strain theory can provide an explanation to the scandal, irrespective of the definition (p. 37).

research on firm-level characteristics and industry-level factors of crime causation (Donegan & Ganon, 2008; Dorminey, Fleming, Kranacher, & Riley, 2010; Lokanan, 2017). In this regard, the paper's contribution to the accounting and finance literature is an empirically defensible analysis of the application of strain theory to fraud. Understanding and preventing future frauds can best be accomplished by systematically situating the discourse within a broader theoretical framework. As such, it might be wise to look at strain theory to obtain insights on how to prevent the next banking scandal (also see Braithwaite, 2009, pp. 439-440).

2. The Factors that Contribute to the LIBOR Fraud

As the GFC of 2007 reached its nascent stage, the credit markets began to freeze up. Banks in particular began to feel the squeeze. Many of the major banks that were holding toxic financial products (e.g., mortgage-backed securities, collateralized debt obligations, and credit default swaps) related to the subprime crisis in the U.S., were already experiencing financial losses (The Economist, 2012). Some of the over-the-counter derivatives (such as credit default swaps) were exempted from regulation. The deregulation of derivatives basically turned the sub-prime mortgage crisis into an international financial crisis. As the U.S. sub-prime mortgages worsened, the LIBOR panel banks began to realize that they were holding worthless securities and tried very hard to hold on to their capital. Concerned about their liquidity position and creditworthiness, the LIBOR banks were no longer willing to take part in interbank lending (Ryder, 2017). Their reluctance to lend created a credit crunch.

These concerns drove some of the more powerful interbank lenders to scale back funding and demand higher returns (How & Skeie, 2014). The inability of banks "to access funding in interbank markets fuelled perceptions of loss in creditworthiness, fuelling a positive feedback loop that increased the credit risk component of LIBOR, ultimately driving spreads wider" (p. 6). This combination of counterparty credit and liquidity concerns drove

many banks to doctor their LIBOR rates downwards, in order to maintain the market perception of their strong liquidity position and credit quality (McConnell, 2013, p. 29). To appear financially sound, the banks considered it to their advantage to underreport their LIBOR rates. Quoting a low interest rate would make the banks appear stronger and thereby assure customers that they were in a healthy financial position and seen as credit worthy by fellow peers (Rayburn, 2013, p. 226). Furthermore, submitting lower rates "would deflect concerns" that the banks "had problems borrowing cash from the markets" (BBC, 2013, para. 9). It should also be noted that, "some of these submitters were even traders themselves, and skewed their LIBOR submissions to drive the profitability of their own money market and derivatives trading positions" (CTFC RBS, 2013). Evidently, one of the root causes of the scandal was that the traders stood to make a profit depending on how much they were able to fix the LIBOR rate each day.

2.1 Control environment

The lack of specific internal controls was one of the features cited for contributing to the LIBOR fraud. The banks did not have any adequate internal control systems and procedures in place for determining and supervising their LIBOR submissions and to ensure that the submissions from the traders reflected an honest assessment of the costs of borrowing unsecured funds in the interbank markets (McConnell, 2013). The control systems in place were either very porous or were simply non-existent. Barclays for example, lacked specific internal controls and procedures that would have enabled its' compliance team to discover the manipulation (CTFC Barclays, 2012). Similarly, RBS traders were able to manipulate their rates because RBS lacked adequate internal controls concerning its LIBOR submission processes (CFTC RBS, 2013). These were not isolated cases. The

investigation into the UBS' conduct noted that despite having a well-publicised Code of Business Conduct manual covering issues related to conflict-of-interest, neither UBS' management nor its compliance team properly recognized, much less addressed the control problems associated with the submission process (CFTC UBS, 2012).

Collusion with competitors to share information and manipulate the interest rates was another unique feature of the LIBOR fraud. The Financial Services Authority (FSA) (now the Financial Conduct Authority) in its notice of hearing, found evidence of more than 1,000 occasions of collusion between UBS and eleven brokers at six different brokerage firms. Their efforts were mainly aimed at fixing the Japanese yen LIBOR market (BBC, 2012). In the small world of financial markets, collusion is common and encourages illegal activities. Collusion occurs in several ways. In the UBS case, brokers were asked to tailor the "run-throughs" (i.e., their views about where LIBOR would be set based on their market knowledge, including information about transactions in the relevant cash markets) that were discussed with traders from other banks, who knew their position in the Yen interest rates (FSA, 2012). In other cases, traders would also "spoof" the market on behalf of UBS, to make false bids and offers on cash trades to create an "illusion that there was more demand on one side of the market than really existed, by advertising bogus requests, in order to influence the interest rates offered by the banks" (BBC, 2012).

The LIBOR scandal also raises questions on the role of the internal auditors who should have been alerted to the possibility of market manipulation from 2003, but did not appear to raise the rate submissions as "high risks" (McConnell, 2013, p. 88). Between January and May of 2009, UBS's Group Internal Audit ("GIA") conducted an audit of its short-term interest rate desk ("STIR"). At the time of the

audit, GIA was aware of the Terms of Reference governing LIBOR's contributors

(The Telegraph, 2013). Despite being aware of the guidelines,

> GIA's review was limited to a "walk through" exercise involving a review of the 2008 procedures and some of the weekly Exception Reports. At the conclusion of that review, GIA did not recommend any further steps or measures in connection with UBS's LIBOR submission process... (FSA, 2012).

At Barclays, the CFTC's enforcement order noted that the bank based its LIBOR submission on the requests of its swap traders, who were trying to influence the interbank offered rate and enhance the profitability of their own trades (BBC, 2012). To make matters worse, certain Barclays swap traders "coordinated with, and aided and abetted traders at certain other banks to influence the [LIBOR] submissions of multiple banks, including Barclays" (CFTC Barclays, 2012). Yet the banks' internal auditor either missed or turned a blind eye to conducts that were regular and pervasive among the banks. This is consistent with a more general trend towards weak internal controls in which the logics of rate submission was geared towards maximising value for the traders and the panel banks.

3. Theory and Literature Review

The extra pressure faced by organisations to maximise profit, and to appear credit-worthy to stakeholders, leads to an increase in financial strain. Financial strain, as it applies to organisations, can be of two types. The first type consists of financial strain that results from the blockage of organisational goals. The second type is the financial strain that can be a direct manifestation of the actual or perceived threat to meet organisational financial goals. The increase in financial strain creates stressors that can only be resolved through income-generating crimes designed to paint a rosy picture of the organisations' balance sheets (Rezaee, 2005; Lokanan, 2015; Morales, Gendron, & Guénin-Paracini, 2014). Together, these stressors increase the likelihood of organisational frauds (Erickson, Hanlon, &

Maydew, 2006; Johnson, Ryan, & Tian, 2009; Keane, 1993). It, therefore, makes intuitive sense to examine the relationship that financial performance has in the occurrence of fraud in an organisational context. To do this, the study draws on some of the key postulates of Merton's (1938) strain theory and applies them to fraud in the banking sector.

3.1. Strain that Results from Blockage of Organisational Goals: H1

In general, strain theory would predict that individuals and organisations will circumvent legislation when they have problems achieving their economic goals through legitimate channels (Agnew et al., 2009, p. 39). Merton (1938) was the first to argue that individuals who feel pressure or experience strain are more likely to be involved in criminality. According to Merton (1938), and later Agnew (1985, 1992), individuals experience strain when their efforts to attain material wealth are rendered unattainable because of blocked opportunities. As such, they feel deprived and revert to illegitimate means to acquire material success.[2] A similar level of reasoning can be applied to criminality at the organisational level (see Donegan & Ganon, 2008; Dorminey et al., 2010; Lokanan, 2015). When executives feel pressured because of poor financial performance, strain arises (Beasley, 1996; Erickson et al., 2006; Farber, 2005; Johnson et al., 2009). Financial strain, in turn, increases the possibility of executives circumventing regulation to maximise profits (Beasley, Carcello, Hermanson, & Lapides, 2000; Dechow, Sloan, & Sweeney, 1996). Prior research has found that executives who are faced with a discrepancy between meeting corporate financial targets and the legal means to achieve them will circumvent legislation to attain this outcome (Beneish, 1997; Dechow et al., 1996; Dechow, 1994; Keane, 1993). Consequently, the greater the decline in the financial performance of the company, the greater the strain

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[2] To clarify, not everyone who is deprived from achieving their goals will revert to illegitimate means. As a matter of fact, there are many individuals who are deprived from reaching their goals and aspirations and do not revert to illegitimate means. For detailed discussion on this issue, see Agnew et al. (2009) and Wang & Holtfreter (2012).

experienced, and, subsequently, the greater the strain to circumvent legislation and commit illegal acts (Keane, 1993, p. 295).

The paucity of research that has been assembled to date has produced findings that are compatible with this argument (Agnew et al., 2009, p. 39). Clinard and Yeager (1980, p. 129) found that financial performance is associated with corporate illegality. However, they were quick to point out that the "relationship between financial performance and corporate violation was, on the whole, only of moderate strength" (p. 129). Similarly, Simpson (2003) noted that, when companies experience profit–squeeze, managers resort to scandalous practices to alleviate the problems. Daly's (1989) work on convicted white-collar offenders found that they were motivated to commit the crimes because of financial loss and the need to provide for their families (pp. 787-789). Keane (1993) also found that in instances where companies were experiencing a decline in financial performance, the managers were more likely to be circumventing legislation in order to maximise profits (Cohen, Ding, Lesage, & Stolowy, 2010). In more recent research, Farber (2005) and Johnson et al. (2009) found that managers were more likely to commit fraud when their companies were blocked from achieving their profitability goals. Fraud occurs when companies "face negative shocks to operating performance" (Johnson et al., 2009, p.3). This study will attempt to examine the efficacy of these findings by examining the following hypothesis:

> *H1: Banks with poor financial performance will be more likely to commit fraud than banks that are performing well.*

3.2. Strain that Results from Actual or Perceived Threat to Organisational Goals: H2

Strain can also arise from the actual or perceived threat to the organisation's financial goals (Agnew et al., 2009, p. 42). Contemporaries such as Donegan and Ganon (2008) argued that financial strain is magnified in times of economic uncertainties and can effectively make

the organisation inherently criminogenic if there are perceived financial difficulties ahead (pp. 5-6). Contraction and other problems experienced by companies in cyclical economic downturns can, together, work as push factors that persuade organisations to reach their financial goals through criminogenic means (Dechow et al., 1996; Dorminey et al., 2010; Lokanan, 2014; Tuckman, 2017). Some companies might be experiencing financial stress that is industry-wide, and may circumvent legislation to appear healthier in the eyes of their peers (Beneish, 1997; Carcello and Nagy, 2004; Dechow, 1994).

A significant body of research has emerged on strain theory that results from the inability to meet organisational goals. Perhaps one of the first studies to look at this phenomenon was Staw and Szwajkowski (1975) who, in their study of trade complaints of *Fortune 500* companies, found that firms cited for trade violations were more likely to have poorer performances for the years preceding the complaints than firms that complied with the law (p. 348, 350). Baucus and Near (1991) also found that "firms were more likely—though not significantly more likely—to behave illegally" when they perceived their performance to be "moderate or very good" (p. 26). Case studies also confirmed that many companies turn to outright scandalous and unethical practices to top up their balance sheet when faced with imminent industry-wide threat to their financial forecasts (Brennan & McGrath, 2010; Knaap & Knaap, 2009). This concern will be assessed by testing the following hypothesis:

> *H2: Banks are more likely to engage in fraud when they experience a decrease*
> *in economic growth or actual or threatened monetary loss in the industry.*

3.3. Strain that Results from Organisational Complexity: H3

The study hypothesises that fraud will be more prevalent in banks that are characterised with a high degree of organisational complexity (Lokanan & Sharma, 2018; McNulty & Akhigbe, 2016). Previous studies highlighted that the governance structure of

large businesses requires strong independent boards (Baysinger & Butler, 1985; Gao & He 2018). Others argued that board independence is influenced by firm complexity (Boone, Field, Karpoff, & Raheja, 2007; Linck, Netter, & Yang, 2008). However, the extant studies that have been assembled to date have not considered the effects of these variables on fraud in banks. This is a significant oversight because strong corporate governance, corporate culture, and fraud are inversely related (Dermine, 2013; Rezaee, 2009). For example, previous research has shown that a low percentage of outside directors and CEO duality are positively related to fraud (Abbott, Park, & Parker, 2000; Beasley et al., 2000; Farber, 2005; Skousen et al., 2015). On this issue, Beasley (1996) found that the incidence of fraud decreases when there is an increase of outside members on corporate governance committee. Similarly, Dunn (2004) found that fraud is more likely to occur when power is concentrated in the hands of a few directors of the firm. The counter argument to this, however, is that strong corporate governance strategies may work to mitigate financial pressures, thus, weakening the effect of financial strain on corporate wrongdoing (Dermine, 2013; Jones, 2010; Wang & Holtfreter, 2012). In particular, Farber (2005), and later Skousen et al. (2015), argued that corporations with less complex governance strategies may mitigate risks and reduce potential financial strain when the goals of the corporation are not met. Thus, the study proposes to test the following hypothesis:

> H3: The effect of financial strain on fraud will be greater in banks
> characterised by a higher level of organisational complexity.

3.4. Financial Strain Perpetuated by a Criminogenic Culture: H4

Certain industries may influence criminogenic behaviour by promoting a culture of fraud and provide learning opportunities for corporations to operate and function within this culture (Cooper, Dacin, & Palmer, 2013; Lokanan, 2015; Schuchter & Levi, 2015; Sikka, 2010). Corporation in these industries may "learn the necessary values, motives,

rationalizations, and techniques favorable to particular kinds of crimes" (Clinard & Yeager, 2006, p. 61). Others noted that criminogenic behaviour often results from the diffusion of fraudulent practices that pervade the industry (Choo & Tan, 2007; Gullkvist & Jokipii, 2013; Jones, 2010; Lokanan, 2014; Palmer, 2012). The key question here is whether industries with a culture that normalises fraudulent conduct will intensify the relationship between financial strain and crime (see Erickson, Stone, & Weber, 2013; McNulty & Akhigbe, 2016). In this respect, corporations who are experiencing a decline in financial performance will be more likely to commit fraud if they are in an industry where it is normal to circumvent regulation to maximise financial performance (Cordis & Lambert, 2017; Hogan, Rezaee, Riley, & Velury, 2012; Rezaee, 2005; Schuchter & Levi, 2015). To address this concern, the following hypothesis is proposed:

> *H4: The effect of financial stain on fraud will be more pronounced in banks where illegality is more prevalent.*

It is evident from the forgoing literature review that fraud may not only result from the inability to satisfy economic goals, but also from the experience of industry-wide threats or economic problems. While these studies have looked at strain as it applies to corporate criminality, no study to date has applied strain theory to examine crimes in the financial service industry. In order "to attain greater certitude" and claim external validity, additional studies are needed to "replicate and verify" the financial strain/fraud relationship in other sectors (Hagan, 2007, p. 7). Such studies must have as their focal point theory testing that attempts to measure whether these entities were blocked from achieving their goals, and the perceived threat to goal blockage. The present study applies strain theory to one segment of the financial service industry: banking.

4. Methodology

4.1. Research Design

The study utilised a binomial logistical regression to test the relationship between financial strain and fraud. A binomial logistic regression technique is used to examine the relationship between the predictor variable, financial strain and the dependent variable, fraud. This is the preferred method because the predictor variable consists of both continuous and categorical variables, while fraud is coded as a dichotomous variable. The model employs a 5-year moving average performance level for both fraud and control banks from 2003 to 2008 (see Lokanan & Sharma, 2018; McNulty & Akhigbe, 2016).

4.2. Fraud and Control Banks

The study used all the sixteen banks (fraud banks) that make up the LIBOR and matched them with a control sample of non-fraud banks. The fraud banks are widely distributed, with some highly involved in commercial transactions, some in retail and others in merchant type services. In order to secure the closest match possible, one control bank was chosen (see Farber, 2005; Lokanan & Sharma, 2018; Skousen et al., 2015). For each fraud bank, I identified an industry and size-matched control firm that was not subject to any criminal proceedings during the years being studied. Matching was done based on the size and revenue of the banks and their four-digit – Standard Industrial Classification (SIC) - industry code (see Farber, 2005; Johnson et al., 2009; Lokanan & Sharma, 2018). A fraud bank cannot serve as another fraud bank's control, regardless of the year in which the fraud occurred (see Farber, 2005). In the final sample, the fraud banks were matched with the non-fraud banks within 30± percentage of their asset (size) and sales revenue (see also Farber 2005; Johnson et al. 2009).

In cases where a four-digit-SIC code could not be found within the 30± percentage range of revenue and asset, then a three-digit SIC code was used as a substitute (Johnson et al., 2009).[3] In some cases where the banks could not be matched base on their size, revenue or SIC code, the matching criteria were relaxed to include banks that were part of the interest rate submission and sold similar financial products (see Lokanan & Sharma, 2018). For the banks that fall in this category, matching was done based on a rate of within ± 2% in the year preceding the fraud detection (e.g., see Erickson et al., 2006; Farber, 2005; Johnson et al., 2009). For 67% of the pairs, match size was found within the 30% range of the fraud banks. The matching approach employed in the study allowed comparing the fraud banks' performance level and governance structure to that of a bank in the same category of approximately the same size and revenue level. This approach to matching allowed for the examination of paired difference in financial performance between fraud and non-fraud banks. The matched pair approach controls for unobservable factors that are similar across same-size banks and, as such, should be relatively insensitive to nonlinearities in relations to unobservable factors (Johnson et al., 2009).

4.3. Data Collection

The data for this study came from S&P Capital IQ (S&P Capital). The S&P Capital platform is a single source financial database that gives unrivalled insights into the performance of commercial entities. S&P Capital consist of real time intelligence data of public and private firms and banks. The data include financial information on company competitors, auditors, business relationships and corporate governance reports. The financial data came from all instances of company's filings, initial and subsequent filings and represent about 99% of the world's market capitalisations. S&P Capital consists of detailed information

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[3] This is an established approach to matching in the accounting and finance literature (see Dechow, Sloan, & Sweeney, 1996; Erickson et al., 2006; Farber, 2005).

on banks and companies' capital structure, financial statements and financial ratios. Moreover, company-level summary data included historical and current ratings from S&P Ratings Services and Moody's. S&P Capital IQ also has data such as bank size and industry type.

Financial performance and governance data were collected from 2005, when it first came to light that the traders were manipulating the LIBOR rates, to 2008, when the fraud was actually discovered. The weighted average financial performance data from 2005 to 2008 were computed for the financial ratios used in the model (see Lokanan & Sharma, 2018; McNulty & Akhigbe, 2016; Staw and Szwajkowski, 1975; Wang & Holtfreter, 2012).[4] The data for all the performance measures were computed separately for each year. Their weighted averages were then computed for the logistic regression analysis (see McNulty & Akhigbe, 2016).[5] To capture the efficiency of the banks, corporate governance proxies that may have an effect on the banks' illegal behaviour were also collected and added to the database. Merton (1938) noted that strain alone cannot lead to crime, unless there are opportunities available. In this regard, variables representing banks' audit practices were also collected and uploaded for further analysis (see also Lokanan & Sharma, 2018; McNulty & Akhigbe, 2016; Morales et al., 2014).

4.4. Independent Variables

4.4.1. Financial Strain

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[4] Using the weighted average of financial ratios is a common method to measure performance in the literature (see McNulty & Akhigbe, 2016; Staw & Szwajkowski, 1975; Wang & Holtfreter, 2012).

[5] McNulty and Akhigbe (2016) employed a similar approach in their study of legal expenses and operational risks in banks. They averaged the performance data from 2002 to 2006 then built a regression model to test the relationship between legal expenses and banks' financial performance.

Previous research has consistently used corporate financial performance measures as proxies to test strain theory in the context of organisational criminality (Baucus & Near, 1991; Keane, 1993; Staw & Szwajkowski, 1975; Wang & Holtfreter, 2012). Others have expanded the call for a broader set of measures that captures leverage and solvency proxies of corporate performance (Baucus & Near 1991; Lokanan, 2017; Wang & Holtfreter, 2012). In this study, financial strain is measured using return on asset (*ROA*), return on equity (*ROE*), and return on capital employed (*ROCE*) to measure banking stability (Staw & Szwajkowski, 1975; Wang & Holtfreter, 2012).

ROA is the overall measure of profitability of assets in terms of how much is earned on each dollar *invested* in the assets. The ROA shows how hard assets are working to generate revenue for the company. ROA is advocated as a much more useful measure of banks' financial performance because it takes into consideration the total return the banks made from all its assets and would give a better indicator of the bank overall performance (Gilbert & Wheelock, 2007). ROA = Profits/average total asset.

ROE measures how much a company generates with each dollar invested by shareholders. ROE is an internal performance measure of shareholders' value. It is by far the most efficient measure that banks use since: (i) it proposes a direct assessment of the financial return of a shareholder's investment; (ii) it is easily available for analysts, only relying upon public information; and (iii) it allows for comparison between different banks (European Central Bank, 2010, p. 8-9). ROE = Net income/average shareholders equity.

ROCE measures the overall profitability of shareholders' investment (i.e. from a shareholder's point of view). More specifically, the ROCE measures how much profit a company generates with every dollar of shareholders' investment. The ROCE is important for potential investors who may want to see how the company is using their money to generate net income. The ROCE also has implications for management. Investors want to see how

effectively management is using their investments to fund operations and generate profits. The ROCE = Operating profits/average common shareholders equity.

To measure the external strain experienced by the banks, total debt to total asset (*TOT_DEBT_TO_TOT_ASSET*), financial leverage (*FNCL_LVRG*), and the loan loss provision coverage ratio (*LOAN_LOSS*) will be used as proxies. Total debt to total asset measures the percentage of total assets provided by credit financing. This proxy indicates the bank's reliance on debt as it measures the proportion of total assets relative to total liabilities. The higher the percentage of debt financing, the more risky is the bank's operation. The *TOT_DEBT_TO_TOT_ASSET* = total liabilities/total asset. Financial leverage proxy shows how much the bank is financed by creditors, liabilities and debt. LEV as a proxy = total debt/total asset. Generally, banks are in the business of lending money to individuals and institutions. The loan loss provision is use as a proxy to examine how best banks can withstand future losses from creditors who are unable to pay back their loans. LOAN_LOSS = income before tax + loan loss provision / net charge-offs.

To measure growth in liquidity, net change in cash flow (*NET_CH_CF*) and the bank efficiency ratio (*EFFIC_RAT*) will be used as proxies (Dechow, Kothari, & Watts, 1998). These measures were chosen because they are the most common in the accounting and finance literature to measure strain and have been used extensively in empirical studies on corporate financial strain (see Baucus & Near 1991; Keane, 1993; Lokanan, 2017; Staw & Szwajkowski 1975; Wang & Holtfreter, 2012). The net change in cash flow (or net change in cash) is the increase or decrease in cash and cash equivalent in the banks' operating, investing, and financing activities. The net change in cash proxy shows the amount of cash coming in (inflows) and the amount of cash going out (outflows) to give a cash balance at the end of the period. *NET_CH_CF* = net change in operating activities + net change in investing activities + net change in financing activities. The bank efficiency ratio examines the banks'

ability to effectively use its assets to maximise profit and manage their liabilities. This ratio is use as a proxy to show how the banks were utilising their assets to generate revenues.

$EFFIC\_RAT$ = expenses − interest expense/revenue.

4.4.2 Size and Growth

Here it is anticipated that the banks will engage in fraud when they experience a decrease in growth or threatened loss of money. It is anticipated that because banks experienced a decline in growth, a perceived decline in profit would exert greater strain in fraud banks than non-fraud banks that are financially sound. As banks grow and increase in size, this creates more subset of activities and decentralisation in decision-making; this increase in activities and decentralisation creates more opportunities for fraud (Baucus & Near, 1991). These assertions need to be empirically investigated to determine whether increase in size leads to greater offending (see Lokanan & Sharma, 2018; Staw & Szwajkowski, 1975; Wang & Holtfreter, 2012). To measure for size and industry wide growth, total asset (*BS_TOT-ASSET*), asset growth rate, (*ASSET_GROWTH*), Tier 1 Capital (T_1_CAPITAL), and Tier 2 Capital (T_2_CAPITAL) were use as proxies.

Total asset is the amount of current and non-current asset owned by the banks. The total asset owned by the banks is a good indicator of a bank's prosperity. The value of the total asset is usually used to determine the economic power of the bank in the industry (Lokanan, 2018; McNulty & Akhigbe, 2016). Larger banks may create more opportunities to act illegally. Most notably, prior research employed amount of asset to measure size (Wang & Holtfreter, 2012). The asset growth rate indicates the stability of the bank (Watanabe, Xu, Yao, & Yu, 2013). A stable growth rate is obviously the desired outcome for banks. The

growth rate is a good indication of the changes in capital levels from one year to the next (James, 2014).

The Basel accord classified banks' capital as Tier 1 and Tier 2 Capital. Tier 1 Capital consists of core capital, while Tier 2 capital consists of supplementary capital. Tier 1 Capital consists of shareholders equity and retained earnings. Tier 2 Capital supplements Tier 1 Capital and includes reserves from revaluation, undisclosed reserves, hybrid financial instruments, subordinated debt and loan-loss reserves. Tier 1 and Tier 2 capital are measures of banks' financial stability and are reliable indicators to examine banks' ability to withstand unexpected losses (Kothari & Lester, 2012). To measure the banks' capital requirement and financial health in comparison to other banks in the industry, their Tier 1 (*T_1_CAPITAL*) and Tier 2 Capital (*T_2_CAPITAL*) was included in the model. Tier 1 and 2 Capital will also show the size of the banks in terms of capital in comparison to other financial institutions. These proxies reflect increased financial pressures that, when coupled with reduced legitimate opportunities, increase the likelihood of banks engaging in fraud (e.g., see Lokanan, 2017; Wang & Holtfreter, 2012).

4.4.3 Organisational Complexity

Organisational complexity was operationalised as structural factors that made it possible for the banks to become involved in the LIBOR fraud (e.g., see Lokanan & Sharma, 2018; Wang & Holtfreter, 2012). Rather than tighter regulation creating pressure for fraud, it may be that organisational complexity creates opportunities to act fraudulently (Baucus & Near, 1991).The proxies used to measure organisational complexity in the banks are: percent of outside directors, board members on the audit committee, whether the CEO is the Chair of the bank, whether the CEO is on other committees, number of branches, number of

employees, whether the banks were involved in securitisation, and the selling of commercial papers.

Ineffective monitoring by management of the board was measured using proxies representing the percentage of outside directors in the banks (*PERCT_OUT_DIR*) and the number of board members (i.e., those that are a part of management) who were on the banks' audit committee (BOD_AUD_COM). It is expected that the LIBOR banks will exhibit corporate governance best practice. In particular, it is expected that the LIBOR banks will ensure that they do not suffer from CEO duality (Jo & Harjoto, 2012) and contagion problems (Mardjono, 2005). Since the presence of these issues may contribute to fraudulent activities, the study controls for both by creating dummy variables, which equal 1 if the CEO was also the Chair of the bank (Duality) and 0 if the CEO was not the Chair (*DUAL-PROBLEM*). To measure the contagion problem, another dummy variable was created to equal 1 if the CEO was on any other corporate governance committee (risk, compensation, audit and regulatory oversight committees, etc.) and 0 otherwise (*CEO_COMM*).

Other proxies focus on measuring the structural complexities of banks (Bertay, Demirgüç-Kunt, & Huizinga, 2013). These measures mostly examine the returns of the banks in relation to their structural complexities (Demirgüç-Kunt, & Huizinga, 2010; Wheelock & Wilson, 2012). The number of branches (NO-BRANCHES) and the number of permanent full-time employees (FULL_TI_EMPLYEE) across multiple jurisdictions can lead to the fragmentation of information flow and presents formidable challenges to map the banks' business activities (Carmassi & Herring, 2016). Both these proxies were recorded as continuous variables with infinite number of possible values. Securitisation (SECURIT_ATION) and the selling of Commercial paper (COMM_PAPER) were other proxies used to measure organisational complexity. Banks involved in securitisation and the selling of commercial papers were seen to have a very complex operating structure (Arora et

al. 2011; Caballero & Krishnamurthy 2008). To measure the increased complexity from securitisation and the selling of commercial papers, dummy variables were created to equal 1 if the banks were involved in securitisation and the selling of commercial papers and 0 otherwise.

4.4.4 Criminogenic Culture

At the industry level, the cultural ethos provides learning opportunities for banks nested within the financial service industry (Lokanan, 2017; McNulty & Akhigbe, 2016; Wang & Holtfreter, 2012). Rules and procedures often lag behind the growth of a firm and provide managers the opportunity to behave illegally because there are no internal rules to proscribe behaviour (Baucus & Near, 1994). It is intuitive to think that banks were more involved in litigation cases after the GFC (2007 to 2012) than the previous five years (Lloyd, 2014). As the markets rebound from the 2000-2001 recession, banks have efficiently mobilized and allocated funds, lowered their costs of capital, and increased capital formation to stimulate financial performance (Levine, 2004). As the economic climate improved, banks implemented procedures to better monitor and managed risks, and consequently, have experienced less litigation as a result (Lloyd, 2014, p. 50). Concerned about their reputational damage, some banks developed stronger internal controls to detect violations of policies governing aggressive and risky behaviours (McNulty & Akhigbe, 2016). On the other hand, some banks may not have been prudent and failed to implement controls to detect risky behaviour. To capture the extent to which the banks violated regulations, a dummy variable (LEG_PROC) was created taking the value of 0 or 1 to indicate the absence or presence of legal proceedings (e.g., see Lokanan & Sharma, 2018; McNulty & Akhigbe, 2016).

Despite the legislative support for whistleblowing policies and procedures in banks, there is very little research on their prevalence. While many banks may have whistleblowing policies and procedures in place, some may choose not to for various reasons. Banks may

choose not to have whistleblowing policies in place because of potential reputational harm (e.g., see Dyck, Morse, & Zingales, 2010). As was seen in the recent Wells Fargo's case, the opening of fake accounts, when exposed, reflected negatively on Wells Fargo's brand. In some cases, reputational harm may also hurt banks' profitability in terms of lengthy litigations, and the subsequent compensation if the bank is found to be at fault. Criminal proceedings against senior officials of banks can further hurt the banks' image when the nature of the activities is exposed to the wider public. To measure the impact of whistleblowing (WHIS_BLOW_POL), a dummy variable was created taking the value of 0 or 1 to indicate the absence or presence of whistleblowing policies in the banks.

Prior research found that firms operating in certain industry tend to behave illegally (Bacus & Near, 1991; Gabbioneta, Greenwood, Mazzola, & Minoja, 2013; Lokanan, 2017). Certain industry culture may predispose managers to seek out illegal acts, which is rationalised to encourage fraudulent behaviour (Loebbecke, Eining, & Willingham, 1989; Lokanan, 2015; Stice, 1991). One way to examine the rationalisation of illegal conduct in a criminogenic culture is to examine the companies' audit rotation policies and opinion. To measure audit change, a dummy variable was created to equal 1 if there was a change of auditors in the two years prior to fraud and 0 if there was no change in auditors in the year in which the fraud occurred (*AUD_CHANGE*). To measure whether an unqualified audit opinion was given, another dummy variable was created to equal 1 if the auditors gave the banks an unqualified opinion and 0 if there was an unqualified opinion with additional language in the year the fraud was discovered (*UNEQUAL_OPIN*).

In more recent research, non-performing assets and non-performing loans were seen as tools in which borrowers collude with banking officials to exploit inefficiencies in controls to borrow funds from banks (Beatty & Liao, 2014; Bushman & Williams, 2012; Fonseca & Gonzalez, 2008; Lokanan & Sharma, 2018). The Punjab National Bank (PNB) is

the latest bank where non-performing assets and loans coupled with lax internal control and a culture of collusion led to one of the largest banking frauds in the Indian banking industry. In the PNB fraud, it was alleged that nepotism and a lending culture that favours the corporate elites were significant factors that contributed to the fraud (Shanker, 2018). Non-performing asset (NON_PER_ASSET) and non-performing loans (NON_PER_LOAN) were coded as continuous variables with infinite possible values.

4.4.5 Dependent Variable

The dependent variable is fraud. Fraud is operationalised as a dichotomous variable and takes the value of 1 for banks implicated in fraud and a value of 0 for the matched sample of banks that were not implicated in fraud. Fraud is operationalised as any criminogenic actions by the banks that are associated with the LIBOR fraud between 2005 and 2008. The study excludes criminal behaviour that has occurred before 2005 and is unrelated to the LIBOR fraud. The empirical model to test H1, H2, H3 and H4 is as follows:

Formula for H1:

Pr(Fraud) = f (ROA, ROE, ROCE, Total debt to total asset, Financial leverage, Loan loss provision, Net change in cash flow, Efficiency ratio, Net income)

Formula H2

Pr(Fraud) = f (Asset size, Asset growth, Tier 1 capital, Tier 2 capital)

Formula: H3

Pr(Fraud) = f (Percentage of outside directors, Board members on the audit committee, CEO Chair of bank, CEO on other committees, Number of branches, Number of employees, Securitisation, Commercial paper)

Formula H4

Pr(Fraud) = f (Violations- legal proceedings, Whistle blowing policy, Audit change, Unqualified audit opinion, Non-performing asset, Non-performing loans)

5. Results

Merton's (1938) strain theory is used as the foundation to examine whether banks experienced financial stress at the time of the LIBOR fraud. Two propositions are put forward in relation to financial strain and fraud:

(1) crimes are committed by banks because they are blocked from achieving their financial targets through legitimate means; and
(2) banks are more likely to be involved in criminal activities when they experience actual and perceived industry-wide threat of impending financial loss.

Based on these propositions, there are four hypotheses proposed:

H1: Banks with poor financial performance will be more likely to commit fraud than banks that are performing well

H2: Banks are more likely to engage in fraud when they experienced actual or threatened loss of money or threatened presentation of negatively valued stimuli related to economic problems in the industry.

H3: The effect of financial strain on fraud will be greater in banks characterised by a higher level of organisational complexity.

H4: The effect of financial stain on fraud will be more pronounced in banks where illegality is more prevalent.

There are 32 observations (16 fraud and 16 non-fraud banks) in the dataset with 26 rows the representing independent variables. The independent variables are identified in Appendix 1.

5.1 Descriptive Analysis

Table 1 contains the mean, standard deviation, lower quartile, median and upper quantile of both groups (accused of fraud and matched sample) for all variables. All the variables were winsorised. Winsorisation is one method, among others, of handling the problem of extreme values in the distribution of data to reduce spurious effects (Reifman & Keyton, 2010, p. 2). The last two columns in Table 1 contain the p-values of differences in the mean and median. Statistical significant differences in mean were detected in asset size, Tier 1 capital, and percentage of outside directors. These findings show that there are differences in the means between the group of fraud banks and non-fraud banks for these

variables. Statistical significant differences in the median were detected in financial leverage, asset size, Tier 1 capital and percentage of outside directors, which indicate that there is a difference in the median between the group of fraud banks and non-fraud banks for these variables. The analysis of both the mean and medium show that there are statistical differences in asset size, Tier 1 capital, and percentage of outside directors.

Differences in mean were tested by two sample t-tests and differences in median were tested by two sample Wilcoxon signed-rank tests. By selecting a p-value that is less than 0.05, the statistically significant differences between the group of fraudulent banks and non-fraudulent banks are on variable level for: asset size, Tier 1 capital and percentage of external directors. A closer look at Table 1 also shows that asset size is, on average, higher for fraudulent banks along with Tier 1 capital. These findings indicate that fraud banks are rather larger banks with better financial strength than banks without fraudulent activities (Lokanan & Sharma, 2018; McNulty & Akhigbe, 2016). Banks accused of fraud also have about 20 percent higher percentage of outside directors than the non-fraud banks. One reason for this outcome is that external directors that are appointed directly to the executive level and not succeeding in making their way up to senior levels in the LIBOR banks, do not necessarily have the financial acumen to understand financial governance and the internal bank processes concerning financial reporting (Bushman & Williams, 2012; Carmassi, & Herring, 2016; Wheelock & Wilson, 2012). As such, they may not be able to correctly identify fraudulent activities taking place in a bank (Bushman & Williams, 2012; Carmassi, & Herring, 2016; Wheelock & Wilson, 2012).

Insert Table 1 about Here

5.2 Logistic Regression Results

The next step in the analysis is to run the logistic regressions of the data. Logistic regression is used for categorical dependent variables and a binomial logistic regression can

be used when the dependent variable, in this case FRAUD, has only two possible outcomes (Hayes & Matthes, 2009). The R-square in a linear regression gives an idea of how good the model fits the data. As can be seen in Table 2, the pseudo R-square value (Cox & Snell) for the logistic regressions on each hypothesis can be interpreted to be a very good fit (values > .2 are generally considered a strong fit).

Insert Table 2 about Here

5.3 Results of tests for financial performance (H1)

Hypothesis 1, which states that banks experiencing financial strain are more likely to commit fraud than banks that are performing well, was rejected. As can be seen in Table 3, the results did not identify any impact between poor financial performance and fraudulent conduct by the LIBOR banks. A closer look at the results in Table 3 shows that H1 was rejected because all variables were statistically insignificant (no $Pr(>|z|)$ was lower than 0.05 or 0.1). The rejection of H1 is proof that the main driving force behind the manipulation of rates is not because the banks were in weak financial positions or because they wanted to present a rosier financial picture to their investors and other stakeholders. Rather, one possible explanation for the fraudulent activities may be that individual employees were trying to over perform in order to maximise their financial rewards or, alternatively, hide potential underachievement for not meeting their quotas (Lokanan, 2017).

Insert Table 3 about Here

5.4 Results of tests of threatened loss of money or negatively-valued stimuli (H2)

Hypothesis 2, which states that banks are more likely to engage in fraud when they experienced actual or threatened loss of money or negatively value stimuli related to economic problems is rejected. As can be seen in Table 4, the results did not identify an impact on the threatened loss of money nor poor negatively valued stimuli related to economic problems in the industry on fraudulent bank activities. All of the explanatory variables tested in the model on fraud were statistically insignificant (no Pr (> | z |) was lower than 0.05 or 0.1). As was mentioned earlier, even though for both fraud and non-fraud banks, Asset size and Tier 1 capital proved to be statistically significant in the descriptive analysis, neither were seen as statistically significant in fraud detection when entered into the logistic regression model. These results are further evidence that larger banks (as measured in terms of Asset value and own more Tier 1 capital) are more prone to engage in fraudulent activities. The pseudo R-square value (Cox and Snell) for this logistic regression is 0.229, which indicates a strong fit.

Insert Table 4 about Here

5.5 Results of tests for financial strain and higher level of organisational complexity (H3)

Hypothesis H3, which states that banks which are characterised by a higher level of organisational complexity and experiencing financial strain are more likely to engage in fraud, was accepted at the 90% confidence level. The results indicate that there was higher level of organisational complexity in fraudulent bank activities. As can be seen in Table 5, the statistical significant variables were percentage of outside directors, board members on the audit committee, and number of employees. The percentage of outside directors and number of employees have positive impact on fraud (i.e., the higher the number of outside directors and employees, the higher the probability of fraudulent activities in a bank).

The positive impact of the percentage of outside directors on fraud occurrence is inconsistent with the corporate governance literature. Previous research found that the higher the percentage of outside directors, the higher the quality of internal control mechanisms to combat fraudulent activities (Beasley et al., 2000; Dermine, 2013; Mardjono, 2005; McConnell, 2013; McNulty & Akhigbe, 2015). One plausible explanation for this outcome is that the higher occurrence of fraud in banks with a higher percentage of outside directors is down to the fact that outside directors may not fully understand the internal process flow in banks. Their lack of knowledge on the institutional apparatus of fraud risks is perhaps the reason why they cannot accurately identify red flags of fraud that are hidden by executives, accountants and informational technology experts, working in collusion to circumvent internal controls (Ashforth & Anand, 2003; Davis & Pesch, 2013; Lokanan, 2015; Power, 2013). Table 4 also shows that the higher the number of employees, the higher the probability of fraudulent activities in a bank (e.g., see Rae & Subramaniam, 2008).

On the other hand, there was negative impact of the number of board members on the audit committee and fraud (lower number of board members on the audit committee means higher probability of fraudulent activity in the bank). In the case of larger banks (both in terms of asset value and the number of employees), the lower the number of qualified individuals on the audit committee, the lower the probability to detect fraud in banks (see Lokanan & Sharma, 2018; Skousen, 2015). By having fewer and less qualified individuals (e.g., without an accounting and/or finance designation) on the audit committee, it makes it more difficult for those representing the banks to understand complex financial statements and the corresponding reporting process. Consequently, these individuals may not be in a position to detect red flags of fraud and may send the wrong message to employees that they are incapable to identify potential fraudulent conduct (Lokanan, 2014; Rezaee, 2005). The pseudo R-square value for this logistic regression is 0.570, which indicates a strong fit.

Insert Table 5 about Here

5.6 Results of tests for financial strain and the prevalence of illegal conduct (H4)

The hypothesis which states that the effect of corporation-level strain on fraud being more pronounced in industries where illegality is more prevalent is rejected. The results did not indicate an impact between corporation-level strain and fraudulent bank activities. As can be seen in Table 6, H4 was rejected because all variables were statistically insignificant (no Pr (> | z |) was less than 0.05 or 0.1). Contrary to the literature, the expectation that criminogenic behaviour will be more frequent in sectors where fraud is more common is not corroborated in this case (Baucus & Near, 1991; Lokanan & Sharma, 2019; Staw & Szwajkowski, 1975; Wang & Holtfreter, 2012). Sector amorality as an input variable has no statistical effect on one's individual morality and, therefore, neither more frequent changes of auditors nor whether or not there was an unqualified audit opinion would have statistical significance on fraudulent activities in banks. The pseudo R-square value for this logistic regression is 0.323, which indicates a strong fit.

Insert Table 6 about Here

6. Discussion and Conclusion

The present paper conjectures that the pressure on the LIBOR banks to meet market expectations led to financial strain. Financial strain created stressors that contributed to fraud in the banks. The focus on the direct and interactive effects of financial strain stems from calls for research to consider the opportunity structures (or the lack thereof) that encourages fraudulent behaviour (McConnell, 2013; McNulty & Akhigbe, 2016); calls to examine the contextual factors and criminogenic environment conducive to Fraud (Lokanan, 2017; Morales et al., 2014); and calls to assess the organisational complexity of entities involved in

Fraud (Ashforth & Anand, 2003; Anand, Ashforth, & Joshi, 2004; McNulty & Akhigbe, 2015). In answering these calls, the paper mobilised evidence and deployed it to peer into the substratum of financial markets operation to make sense of the LIBOR fraud.

Using data collected for both the LIBOR banks that were matched with a sample of data from non-fraud banks, the present paper tested four hypotheses. First, it was hypothesised that banks with poor financial performance are more likely to commit fraud than banks that are performing well (Hypothesis 1). Second, the paper tested the hypothesis that banks are more likely to engage in fraud when they experienced actual or threatened loss related to perceived economic problems in the industry (Hypothesis 2). Third, the paper hypothesised that the effect of financial strain on fraud will be greater in banks that are characterised by a higher level of organisational complexity (Hypothesis 3). Fourth, the paper hypothesised that the effects of financial strain on fraud are more pronounced in banks where illegality is more prevalent (Hypothesis 4).

Overall, the statistical analysis does provide some support for strain theory related to banks experiencing financial stress at the time of the LIBOR fraud. There is insufficient statistical evidence to support the first, second and fourth hypotheses that relate to poor financial performance, threatened loss of money or presentation of negatively-valued stimuli related to economic problems in industry, or industries where illegality is more prevalent. That said, there is sufficient statistical evidence to corroborate previous findings that fraud will be greater in banks characterised by a higher level of organisational complexity (Lokanan & Sharma, 2018; McNulty & Akhigbe, 2015). Before turning to the implications of the study, the findings of the third hypothesis warrant further discussion.

The statistical model related to the third hypothesis provides an adequate level of prediction using the variables of percentage of outside directors, board members on the audit committee and number of employees. The Percentage of Outside Directors (.077), the

number of Board Members on the Audit Committee (.077), and the number of employees (.086) all have a positive relationship to fraud. It may be that outside directors are more aware of industry-wide threats and having an informed and qualified audit committee (that is individuals with the necessary financial expertise) can help to mitigate fraudulent activities.

There are several implications that have emerged from the study. First, general strain theory holds some promise to explain fraud in banks. The variables that represent opportunity structures and organisational complexity, more generally, offer key insights into detecting and preventing frauds. Despite the prominence of strain theory as a framework to understand frauds in bank, several key propositions remain unexplored. Further analysis on banking culture may provide an alternative explanation of financial strain and its relations to fraud (Tuckman, 2017). Banks experiencing financial strain may very well engage in fraud, not because of declining financial performance, but because they possess banking cultures that are more conducive to criminogenic activities (see Cooper et al., 2013; Davis & Pesch, 2013; Erickson et al., 2013; Loebbecke et al., 1989; Lokanan, 2017). The underlying message here is that the conditions for the existence of the LIBOR fraud were not limited to the usual suspects of managerial greed, inappropriate incentives and pressure or financial strain exerted from profit motive (although these were no doubt proximate to the fraud). On the contrary, market manipulation was pervasive and involved a constellation of norms, motives and attitudes that were themselves an integral part in the daily operation of the international money markets (Lokanan, 2017; McConnell, 2013). These nodes of problematisation manifested themselves in toxic banking cultures that were incentivised by inadequate (and in some cases non-existent) control systems (McNulty & Akhigbe, 2015).

In adopting this analytical lens, it may be useful to look at cultural pressures that affect honesty and cheating in the banking industry. For example, how does a culture of dishonesty and watching your seniors and fellow co-workers acting dishonestly make one

susceptible to join the subculture and act dishonestly? (see Lokanan, 2017). The answer could

be the instinctive pressure one feels to confirm when working in subcultures that are already

criminogenic (Sutherland, 1947). When viewed through this lens, fraud should be conceived

of as influenced by organisational and environmental circumstances (Choo & Tan, 2007;

Lokanan 2015; Morales et al., 2014) and not just the individual propensity to offend

(Lokanan, 2017). Criminals are no different from non-criminals; both groups are subjected to

the same sociological influences, which lead them to interiorise differing understandings of

what is right and wrong. These circumstances are not 'opportunities' as much as

socialisation. In this regard, criminality is not so much the result of financial pressure, but,

rather, because of prior socialisation that influences criminogenic behaviour (Lokanan, 2017).

So, instead of seeing pressure as the product of unquenched desires, it could be that the

pressure to cheat is learned and influenced by primary intimate subcultures (Ashforth &

Anand, 2003; Palmer, 2012; Stice, 1991; Sutherland 1947). Within these subcultures,

managers and other bank personnel (traders, submitters, brokers, etc.) learn criminal

behaviour just like any other behaviour. Criminality becomes the output, and, like any other

behaviour, fraudulent conduct is learned from others in social settings (Donegan & Ganon,

2008, p. 6).

Some individuals, by their very nature, have an egoist mentality, are selfish, have no

principles, self-respect and are inclined to cheat others (Murphy & Dacin, 2011; Lokanan,

2014; Murphy, 2012). Among banking officials, there will be a small cohort with these

personality traits. It is this cohort that sees market manipulation as an avenue to amass

wealth, prestige, power and boost their egos (Brennan & Conroy, 2013; Dedoulis, 2006;

Erickson et al., 2013; Lokanan, 2015). These traits are what ignite and accelerate the

propensity of bankers to commit fraud. Strong will and imperious managers who emphasise

profit maximisation at all costs feed upon this moral deficit and acquaint themselves with

individuals who exhibit these traits (Cohen et al., 2010). Such behavioural traits are needed if the banks are to remain competitive. Consequently, many of the managers, traders and brokers who were implicated in the scandal may not be experiencing a non-shareable financial pressure to circumvent the law (Cooper et al., 2013; Lokanan, 2017; Morales et al., 2014), but they may have found themselves embedded in an environment that was already criminogenic and had to act in accordance with the norms of the subgroup within which they were embedded (Dedoulis, 2006, pp. 157-158; Donegan & Ganon, 2008, p.7).

6.1. Model Limitations and Suggestions for Further Research

The model employed in this paper suffers from three limitations. The first limitation concerns the matching of the fraud banks with non-fraud banks. Most of the banks involved in the LIBOR fraud were some of the largest banks worldwide. As such, it was not at all possible to match these banks base on size and revenue. To find a suitable match and to maintain power, these banks were matched with banks that were involved in interest rate submission, sold similar financial products and had similar operations (see Erickson et al., 2006; Farber, 2005; Johnson et al., 2009; Lokanan & Sharma, 2018).

The second limitation concerns variable selections. In pursuit of suitable measures, the paper developed variables meant to be proxies for financial strain. While some of these measures have been employed in previous studies (see Baucus & Near, 1991; Beneish, 1997; Skousen et al., 2015; Staw & Szwajkowsk, 1975; Wang & Holtfreter, 2012), they were never employed in the context of banking fraud. The present paper employed some of the same variables to measure financial strain and criminal roles within the organisational structure of banks. Even though most of the variables are found to be unimportant, this paper can pave the

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way for researchers to strive for and develop measures for unobservable variables, which can be expensive and logistically unattainable in empirical research.

The third limitation concerns the reliability of the accounting ratios and governance data used in the paper (Razaee & Riley, 2010). It must be remembered that ratio calculations are based on "financial statements and that the results of the financial analysis are dependent on the quality of those underlying statements" (McLaney & Atrill, 2002, pp. 232-233). That is, accounting data are often manipulated to present a favourable picture to users of financial information (Razaee, 2005). Subsequently, ratios will inherit the limitations of the financial statements that they are based upon (p. 223). As mentioned earlier, the LIBOR fraud occurred over a period of time. During that period, it became apparent that the banks' balance sheets did not show a true and fair view, were overly optimistic and did not properly provision against their asset values. The inadequacy of source data (i.e., from the income statement and balance sheet) can, therefore, increase the margin of error and severely impact the materiality of the financial reports (Chadwick, 2001; Lokanan, 2017). These limitations of source data must be taken into consideration when interpreting the findings.

It is evident that a certain process of association contributes to market manipulation and not just the mere association with criminogenic subcultures. However successful this endeavour has been, much still needs to be done to examine the relationship between the LIBOR fraud and banking subcultures. The next step is for researchers to collate reliable data in order to examine the process in which market manipulation is learned in the course of the perpetrators' occupation. Testable hypotheses can be developed to examine the causal connections between social learning and market manipulation. One potential area of research is to develop a test to show how the modalities of association with criminogenic and anti-criminogenic subcultures vary among criminal and law-abiding managers and bank personnel. Additional research may want to look at the intensity of association and examine

whether the inner circle of senior managers' involvement in criminal behaviour is associated with co-workers also having previously engaged in criminal behaviour. Such a hypothesis can fruitfully test the assertion of senior managers become white-collar criminals due to repeated contact with criminal activities and a lack of contact with non-criminal activities.

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Appendix 1: Independent Variables, their Acronyms, and Units Measurement

Independent Variables	Representation	Measurement
Return on asset	ROA	Continuous
Return on equity	ROE	Continuous
Return on Capital employed	ROCE	Continuous
Total debt to total asset	TO_DEBT_TO_TOT_ASSET	Continuous
Financial leverage	FNCL_LVRG	Continuous
Loan loss provision	LOAN_LOSS	Continuous
Net change in cash flow	NET_CH-CF	Continuous
Efficiency	EFFIC_RAT	Continuous
Net Income		
Asset Size		
Asset Growth	ASSET_GROWTH	Continuous
Tier 1 Capital	T_1_Capital	Continuous
Tier 2 Capital	T_2_Capital	Continuous
Percentage of outside directors	PER_OUT_DIR	Continuous
Number of Board members on the audit committee	BOD_AU_COM	Continuous
CEO chair of bank	DUAL_PROBLEM	1=CEO chair; 0=CEO not chair
CEO on other committees	CEO_COMM	1=CEO on other committee; 0=CEO not on other committee
Number of branches	NO_BRANCHES	Continuous
Number of employees	FULL_TI_EMPLYEE	Continuous
Securitisation	SECURIT_ATION	1 = securitised debt; 0 = no securitisation
Commercial Paper	COMM_PAPER	1 = commercial paper; 0 = no commercial paper
Violation - legal proceedings	LEG-PROC	1= involve in legal

		proceedings; o=not involved in legal proceedings
Whistleblowing policy	WHIS-BLOW-POL	1=have whistleblowing policies; 0= no whistleblowing policies
Audit change	AUD_CHANGE	1= Change of auditors; 0=no change of auditors
Unqualified audit opinion	UNQUAL_OPIN	1=Qualified opinion; 0=unqualified opinion
Non-performing asset	NON_PER_ASSET	Continuous
Non-performing loans	NON_PER_LOAN	Continuous

Table 1: Descriptive Statistics of Fraud and Non-Fraud Firms

Variable	Sample	Mean	Standard deviation	Lower Quantile	Median	Upper Quantile	Difference in mean (p-value)	Difference in median (p-value)
Return on Asset	Accused of fraud	0.72	0.43	0.48	0.67	0.83	0.88	0.35
	Matched sample	0.75	0.51	0.45	0.66	0.93		
Return on Equity	Accused of fraud	11.31	4.66	8.88	10.80	13.04	0.84	0.90
	Matched sample	10.96	5.47	10.18	11.29	13.30		
Return on Capital Employed	Accused of fraud	10.84	5.55	9.08	10.37	12.44	0.93	0.60
	Matched sample	11.00	6.03	10.10	11.41	13.62		
	Accused of fraud	35.92	11.07	31.83	36.51	39.25	0.36	0.56
Total debt to total asset	Matched sample	42.97	24.76	23.00	37.70	56.42		
Financial leverage	Accused of fraud	27.63	12.44	20.39	23.84	32.69	0.06	0.03
	Matched sample	21.23	11.25	10.50	21.81	27.97		*
Loan loss provision	Accused of fraud	75.91	79.31	39.10	51.00	68.44	0.97	0.80
	Matched sample	76.00	59.03	47.29	62.48	90.75		
	Accused of fraud	3653.27	5789.58	55.60	1428.55	5324.12	0.59	0.38
Net change in cash flow	Matched sample	2535.09	7385.84	267.10	523.47	4579.79		
Efficiency	Accused of fraud	49.11	23.62	44.85	51.04	63.18	0.62	0.60
	Matched sample	53.55	17.95	45.53	57.00	63.08		
Net income	Accused of fraud	10.06	14.17	8.40	12.50	14.37	0.23	0.46
	Matched sample	25.61	40.84	4.33	11.76	23.04		
Asset size	Accused of fraud	1420727.82	715834.57	978666.83	1319245.40	1731586.40	0.01	0.00
	Matched sample	757218.06	756860.42	228242.00	485354.50	1059394.85	**	**
Asset growth	Accused of fraud	16.97	10.50	12.23	13.81	18.32	0.76	0.86
	Matched sample	18.40	13.71	11.83	13.16	17.75		
Tier 1 capital	Accused of fraud	52666.89	39436.77	23682.05	27203.00	89393.83	0.03	0.02
	Matched sample	26309.29	34243.10	8922.00	16592.00	21680.55	*	*
Tier 2 capital	Accused of fraud	29047.72	29327.29	10559.13	12306.00	37470.00	0.08	0.11
	Matched sample	13893.19	17092.07	3400.75	8544.77	17522.50		
Percent of outside directors	Accused of fraud	81.04	15.99	67.34	78.78	100.00	0.03	0.04
	Matched sample	60.83	24.31	47.21	61.57	72.50	*	*
Board members on audit committee	Accused of fraud	2.81	2.48	0.75	2.00	5.00	0.14	0.17
	Matched sample	4.38	1.96	4.00	4.50	5.00		
CEO chair of bank	Accused of fraud	0.38	0.48	0.00	0.00	1.00	0.27	0.30
	Matched sample	0.19	0.39	0.00	0.00	0.00		
CEO on other committees	Accused of fraud	0.56	0.50	0.00	1.00	1.00	0.67	0.77
	Matched sample	0.50	0.50	0.00	0.50	1.00		
	Accused of fraud	3367.88	2594.94	1530.38	2600.00	3653.00	0.21	0.08
Number of branches	Matched sample	1906.35	2105.71	840.00	1448.00	1896.75		
	Accused of fraud	98295.56	84562.43	50558.41	59387.65	139202.75	0.06	0.05
Number of employees	Matched sample	46618.65	37651.89	18903.43	44013.07	52865.00		
Securitization	Accused of fraud	0.38	0.48	0.00	0.00	1.00	1.00	1.00
	Matched sample	0.38	0.48	0.00	0.00	1.00		
Commercial paper	Accused of fraud	0.56	0.50	0.00	1.00	1.00	0.50	0.53
	Matched sample	0.44	0.50	0.00	0.00	1.00		
	Accused of fraud	0.88	0.33	1.00	1.00	1.00	0.06	0.07
Violations- legal proceedings	Matched sample	0.56	0.50	0.00	1.00	1.00		
	Accused of fraud	0.38	0.48	0.00	0.00	1.00	0.50	0.53
Whistleblowing policy	Matched sample	0.25	0.43	0.00	0.00	0.25		
Audit change	Accused of fraud	0.88	0.33	1.00	1.00	1.00	0.43	0.48
	Matched sample	0.75	0.43	0.75	1.00	1.00		
	Accused of fraud	0.63	0.48	0.00	1.00	1.00	0.50	0.53
Unqualified audit opinion	Matched sample	0.50	0.50	0.00	0.50	1.00		
	Accused of fraud	9785.55	8035.39	4630.73	5951.50	14656.33	0.14	0.06
Non-performing asset	Matched sample	5836.05	7061.97	573.50	4104.47	7120.66		
	Accused of fraud	9464.79	8013.98	4335.07	5693.50	13252.81	0.32	0.30
Non-performing loans	Matched sample	7254.74	8032.13	561.25	4233.62	10072.25		

Table 2: Results of the Pseudo R-square Values

Hypothesis	pseudo R-square value (Cox and Snell)
H1	0.329
H2	0.229
H3	0.570
H4	0.323

Table 3: Logistic Regression Results for Hypothesis 1[6]

Variable	Coeff.	Std. Error	Z value	Pr(>|z|)	Sign.
Intercept	-0.27110	304.800	-0.089	0.929	
ROA	-0.18010	159.500	-0.113	0.910	
ROE	0.67740	0.65250	1.038	0.299	
ROCE	-0.62140	0.57870	-1.074	0.283	
Total debt to total asset	-0.03851	0.03458	-1.114	0.265	
Financial leverage	0.06689	0.05405	1.238	0.216	
Loan loss provision	0.00026	0.00696	0.038	0.970	
Net change in cash flow	0.00001	0.00006	0.171	0.864	
Efficiency ratio	-0.01215	0.02297	-0.529	0.597	
Net income	-0.04279	0.02679	-1.597	0.110	

Table 4: Logistic Regression Results for Hypothesis 2

Variable	Coeff.	Std. Error	Z value	Pr(>|z|)	Sign.
Intercept	-134.800	0.93440	-1.443	0.149	
Asset size	0.00000	0.00000	1.603	0.109	
Asset growth	-0.00864	0.03490	-0.248	0.804	
Tier 1 capital	0.00001	0.00002	0.618	0.536	
Tier 2 capital	-0.00001	0.00004	-0.207	0.836	

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[6] Generally, when the p-value (second column from right) is higher than 0.1, then there is no symbol in the last column. When the p-value is from 0.05 to 0.1, there is ".". When the p-value is from 0.001 to 0.01, then it is represented as "", and when the p-value is from 0 to 0.001, then it is represented with a "*". When the p-value is from 0.001 to 0.01, then it is represented by "**", and when the p-value is from 0 to 0.001 then it is represented by "***". In this case the small dot is when Pr (> | z |) was less than 0.1.

Table 5: Logistic Regression Results for Hypothesis 3

Variable	Coeff.	Std. Error	Z value	Pr(>|z|)	Sign.
Intercept	-1.304,000	788.100	-1.655	0.0980	.
Percent of outside directors	0.14910	0.08436	1.767	0.0772	.
Board members on the audit committee	-0.65890	0.37270	-1.768	0.0771	.
CEO chair of bank	-431.700	337,600	-1.279	0.2009	
CEO on other committees	-0.18520	181.900	-0.102	0.9189	
Number of branches	0.00002	0.00030	0.055	0.9560	
Number of employees	0.00006	0.00003	1.715	0.0863	.
Securitisation	0.96620	175.900	0.549	0.5828	
Commercial paper	274.100	168.300	1.629	0.1034	

Table 6: Logistic Regression Results for Hypothesis 4

Variable	Coeff.	Std. Error	Z value	Pr(>|z|)	Sign.
Intercept	-252.040	161.842	-1.557	0.119	
Violations- legal proceedings	111.488	109.055	1.022	0.307	
Whistleblowing policy	155.028	109.379	1.417	0.156	
Audit change	0.19616	130.284	0.151	0.880	
Unqualified audit opinion	0.72355	103.084	0.702	0.483	
Non-performing asset	0.00115	0.00095	1.215	0.224	
Non-performing loans	-0.00106	0.00095	-1.118	0.263	