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Contemporary Issues in International Banking: Regulatory Capture, Financial Contagion, and Excessive Risk-taking

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Ciclo: 28

Titolo della tesi: Contemporary Issues in International Banking: Regulatory Capture, Financial Contagion, and Excessive Risk-taking

Abstract:

The 2008 global financial crisis has reshaped the landscape of international banking. Subsequent to the widespread government bailout, series of regulatory reforms have taken place aimed to reduce risk-taking activities in the banking industry. Structural reforms are also introduced aiming at separating high-risk investment banking from low-risk retail banking and restricting bank exposure to hedge funds investments and private equity. The thrust of capital market reforms attempts to reshape bank behavior through transporting OTC derivatives onto exchanges, transforming post-trade execution of many financial instruments, and reassigning the roles of many bank and market operators. Almost concurrently, accounting standard setters have been addressing this issue through adjusting disclosure rules. Market discipline, functions through market-based incentive schemes, is another device affecting bank behavior. Literature on reputational penalties lends considerable support to this role. It is rather surprising that banks, subject to market discipline, prudential regulation and accounting regulation, still continuously expose new problems and pose great challenge to regulators. Recent series of market manipulation scandals involved the majority of systemically important banks suggest that the ethics of individuals to the entire sector is questionable. Meanwhile, our understanding of the interlinkages between the various parts of banking sector remains limited because research on banking industry has been hampered by the complexity of the concerned problems and the lack of integration between different perspectives. In light of these aforementioned major changes and regulatory innovations, abundant opportunities emerge for further research that addresses these issues. This dissertation aims to provide comprehensive and timely overview and discussion of key issues in international banking. It focuses on three key and challenging issues in banking regulation and consists of three chapters themed on regulatory capture, financial contagion, and excessive risk-taking, respectively. The departure point of this dissertation is the LIBOR scandal, which offers an ideal setting to understanding bank behavior and the underpinning of regulation through linking the present evidence to the historical account. Further, Chapter 2 empirically tests the capital market reaction to the LIBOR scandal and identifies reputational effect and contagion effect of bank misconduct, links such outcome of market discipline to the role of legal enforcement, and illuminates on the theme of the interplay of market and institutional setting and its impact on bank behavior. Lastly, Chapter 3 extends the enquiries into banks' derivatives usage and risk in relation to the increasingly discussed topic on the impact of interplay of accounting and capital regulation on bank behavior.

Abstract (Italiano):

La crisi finanziaria globale del 2008 ha modificato il panorama del sistema bancario internazionale. In seguito alla diffusione dei salvataggio di Stato, una serie di riforme normative hanno avuto luogo con lo scopo di ridurre le attività di assunzione dei rischi nel settore bancario. Le riforme strutturali che sono state introdotte mirano a separare gli alti rischi delle banche di investimento da quelli a più basso rischio delle banche retail e limitando l'esposizione della banca negli investimenti in fondi e private equity. La spinta delle riforme del mercato dei capitali tenta di ridisegnare il comportamento delle banche attraverso il funzionamento dei derivati OTC sugli scambi, cambiando l'esecuzione post-negoziazione di molti strumenti finanziari, e riassegnando i ruoli di molti operatori bancari e di mercato. In contemporanea, gli organismi di regolamentazione hanno affrontato il problema attraverso il cambiamento delle regole di disclosure. Inoltre sono stati introdotti piani di incentivazione basati sul funzionamento del mercato al fine di influenzare il comportamento delle banche. La letteratura in materia di sanzioni basata sulla reputazione presta notevole sostegno a questo ruolo. E 'piuttosto sorprendente come le banche, che sono soggette a disciplina di mercato, a regolamentazioni contabili e preventive, continuamente espongono nuovi problemi e pongono grande sfida per le autorità di regolamentazione. La recente serie di scandali riguardanti la manipolazione del mercato ha coinvolto la maggior parte delle banche di rilevanza sistemica e suggeriscono che l'etica degli operatori del settore è alquanto discutibile. Nel frattempo, la nostra comprensione di eventuali correlazioni tra le varie parti del settore bancario rimane limitata perché la ricerca sul settore bancario è stata ostacolata dalla complessità delle problematiche in questione e dalla mancanza di integrazione tra i diversi punti di vista. Alla luce dei cruciali cambiamenti sopra menzionati e delle nuove norme, emergono interessanti opportunità per ulteriori ricerche riguardanti questi temi. Questa tesi si propone di fornire una completa panoramica sulla discussione di questioni chiave nel settore bancario internazionale. La tesi si focalizza su tre questioni fondamentali della regolamentazione bancaria e si divide in tre capitoli riguardanti rispettivamente il tema della regolamentazione dei cattura della regolamentazione, il contagio finanziario, e l'eccessiva assunzione di rischi. Il punto di partenza della tesi è lo scandalo LIBOR, che offre uno scenario completo per capire il comportamento delle banche e della loro regolamentazione collegando le evidenze attuali a quelle storiche. Inoltre, il Capitolo 2 mostra empiricamente la reazione del mercato dei capitali allo scandalo LIBOR e individua l'effetto reputazionale e l'effetto del contagio della cattiva gestione delle banche, collegando il risultato alla disciplina di mercato e al ruolo di applicazione della legge, ed evidenzia il tema dell'interazione del mercato e delle istituzioni e del loro impatto sul comportamento delle banche. Infine, il capitolo 3 estende l'analisi all'utilizzo e al rischio dei derivati delle banche e al rischio riguardante al discusso tema dell'interazione dell'impatto della regolamentazione contabile sul comportamento delle banche.

Firma dello studente

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CONTEMPORARY ISSUES IN INTERNATIONAL BANKING: REGULATORY CAPTURE, FINANCIAL CONTAGION, AND EXCESSIVE RISK-TAKING

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In memory of Graham Dietz 1969 – 2014

Contents

ACKNOWLEDGEMENTS

PREFACE

The 2008 global financial crisis has reshaped the landscape of international banking. Subsequent to the widespread government bailout, series of regulatory reforms have taken place aimed to reduce risk-taking activities in the banking industry. The Dodd-Frank Wall Street Reform and Consumer Protection Act 2010 brought the most significant changes to financial regulation to reduce the probability of taxpayer bailouts of major US banks through curbing proprietary trading as well as other similarly volatile business areas. Similar actions have also taken place throughout the European Union. Comprehensive reforms of international capital adequacy embodied under Basel III also require financial institutions to hold more capital and higher level of liquidity to reduce the risk of system wide shocks, improve risk management and governance, and strengthen banks' transparency and disclosures. Systematically important banks and financial institutions are also subject to increased capital requirements and greater regulatory scrutiny. Structural reforms are also introduced aiming at separating high-risk investment banking from low-risk retail banking and restricting bank exposure to hedge funds investments and private equity. The thrust of capital market reforms attempts to reshape bank behavior through transporting OTC derivatives onto exchanges, transforming post-trade execution of many financial instruments, and reassigning the roles of many bank and market operators. Almost concurrently, accounting standard setters have been addressing this issue through adjusting disclosure rules. In the area of regulatory capital, the new IFRS 9 "Financial Instruments" that is expected to become effective on 1 January 2018 will shift from the existing incurred loss model to a more stringent expected loss model. Similar proposal has been under discussion by the US regulators and a timelier provisioning is proposed. Market discipline, functions through market-based incentive schemes, is another device affecting bank behavior. Literature on reputational penalties lends considerable support to this role.

It is rather surprising that banks, subject to market discipline, prudential regulation and accounting regulation, still continuously expose new problems and pose great challenge to regulators. As noted by O'Brien (2014), banking regulation has shifted from a rubric of "too big to fail" to "too big to regulate". Recent series of market manipulation scandals (e.g. the LIBOR scandal; the FOREX scandal) involved the majority of systemically important banks suggest that the ethics of individuals to the entire sector is questionable. Meanwhile, our understanding of the interlinkages between the various parts of banking sector remains limited because research on banking industry has been hampered by the complexity of the concerned problems and the lack of integration between different perspectives. As a prominent example, there are relatively fewer studies integrating accounting perspective to financial regulation in the empirical enquiry into banking industry, let alone fully deliberating the implications of the consequence of conflicts induced by differences existing in the two sets of rules and possible reconciliation between them. As a possible response under the present financial world where accounting standards and bank capital regulation tend to be increasingly commoditized, "Accounting for Banking" can be an emerging area that engages multidisciplinary exchange and informs existing and emerging debate on issues in international banking.

In light of these aforementioned major changes and regulatory innovations, abundant opportunities emerge for further research that addresses these issues. This dissertation aims to provide comprehensive and timely overview and discussion of key issues in international banking. It focuses on three key and challenging issues in banking regulation and consists of three chapters themed on regulatory capture, financial contagion, and excessive risk-taking, respectively. The departure point of this dissertation is the LIBOR scandal, which offers an ideal setting to understanding bank behavior and the underpinning of regulation through linking the present evidence to the historical account. In Chapter 1, it investigates underlying paradigm of banking

regulation particularly the extent to which the government bailout since August 2007 has created a problem of moral hazard. This endavour is believed to be essential in ascertaining the key principles that regulators may refer to in the redesign of the financial system. Further, Chapter 2 empirically tests the capital market reaction to the LIBOR scandal and identifies reputational effect and contagion effect of bank misconduct. Additionally, it links such outcome of market discipline to the role of legal enforcement and illuminates on the theme of the interplay of market and institutional setting and its impact on bank behavior. The key implication, aside from affirming the new concept of "reputational contagion", is that enforcement does matter in disciplining banks. Lastly, Chapter 3 extends the enquiries into banks' derivatives usage and risk in relation to the increasingly discussed topic on the impact of interplay of accounting and capital regulation on bank behavior. A key implication of findings in this chapter is that the ability of capital adequacy to discipline bank behavior is limited, as banks can use financial reporting discretion to circumvent capital adequacy requirements and assume additional risk. As a result, we call for new rules on derivatives and the reconciliation between accounting and prudential regulation, as the widely applied capital adequacy regulation appears to be insufficient in addressing the issue of risk.

In other words, Chapter 1 serves as a bridge that links the historical narration and to the present evidence on financial regulation. Chapter 2 and Chapter 3 from different perspectives provide rich empirical evidence on the events described and theoretically interpreted in Chapter 1 to further validate the argumentations and conclusions drawn. Nevertheless, all of these point to one end: the regulation: both external and internal. "External" as in the market environment (consists of multiple dimensions including legal, societal, technological, and cultural) within which the financial market operations are carried out. "Internal" as in the human components and the consequences of human behaviour in the process of the operations, expressed as regulatory capture, market manipulation, and excessive risk taking in this work.

UNDERSTANDING THE LIBOR SCANDAL: THE HISTORICAL, THE ETHICAL, AND THE TECHNOLOGICAL

Abstract

Given the inadequacies in our present state of knowledge of banking regulation, we develop a theoretical model of banking regulation, which concerns three key areas: regulatory capture, speculative behavior empowered by technology in banking, and financial system design that are derived from the overlapping between three clusters: structural nature, technological nature, and human nature. Through applying this model to the evidence from the 2012 LIBOR scandal and parallel financial scandals, we advance a theory of banking regulation: regulation should limit the speculative nature of human beings, recognize the capitalistic and interest-calculating nature of financial industry and the structural constraints on the existing financial system, and design incentive structures that engage key players to serve the policies and avoid being captured by the regulatees. Our study contributes to the decades-long debate on public view versus private view of banking regulation and is of interest to policy makers in the ongoing process of rewriting banking rules.

Key Words: Financial Regulation; Regulatory Capture; Technological System; LIBOR Scandal.

1. INTRODUCTION

The year 2012 was an eventful year for bankers, for the frequent high-profile banking scandals connecting to benchmark rate manipulations, depraved trading, mis-selling, bribery, insider trading, and money laundering. Flesher and Flesher (1986) ended their article on Ivar Kreuger's contribution to the US financial reporting with cautions on secrecy and banking consolidation: "A reminder of Kreuger's activities certainly indicates the magnitude that such problems can take on if not addressed soon". One may feel quite acquainted when linking them to the present reality: either the LIBOR (London Interbank Offered Rate) rigging scandal, the FOREX scandal, or "The London Whale". If the financial markets are often referred to as the "Wild West", the very recent evidence positively endorses so. Within the post-Lehman timeframe, we have gradually shifted from "a rubric of 'too big to fail' to a dawning recognition that systemically important financial firms are not only too big to manage, and to regulate, but also to litigate effectively against" (O'Brien, 2014). All of these pose critical questions: What is the underlying paradigm of banking regulation? How far does the government bailout since August 2007 create a problem of moral hazard (i.e. excessive risk taking)? What are the key principles for regulators to follow in the redesign of the financial system?

It may be a matter of regulation, pronounced by regulators subsequent to any major financial crises and scandals. Or is it simply just a matter of human nature as the saying goes: "The game does not change and neither does human nature" (Lefèvre, 1923)? This paper is in no endeavors to answer the human nature question, as it is more of a task to be undertaken by anthropologists, sociologists, sociobiologists, and psychologists. Rather, it takes the regulation side and investigates into the recent high-profile LIBOR rigging scandal. From a systemic viewpoint, there are still plenty of inadequacies in our present state of knowledge of the financial markets, in particular the banking sector. One could approach the many issues existing in the banking sector

reflected through the LIBOR scandal through, for instance, a reexamination of the flaws in the fundamental assumptions and the design of the system, or a sociocultural centrum focusing on how the banking culture is inherited, or even the long-standing ownership versus control issue in modern capitalism. Our study, however, encompasses these multibody problems rooted in human nature, structural nature and technological nature, and focuses on the overlaps between them, namely regulatory capture, speculative behavior empowered by technology in banking, and financial system design (Figure 1).

The research instrument (Figure 2) in our study is constructed in an inductive way while the process of screening theories to explain the observed phenomena is deductive, ranging from the initial theoretical enquiries to the defined argumentations. The research instrument in our study serves as an assembling device and an orchestra instrument to gain an in-depth understanding towards the burning questions in financial markets mirrored through the LIBOR scandal which demand prompt actions. If chaotic capitalism were the paradigm of the current state of global financial markets, our choice of LIBOR as the viewpoint would yield clarity in the attempt in addressing these multibody problems, as it is in the eye – the calmest part – of a hurricane. That is, LIBOR stands at the very center of the recent benchmark storm in financial markets. We base our viewpoint on LIBOR and set out from the recent LIBOR scandal to carry out an enquiry into the current state of art in capitalism underpinned by the global financial integration. However, LIBOR scandal, in itself, is not the entire story. This paper reviews the tumultuous history of LIBOR, not only to give an account of the LIBOR scandal in its own right, but also to enlighten the contentious debates that swirl around the question of advancing alternative models of regulatory behavior today.

A key feature of modern banking is the paradox rooted in the government-bank partnership, accompanied by the recurrent nature of regulation, deregulation, and

re-regulation[1] that sustains this "unchanged game". Stigler (1971) defines this process as regulatory capture, centering on the power of wealth in acquiring regulation: "as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit". This is particularly true for the banking industry in light of the ongoing movement of bank consolidation on a global scale. In fact, "over the course of the past 20 years, banking regulation has edged in a self-regulatory direction for understandable, but self-defeating, reasons. The regulatory regime has tilted from constrained discretion to unconstrained indiscretion" (Haldane, 2013). While one ought to acknowledge that banking culture plays a substantial role in shaping the practice and affecting the regulation of financial markets, we limit our focus on the coexistence of standards and regulation in a seemingly aligned way, yet often contradict each other and even leads to failure. The failure, in turn, is accompanied by the recurrent rotation between regulation, deregulation, and re-regulation, shown as an orbit in the framework. This study takes Ferguson's (2009) approach to the complexities of modern financial institutions, which considers the understanding of the origins of an institution or instrument as a prerequisite to the grasp of its present-day role. In this way, these research questions are brought together by historical coherence and interconnectedness, as it is often seen in the modern financial history, financial institutions are first given freedom and incentives to trade to gain the subsequent growth in size until they become too powerful to regulate.

2. THE END OF AN ERA

The original form of LIBOR is associated with a Greek banker named Minos Zombanakis[2] who in 1969 arranged one of the first syndicated loans amounting $80 million from Manufacturer's Hanover (now part of JP Morgan) to the Shah of Iran

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[1] In Berstein (1955), it is referred to as a "life cycle", within which commissions pass through successive stages, starting with vigorous prosecution of enforcement yet ending with ossification and debility.
[2] In a telephone interview after the LIBOR scandal, Minos Zombanakis claimed, "I was, more or less, if you excuse the lack of modesty, the one who started the whole thing".

based on the reported funding costs of a set of reference banks[3]. By the mid 1980s, the rate submission banks had also started to borrow heavily using LIBOR-referenced contracts, creating an incentive to underreport funding costs. In 1986, British Bankers' Association (BBA) took control of the LIBOR to formalize the data collection and administration process. LIBOR then is also called BBA LIBOR, which represents the costs of short-term wholesale funds for major banks in London interbank market. Prior to the transfer of responsibility for administration from BBA to ICE (Intercontinental Exchange Benchmark Administration Ltd) on 31 January 2014, LIBOR was calculated and published each business day by Thomson Reuters, to whom major banks submit their cost of borrowing unsecured fund in 10 currencies[4] for 15 maturities[5], which yield 150 different LIBOR rates reported daily. For each currency, there is a panel consist of contributor banks. The submitter from each panel bank is asked to answer the question "at what rate do you think interbank term deposits will be offered by one prime bank to another prime bank for a reasonable market size today at 11am?"[6] Thomson Reuters further trims the rates by removing the top 25 per cent and bottom 25 per cent, and then averages the remainder to create the final LIBOR rates, which are published and available to world around midday London time. Such mechanism is subject to a number of shortcomings since it is hypothetical, subjective, and open to abuse when an unethical person answers it (McConnell, 2013), and thus is ineffective in preventing manipulation.

At the heart of the LIBOR prosperity was the boom of Eurodollar market. The importance of LIBOR grew and outstood as a response to the propagation of the Eurodollar[7] market in the 1950s and 1960s (Kawaller, 1994; Schenk, 1998). Offshore

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[3] A Greek banker spills on the early days of the LIBOR and his first deal with the Shah of Iran. Business Insider, 8 August 2012. Available from: www.businessinsider.com/history-of-the-libor-rate-2012-8.
[4] AUD, CAD, CHF, DKK, EUR, GBP, JPY, NZD, SEK, and USD.
[5] Overnight, 1 week, 2 weeks, 1 month, 2 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, and 12 months.
[6] British Bankers' Association (2013). Historical Perspective. Available from:
http://bbalibor.com/bbalibor-explained/historical-perspective [accessed on 10 January 2013].
[7] Eurodollar is term deposit denominated in US dollars yet held by banks outside of the US (including a foreign branch of a US bank) and is free from the regulation by the US Federal Reserve.

Eurodollar deposits are a considerably cheap source of fund for international banks as they are exempted from deposit insurance and regulatory reserve requirements. In its early days, this "back-door market" had continued to grow secretively for a decade, and it was not until 1959 that this strange new money market was openly inquired (Van Dormael, 1997), as documented in Einzig (1965):

"The Eurodollar market was for years hidden from economists and other readers of the financial Press by a remarkable conspiracy of silence. Bankers deliberately avoided discussing it with financial editors, presumably for fear that publicity might attract additional rivals to the market, or that it might breed criticism in the Press and opposition in official quarters…When I embarked upon an inquiry on it in London banking circles, several bankers emphatically asked me not to write about the new practice, except perhaps in articles in learned journals or in my book which, they assumed, were in any case too technical for the uninitiated."

Starting from the 1970s, governments and corporations not only actively borrowed Eurodollar deposits from banks, but also started to issue securities in Eurodollars at rates lower than the local borrowing rates. Schenk (1998) argues that, "the Eurodollar should not be viewed exclusively as a defensive innovation but also an aggressive one as banks took advantage of opportunities for profit through domestic currency swaps and third party lending, and also sought to meet the need of customers". Despite the fast growing Eurodollar markets provide cheaper available funds to borrowers, the risk arises from the mismatch between the borrowers' sources of income and funding remained severe, which further triggered a new innovation - the IRS (Interest Rate Swap) - to eliminate such risk. IRS is considered as "one of the most innovative financial products of the late twentieth century" (Corb, 2012). In 1986, as part of the "Big Bang" (the deregulation of the UK financial markets), BBA developed a mechanism for an accurate measure of the rates at which banks lend money to each

other and the contracts are settled, termed LIBOR. The importance of LIBOR continues to grow along with London's growing status as an international financial center, from which over 20 per cent of all international banking lending and over 30 per cent of all foreign exchange transactions are executed[8] (BBA LIBOR, 2010). Overtime, the prominence of LIBOR has grown drastically and is now deeply rooted in the international financial system, serving two primary purposes: as a reference rate and as a benchmark rate. As a reference rate, LIBOR serves as the basis for valuing financial instruments and establishing the terms of agreement for short-term floating rate contracts such as IRS that are traded on exchanges such as CME (Chicago Mercantile Exchange) and OTC (Over The Counter). It is one of the single most important global reference rates that affect contracts with an outstanding value of at least $300 trillion, which is equivalent to approximately four and half times global GDP. Variable rate loans ranging from adjustable rate mortgages to credit cards to private student loans are also often tied to LIBOR. As a benchmark rate, LIBOR is used as the performance measure for funding costs and investment returns and an indicator for the soundness of a business and financial market as a whole.

On 27 June 2012, the 300-year-old British bank Barclays admitted to misconduct related to manipulating daily setting of the LIBOR and the EURIBOR (Euro Interbank Offered Rate) and reached a $453 million fine settlement with the UK Financial Services Authority (FSA), the US Commodity Futures Trading Commission (CFTC), and the US Department of Justice (DoJ). In the *Statement of Facts* supplied by the DoJ, Barclays admitted to three types of manipulation dated back as early as in mid-2005: under-reporting, over-reporting, and holding constant. The motive behind the three types of misrepresentations varied over time from benefitting derivatives trading positions to avoiding the stigma of appearing weak relative to other banks during the

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[8] BBA LIBOR (2010). Understanding BBA LIBOR – A briefing by the British Bankers' Association. Available from: www.bbalibor.com/news-releases/understanding-bba-libor

financial crisis[9]. Evidence from the ongoing probe by regulators confirms that the manipulation of LIBOR is not solely a localized event, but rather a blatantly unethical and occasionally illegal practice that deliberately and systematically manipulates borrowing rates, which had been part of business-as-usual in the global financial markets.

As early as in 2005 there was evidence showing that Barclays had tried to manipulate the US dollar LIBOR and EURIBOR at the request of its derivatives traders and other banks. Concerns regarding the integrity of LIBOR rate were raised publicly since at least as early as one report published in *The Wall Street Journal* (WSJ) on 16 April 2008. Following the WSJ report, a senior Barclays treasure manager defended its misconduct in a phone call with BBA: "*We are clean, but we are dirty-clean, rather than clean-clean.*" The BBA representative responded: "*No one is clean-clean.*" Later, over a call to the FSA, a manager commented: "*…I would sort of express us maybe as not clean-clean, but clean in principle.*" A transcript of investigation into the FOREX scandal released by the New York Department of Financial Services (DFS) documented one Barclays trader wrote on 5 November 2010: "*If you ain't cheating, you ain't trying*".[10] The US DoJ also revealed that during December 2007 and January 2013, traders at Barclays, Citigroup, JP Morgan and RBS described themselves as "The Cartel" that manipulate benchmark exchange rates through the use of an exclusive chatroom and coded language in an effort to increase their profits.[11]

In the final notice to Barclays issued by FSA on 27 June 2012, FSA identified that:

"…between January 2005 and May 2009, at least 173 requests for US dollar LIBOR submissions were made to Barclays' Submitters (including 11 requests based on

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[9] See Monticini and Thornton (2013) for the effect of misrepresentations on LIBOR rates.
[10] Trader transcripts: 'If you ain't cheating, you ain't trying'. Financial Times, 20 May 2015. Available from: www.ft.com/intl/cms/s/0/eac637ae-fefb-11e4-84b2-00144feabdc0.html#axzz3asIX6Agg
[11] Six banks fined $5.6bn over rigging of foreign exchange markets. Financial Times, 20 May 2015. Available from: www.ft.com/intl/cms/s/0/23fa681c-fe73-11e4-be9f-00144feabdc0.html#slide0

communications from traders at other banks)…[and] between September 2005 and May 2009, at least 58 requests for EURIBOR submission were made to Barclays' Submitters (including 20 requests based on communications from traders at other banks)…[and] between August 2006 and June 2009, at least 26 requests for yen LIBOR submissions were made to Barclays' Submitter."[12]

In the same notice, a number of requests made by Barclays' derivative traders to benefit their own trading positions are documented:

"On Friday, 10 March 2006, two US dollar Derivatives Traders made email requests for a low three month US dollar LIBOR submission for the coming Monday: Trader C stated '*We have an unbelievably large set on Monday (the IMM). We need a really low 3m fix, it could potentially cost a fortune. Would really appreciate any help*'; Trader B explained '*I really need a very very low 3m fixing on Monday – preferably we get kicked out. We have about 80 yards* [billion] *fixing for the desk and each 0.1* [one basis point] *lower in the fix is a huge help for us. So 4.90 or lower would be fantastic*'. Trader B also indicated his preference that Barclays would be kicked out of the average calculation."

"On Monday, 13 March 2006, the following email exchange took place:
Trader C: '*The big day* [has] *arrived… My NYK are screaming at me about an unchanged 3m libor. As always, any help wd be greatly appreciated. What do you think you'll go for 3m?*'

Submitter: '*I am going 90 altho 91 is what I should be posting*'.
Trader C: '[…] *when I retire and write a book about this business your name will be written in golden letters […]*'.

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[12] FSA. Final Notice to Barclays Bank plc (27 June 2012). Available from: www.fsa.gov.uk/static/pubs/final/barclays-jun12.pdf

Submitter: '*I would prefer this [to] not be in any book!*'"

On 5 February 2008, Trader B (a US dollar Derivatives Trader) stated in a telephone conversation with Manager B that Barclays' Submitter was submitting '*the highest LIBOR of anybody* […] *He's like, I think this is where it should be. I'm like, dude, you're killing us*'. Manager B instructed Trader B to: '*just tell him to keep it, to put it low*'. Trader B said that he had 'begged' the Submitter to put in a low LIBOR submission and the Submitter had said he would '*see what I can do*'."

Similar requests also come from external traders. "At least 12 of the US dollar LIBOR requests made to Barclays' Submitters were made on behalf of external traders that had previously worked at Barclays and were now working at other banks (although those banks did not contribute US dollar LIBOR submissions)."

"…on 26 October 2006, an external trader made a request for a lower three month US dollar LIBOR submission. The external trader stated in an email to Trader G at Barclays '*If it comes in unchanged I'm a dead man*'. Trader G responded that he would '*have a chat*'. Barclays' submission on that day for three month US dollar LIBOR was half a basis point lower than the day before, rather than being unchanged. The external trader thanked Trader G for Barclays' LIBOR submission later that day: '*Dude. I owe you big time! Come over one day after work and I'm opening a bottle of Bollinger*'."

Timothy Geithner, then the president of the Federal Reserve Bank of New York, had actively communicated with senior executives at Barclays during April 2007 and October 2008, including on 10 October 2008, a morning meeting with Bob Diamond, then the CEO of Barclays who resigned one week after the Barclays settlement. In truth, the document stating the timeline of events released by Barclays prior to the UK parliamentary enquiry on Diamond indicates the meeting on that day between bank

officials and anonymous Fed representatives was one in the series of discussions centering on the process of LIBOR fixing during the financial crisis. Neither the topics nor any details of this meeting were listed in Geithner's calendar. In addition, a meeting scheduled for the afternoon of 28 April 2008 titled "Fixing LIBOR" was the only one explicitly focuses on LIBOR in his calendar[13].

On 13 July 2012, the Federal Reserve Bank of New York confirmed that central banks and the US government were aware of the problems years ago:

"In the fall of 2007 and early 2008, [there] were indications of problems with accuracy of LIBOR reporting. On April 11 [2008]…the Barclay employee explained that Barclays was underreporting its rates to avoid the stigma associated with being an outlier with respect to its LIBOR submission, relative to other participating banks. That same day – April 11, 2008 – analysts in the Markets Group [of Federal Reserve Bank of New York] reported on the questions surrounding the accuracy of the BBA's LIBOR fixing rate…The briefing note cited reports from contacts at LIBOR submitting banks that banks were underreporting borrowing rates to avoid signaling weakness. This report was circulated to senior officials at the New York Fed, the Federal Reserve Board of Governors, other Federal Reserve Banks, and the US Department of Treasury. The New York Fed also acted to brief other US agencies…. raised the subject at a meeting of the President's Working Group on Financial Markets…. briefed senior officials from the US Treasury in detail. The New York Fed analysis culminated in a set of recommendations to reform LIBOR [which were emailed on June 1, 2008 to]…. the Governor of the Bank of England."[14]

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[13] LIBOR scandal: As New York Fed Chief, Timothy Geithner had multiple meetings with Barclays. Huffington Post, 10 July 2012. Available from:
www.huffingtonpost.com/2012/07/10/timothy-geithner-barclays-libor_n_1662389.html
[14] Federal Reserve Bank of New York (2012). New York Fed Responds to Congressional Request for Information on Barclays – LIBOR Matter. 13 July 2012. Available from:
www.newyorkfed.org/newsevents/news/markets/2012/Barclays_LIBOR_Matter.html

"And then, the New York Fed continued to monitor for problems related to LIBOR. And then? Then the report ends". (Pollock, 2012)

Following the Barclays episodes, the UK government asked Martin Wheatley, former managing director of the FSA and CEO of the new Financial Conduct Authority (FCA), to establish an independent review into how LIBOR rate is calculated and regulated. The key recommendation provided in the Wheatley Review is a comprehensive reform of LIBOR rather than radical shorthand proposals to terminate or replace LIBOR, as Wheatley expounded, "[LIBOR] *is something that is fundamental to the smooth running of markets, and to confidence in the financial system...retaining LIBOR unchanged in its current state is not a viable option, given the scale of identified weaknesses and the loss of credibility that it has suffered...* [There should be] *enough change, but not changing it so far so that millions of contracts are put at risk*"[15].

On 1 April 2013, the FSA was replaced by the "twin peaks" of the Financial Conduct Authority (FCA) and the Prudential Regulatory Authority (PRA). Primary operational objectives of the FCA are consumer protection, integrity and effective competition. It is responsible for ensuring that relevant markets function well and is the conduct and compliance supervisor for around 50,000 businesses (around 26,000 firms across the whole industry and around 23,000 firms not regulated by the PRA). The PRA is the prudential supervisor that is responsible for promoting the safety and soundness of around 1,700 banks, building societies and credit unions, insurers and major investment firms and helps to ensure an appropriate degree of protection of insurance policy holders[16]. The PRA, as part of the BoE, works closely with other parts of the BoE. Within the "twin peaks" regulatory structure, deposit takers, insurer and SIFs are dual-regulated, and the remaining financial services companies are solely regulated by

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[15] LIBOR review: Wheatley says system must change. BBC News, 10 August 2012. Available from: www.bbc.com/news/business-19203103

[16] Bank of England (2013). PRA and the general public. Available from: www.bankofengland.co.uk/pra/Pages/about/generalpublic.aspx.

the FCA. A third new body, created by the Financial Services Act 2012, the Financial Policy Committee, reports directly to the BoE and is able to force banks to cut lending to certain sectors to relieve systemic risks building up in the economy. One of the outcomes of the new regulatory outlook is the act of making the administration of LIBOR a regulated activity overseen by the FCA, which is "seen by most as being a direct result of the fixing scandal"[17]. While the split of the FSA is driven by the fact that "FSA failed as it was an inept prudential authority…and it was an incompetent conduct supervisor"[18], it is rather difficult to not to deliberate the stake of the LIBOR scandal in promoting this enactment.

To date, more than $9 billion of legal and regulatory sanctions have been imposed on a number of banks and brokers worldwide (Table 1), all of which are global leading banks that are systemically important. In the wake of the LIBOR scandal, parallel investigation has been launched into other benchmarks such as foreign exchange, oil, and precious metals. On 20 May 2015, six global banks (i.e. Bank of America, Barclays, Citigroup, JP Morgan, RBS, and UBS) reached the settlements with the UK and US regulators, lifting the total fine paid in relation to the FOREX scandal to $10 billion (Table 2). These settlements, in comparison to their total assets or market capitalizations, are merely a drop in the bucket (Table 3). Four of them (i.e. Barclays, Citigroup, JP Morgan, and RBS) agreed to plead guilty antitrust violations stemming from their collusion to fix prices and rig bids in the $5.3 trillion a day FOREX market. UBS announced that it would plead guilty to one court of wire fraud for its role in rigging LIBOR and accept a three-year probation[19]. It is not over yet, In May 2015, the New York DFS probed into Wall Street banks in systematically abusing FOREX markets

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[17] The new LIBOR rules that spilt up the FSA. The Anti-fraud Network, 29 April 2013. Available from: antifraudnetwork.com/2013/04/the-new-libor-rules-that-split-up-the-fsa/

[18] Why the FSA was split into two bodies. Financial Times, 8 May 2013. Available from: www.ftadviser.com/2013/05/08/regulation/regulators/why-the-fsa-was-split-into-two-bodies-SX5toVpnEQtBbYNlcUC9xJ/article.html

[19] Four banks plead guilty to foreign exchange collusion, UBS pleads guilty to wire fraud. Forbes, 20 May 2015. Available from: www.forbes.com/sites/antoinegara/2015/05/20/four-banks-plead-guilty-to-foreign-exchange-collusion-ubs-pleads-guilty-to-wire-fraud/

through the use of automated trades driven by computer algorithms[20]. The US CFTC fined Barclays $115 million for alleged manipulation of Isdafix[21] over a five-year period ending in 2012[22]. The uncovery of a more widespread market abuse is on the way.

3. THE DEATH OF GLASS-STEAGALL

Were the Glass-Steagall still law, none of the LIBOR provisions would have applied. The Glass-Steagall Act, enacted by the US Congress in 1933, was a response to restore trust in the banking sector after the collapse of over 11,000 banks during the Great Depression period of 1929-1933. In addition to creating the Federal Deposit Insurance Corporation, the Act built a financial architecture within which commercial and investment banking affiliation and activities were separated: commercial banks were prohibited from underwriting or trading securities (except for US Treasury and municipal bond), and investment banks were banned from receiving and investing customers' deposits. The repeal of the Glass-Steagall Act commenced in the mid 1960s when the global financial markets became more integrated, within which the US banks are losing the competitive edge in relation to its European counterparts. The decades-long congressional efforts to repeal the Glass-Steagall Act culminated in the Gramm-Leach-Bliley Act (The Financial Services Modernization 1999), signed by President Clinton into law on 12 November 1999, which permits "commercial banks and investment banking houses can poach on each others' turf without restriction" (Sloan, 1995). The Act facilitated two major banking mergers: the merger of Citicorp and The Travelers Group to create the new entity Citigroup that was approved in 1998,

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[20] Banks probed over automated forex deals. Financial Times, 22 May 2015. Available from: www.ft.com/intl/cms/s/0/092572d2-0005-11e5-abd5-00144feabdc0.html?ftcamp=crm/email/2015?ftcamp=crm/email/2015522/nbe/ExclusiveComment/product_a2___a3__/nbe/ExclusiveComment/product#axzz3asR2B6rP
[21] Isdafix was created in 1998 by the International Swaps and Derivatives Association, which is mainly used by traders to set the price for IRS based on submissions from 16 banks.
[22] CFTC takes aim at Isdafix manipulation with Barclays case. Financial Times, 20 May 2015. Available from: www.ft.com/intl/cms/s/0/c6793dca-fefa-11e4-94c8-00144feabdc0.html#axzz3h2rUj3jT

which was then against the law; the merger of Chase Manhattan and JP Morgan & Co. to form JP Morgan Chase that was approved in 2000. In short, the Gramm-Leach-Bliley Act has completely transformed the nature of the formation of capital and "returned the banking financial environment to the pre-1933 conditions that encouraged banks to invest in risky assets and to take high risk" (Abdel-khalik and Chen, 2015).

Another landmark legislation in the US that fundamentally contributed to the LIBOR provisions is The Commodity Futures Modernization Act of 2000 (CFMA), which revoked oversight and control over the derivatives market, particularly the anti-bucket shop laws that prohibit gaming or gambling on the price movements of commodities and securities. In addition, it abrogated all restrictions on the types of futures contracts that could be traded and all restrictions on qualified participants in those contracts. So the "bucket shops" were revived, and they became even stronger than it used to be: banks are not only allowed to gamble with their depositor's money but also protected from fraud and manipulation. If the Gramm-Leach-Bliley Act is a pre-condition – to be sufficiently powerful through gaining size – for banks to seek their private interest, the CFMA is an essential requirement for banks to extract benefits from trading derivatives.

The two landmark legislations in 1999 and 2000 jointly removed the legal uncertainty of permitting OTC markets to continue operating in the dark and completely free of any regulation, even a call for the slightest transparency, and deviated markets and market participants from the penalties of writing and trading in naked derivatives (Abdel-khalik and Chen, 2015). The volume of OTC derivatives has therefore grown rapidly since the late 1990s (Figure 3), so that by the end of 2014 the notional value of all outstanding OTC derivatives reached 630 trillion[23], a significant portion of which is held by bank holding companies. Such things were virtually unknown before the 1980s (Ferguson, 2008). The notional value of derivatives held by banks has been soaring starting from

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[23] BIS (2015). OTC derivatives statistics at end-December 2014. Available from: www.bis.org/publ/otc_hy1504.pdf

2000 (Figure 4), with a significant portion held by member banks of the LIBOR panel (Table 4). Spread of the extent of derivatives usage between LIBOR panel banks and the average has been widening beyond 2004 (Figure 5[24]), providing stronger incentives for these banks to be engaged in the rate manipulation. As one of numerous examples of the direct consequence of and how financial institutions are permitted to use derivatives for gambling and speculation, "The London Whale" (named after the nickname of JP Morgan Chase trader Bruno Iksil), wherein traders gambled big on an obscure corner of the CDS (credit default swaps) market and lost in spectacular fashion, with $6.2 billion losses incurred. Although a team of Fed experts had recommended "a full-scope examination" in August 2009, the New York's Fed failed to examine the investment office ahead of the trading debacle "due to many supervisory demands and a lack of supervisory resources, weakness in planning procedures, and the loss of institutional knowledge after a 2011 reorganization of the team supervising JP Morgan"[25]. However, if trading derivatives is a zero-sum game, the account of trading and derivatives of those banks involved in the LIBOR scandal and FOREXT scandal (Table 5) shows that they have been frequent winners over years.

Meanwhile, the same yet different kind of movement took place across the Atlantic Ocean. The financial deregulation in the UK was more explicit and efficient. Financial market deregulation sprang up in the UK in October 1986, through what was known as the "Big Bang" (The Financial Services Act 1986), encouraged the banks including retail banks to increase their securities market activities by performing underwriting business and market-making activities. Section 63 of the Act removed oversight of the courts on derivatives contacts, which might otherwise have been considered speculative and was prohibited by the Gaming Act 1845 (Schwartz and Smith, 1997). This Act also

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[24] Relying on the same data that constructs Figure 4, we calculated the extent of derivatives usage by scaling the notional value of a bank's derivatives by total assets.

[25] New York Fed faulted in 'London Whale' case. The Wall Street Journal, 21 October 2014. Available from: www.wsj.com/articles/new-york-fed-failed-to-examine-j-p-morgan-london-whale-unit-1413900070

promoted self-regulation: Securities and Investment Board (SIB)[26] was created to preside over many new self-regulating organizations (SROs). The creation of BBA LIBOR is part of this "big bang". Prior to the LIBOR reform, despite the board of BBA LIBOR was independent of the panel banks, the committee was selected from panel banks and users group and chaired by members of contributing banks[27]. In short, LIBOR was a self-regulated activity. Distinct from the situation in the US, the British deregulation provided banks with a "fast track" to engage in proprietary trading in one single Act.

And now, the game is full on.

4. ANYTHING FOR YOU BIG BOY

Banking regulation, particularly government banking regulation, according to the continuing thread of history, was seldom a "natural" product, but rather a byproduct or creation to conflicts or crises. In the US, in addition to the Glass-Steagall Act, for example, both the creation of Federal Reserve System in 1913 and the Federal Deposit Insurance for banks and thrifts in 1977 followed a banking crisis. In the UK, the switch from self-regulation to legal regulation on banking sector was provoked by series of crises: The Banking Act 1979 was enacted in the wake of the Secondary banking crisis of 1973-1975, which was "the first formal attempt at statutory regulation of banking and marks the end of a momentous decade for banking in the UK" (Neate, 1980). However, flaws of the 1979 Act were exposed with the collapse of Johnson Matthey Bankers, which led to its repeal and the enactment of the Banking Act 1987, which replaced the two-tier system of authorization with a single system of authorization that was applied

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[26] The Financial Services Act 1986 was repealed and superseded by the Financial Services and Markets Act 2000, under which the SIB and SROs were merged to form the FSA.
[27] The Wheatley Review of LIBOR: Final Report. Available from:
www.gov.uk/government/uploads/system/uploads/attachment_data/file/191762/wheatley_review_libor_finalreport_280912.pdf

to all institutions accepting deposits in the course of their business. The discretion-based style of supervision was continuously encouraged even after the collapse of BCCI (Bank of Credit and Commerce International) and Barings, albeit the formalization of prudential supervision (Singh, 2007). The Banking Act 2009 calls for a return to an historical simplistic banking system and a more conservative approach[28] after the Financial Services and Market Act 2000 (FSMA 2000) that repealed the Banking Act 1987 has been proven insufficient to stop the collapse of Northern Rock and the following banking crisis (Chambers, 2010). These are also true at an international level that regulation is prompted by financial failure and regulation following crisis is a constant in the history of commercial banking (Lastra, 1996). Banks oftentimes play a significant role in rewriting banking rules, as they are every few decades, normally after a crisis. In 2010, the US Congress set new guidelines that invite all Americans to express their views about banking regulation when the main participants are lawyers and lobbyists for the largest banks. In the process of enacting the Dodd-Frank Act that bans banks from proprietary trading and restricts investment in hedge funds and private equity by commercial banks and their affiliates, SEC held 34 meetings: only one of these meetings has been with a consumer-advocacy group while all the others have been with large banks and their representatives[29].

Problems reflected through the lens of the LIBOR scandal are hardly just the matter of banking culture[30]. It illuminates an ancient theme of the public interest view versus private interest approach to regulation or the continual adaptation between the two opposing forces: political processes of regulation and economic processes of regulatee avoidance[31]. The decades-long debate is on whether the given behavior of a regulator

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[28] Brown: Banks should be 'servants'. BBC News, 22 February 2009. Available from: http://news.bbc.co.uk/1/hi/uk/7903985.stm
[29] The Wild West of finance. The New York Times Magazine, 7 December 2011. Available from: www.nytimes.com/2011/12/11/magazine/adam-davidson-wild-west-of-finance.html?_r=0
[30] Bank of England head says bank must change culture. BBC News, 29 June 2012. Available from: www.bbc.com/news/business-18642732; Barclays: FSA regulator criticizes 'culture of gaming'. BBC News, 16 July 2012. Available from: www.bbc.com/news/business-18854193; 'No hint' of Barclays culture change – Lord McFall. BBC News, 25 July 2012. Available from: www.bbc.com/news/uk-politics-18981730
[31] The regulatory dialectic framework developed by Kane (1977) that embodies and interpretive vision of cyclical

denotes the presence of "public interest" or "capture". The dominated thinking to banking regulation during the twentieth century[32] and is still taken for granted in the international forum of regulation is based on the public interest view that "governments regulate banks to facilitate the efficient functioning of banks by ameliorating market failures, for the benefit of broader civil society. In banking, the public interest would be served if the banking system allocated resources in a socially efficient manner and performed well the other functions of finance"[33] (Barth et al., 2005). However, the utility of public interest approach has been undermined by a handful of evidence that immensely reinforce the private interest view, represented by what Stigler (1971) termed as "regulatory capture" that organizations with wealth can either create legislation for self-interest or co-opt the legislative process to weaken the effect of legislation pointed at them, and "the rule-making agencies of government are almost invariably captured by the industries which they are established to control" (Heilbroner, 1972).

The LIBOR scandal, examined in the historical account, exhibits a striking rise in the complexity of banking scandal, as it combines the issues exposed by the collapse of BCCI (banking frauds) and the closure of Barings (securities trading). The collapse of BCCI is one of the major banking frauds of the twentieth century caused by the exposure of widespread of fraud and mismanagement had made it insolvent. The closure of BCCI called into question the Bank's methods of prudential supervision. The Bingham Report[34] required five points to be considered:

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interaction between political and economic pressures in regulated markets.

[32] As noted by McCraw (1975), "public interest" is a thread of continuity at the heart of regulatory ideology, from its origins down to the present. The notion of "public interest" dominated the rhetoric of reformers, the utterances of presidents, and the decisions of commissioners. It served as an ideological glue binding together the quasi-legislative, quasi-judicial duties of regulators.

[33] As noted by Levine (1997), these other functions consist of facilitating payments, mobilising savings, allocating capital, monitoring managers, and providing tools for the management and trading of a variety of risks.

[34] Inquiry into the Supervision of the Bank of Credit and Commerce International (1992) Chairman: The Right Honourable Lord Justice Bingham (Bingham Report). London: HMSO. Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/235718/0198.pdf

1) What did the UK authorities know about BCCI at all relevant times?

2) Should they know more?

3) What action did the UK authorities take in relation to BCCI at all relevant times?

4) Should they have acted differently?

5) What should be done to prevent, or minimize the risk of, such an event recurring in the future?

All of these questions appeared again in the LIBOR probe. In the attempt of answering these questions, it has been revealed that staff at Barclays informed FSA that the LIBOR submissions were wrong in 2007 and 2008. As a result, FSA and the BoE were accused of being "asleep at the wheel"[35] and giving Barclays a "nod and wink" to LIBOR rigging[36]. However, it still remains as an open question with regard to the possibility of taking any different measures that prevent such kind of event from recurring in the future.

The collapse of Barings in 1995[37], on the other hand, had raised much concerns towards the ongoing effort in repealing Glass-Steagall: "…ending Glass-Steagall could unleash financial disasters that would make the S&L industry collapse look like a walk in the park…the idea that you can combine risky institutions like banks with ultra-risky investment banks and somehow make the world safer for everyone doesn't make much sense. Especially when you consider that as a group, neither banks nor investment banks have done particularly well in their own businesses. Why should they do better in other businesses?" (Sloan, 1995) Nonetheless, it was proven that none of these were the major

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[35] LIBOR scandal put BoE in line of fire. Financial Times, 17 July 2012. Available from:
www.ft.com/intl/cms/s/0/68605a86-d02a-11e1-bcaa-00144feabdc0.html#axzz3YcmMyEV7
[36] Bank of England in the spotlight over 'nod and wink' to LIBOR rigging. The Telegraph, 4 July 2012. Available from:
www.telegraph.co.uk/finance/newsbysector/banksandfinance/9377183/Bank-of-England-in-the-spotlight-over-nod-and-wink-to-Libor-rigging.html
[37] The collapse of Barings Bank is associated with the name of a single employee, Nicholas Lesson, head of settlement in Barings Singapore. His outstanding performance led to his additional appointment as head of trading. This dual appointment that was not common in most other banks back then had allowed Lesson to settle his own deals and hide the excessive risk he was taking as well as any losses incurred, which led to a loss of approximately $1 billion and ultimately the collapse of the 200-year-old British bank.

concern for the Federal government. Regardless of the premise of the "capture", a key feature of modern banking is the paradox rooted in the government-bank partnership: Banks are a source of finance for governments that regulate them. On behalf of banks, governments regulate debtors through credit contracts while they count on these debtors for political support. In the event of bank failures, governments allocate losses among creditors while seek political support from the largest group of these creditors (i.e. bank depositors). This partnership shaped by the institutions that govern the power distribution in the political system is reflected through government policies towards banks. Deals that give rise to this partnership, steered by the logic of politics instead of the logic of the market, determine which legislations are passed and which interest groups have licenses to contract with whom, for what and on what terms. This deal making process is the so-called "game of bank bargains" (Calomiris and Haber, 2014), within which governments and banks empower each other through relentless power-wealth exchange. Baring Brothers, financed British military operations overseas, Portugal's pay off to war debts, and the US's purchase of Louisiana Territory, were named one of the six great powers in nineteenth-century Europe along with England, France, Prussia, Austria, and Russia (Bhalla, 1995). With the tacit approval of the BoE, the Committee of London Clearing Bankers (CLCB) managed an interest rate cartel during 1939 and 1971 that was part of a system of regulated banking created to facilitate government borrowing and maintain financial stability. Clearing banks set deposit rates at a level two per cent below the BoE's official bank rate. The BoE, whenever demanded by the cartel, stepped in to warn clearing banks not to break ranks (Reveley and Singleton, 2014). In Hamilton's days, the company that was in charge of building New York's water system lobbied regulators to craft the legislature that permits the company to engage in virtually any business it wants to in exchange for "supplying the city of New York with pure and wholesome water" (Gordon, 2000). It soon turned out that the company's heart was never in the water business when a bank (later known as Chase Manhattan) was created before a single pipe was laid. Hamilton regretted his part

in the creation of the company and called it "a perfect monster in its principles but a very convenient instrument of profit and influence" (Miller, 1959). The perfect monster continued to grow and later merged to JP Morgan, who played a controversial role in deciding which banks survived and which failed throughout the serious banking panic of 1907 in the US.

Despite it is an open secret that large banks expand their power to the regulation on the industry, more recent evidence demonstrates a more explicit form, as what is revealed through the *Goldman Tapes*[38]: regulators are not only influenced by the regulatees in legislation but also showing a tendency that they are afraid to offend powerful banks in the conduct of surveillance activities. William D Cohan, the author of *Money and Power: How Goldman Sachs Came to Rule the World*, contends that the system of 12 Federal Reserve banks created nearly a century ago by an act of Congress after secret meetings chaired over by J.P. Morgan himself is working just as designed – its central premise and critical thrust is to benefit the banks that designed the system. "To think that these banks exist for any other reason than to serve their Wall Street masters is complete folly. It has never been so and it will never be so – as long as the current system remains intact". The *Goldman Tapes* thus revealed "little or nothing that was not already known"[39]. Nevertheless, financial deregulation such as repeal of the Glass-Steagall Act that glues the conjuncture between commercial banking and investment banking assembled the respective misconduct and speculative behavior into one single type of institution. In other respect, the ongoing wave of bank consolidation erected in the 1980s, spurred partly by the recent financial crisis and recession, has yielded a decline of number of banks and the increased shares of deposit held by the largest banks – the ten largest banks hold approximately 50 per cent of total US deposits

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[38] In September 2014, Carmen Segarra, the Former employee of New York Fed, claimed that she was fired in 2012 for being too tough on Goldman Sachs and released more than 46 hours of secret audio recordings to the radio program *This American Life* and the investigative publication *ProPublica*. On the tape, Segarra's ex-boss urged her to abandon her accusation of the bank for having no policy on conflicts of interest, with a sharp tone.
[39] Why the Fed will always wimp out on Goldman. Politico Magazine, 26 September 2014. Available from: www.politico.com/magazine/story/2014/09/why-the-fed-will-always-wimp-out-on-goldman-111356.html#.VVtLg2A z8Vw

(Wheelock, 2011). Banking reform envisaged since the global financial crisis has concentrated the supervisory powers in the hands of single bank supervisors whose monopoly on information acquisition makes their capture by the industry more likely (Boyer and Ponce, 2012). The more concentrated market share of deposits of large banks and the more concentrated supervisory powers in the hands of single bank supervisors thus enters into the mechanism of power-wealth exchange that yields a stronger form of capture.

5. ON THE VERGE OF A NEW SYSTEM

The paradox of modern banking does not merely concern these inherent conflicts of interest, but also suggest the crux of problem that technical criteria performed by human. In either the collapse of Barings or the LIBOR scandal, neither financial derivatives nor LIBOR were the devil's plaything, especially when we view the financial system as a large technological system and LIBOR strictly as a technology that facilitates transactions within the system. Ultimately, the market requires a single final price to carry out deals. Banking system is a form of "capital-intensive technological systems" embedded in capitalistic and interest-calculating societies. Legislative artifacts such as regulatory laws are also part of technological systems, as they are socially constructed and adapted in order to function in systems (Hughes, 1987). The system may suffer from crises of control as the complexity of the system grows (Beniger, 1986). BBA's takeover of the administration LIBOR in the 1980s was a response to such kind of crisis of control due to the boom of Eurodollar markets and financial innovation such as IRS. In light of this, current effort in reforming LIBOR activities through shifting the responsibility for administration from BBA to ICE and eliminating some currencies and maturities in the reported LIBOR is another response to the crisis of control, yet they are more of changes of formality rather than substance. In other respect, the concepts of chaos and nonlinear dynamics in financial markets attribute this problem to that system

tends to lose memory of initial conditions, albeit the effect continues to be sensed (Peters, 1996). The public interest, irrespective of the definition, cannot remain static in both the society and the mind of an individual due to industries or societies require different things in different phases of development. In the transition from one phase to another, the industry or society fulfills or discards old needs and pursue new ones (McCraw, 1975). Like any systems featuring physical productivity, a financial system or its inclusive regulatory system is likely to reach a point of diminishing returns in terms of social benefits, and thus begins to generate negative returns to scale conceptually, as it becomes obsolete or lacks suitability given the actors, the policy, and the technology. The notion of diminishing returns to scale is hence a combination of social change giving rise to the need for "refreshing" the role of regulation in order to achieve a social benefit when several factors change including institutional relationships between the regulator and regulatee, conditions of the economy such as growing trend of consolidation of those being regulated, and technology (in this case the technology of communication). Given these changes the regulatory responses such as Sarbanes Oxley and Dodd Frank lag in their ability to regulate because the argument would be that their processes are not sufficiently developed for the changes in the capital market intermediation system.

In particular, technological progression in the territory of banking regulation presents a cyclical nature that further aligns to the recurrent rotation between deregulation and re-regulation. Kane (1981) approaches this process as an outcome of technological and regulation induced innovation (also known as "loophole mining") that can hardly reach a stationary equilibrium as long as there presents series of lagged responses induced by regulators and regulatees seeking to maximize their own objectives, conditional on how they perceive the behavior of the opponent. This dynamic is further and most amplified by the impact of technological progression on market environment when changes in environment become increasingly uncertain. In Kane's work, market environment (i.e.

accelerating inflation) and exogenous technological change (i.e. Computer Revolution) jointly open up arbitrage opportunities for the regulatees, with the adoption of electronic fund transfer (ETF) as one major product, which is further accelerated by regulatory restrictions and in turn undermined those restrictions. Applied to the current state of banking regulation, uncertainties present both internal and external to the financial system. The market too frequently suggests the financial system at work is inherently instable, with severe turbulence in stock price, gold price, and oil price. Such turbulence, in essence, is an indication of increased demand for safe assets that are rather difficult to secure at the current stage. Externally, technological progression in information handling and transaction execution profoundly facilitated the speculative activities and vitiated regulatory restrictions. Despite speculation has been well archived throughout the banking history, not a single period has possessed such a powerful tool in enabling speculation as it currently does. If the early history of speculation is the history of human greed, the modern financial history is infused with the presence of technology as an integral part in empowering human greed. The greed nowadays has a manifest technological dimension that did not come into existence until electronic and computing technology was adopted in banking. There indeed is a spectacular evolution of speculation in banking history. It is hard to remove this self-interest nature from bankers or human beings in general. Nonetheless, the restrictions on their authority to trade on their own accounts would radically restrict the incentives to speculate while revolution in information technology would innovate regulatory technique.

Following this recurrent pattern of banking regulation, there should be new legislation coming on its way after the closure of this series of banking scandal. The opportunity to reform the system has fallen short in the eyes of many, the Volker Rule which has been a likely way to reduce abuses of large institutions trading first for their own benefit and then perhaps placing less attractive choices into the public money they manage, is one of the political issues. No one wishes to regulate when the economy is depressed, and

there are international complexities brought about by technology which have not been effectively controlled because multinational regulation is needed and the dependencies and suspicions and cultural dissonance which exists does not permit effective global cooperation, as indicated by the LIBOR being used perhaps to the advantage of one party over another, or one nation over another. The redesign of financial system, if it ever occurs and most likely it will, could resort to the basic principles of design: increasing the size of the system under control while reducing the size of the environment that is not (Hughes, 1987). In a purely technical sense, it is much similar to computer operating systems design and software development: system patches are developed to fix the bugs identified. For instance, when system upgrades from Windows 8 to Windows 10, in addition to new features added to improve the problems identified from the old version, there is certain level of consistence between different versions of operating systems. Also, the introduction of new operating systems is always companioned with negative feedbacks and the discovery of new bugs. Even a pre-programmed system cannot guarantee the all-time smooth operations，the understanding of this recurrent nature in the endeavor of banking regulation made easier with the thinking of the interference by human nature in conjunction with problems arising from asymmetric information，recurring problems in the endeavor of banking regulation seem inevitable. If we view financial system as the cyber networks powered by the operation systems, then speculators in financial industries corresponds the hackers in the cyber world: Their acquaintance with the system and their superior adaptability allow them to quickly identify the loopholes within the system, providing them with accesses to self-interest pursuing. Drawn from the fundamentals of operating systems design – an operating system mediates among application programs, utilities, and users, on one hand, and the computer system hardware on the other, while the design of the system depends on the current state of technology and the particular application requirements (Stallings, 2009) – a financial system mediates among regulatory schemes, utilities of regulation, regulators and regulatees, and the industry as

a monetary or power premise. The design of the financial system, therefore, depends on disturbing exogenous forces including the unpredictability of financial environment and extensive change in financial technology, and the internal process of continual adaptation between two opposing forces – political processes of regulation and economic processes of regulatee avoidance – with lagged responses.

Among much work done by regulation historian, New Deal has been a frequently visited landmark. The New Deal replaced *caveat emptor* with a disclosure philosophy, albeit the unsolvable part of it – human nature – still persists. Chatov (1975) closely approximates capture theory in accounting history and argues that the financial regulatory structure erected during the New Deal was paper tiger too obeisant to the demands of dominant business interests. However, the supervisory scheme that is later called "the public use of private interest" (Schultze, 1977) hammered by Landis and his colleagues throughout the New Deal has important implications as regard the incentive structures that engage the major players to serve the policies of the regulator. The emphasis of SEC's mandate during this period was to promote disclosure more than to punish fraud through providing accountants, bankers, brokers, executives, and lawyers a stake in assisting to enforce the law, which further helps to minimize the danger of being captured by the industry (McCraw, 1982). However, preliminary effort in reforming the system in the UK is converging to an opposite end. First, effort of re-regulating the financial system in the UK has been mainly relying on regulatory and legal sanctions, with the FCA imposed fine soaring strikingly after the LIBOR scandal (Figure 6). Second, the "twin-peak" regulatory architecture created in the UK after the LIBOR scandal shows a tendency of the British banking moving towards the US "dual banking system" birthed after the Civil War. Through introducing multiple regulators, conflicts of interest in defining regulatory power and territory may be increasingly induced. This is best demonstrated and particularly cautionary through the comparison between the American and Canadian banking experiences, considering both countries

started life as colonies of Great Britain with the original institutional foundations laid in place in the early nineteenth century. The two systems diverged at the end of the twentieth century when Canada set out for a more concentrated banking system that is able to absorb the key sources of systemic risk through placing the supervisory power over the consolidated entity of commercial and investment banking in the hand of one overarching regulator. In the US, the system featuring separate affiliation between commercial and investment banking regulated by multiple competing regulatory authorities gradually evolved as a fragmented, fragile and crisis-prone one that heavily relies on securities markets for industrial finance, substantially contributing to financial instability (Bordo et al., 2015). The main implication for the US banking reform is thus on addressing persisting fundamental structural weakness while the UK ought to ponder to where the chosen pathway is leading it.

6. EPILOGUE

The 2012 LIBOR scandal is one episode in the series of unsavory behavior of bankers in the banking history. The aftermath of this scandal spread probes into other benchmark setting processes carried out by the same group of banks and uncovered a more widespread market abuse. Ongoing effort has been spent on rewriting the banking rules to prevent it from recurring in the future, albeit the regulatory capture is deemed to persist as long as the underlying government-bank partnership does not undergo fundamental changes. Both deregulation and re-regulation are merely policy instruments for regulators and leverage for politicians in getting elected and reelected. After all, we ought to acknowledge that the advancement of financial system and have faith in the good in people. We are performing on the most powerful technologies in banking: not a single point in history can execute a transaction as quickly as we do at present – the average time it takes to execute a trading order is 300 microseconds (Ding et al., 2014). However, when human nature is multiplied by technological nature,

activities featuring excessive risk taking and loophole mining are consequently amplified. Regulation should limit the speculative nature of human beings, recognize the capitalistic and interest-calculating nature of financial industry and the structural constraints on the existing financial system, and design incentive structures that engage key players to serve the policies and avoid being captured by the regulatees.

Meanwhile, re-regulation is taking place: In early 2015, The European Commission proposed a structural reform to break up big banks in EU member states in order to force them to hive off risky trading activities. It also offered the UK a carveout to proceed with the Vickers reform that attempts to ringfence retail banking from riskier investment banking[40]. This initiative to return the banking to the Glass-Steagall days is utopian: until the expectations of society are adjusted to the new norm, the old institutional arrangements will persist. Calls for reducing big banks hence have to be market driven rather than mandated – for now the markets are being funded by savings and living off a national wealth accumulated over a long period of time. The recent market turbulence and the cascade of banking scandals can be seen as responses to the inability to create wholly new forms of financial institutions to meet the demand of creative destruction[41]. On 11 June 2015, the BoE governor Mark Carney announced an end to "the age of irresponsibility" and ethical drift, with tougher criminal sanctions for market abuse extended to cover thousands of asset managers, hedge funds and even the BoE itself[42]. Is this time going to be different? In answer to this question, we adapt an elegant summation by Van Dormael (1997):

"Every century has seen major speculative orgies…From time to time the market is gripped by irrational emotions, when it seems the sky is the limit. Then zest and rapture

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[40] EU reforms to break up big banks at risk. Financial Times, 29 January 2015. Available from:
www.ft.com/intl/cms/s/0/09025d06-a7d1-11e4-97a6-00144feab7de.html#axzz3d9hU0lIM
[41] Schumpeter (1987) suggests the process of creative deconstruction – economic structure should be revolutionized from within with the old one destroyed and a new one created – is the essential fact about capitalism.
[42] Bank of England governor Mark Carney to extend market abuse rules. Financial Times, 11 June 2015. Available from: www.ft.com/intl/cms/s/0/d24ce466-0f8b-11e5-b968-00144feabdc0.html#axzz3d9hU0lIM

intoxicate the most cautious players, until suddenly the music stops, the gambling instinct demands its appropriate toll and the market destroys itself through overextension. The dream then becomes a nightmare…At any time, once more, an unforeseeable insignificant occurrence somewhere, may spark a 'butterfly effect' spawning waves of deterministic chaos, wiping out paper fortunes and destroying lives, until the financial seism runs out of steam and the market settles upon its own debris on a new equilibrium that will stand the test of time, until the next crisis."

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Figures and Tables
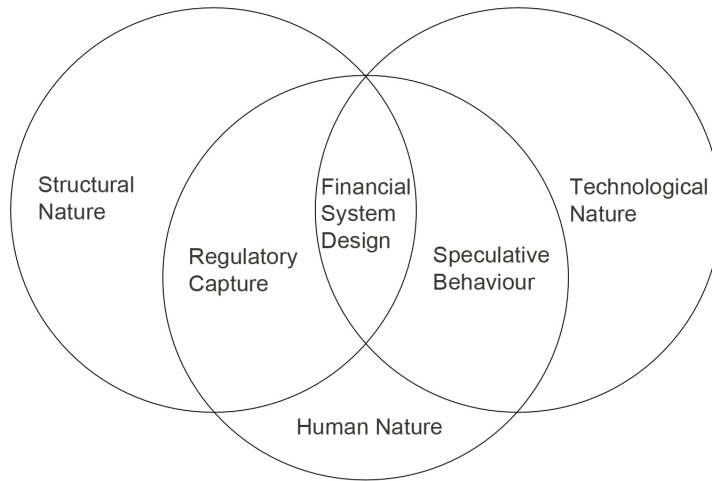
Figure 1. A Model of Banking Regulation
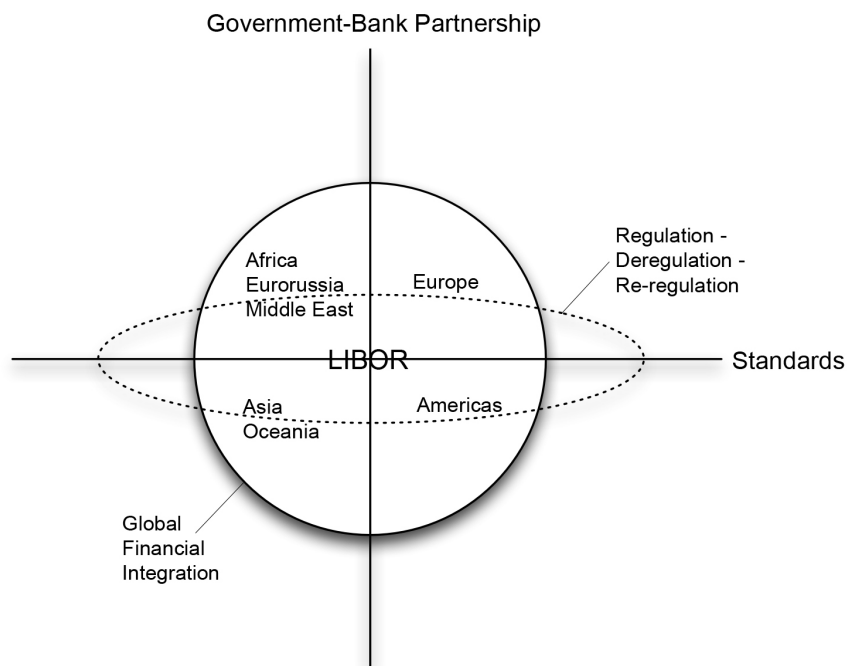
Figure 2. The Research Instrument
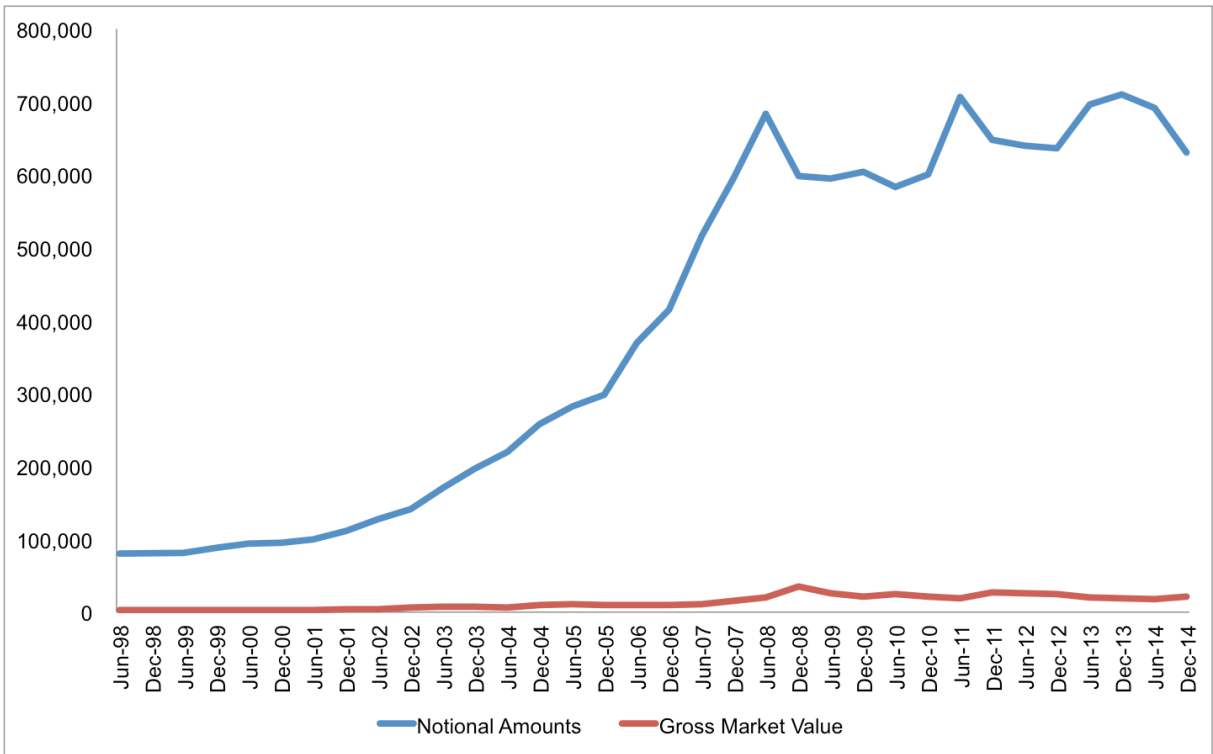
Figure 3. Global OTC Derivatives Markets 1998-2014 (USD billion)
Source: BIS (2015)
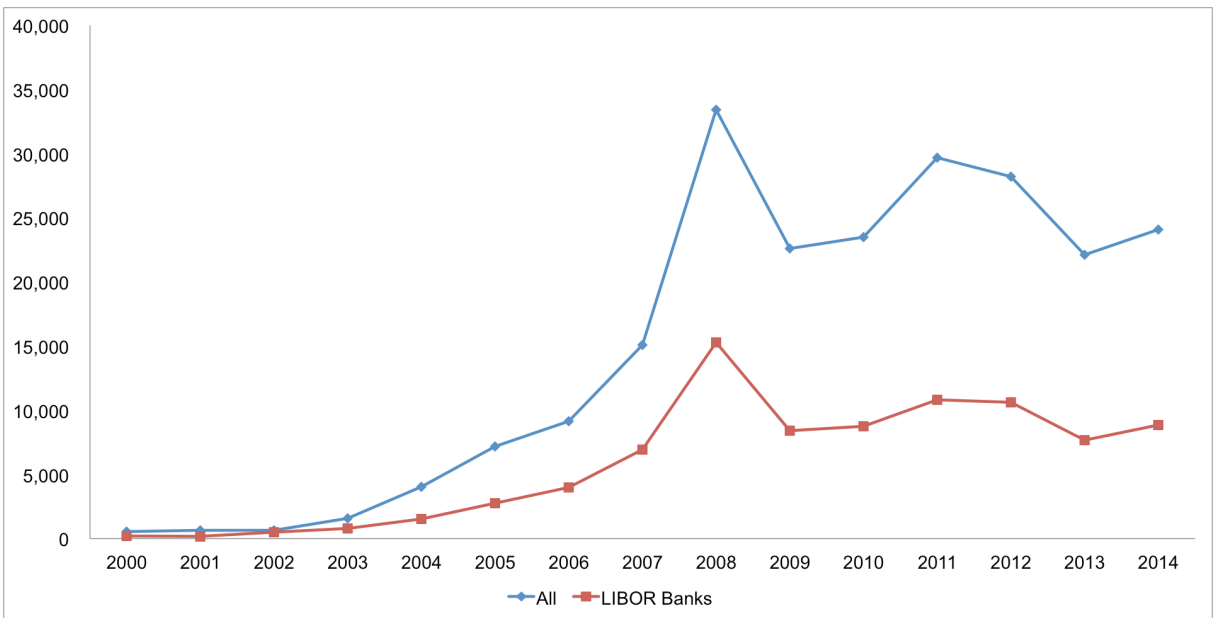
Figure 4. Total Derivatives Exposure 2000-2014 (USD billion)
Source: Bankscope
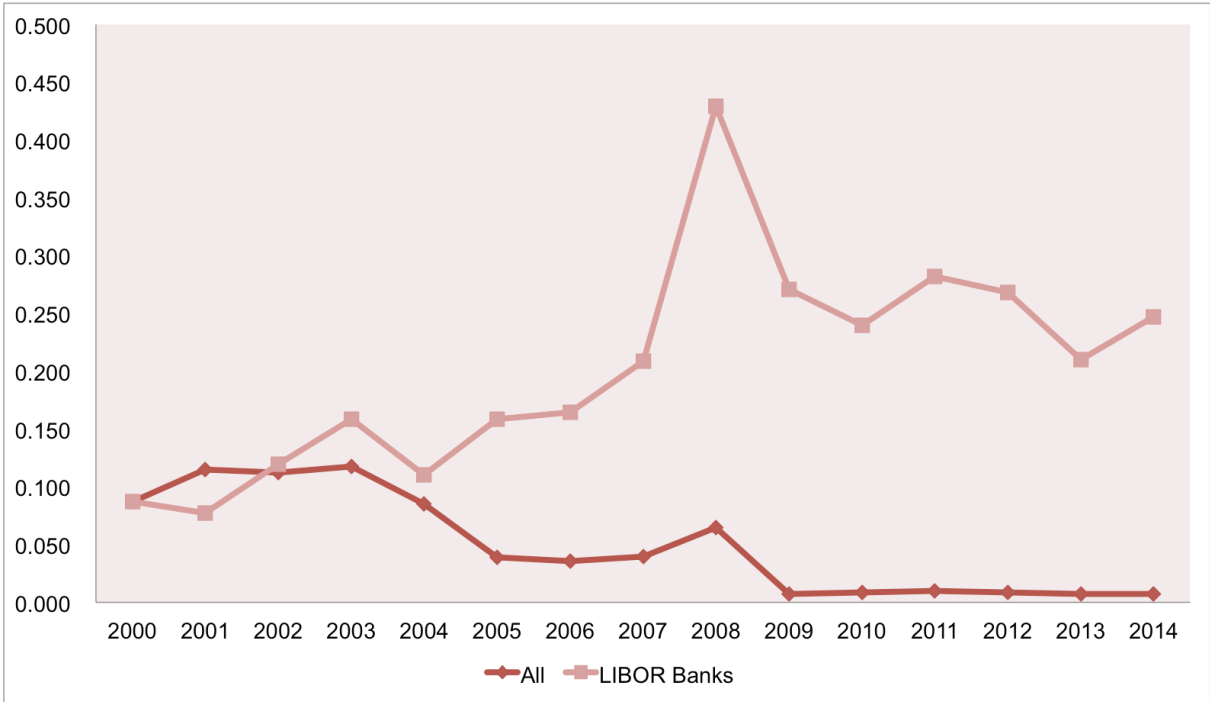
Figure 5. Extent of Derivatives Usage 2000-2014
Source: Bankscope
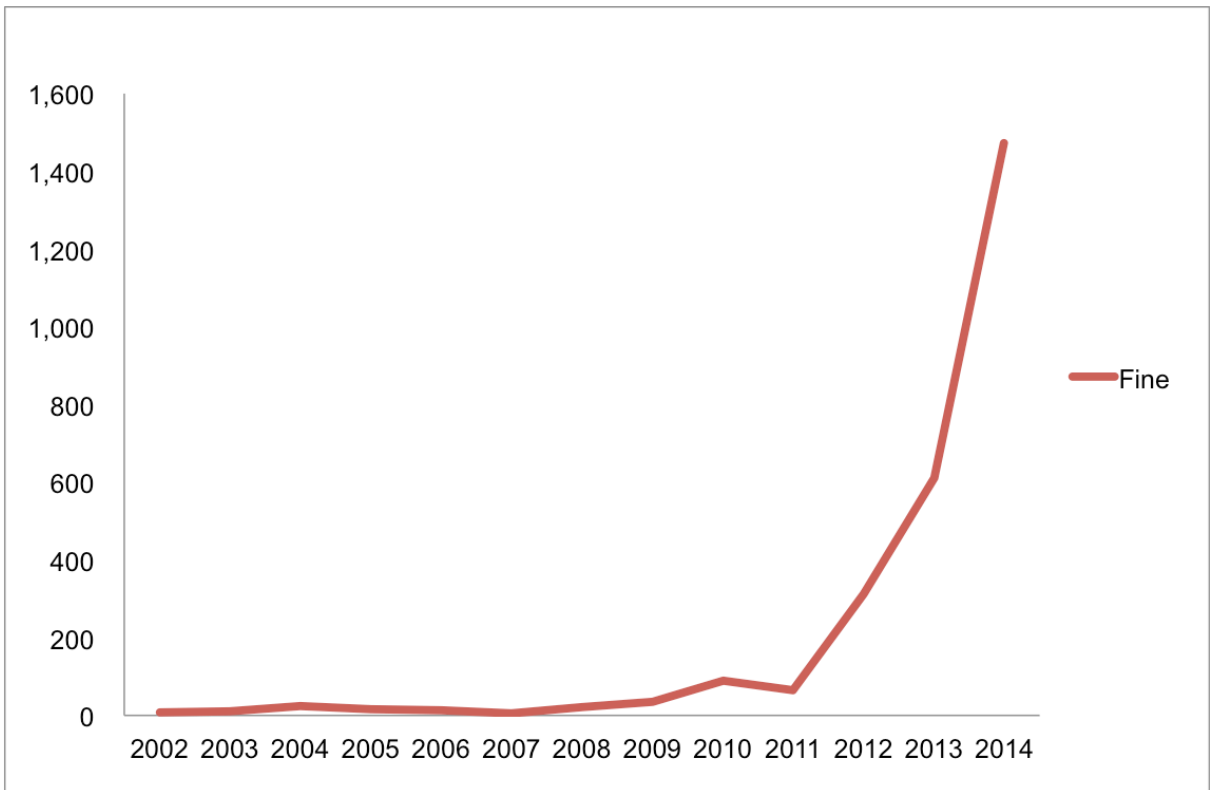
Figure 6. FSA/FCA Fine Amount 2002-2014 (£million)
Source: Financial Services Authority (2012); Financial Conduct Authority (2015)

Table 1. LIBOR Fine Settlements

Bank	Settlement Date	Settlement Amount ($million)
Barclays	27/06/2012	454
UBS	19/12/2012	1,500
RBS	06/02/2013	612
ICAP	25/09/2013	87
Rabobank	29/10/2013	1,070
Deutsche Bank	04/12/2013	971
Société Générale	04/12/2013	604
RBS	04/12/2013	530
JP Morgan	04/12/2013	108
Citigroup	04/12/2013	95
RP Martin	04/12/2013	0.3
RP Martin	15/05/2014	2.3
Lloyds Banking Group	28/07/2014	370
JP Morgan	21/10/2014	117
UBS	21/10/2014	16
Credit Suisse	21/10/2014	11.7
Deutsche Bank	23/04/2015	2,500
Barclays	20/05/2015	60
UBS	20/05/2015	203
	Total	**$9 billion**
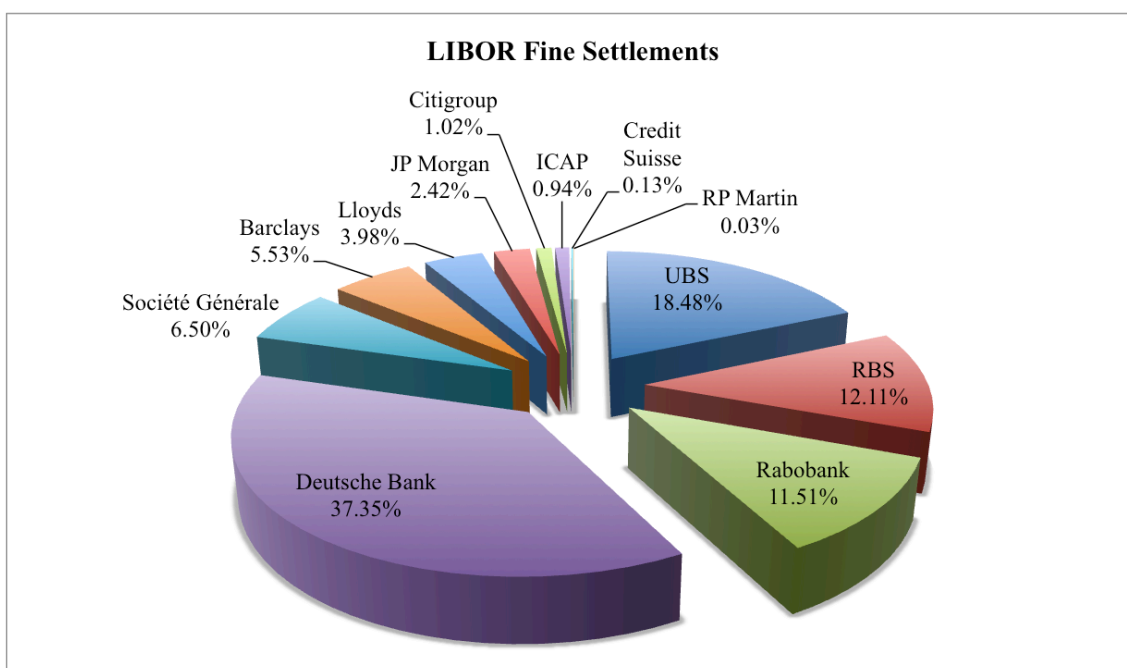
Table 2. FOREX Fine Settlements

Bank	Settlement Date	Settlement Amount ($million)
Bank of America	12/11/2014	250
Citigroup	12/11/2014	1,020
HSBC	12/11/2014	618
JP Morgan	12/11/2014	1,000
RBS	12/11/2014	634
UBS	12/11/2014	799
Bank of America	20/05/2015	205
Barclays	20/05/2015	2,320
Citigroup	20/05/2015	1,270
JP Morgan	20/05/2015	892
RBS	20/05/2015	669
UBS	20/05/2015	342
	Total	**$10 billion**
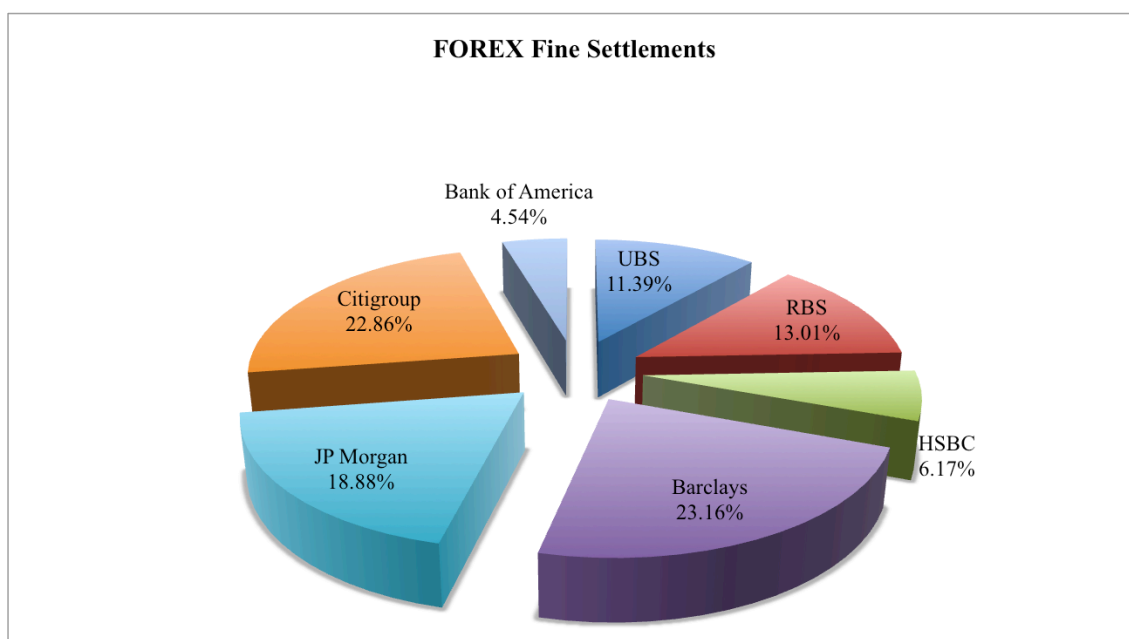
Table 3. LIBOR and FOREX Fine Settlements as Proportion in Total Assets and Market Capitalisation

Bank	Total Settlement ($million)	% in Total Assets 2014	% in Market Capitalisation 2014
Bank of America	455	0.02%	0.24%
Barclays	2,834	0.13%	4.52%
Citigroup	2,385	0.13%	1.45%
Credit Suisse	11.7	0.00%	0.03%
Deutsche Bank	3,471	0.17%	8.24%
HSBC	618	0.02%	0.34%
JP Morgan	2,117	0.08%	0.90%
Lloyds Banking Group	370	0.03%	0.44%
RBS	2,428	0.15%	6.20%
Société Générale	604	0.04%	1.77%
UBS	2,858	0.27%	4.47%

Table 4. Member Banks of the LIBOR Panel

Contributor Bank	Country	USD	EUR	GBP	JPY	CHF	CAD	AUD	NZD	DKK	SEK
Abbey National (Santander)	Spain		X	X							
Bank of America	USA	X									
Bank of Nova Scotia	Canada						X				
Bank of Tokyo-Mitsubishi UFJ	Japan	X	X	X	X	X					
Barclays	UK	X	X	X	X	X	X	X	X	X	X
BNP Paribas	France	X		X							
Canadian Imperial Bank of Commerce	Canada						X				
Citigroup	USA	X	X	X		X					
Commonwealth Bank of Australia	Australia							X	X		
Crédit Agricole	France	X		X	X						
Credit Suisse	Switzerland	X	X			X					
Deutsche Bank	Germany	X	X	X	X	X	X	X	X	X	X
HSBC	UK	X	X	X	X	X	X	X	X	X	X
JP Morgan Chase	USA	X	X	X	X	X		X	X	X	X
Lloyds Banking Group	UK	X	X	X	X	X	X	X	X	X	X
Mizuho Bank	Japan		X	X	X						
Norinchukin Bank	Japan	X				X					
Rabobank	Netherlands	X	X	X							
Royal Bank of Canada	Canada	X	X	X			X				
Royal Bank of Scotland	UK	X	X	X	X	X	X	X	X	X	X
Société Générale	France	X	X	X	X	X	X				
Sumitomo Mitsui Banking Corporation	Japan	X				X					
UBS	Switzerland	X	X	X	X	X					

Table 5. Gains/Losses on Trading and Derivatives 2005-2014 (USD billion)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bank of America	1.81	3.17	-5.13	-5.91	12.24	10.05	5.71	8.32	7.56	6.31
Barclays	4.56	7.47	6.89	-0.47	14.29	12.03	7.66	12.51	11.15	5.15
Citigroup	.	.	-12.97	-26.75	8.16	8.11	5.46	6.79	7.53	6.48
Credit Suisse	4.29	7.73	5.46	-13.98	16.12	9.58	4.05	1.30	3.07	2.05
Deutsche Bank	.	11.68	5.77	-47.06	8.50	4.83	3.37	5.43	3.36	3.71
HSBC	5.86	8.22	9.83	6.56	9.86	7.21	6.51	8.03	9.27	6.76
JP Morgan Chase	5.86	10.35	9.02	-12.70	12.10	10.39	8.61	6.47	10.59	10.53
Lloyds Banking Group	16.01	12.45	6.26	-13.39	30.93	24.61	-0.57	23.68	27.12	15.86
RBS	4.03	5.25	2.66	-13.16	6.09	7.07	4.18	2.64	4.23	2.01
Société Générale	8.02	13.88	14.12	6.39	2.39	6.51	4.89	3.00	4.37	8.32
UBS	6.08	11.26	-11.98	-64.99	5.57	8.52	-3.73	10.47	7.95	6.37

Source: Bankscope

WHEN LIBOR BECOMES LIEBOR: THE COST OF MAKING

BANKERS BEHAVE[43]

Abstract

We analyze security returns of banks that are implicated in the LIBOR scandal during the period from January 2011 to December 2013 and identify 39 event dates on which banks are accused of or sanctioned for manipulating LIBOR. Relying on a sample of 30 banks and a control sample of 1,262 banks from 11 countries, we capture a substantial size of reputational damage of banks upon the announcement of their involvement in the scandal. We also document a contagion effect of the reputational damage passing on from banks alleged of LIBOR manipulation to other non-alleged banks sharing the same regulatory panels. The contagion effect of the reputational damage is underscored by the association between the extent of such effect and legal enforcement of a country, highlighting and reaffirming the important role of a country's legal enforcement and institutional setting in disciplining banking behavior.

Key Words: Market Discipline; Reputational Damage; Bank Contagion; Corporate Misconduct; LIBOR Scandal.

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1. INTRODUCTION

Reputation, in modern corporate life, plays an imperative role as "quality-assuring devices" (Klein and Leffler, 1981). Meanwhile, the growing international financial market integration has created plural channels for the transmission of any shocks. In this paper, we study the reputational penalties that banks received for involving in the LIBOR scandal and the related contagion effect on other "clean" or "temporarily clean" banks that are sitting in the LIBOR and connected panels[44] ("The Panel" hereafter). We believe that there is a contagion effect of reputational penalties, within a network featuring institutional ties facilitated by "The Panel", passing on from banks implicated in the scandal to banks not or not yet involved. Our study encompasses reputational penalty and financial market contagion. The recent high-profile LIBOR rigging scandal centering on UBS, Barclays, RBS and a number of other global leading banks have drawn much attention to the course concerning how to make bankers behave. While the aftermath of the scandal is still being calculated, the LIBOR scandal setting provides us the opportunity to appraise the penalties imposed by the markets and the degree to which misconduct by banks can affect connected banks. Indeed, corporate misconduct has been a prevailing subject of study in various disciplines. In accounting and finance literature, it is often examined in conjunction with stock market reaction (i.e. trading volume; stock price), earnings and risk, cost of capital, firm value, and corporate governance structure. In reputation literature, the centrality is reputational penalties induced by financial penalties sanctioned by regulators. Yet, there has been a wide acknowledgement of a systemic ethical deficit since financial penalties alone are recognized as "the cost of doing business" and thus failed to guide and regulate market behavior (O'Brien, 2014).

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[44] We construct a panel called "The Panel" consisting of 30 banks by pooling three panels: 1) LIBOR panel that combines all the submitter banks for all currencies; 2) Global Systemically Important Banks (GSIB); and 3) G14 – The largest 14 derivatives dealers. Some banks such as Barclays, Citigroup and UBS are the member banks of all the three panels while some sit in one or two of the three panels.

To conduct our investigation, we analyze security returns of banks that are alleged for LIBOR rigging during the period from January 2011 to December 2013 and identify 39 event dates on which banks are accused of or sanctioned for manipulating LIBOR. Relying on a sample of 30 banks and a control sample of 1,262 banks from 11 countries during the period 2011 and 2013, we capture a substantial size of reputational damage when alleged rate manipulation is announced. Reputational damage, measured by the stock returns in a three-day window around the event (i.e. [-1, +1]), is substantially severe. We also document a contagion effect of the reputational damage passing on from banks alleged of LIBOR manipulation to other non-alleged banks sitting in "The Panel". We believe the merit of our study rests in the research design that examines the effects of corporate misconduct on a more micro level encompassing different dates throughout the LIBOR saga rather than merely taking the first announcement date as most event studies do in this stream. We consider findings of our study are of significant importance in light of the speed and scope of contagion in banking sector, as demonstrated by numerous amount of cases in history, are relatively high and large, which are prone to give rise to a larger scale and scope of failure, larger losses to creditors and depositors, and can easily extend beyond the banking sector to adversely affect other industries even the macroeconomy (Kaufman, 1994).

The contribution of our study to the literature is manifold. First, it adds clarity to the ongoing study of reputational damage through examining reputational damage of banks in 11 developed markets, which is a sizeable scope that has rarely been covered in the previous studies. Second, in the same manner, our study contributes to the vast literature on international bank contagion. Prior studies on bank contagion are either done within a single country or a group of countries within the same region (i.e. Central and Eastern Europe). In our knowledge, only Chan-Lau et al. (2012) span the investigation of bank contagion on an international scale. The two types of study are precisely the

representations of the two extremes of choice of research setting in studying bank contagion: crisis period and normal period, respectively. A moderate setting in between the two and simultaneously presents a common shock posed by the same event to all banks has not yet been explored. Our choice of LIBOR scandal as the setting to examine international bank contagion fills this gap. Third, The existing body of literature suffers from a number of shortcomings and identification problems: Preliminary evidence derived from the existing cross-country studies demonstrates a variation across markets. However, reputational penalties are often assessed for different events at different spots of time. Thus, the results are seemingly unconvincing at some occasions due to the lack of sophistication such as regulatory changes cannot be ruled out. A study based on a common event occurring on an international scale would be conducive to address this issue. Moreover, conventional methodology from accounting and finance research has been frequently employed to address issues in law and economics disciplines with a focal point of the coordination between legal sanctions and reputational penalties to reach an optimal social construct and legal system. These studies do not study micro level internal to these issues and thus the identification and examination lack accuracy. In addition, reputational penalties are seldom wholly tested in the discipline where it stems from. From this stance, it is necessary to initiate a more thorough enquiry of reputational penalties utilizing research tradition and toolkits in accounting and finance research. Fourth, bridging the theory of reputation to international financial contagion theory, our study contributes to emerging evidence on reputational contagion pioneered by Morrison and White (2013), which advocates that common regulation as a substantial channel for contagion, which complements the conventional and prevailing channels such as correlated assets and interbank lending suggested in prior studies in this field. We show that the institutional linkages among the banks derived from sharing a common regulator (e.g. British Bankers' Association) facilitate a potent channel for bank contagion. Lastly, we extend our investigation to

include the role of a country's legal enforcement in moderating the reputational penalty imposed by the market. This perspective illuminates on the factors that affect reputational contagion and allows us to fully exploit the cross-country variation in our sample.

Our study of reputational effect and contagion effect of the LIBOR scandal should also be of interest to both practitioners and policy makers. The breadth of contagion effect in international banking system shown in our study reinforces the importance of cross-country banking supervision and risk management at the current stage of international banking regulation. Further, our evidence suggests a contagion effect of the reputational damage passing on from banks alleged of LIBOR manipulation to other non-alleged banks linked by the common regulatory panels, and such effect is greater for banks in countries with higher score for legal enforcement, highlighting and reaffirming the important role of a country's legal enforcement and institutional setting in disciplining banking behavior.

This paper is structured as follows: Section 2 provides an overview of the LIBOR scandal and discuses how our study is themed on ethics and discipline issues in banking. Section 3 reviews the related literature, focusing on the theory of reputation and bank contagion that guide the empirical inquiry, on the basis of which develops the hypotheses. Section 4 describes the data and methodology. Section 5 presents the main results. Section 6 concludes.

2. LIBOR and the LIBOR Scandal

LIBOR stands for London Interbank Offered Rate. It is a set of rates first published by British Bankers' Association (BBA) in 1986 that represents the costs of short-term

wholesale funds for major banks in London interbank market. Overtime, the prominence of LIBOR has grown drastically and is now deeply rooted in the international financial system, serving two primary purposes: as a reference rate and as a benchmark rate. As a reference rate, LIBOR serves as the basis for valuing financial instruments and establishing the terms of agreement for short-term floating rate contracts such as swaps and futures. It is one of the single most important global reference rates that affect contracts with an outstanding value of at least $300 trillion, which is equivalent to approximately four and half times global GDP. Variable rate loans ranging from adjustable rate mortgages to credit cards to private student loans are also often tied to LIBOR. As a benchmark rate, LIBOR is used as the performance measure for funding costs and investment returns and an indicator for the soundness of a business and financial market as a whole.

Prior to the transfer of responsibility for administration from BBA to ICE (Intercontinental Exchange Benchmark Administration Ltd) on 31 January 2014, LIBOR was calculated and published each business day by Thomson Reuters, to whom major banks submit their cost of borrowing unsecured fund in 10 currencies[45] for 15 maturities[46], which yield 150 different LIBOR rates reported daily. For each currency, there is a panel consist of contributor banks. The submission process requires contributing banks to exercise their subjectivity in evaluating the rates at which money may be available in the interbank market in determining their submission. The submitter from each panel bank is asked to answer the question "at what rate do you think interbank term deposits will be offered by one prime bank to another prime bank for a reasonable market size today at 11am?"[47] Thomson Reuters further trims the rates by removing the top 25 per cent and bottom 25 per cent, and then averages the remainder

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[45] AUD, CAD, CHF, DKK, EUR, GBP, JPY, NZD, SEK, and USD.
[46] Overnight, 1 week, 2 weeks, 1 month, 2 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, and 12 months.
[47] British Bankers' Association. Historical Perspective. [Online] Available from: http://bbalibor.com/bbalibor-explained/historical-perspective [accessed 10 January 2013].

to create the final LIBOR rates, which are published and available to world around midday London time. Such mechanism is subject to a number of shortcomings since it is hypothetical, subjective, and open to abuse when an unethical person answers it (McConnell, 2013), and thus is ineffective in preventing manipulation.

On 27 June 2012, the 300-year-old British bank Barclays admitted to misconduct related to manipulating daily setting of the LIBOR and the EUROLIBOR (Euro Interbank Offered Rate) and reached a $453 million fine settlement with the UK Financial Services Authority (FSA), the US Commodity Futures Trading Commission (CFTC), and the US Department of Justice (DoJ). In the statement of facts supplied by the DOJ, Barclays admitted to three types of manipulation dated back as early as in mid-2005: under-reporting, over-reporting, and holding constant. The motive behind the three types of misrepresentations varied over time from benefitting derivatives trading positions to avoiding the stigma of appearing weak relative to other banks during the financial crisis[48]. Evidence from the ongoing probe by regulators confirms that the manipulation of LIBOR is not solely a localized event, but rather a blatantly unethical and occasionally illegal practice that deliberately and systematically manipulates borrowing rates, which had been part of business-as-usual in the global financial markets. To date, more than $9 billion of financial penalties have been imposed on a number of banks and brokers worldwide, all of which are global leading banks that are seen as systemically important. In the wake of the LIBOR scandal, parallel investigation had been launched into other benchmarks such as foreign exchange, oil, and precious metals.

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[48] See Monticini and Thornton (2013) for the effect of misrepresentations on LIBOR rates.

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.1. Bank Ethics, Market Discipline, and Regulatory Discipline

Bank ethics, market discipline, and regulatory discipline (i.e. financial market regulation and supervision) are three facets on the continuum that shapes bank behavior, albeit they are mostly studied separately in the existing body of literature on bank behavior. This section reviews studies in the three respective areas and draw a link between them through the issue raised in this study. Just like other areas of finance, banking is often seen as an amoral field focused purely on risk and return. Yet, ethics does play an important role in history and as business and banking evolve (Cowton, 2002). The perceived ethics of a bank has direct effect on its reputation. While the role of good strategy and prudent management played in business success should be acknowledged, good reputation is believed to be a critical factor ensuring long-term success (Green, 1989). In the domain of reputation, bank ethics and market discipline can be parallel, as consequentially they both direct to the end of the perceived reputation of a firm by other market participants. However, the main distinction between the two rests on the means through which the end is reached: bank ethics is mainly based on the autonomous choice of banks according to the code of ethical conducts while market discipline functions through the reaction (e.g. penalty) of associated stakeholders.

Market discipline has less to do with market *per se* and relates more to the institutional framework namely information, incentive, and control that is used to reduce problems arising from asymmetric information problems (e.g. moral hazard) that are endemic in banking (Stephanou, 2010). It embodies a market-based incentive mechanism that can potentially curb the incentive to take excessive risk by making risk-taking more costly. That is, investors in bank liabilities, such as subordinated debt or uninsured deposits, 'punish' banks for greater risk-taking by demanding higher yields on those liabilities.

Banks that are subject to stronger market discipline tend to limit their risk of default through holding higher capital buffers (Nier and Baumann, 2006). Bliss and Flannery (2002) interpret this notion with two distinct components: market monitoring and market influences. The former refers to that investors accurately evaluate changes in a firm's condition and promptly incorporate those assessments into the firm's security prices while the latter is associated with the process through which external claimants affect a firm's actions. The majority of studies on market discipline that are based on subordinated debt issues (e.g. Cakici and Chatterjee; 1993; Blum, 2002; Sironi, 2003; Chen and Hasan, 2011).

Regulatory discipline, on the other hand, is often seen as complementary or even replacement to market discipline, reflected in the wave of financial deregulation that relax regulations on rapidly growing unregulated players (e.g. hedge funds) and instruments (e.g. over-the counter derivatives), and the dependence of prudential capital regulation on market-based measures of risk (Stephanou, 2010). Market discipline and regulatory discipline jointly determine a bank's cost of misconduct: markets penalize banks for misconduct by demanding higher costs of debt financing and limiting the types of claims a bank may issue while regulatory discipline acts through a number of channels including risk-based capital requirements and insurance premium, examination frequency and intensity, and cease and desist orders. Billett et al. (1998) compare the costs associated with these two disciplines and show that bank shareholders perceive the costs associated regulatory discipline to be less sensitive to risk increases than the costs associated with market discipline. Nevertheless, appropriate regulations can enhance the power of market discipline while market signals can provide relevant information and incentives for banks and supervisory actions (Stephanou, 2010).

3.2. Reputational Penalties for Corporate Misconduct

Various consequences of corporate misconduct are documented in the literature. Prior market-based research of corporate misconduct finds substantial losses in market value of firms implicated in allegation of misconduct, which legitimates reputational effects as an important device in disciplining firms. In particular, the magnitude of the reputational penalties has been examined in a number of different settings, and a majority of these studies have documented negative average abnormal returns in the selected event period. Karpoff and Lott (1993) examine alleged frauds by public corporations and suggest that a small portion of the loss in shareholder wealth is explained by criminal and civil sanctions imposed through the courts while a substantial portion of the loss in market value is associated with the reputational penalties imposed through the market. They also find some evidence that firms' earnings drop after a fraud announcement while regulatory violations do not lead to reputational losses. Alexander (1999) finds similar reputational effects on shareholder wealth by investigating reputational penalties of the public corporations that are accused of federal crimes, in addition to which a number of factors including management turnover, shutdown of business unit, and announcement of remedial strategies are connected to the reputational consequences of corporate crime. Based on the investigation of SEC enforcement actions for financial misrepresentation, Karpoff et al. (2008) provide additional evidence reaffirming the role of market-based reputational penalties: two thirds of the 41 per cent drop in market value resulting from the announcement of misconduct are attributable to the reputational losses. A considerable amount of the evidence from these studies is conditioned on the contractual relationship between the offending party and offended party. For instance, Alexander (1999) suggests that shareholder wealth losses are larger in cases where the offended party is in a contractual relationship with the offending party rather than a third party. Similarly, Karpoff et al. (1999) argue that the size of reputational penalties differ in defense procurement fraud: unranked contractors

are penalized heavily for procurement fraud, undergoing both a drop in market value and a subsequent loss in government contract revenue while such changes are negligible for influential contractors.

Although the role of reputation as a disciplinary mechanism for corporate misconduct has been affirmed in the literature, Murphy et al. (2009) argue that past studies do not provide definitive evidence linking allegation-related wealth losses to changes in financial performance, journeying from which they find decrease in earnings and increase in risk as the relevant explanation for the allegation-related wealth and reputation effects. Among all types of misconduct (i.e. antitrust violations, bribery, copyright violations, and fraud) studied, fraud has the largest negative effect on firms' market value. In studying the types of corporate misconduct, Karpoff et al. (2005) find that market reaction to violations of environmental regulation, on average, is not larger than the legal penalties imposed, suggesting that share value losses are attributed to prospective legal sanctions rather than to any reputational costs, which is consistent with the argument that environmental violations do not lead to reputational losses.

Another stream of literature focuses on the reputational penalties in relation to earnings restatement and operational loss announcement. Palmrose et al. (2004) explore the market reaction to restatement announcements and find that, among all, restatements involving fraud pose more negative market reaction. In particular, content of restatement announcement affects returns with a penalty for missing information. Perry and de Fontnouvelle (2005) assess a corporation's stock price reaction to the announcement of a major operational loss event, whereby identify a reputational loss when a firm's market value declines by more than the announced loss amount. They find negative reputational effects for losses caused by internal fraud while external events have no reputational effect. The study of Cummins et al. (2006) obtains

consistent results by focusing on operational losses in banks and insurance companies. Sturm (2013) analyzes reputational damage caused by operational losses of European financial firms and contends that the negative stock market reaction is more pronounced to the announcements of settlement than the initial indications of the loss, and reputational damage is more pronounced for banks with high leverage.

More recent studies extend this topic into a cross-country context. Gillet et al. (2010) analyze market reactions to operational loss announcements by financial firms listed in Europe and US and filter out the effects of reputational damage (i.e. loss in market value exceeds the amount of operational loss) connected with internal fraud. While the US firms share the same feature as the entire sample, European companies usually demonstrate lower market value, indicating higher reputational damage. Such findings are intriguing, for the fact that it provides a desirable setting to assess the regulatory enforcement and level of appreciation of reputation and trust in different geographical areas or societies. Tanimura and Okamoto (2013) conduct cross-country comparison and note that reputational penalties are larger in Japan than in the US, endorsing the pervasive belief that reputation and trust have a great influence on Japanese society. Fiordelisi et al. (2014) suggest that reputational losses in financial industry are higher in Europe than in North America. Armour et al. (2012) analyze the reputational losses sustained by financial firms that are penalized by the regulatory body in the UK and find that reputational penalties are on average 9 times the size of the financial penalties. They also notice that in the UK the magnitude of levied penalties does not necessarily imply the seriousness of the wrongdoing perceived by investors and clients, but rather, the disclosure of misconduct *per se* is the primary source of the reputational damage.

In light of above studies, in our first hypothesis we investigate whether the market penalizes banks for alleged LIBOR manipulation. We expect that following an

announcement of involvement in the scandal, a bank experience reputational penalty imposed by the market, denoted as a drop in share value. We believe that stock price, as the present value of all future cash flows, around the announcement date is a final price generated through the mechanism consists of multiple underlying channels through which stakeholders including customers and clients, employees, suppliers, debtholders, and equity holders (Engelen and van Essen, 2011) penalize the bank for alleged LIBOR manipulation. Thus, we posit our first hypothesis as follows:

Hypothesis 1 (H1). The market penalizes banks for involving in the LIBOR scandal upon the announcement of alleged manipulation, leading to a reputational damage of these banks.

3.3. Financial Market Contagion

The elusive presence of financial contagion is deeply complex and steeped in the increasingly integrated networks of international financial markets. Results from studies regarding the existence and breadth of financial contagion is fairly controversial and diverse at all levels that are subject to a range of definitions, propagation mechanism and channels, research settings, as well as methods. Tests for financial market contagion are mostly done in the setting of financial crisis on national level (Longstaff, 2010; Bekaert et al., 2011; Kenourgios et al., 2011; Gallegati, 2012) with considerable attention paid on emerging markets (Baig and Goldfajn, 1998; Kaminsky and Reinhart, 2000; Forbes and Rigobon, 2002; Bae et al., 2003; Khalid and Kawai, 2003; Chiang et al., 2007; Iwatsubo and Inagaki, 2007; Rodriguez, 2007; Dimitriou et al., 2013). For instance, Forbes and Rigobon (2002) refer to the high level of market comovement in all periods during 1997 Asian crisis, 1994 Mexican devaluation, and 1987 US market crash as interdependence rather than contagion due to no detected unconditional

correlation coefficients. Corsetti et al. (2005) focus on the international contagion effect of the Hong Kong stock market crisis of October 1997 and identify "some contagion, some interdependence" in the 17 markets studied. Studies on contagion effect at corporate level, by contrast, have chiefly concentrated on the spillover effect of shocks passing on from one business to other businesses, investigating contagion effect on stock returns subsequent to bankruptcy (Lang and Stulz, 1992; Ferris et al., 1997), managerial forecast announcements (Ramnath, 2002), earnings restatements (Gleason et al., 2008), and corporate scandals (Akhigbe et al., 2005; Gande and Lewis, 2009; Bonini and Boraschi, 2010).

Another avenue of empirical studies has solely focused on banking sector, examining whether bad news such as bank failures and financial distress announcements of one or group of banks adversely affect other banks. Aharony and Swary (1983) detect contagion effect through analyzing the three largest bank failures in the US and claim that the observed drop in prices of solvent banks arises from investor's response to a common type of negative signal instead of a contagion effect. Schoenmaker (1996) employs a larger sample of bank failures under the US National Banking System from 1880 to 1936 and confirms the presence of contagion risk in banking. Based on simulation attempting to show the impact of the failure of one bank on other banks, Furfine (2003) studies interbank payment flows of 719 US commercial banks that are Fedwire users in 1998 and proffers that contagion arising from direct interbank linkages does not necessarily present a system-wide threat to the US banking system. Following the typology that classifies US banks into money-center banks and regional banks, Docking et al. (1997) analyze loan-loss announcements over the 1985-90 period and document significant negative contagion effect in both money-center banks and non-announcing regional banks. Slovin et al. (1999) assess dividend reductions of commercial banks and conclude that dividend reductions by money-center banks have

negative contagion effect on rival banks while such effect is absent when the dividend reductions are undertaken by regional banks. Similarly, Bessler and Nohel (2000) study contagion effect of dividend reductions by 17 US money-center banks and document contagion effect in both non-announcing money-center banks and big regional banks. Brewer and Jackson (2002) test for contagion effect of financial distress announcements in US commercial banks and life insurance companies and argue that the documented inter-industry shareholder wealth effects are not purely contagious in nature, but rather attributable to factors such as asset portfolio composition, geographic proximity, leverage, and regulatory expectations.

In addition to the above studies based on the US data, a great deal of studies have been done using data from different countries and regions worldwide including Australia and New Zealand (Pais and Stork, 2011), Austria (Elsinger et al., 2006a), Belgium (Degryse and Nguyen, 2007), Denmark (Bech et al., 2002; Amundsen and Arnt, 2005), Finland (Toivanen, 2009), Germany (Upper and Worms, 2004), Hong Kong (Gay et al., 1991), Hungary (Lublóy, 2005), India (Iyer and Peydro, 2011), Ireland (Duggar and Mitra, 2007), Italy (Angelini et al., 1996; Mistrulli, 2011), Mexico (Martinez-Jaramillo et al., 2014), Netherlands (van Lelyveld and Liedorp, 2006; Liedorp et al., 2010), Sweden (Blåvarg and Nimander, 2002; Frisell et al., 2007), Switzerland (Sheldon and Maurer, 1998; Müller, 2006), and the UK (Wells, 2004; Elsinger et al., 2006b). A substantial portion of these studies concentrates on domestic contagion effect while the rest considers both demotic and cross-country contagion. The post-2000 period experiences a bloom of cross-country contagion studies, which takes form in either wholly cross-country studies or domestic studies attaining cross-country contagion. This trend has multiple implications: first, the increasing number of cross-country contagion studies implies the changing environment of international financial markets, in particular the growth of interconnectedness. Evidence from early studies indicates the

absence of contagion, however, may still be valid since the architecture of financial markets back in the 80s and 90s seems not so conducive in facilitating financial contagion. Indeed, recent studies on both regional and international level suggest the escalating bank contagion over time. Second, now that research settings and design based on single country have been intensively exploited, researchers are driven to enter a cross-country context for novelty seeking.

So far, only a handful number of studies examine the presence of contagion in a relatively broad domain. Upon the failure of the Bank of Credit and Commerce International, Kanas (2005) provides strong evidence of "pure" contagion effect[49] in the UK while such effect is absent in the US and Canada. In Central and Eastern Europe (CEE), Geršl (2007) posits that both the entry of foreign banks and borrowing abroad increase the likelihood of cross-border contagion while Jokipii and Lucey (2007) show that among the three major CEE countries (i.e. Czech Republic, Hungary, and Poland), contagion shifts from Czech Republic to Hungary only. Ongena et al. (2013) expand the test from Eastern Europe to Near Asia on a firm-bank level and find international bank liquidity and ownership as an international financial contagion channel. Gropp and Moerman (2004) conduct simulations to test for contagion effect in a sample of 67 EU banks and document the tight links connecting banks within countries as well as major banking systems in Europe. They also propose "net contagious influence", which is a non-parametric measure that can be used to assess the systemic importance of a bank within and across countries. Cocozza and Piselli (2011) partition EU into Eastern Europe and Western Europe in their sample and find evidence of contagion spreading from Eastern European banks, confirming the prevalent trend of contagion diffusing from emerging markets to banks in developed markets that are linked to these markets. The study by Chan-Lau et al. (2012) is the only one that brings the empirical inquiry of

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[49] Contagion effect arises from a bank failure caused by fraud and internal irregularities.

contagion in international banking system. Based on the analysis of market-based indicators of the 24 top global banks from the US, EU, UK and Japan, they present interesting evidence: 1) at country level, US banks are fairly vulnerable to contagion risk from both domestic and foreign banks, the presence of contagion effect is markedly among European banks, and major Japanese banks are insulated from shocks to foreign banks; 2) at corporate level, there is a bipolar variation of the contagion effect among the top global banks, which can be further used as an indicator for systemic importance assessment.

Our second research question investigates the contagion of the reputational damage when it does incur. According to previous studies of bank contagion, it is evident that whether contagion effect can be captured is largely depending on how contagion is defined, one's belief regarding how contagion spreads, and the method to measure it in the specific setting. In light of this, we begin with working out the definition of bank contagion to be used in our study. Following Kaufman (1994), Docking et al. (1997), Gropp and Moerman (2004), Kanas (2005), and many others, we proceed with a working definition of financial contagion as negative stock returns experienced by other banks arising from the disclosure of misconduct by one bank or group of banks. Our definition of financial contagion is closest to the spirit of Lang and Stulz (1992) and Kaufman (1994), who regard negative information externalities (spillovers) as contagion. Previous literature suggests a number of channels through which a contagion spreads in financial markets such as correlated-information channel (Dornbusch et al., 2000; Kiyotaki and Moore, 2002), liquidity channel (Allen and Gale, 2000; Kodres and Pritsker, 2002; Brunnermeier and Pedersen, 2009), and risk premium channel (Acharya and Pedersen, 2005). We follow Morrison and White (2013) and consider institutional linkages among the banks derived from sharing a common regulator as a potent channel for bank contagion. In other words, when one bank is penalized for alleged LIBOR

manipulation, other banks sitting in "The Panel" will experience similar effect, on the basis of which we posit the following:

Hypothesis 2 (H2). There is a contagion effect of the reputational damage passing on from banks alleged of LIBOR manipulation to other non-alleged banks sitting in "The Panel".

3.4. Institutional Setting and Legal Enforcement

A country's institutional setting, in the broadest sense, embodies specific corporate and securities market laws, stock exchange listing rules, enforcement mechanisms to ensure compliance, and other economic, political, and social structures that shape business practices (Preiato et al., 2015). These differences have been widely acknowledged in accounting and finance research with numerous studies using a variety of metrics to capture the key elements of the institutional setting that proxy for legal enforcement (i.e. the extent to which companies comply with corporate and securities market laws and financial reporting regulations). La Porta et al. (1998) distinguish countries according to their legal system origin (e.g. common law versus code law) and attributes of the legal setting, which are assumed to represent a fundamental difference in the degree of protection provided by the law and its enforcement. Studies of the effectiveness of securities market regulators have focused on aspects of their enforcement powers and how they are used, and distinguish between public and private enforcement activities (La Porta et al., 2006; Jackson and Roe, 2009). Another widely used set of proxies developed by Kaufmann et al. (2011) measures differences between countries on various attributes including rule of law, regulatory quality, control of corruption, government effectiveness, political stability, and voice and accountability. In other respect, World Economic Forum (2014) published a range of country-specific measures

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for institutional setting including strength of auditing and reporting standards, protection of minority shareholders' interests, and judicial independence, among many others. Given that the enforcement of securities market laws plays a pivotal role in disciplining the capital markets (through offering investors protection, for instance), we expect to capture stronger contagion effect in countries with higher score for legal enforcement. Thus, we posit the following:

Hypothesis 3 (H3). The contagion effect of the reputational damage is stronger in countries with higher score for legal enforcement.

4. DATA AND METHODOLOGY

4.1. Sample Selection

To conduct our investigation, we construct a database for a sample of banks that are accused of committing LIBOR rigging during the period between January 2010 and December 2013. We hand collect news on the LIBOR scandal from the following four major news providers: BBC News, Bloomberg, Financial Times, and Wall Street Journal. We initially identify 92 events and further exclude the events where no substantial information regarding the investigation is disclosed. In addition, we exclude the events relating to the brokers since we want to solely focus on banks. As of the stale news such as market anticipation and the news provided by the insiders who are familiar with the situation prior to the actual fine settlement date, we take the very first available date. After the screening, we obtain 39 event dates for this study. Table 2 describes each event date used in our analysis.

Insert Table 1 about here

We test our three research hypotheses by retrieving market data around the event dates for all banks that belong to the following three panels: 1) LIBOR panel that contains all submitter banks for all currencies; 2) Global Systemically Important Banks (GSIB); and 3) G14 – The largest 14 derivatives dealers. Some banks such as Barclays, Citigroup and UBS are the member banks of all the three panels while some sit in one or two of the three panels. We further pool the three panels in one set and name it "The Panel" as presented in Table 2. Some of the panel banks were involved in the LIBOR scandal while others in "The Panel" have not been alleged of misconduct. We test whether the market punishes banks involved in the LIBOR scandal, and whether non-alleged banks that sit in "The Panel" receive penalty as well. We refer the former as to "reputational effect" and the latter as to "contagion effect". Our identification strategy relies on comparing market returns (as described in the following) around the event dates for Panel banks (both alleges and non-alleged banks) and a control group of banks that are external to "The Panel" and thus are not involved in the scandal.

Insert Table 2 about here

We obtain daily stock price data from January 2010 to December 2013 from Compustat. In order to capture a more accurate event effect on the banking industry, we construct a market portfolio of the financial services sector (SIC code ranging from 6000 to 6500) in each country to calculate the capitalization-weighted market return rather than using stock indices as the proxy for market return. We further retrieve accounting figures of 1,408 banks from the 11 countries from Bankscope for the purpose of generating control variables for our analysis. We have also obtained each country's 10-year bond yield rates from Datastream, proxying for treasury interest rate.

4.2. Methodology

The measurement of reputational penalties, in the existing body of literature, is fundamentally based on the belief that stock price is an equilibrium price of investors' expectations concerning the value of the company based on the mechanism of supply and demand, which consists of manifold channels through which stakeholders impose reputational penalties on the company. In this mechanism, reputational penalties imposed by various stakeholders such as the loss of customers and business partners, the loss of employers and suppliers that induces the increase in costs, and the potential rise in cost of capital demanded by debt holders and equity holders to reflect the lifted company risk, all of which, in turn, will be incorporated in a drop in stock price upon the announcement of corporate misconduct. However, reputational penalties are recognized and measured in varying ways, among which a prevailing way is to take the residual in market value loss after deducting the amount of either legal sanction or announced loss amount. Some studies, such as Murphy et al. (2009), consider the sum of the market value loss, drop in earnings, and rise in risk as the reputational penalties. In this study, we adopt the multifactor model in Beatty et al. (1996), in which bank-specific returns are regressed on the market return, on a variable capturing interest rate changes, and on event dummy variables. The event dummy variables provide for mean shifts in returns on event days. It is assumed that the following generic model holds for each bank in our sample. For the ease of presentation, all subscripts are omitted.

$$R = \alpha_1 + \beta_1 R_m + \gamma_1 \Delta Treasury + \delta_1 Event + \theta_1 ADJFINE + \varepsilon \qquad (1)$$

$$R = \alpha_2 + \beta_2 R_m + \gamma_2 \Delta Treasury + \delta_2 Nonevent + \theta_2 ADJFINE + \varepsilon \qquad (2)$$

$$R = \alpha_3 + \beta_3 R_m + \gamma_3 \Delta Treasury + \delta_3 Nonpanel + \theta_3 ADJFINE + \varepsilon \qquad (3)$$

where R is the daily stock return for individual bank in the sample. R_m is

capitalization-weighted daily market return. $\Delta Treasury$ is daily change in 10-year government bond yield. $ADJFINE$ is fine settlement scaled by the pre-settlement market capitalization.

Model (1) uses a three-day event window to test for reputational effect (H1) for each of the events listed in Table 1. That is, upon the date of announcement of alleged manipulation for a bank, $Event$ takes a value of 1 on the day before, the day of, and the day after the event date. If an event takes place on a weekend, the event date is adjusted to the next trading day. If two event windows overlap, we merge the two event windows by extending from the day prior to the first event to the day following the latter event. H1 would predict a significant and negative sign on δ_1. Model (2) tests for the contagion effect (H2). $Nonevent$ takes a value of 1 when a bank satisfied the following two conditions: 1) the bank is a member bank of "The Panel", and 2) the bank has not been accused of manipulation when one or many banks from "The Panel" are alleged on the event date. The coefficient of interest is δ_2, which represents the contagion effect. H2 predicts δ_2 to be significantly negative. In order to rule out the possibility that the negative stock returns in Model (1) and (2) are industry-wide instead of specific to banks in "The Panel", we estimate Model (3) in which the dummy variable $Nonpanel$ takes a value of 1 when: 1) a bank is not a member bank in "The Panel", and 2) it is an event date for one or many other banks in "The Panel". We expect δ_3 to be not statistically significant at any conventional level.

We estimate Model (4) to examine the role of legal enforcement in moderating the reputational penalty imposed by the market. The regression takes the following form:

$$CE = \beta_0 + \beta_1 SIZE + \beta_2 MTB + \beta_3 LEVERAGE + \beta_4 LIQUIDITY + \beta_5 ROE +$$
$$\beta_6 ROL + \varepsilon \qquad (4)$$

CE is the coefficient of the dummy variable *Nonevent* when Model (2) is estimated for the 30 banks in "the Panel" for each event. SIZE is a size measure calculated by taking the natural logarithm of total assets. MTB is market-to-book ratio capturing the valuation effects. LEVERAGE is calculated by scaling total liabilities by total assets. LIQUIDITY is calculated by scaling loans by deposits. ROE refers to return on equity and is calculated by scaling net income by equity. All accounting data featured in our study is lagged by one year. ROL is *Rule of Law* measure from La Porta et al. (1998) and it proxies for a country's legal enforcement. All variables in the resulting sample are winsorized at 1% in both tails to account for extreme observations.

4.3. Benchmarking and Descriptive Statistics

We benchmark and describe our sample in three ways. First, Table 3 reports the sample composition and coverage by country and the criteria for benchmarking. Our sample consists of banks from 11 countries. The sample that we use for the calculation of daily market return for each of the 11 countries features 2,860 banks. In the final sample where our empirical models are based, there are 1,262 unique banks. Second, Table 4 presents descriptive statistics for 21,151 observations in Panel A and 30 observations in Panel B. The average SIZE of banks in our sample is 14.01 while the average ROE of them is 6.99, suggesting they are large and profitable. Third, Table 5 reports the correlation for each of the variables.

Insert Table 4 about here

Insert Table 5 about here

5. RESULTS

5.1. Initial Emergence of the LIBOR Scandal

Table 6 reports the significant events surrounding the initial emergence of the LIBOR scandal. On Thursday March 24, 2011, Barclays emerged as a key focus of the investigation by the US and UK regulators. The following day (Day +1), Barclays' shareholders experienced a raw return of –0.31% while the financial services industry capitalization-weighted daily return in the UK is 0.96%. The capital market reaction to the initial emergence of the LIBOR probe is fairly weak particularly when it is compared to the reaction to the first LIBOR settlement on Wednesday June 27, 2012, when Barclays admitted to misconduct and reached fine settlements amounting $450 million with both UK and US regulators. Barclays' shareholders experienced a raw return of –15.5% (equivalent to a £120.27 million loss in its firm value) on the following day (Day +1) while the financial services industry capitalization-weighted daily return in the UK is –0.64%. The difference between the two event dates suggests that the market does not penalize the bank until the misconduct is affirmed with financial penalty imposed. An alternative explanation can be that the financial penalty issued by the regulators is higher than the expectation of the market. The average raw return of the remaining 17 unexposed banks in "The Panel" on June 28, 2012 (Day +1) is –0.42%, providing preliminary evidence for the contagion effect of the penalty on Barclays' misconduct.

Insert Table 6 about here

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5.2. Reputational Penalties and Contagion Effect

Results from the tests of Hypothesis 1 and Hypothesis 2 are shown in Table 7. When interpreting the results in the table, it is necessary to note that the single-event results reflect an average return during the event window. The overall sample abnormal return can thus be obtained by multiplying each of these reported figures by number of days in the event window, which is three days in our study. Banks that are either accused of or admit to misconduct on average experienced a –0.6% cumulative abnormal return (CAR) within the three-day event window. The coefficient of *Event* in (1) is negative and statistically significant, indicating that alleged banks experienced negative abnormal returns during the periods surrounding the announcement of alleged manipulation, which supports Hypothesis 1. Column (2) reports the market reaction of nonevent Panel banks during the period when one or a group of Panel banks are accused of misconduct. Nonevent banks on average experienced a –0.3% CAR during the three-day period. The coefficient of *Nonevent* is significantly negative, suggesting that the other non-alleged banks in "The Panel" experienced negative abnormal returns during the period surrounding the announcement of manipulation for alleged banks, which is interpreted as the contagion effect of the reputational damage and hence supports Hypothesis 2. The coefficient of *Nonpanel* in (3) is insignificant, which means that the reputational damage and the contagion effect of the reputational damage are only specific to the banks in "The Panel". The insignificant coefficient of δ_3 in the third column of Table 7 rules out the possibility that results in the first two columns are due to industry-wide shocks that occurred around our event dates. Overall, our results from Column (1) to (3) in Table 7 support both H1 and H2.

Insert Table 7 about here

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5.3. Legal Enforcement

Relying on the same regression that generates the results in column (2) of Table 7, we obtained a set of 30 coefficients that are named CE after preforming the regression individually for the 30 Panel banks. Results from regressing CE on a number of control variables are reported in Table 8. Each of the control variables is the average value throughout the sample period considering that CE is the mean value during the same period. The coefficient of ROL is negative and statistically significant at the 5% level. The negative coefficient of ROL suggests that unexposed Panel banks in countries with higher level of legal enforcement experienced stronger contagion effect comparing to unexposed banks in countries with lower level of legal enforcement, highlighting and reaffirming the important role of a country's legal enforcement and institutional setting in disciplining banking behavior. This result supports our third research hypothesis.

Insert Table 8 about here

5.4. Robustness Tests

In this section, we further examine the robustness of the results presented in the previous section by performing additional tests. The robustness tests are carried out for Panel A and Panel B separately. As for Panel A, in order to control for the bias induced by the shocks that are common to all banks in the markets, we create three benchmark groups based on SIZE: First, a balanced sample of 778 banks matched to the number of panel banks in each of the three geographical areas: Europe, Japan and North America. The sample composition of the balanced sample is reported in Table 4; Second, a sample of 30 banks that is created through 1-to-1 matching to "The Panel" banks within each country; Third, a sample of 30 banks that is generated through 1-to-1 matching to

"The Panel" banks in the 11 countries. The coefficient of interest is *Nonpanel* in the robustness check for Panel A. Regardless of which benchmark group we use, the results are consistent with our previous findings: the coefficient of *Nonpanel* is insignificant across all of the three regressions performed (Table 9), reinforcing that the reputational damage and the contagion effect of the reputational damage are restricted to "The Panel" banks only.

We also check the robustness of the results we obtain in relation to the role of legal enforcement in disciplining banks. Relying on the same regression, we use JSE (Efficiency of Judicial System) from La Porta et al. (1998) instead of ROL to proxy for the legal enforcement to see whether the results still hold when we change the measure for legal enforcement. Further, we add ASR (Accounting Standards Rating) from La Porta et al. (1998) to control for the potential effect of corporate governance on CE, since basic accounting standards are required to render company disclosure interpretable when investors assess a company as an investment opportunity. We perform the regression separately for ASR with JSE and ASR with ROL, and the coefficients of ASR are both insignificant in the two regressions. Results on other variables are broadly consistent with our previous OLS regression results and the findings are reported in Table 9. The coefficients of JSE are both negative and statistically significant at the 5% level when it is included with or without ASR. ROL continues to be negatively significant at the 5% level, which is consistent with the previous results when it is included without ASR in the regression.

Insert Table 9 about here

6. CONCLUSION

This paper provides a set of empirical facts about reputational damage and international bank contagion in the setting of financial scandal. We find strong evidence that banks experience substantial reputational damage imposed by markets – measured by the stock returns in a three-day window surrounding the event – when their involvement in the scandal is disclosed, which suggests that reputation helps discipline banking behavior. No other banks outside of the LIBOR and related panels are adversely affected by the LIBOR scandal. In addition, we document a contagion effect of such reputational damage, passing on from banks alleged of LIBOR manipulation to other non-alleged banks linked by the common regulatory panels, a finding true even when it is before the initial exposure of the non-alleged banks. Further, we find that such contagion effect is stronger in countries with higher score for legal enforcement, but we do not find evidence that quality of accounting standards is relevant to such effect. This conclusion is essentially consistent with the recent development in the research of international accounting research of the IFRS adoption on a global scale. Although our study does not investigate exactly the same consequences as this line of research does, the results direct to the same issue guiding the understanding and empirical enquiries in international accounting regulation and banking supervision: effective regulation is not merely about regulation *per se*, it also demands a sound and efficient legal environment. Or, as simple as what Christensen et al. (2013) termed: "enforcement matters". Our study themed broadly on bank ethics, market discipline, and regulatory discipline raises critical question concerning how bank behavior is shaped and has important policy implications. While bank ethics is more of an autonomous factor in this context, the task of disciplining banks falls on market discipline and regulatory discipline. However, it does not necessary mean bank ethics is not important in this endeavor. Putting together, a sound and ethical banking demands the joint effort of the following: banks ethics as an autonomous factor ensuring ethical behavior, market discipline and regulatory

discipline as devices to guide and supervise bank behavior, and an effective legal environment provides contextual support for the function of these two devices.

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Table 1. List of Events

Date	Event
24/03/2011	Barclays has emerged as a key focus of the investigation by the US and UK regulators. Bank of America and Citibank have also received subpoenas.
26/07/2011	UBS confirmed the LIBOR investigation has widened scope to Yen rates.
09/12/2011	Citigroup and UBS face TIBOR penalties.
03/02/2012	Swiss authorities have launched a probe into 12 banks (Bank of Tokyo-Mitsubishi, Citigroup, Crédit Sussie, Deutsche Bank, HSBC, JP Morgan, Mizuho Corporate Bank, Rabobank, RBS, Société Générale, Sumitomo Mitsui Banking Corporation, and UBS) over claims they have been fixing their interbank lending rates.
10/02/2012	Citigroup was forced to write off $50m after two traders accused of attempting to influence global lending rates left the bank.
20/03/2012	Deutsche Bank gets data request in LIBOR probe.
27/06/2012	Barclays admitted to misconduct. The UK's FSA and the US Department of Justice and the CFTC imposed fines worth $450m in total.
03/07/2012	Crown Office confirms investigation into Scottish banking sector. (Lloyds Banking Group, RBS)
05/07/2012	RBS withdrawn from TIBOR panel. Moody's and S&P have lowered their outlook on Barclays from stable to negative amid the LIBOR rigging scandal.
18/07/2012	Investigations are focusing on Barclays, whose traders were the ringleaders of a circle that included Crédit Agricole, HSBC, Deutsche Bank, and Société Générale.
31/07/2012	Deutsche Bank has confirmed that a "limited number" of staff were involved in the LIBOR scandal.
05/08/2012*	Crédit Agricole , Deutsche Bank, HSBC, Rabobank, and Société Générale are linked to the LIBOR rigging probe.
09/08/2012	Bank of Tokyo Mitsubishi has become the latest lender to face questions in the widening LIBOR rigging scandal.
16/08/2012	Barclays, Citigroup, Deutsche Bank, HSBC, JP Morgan, RBS, and UBS are to be questioned in the US for alleged LIBOR rigging.
23/08/2012	A former Singapore-based trader at RBS has opened a new window into how attempts were allegedly made to manipulate LIBOR.
07/09/2012	RBS in talks to settle LIBOR allegations that would cost it £200-£300m.
10/09/2012	Trial begins of former UBS trader.
15/10/2012	A group of U.S. homeowners is suing Barclays, Bank of America, JP Morgan, UBS, RBS, Citigroup, Rabobank, Crédit Suisse, Deutsche Bank, HSBC, Lloyds Banking Group, and Royal Bank of Canada, claiming they are liable for their mortgage rates being artificially higher because of illegal LIBOR rigging.
26/10/2012	Subpoenas have been sent to: Bank of America, Bank of Tokyo Mitsubishi, Crédit Suisse, Lloyds Banking Group, Rabobank, Royal Bank of Canada, Société Générale, Norinchukin Bank, and WestLB. The banks joined the probe to increase the number of banks under investigation by the two state prosecutors to 16.
29/10/2012★	First LIBOR damages trial set to proceed, a case brought by a care home operator against Barclays to go ahead.
15/11/2012	Canadian regulators investigating a half-dozen global banks in LIBOR manipulation probe have publicly rebuked RBS.

03/12/2012	UBS is in global talks to reach a settlement of more than $450m over the alleged manipulation of LIBOR.
11/12/2012	Three men have been arrested in connection with investigations into the LIBOR rigging. Hayes (UBS, Citigroup) and Two brokers (RP Martin).
13/12/2012	UBS faces $1bn fine over LIBOR allegation.
14/12/2012	UBS staff face LIBOR probe in the UK.
19/12/2012	UBS has agreed to pay $1.5bn to US, UK and Swiss regulators for attempting to manipulate the LIBOR inter-bank lending rate.
20/12/2012	Former UBS trader who faces criminal charges in the probe has been linked to traders at RBS, JP Morgan, Deutsche Bank and Citigroup.
25/01/2013	Ex-Barclays chiefs named in LIBOR case.
06/02/2013	RBS has been fined $610m by UK and US authorities for its part in the LIBOR rigging scandal. Japanese banks accused of TIBOR fixing.
19/03/2013	Freddie Mac has sued more than a dozen banks (Bank of America, JP Morgan, UBS, Citigroup, Crédit Sussie, and Deutsche Bank) and the British Bankers' Association. UBS joins exodus from EURIBOR panel.
11/04/2013	Yen LIBOR probe focus on RBS.
17/06/2013	Former UBS and Citigroup trader Hayes has been charged by the Serious Fraud Office in connection with its investigation into the LIBOR rigging scandal.
18/06/2013	HSBC probed by Hong Kong regulator over HIBOR.
18/09/2013*	A Japanese investment banking unit of UBS was ordered to pay a $100m criminal fine after pleading guilty to manipulate LIBOR.
23/09/2013	The US credit union regulator has filed an anti-trust lawsuit against 13 banks (UBS, RBS, Barclays, Société Générale, Crédit Suisse, JP Morgan, Lloyds Banking Group, WestLB, Raiffeisen Bank, Norinchukin Bank, Bank of Tokyo Mitsubishi, and Royal Bank of Canada) as part of the LIBOR rigging scandal.
21/10/2013	Former employees of Rabobank, RBS, Deutsche Bank, UBS, and ICAP were among 22 names that the UK Serious Fraud Office included as alleged co-conspirators on a draft indictment against Hayes, a former trader at both UBS and Citigroup who is facing criminal charges stemming from a probe into alleged LIBOR rigging.
31/10/2013	Fannie Mae sues 9 banks for $800m over LIBOR: Barclays, Deutsche Bank, Citigroup, Bank of America, UBS, RBS, Crédit Sussie, JP Morgan, and Rabobank.
08/11/2013	Barclays and Deutsche Bank to face LIBOR claims in civil cases.
04/12/2013	The European Commission has fined six banks (RBS, Deutsche Bank, Société Générale, JP Morgan, Citigroup, and RP Martin).

* Event day is on a weekend

★ Hurricane Sandy shuts down the stock market in the US

Table 2. The Panel

Contributor Bank	Origin	GSIB*	G14★	LIBOR	USD	EUR	GBP	JPY	CHF	CAD	AUD	NZD	DKK	SEK
Abbey National (Santander)	ESP	-		X		X	X							
Bank of America	USA	2	X	X	X									
Bank of New York Mellon	USA	1												
Bank of Nova Scotia	CAN	-		X						X				
Bank of Tokyo-Mitsubishi UFJ	JPN	2		X	X	X	X	X	X					
Barclays	GBR	3	X	X	X	X	X	X	X	X	X	X	X	X
BBVA	ESP	1												
BNP Paribas	FRA	3	X	X	X		X							
Canadian Imperial Bank of Commerce	CAN	-		X						X				
Citigroup	USA	3	X	X	X	X	X		X					
Crédit Agricole	FRA	2		X	X			X	X					
Credit Suisse	CHE	2	X	X	X	X			X					
Deutsche Bank	DEU	3	X	X	X	X	X	X	X	X	X	X	X	X
Goldman Sachs	USA	2	X											
HSBC	GBR	4	X	X	X	X	X	X	X	X	X	X	X	X
ING	NLD	1												
JP Morgan Chase	USA	4	X	X	X	X	X	X	X	X		X	X	X
Lloyds Banking Group	GBR	-		X	X	X	X	X	X	X	X	X	X	X
Mizuho Bank	JPN	1		X		X	X	X						
Morgan Stanley	USA	2	X											
Nordea Bank	SWE	1												
Royal Bank of Canada	CAN	-		X	X	X	X			X				
Royal Bank of Scotland	GBR	2	X	X	X	X	X	X	X	X	X	X	X	X
Société Générale	FRA	1	X	X	X	X	X	X	X	X				

Standard Chartered	GBR	1								
State Street	USA	1								
Sumitomo Mitsui Banking Corporation	JPN	1		X	X				X	
UBS	CHE	2	X	X	X	X	X	X	X	
UniCredit	ITA	1								
Wells Fargo	USA	1	X							

* Global Systemically Important Banks; The "bucket number" developed by the Financial Stability Board (FSB) to measure the systemic importance of a bank from 1 (lowest) to 5 (highest)

★ The largest 14 derivatives dealers that hold 82 per cent of the total notional amount outstanding by mid-2010

Table 3. Sample Composition and Coverage by Country

Country	Number of Banks*	Number of Banks★	Number of Panel Banks
Canada	261	4	3
France	44	40	3
Germany	94	89	1
Italy	45	43	1
Japan	198	187	3
Netherlands	13	11	1
Spain	25	22	2
Sweden	15	13	1
Switzerland	54	52	2
UK	156	142	5
US	1,955	659	8
Total	2,860	1,262	30

* Banks that are used to construct the market portfolio for market return calculation

★Banks in the final sample

Table 4. Descriptive Statistics

	N	Mean	SD	p25	p50	p75
Panel A						
R	21,151	0.00	0.02	-0.01	0.00	0.01
R_m	21,151	0.00	0.01	-0.01	0.00	0.01
Treasury	21,151	0.00	0.02	-0.01	0.00	0.01
ADJFINE	21,151	0.00	0.00	0.00	0.00	0.00
Panel B						
SIZE	30	14.01	0.65	13.58	14.25	14.60
MTB	30	0.95	0.85	0.53	0.70	0.89
LEVERAGE	30	0.50	1.36	0.91	0.95	0.97
LIQUIDITY	30	0.62	0.28	0.51	0.65	0.83
ROE	30	6.99	5.69	5.39	7.78	9.51
ROL	30	9.33	0.74	8.57	9.62	10.00

Table 5. Correlation Between Variables

Panel A

	R	Event	R_m	Treasury	ADJFINE
Event	0.001	1			
R_m	0.222***	0.003**	1		
Treasury	0.099***	0.002	0.299***	1	
ADJFINE	0	0.131***	0	0.002*	1

* p<0.05, ** p<0.01, *** p<0.001

Panel B

	CE	SIZE	MTB	LEVERAGE	LIQUIDITY	ROE	ROL
SIZE	0.107	1					
MTB	−0.096	−0.413*	1				
LEVERAGE	−0.281	−0.224	0.166	1			
LIQUIDITY	0.063	0.259	0.238	0.067	1		
ROE	−0.057	−0.484**	0.514**	−0.021	−0.052	1	
ROL	−0.301	−0.342	0.384*	0.15	−0.412*	0.404*	1

* p<0.05, ** p<0.01, *** p<0.001

Table 6. The Initial Emergence of the LIBOR Scandal

This table reports news and stock returns associated with the two key events surrounding Barclays' emergence as the key focus of the LIBOR investigation (March 24, 2011) and the first bank to have received financial penalty from the regulators (June 27, 2012). The sample of "Nonevent Panel Banks" consists of "The Panel" banks that have not been reported in the news associated with LIBOR manipulation on the event date. Thus, we have two different sample sizes for the two event dates reported in this table. The "Financial Services Industry Daily Return" is the return to a market-capitalization-weighted portfolio consisting of all the UK common stocks in Compustat with SIC code ranging from 6000 to 6500.

Date	Event Day	Barclays Closing Price	Daily Raw Return	Nonevent Panel Banks Mean Daily Raw Return (n=27)	FTSE250 Daily Return	Financial Services Industry Daily Return	News
23 March 2011	−1	£2.87	−0.43%	−0.03%	0.05%	−0.75%	
24 March 2011	0	£2.91	1.27%	0.69%	1.38%	−0.43%	Barclays has emerged as a key focus of the investigation by the US and UK regulators.
25 March 2011	+1	£2.90	−0.31%	−0.18%	0.21%	0.96%	

Date	Event Day	Barclays Closing Price	Daily Raw Return	Nonevent Panel Banks Mean Daily Raw Return (n=17)	FTSE250 Daily Return	Financial Services Industry Daily Return	News
26 June 2012	−1	£1.92	−0.95%	−0.61%	−0.06%	−0.17%	
27 June 2012	0	£1.96	1.90%	2.22%	0.81%	0.85%	Barclays admitted to misconduct. The UK's FSA and the US Department of Justice and the CFTC imposed fines worth $450m in total.
28 June 2012	+1	£1.66	−15.5%	−0.42%	−0.59%	−0.64%	

Table 7. Reputational Penalties and Contagion Effect

	R		
	(1)	(2)	(3)
Event	−0.002**	-	-
	[−2.528]	-	-
Nonevent	-	−0.001**	-
	-	[−2.633]	-
Nonpanel	-	-	−0.000
	-	-	[−0.443]
R_m	1.087***	1.076***	0.398***
	[18.872]	[17.592]	[30.915]
Treasury	0.134***	0.133***	0.040***
	[4.442]	[3.414]	[9.615]
ADJFINE	0.056	-	-
	[0.178]	-	-
Constant	−0.000	−0.000	0.000***
	[−1.296]	[−1.268]	[9.729]
Observations	21,151	14,624	862,840
R-squared	0.563	0.593	0.046

*$p<0.05$, **$p<0.01$, ***$p<0.001$

[Robust t-statistics in brackets]

Table 8. Legal Enforcement

	CE
SIZE	0.000
	[0.025]
MTB	0.000
	[0.776]
LEVERAGE	−0.001
	[−1.553]
LIQUIDITY	−0.000
	[−0.382]
ROE	0.000
	[0.118]
ROL	−0.001**
	[−2.065]
Constant	0.012
	[0.524]
Observations	30
R-squared	0.154

*p<0.05, ** p<0.01, *** p<0.001*

[Robust t-statistics in brackets]

Table 9. Robustness Tests

Panel A

	R		
	(1)	(2)	(3)
Nonpanel[a]	0.000	-	-
(n=778)	[0.402]	-	-
Nonpanel[b]	-	0.000	-
(n=30)	-	[0.322]	-
Nonpanel[c]	-	-	0.000
(n=30)	-	-	[0.730]
R_m	0.438***	0.694***	0.782***
	[27.803]	[8.129]	[9.609]
Treasury	0.068***	0.080**	0.067**
	[11.606]	[2.639]	[2.144]
ADJFINE	-	-	-
	-	-	-
Constant	0.000***	–0.000	0.000
	[3.964]	[–0.174]	[0.682]
Observations	529,509	22,365	22,445
R-squared	0.074	0.293	0.249

a. Balanced matching according to the number of Panel banks in each geographical area (i.e. Europe, Japan and North America)
b. 1-to-1 matching according to total assets within each country
c. 1-to-1 matching according to total assets within the 11 countries

Panel B

	CE		
	(1)	(2)	(3)
SIZE	0.000	0.000	0.000
	[0.159]	[0.155]	[0.138]
MTB	0.000	0.000	0.001*
	[0.728]	[0.519]	[1.756]
LEVERAGE	−0.001**	−0.001*	−0.000
	[−2.054]	[−1.790]	[−0.870]
LIQUIDITY	−0.001	−0.001	−0.002
	[−0.471]	[−0.466]	[−0.826]
ROE	−0.000	−0.000	0.000
	[−0.091]	[−0.104]	[0.011]
JSE	−0.001**	−0.001**	-
	[−2.408]	[−2.213]	-
ROL	-	-	−0.002**
	-	-	[−2.119]
ASR	-	−0.000	−0.000
	-	[−0.110]	[−1.659]
Constant	0.007	0.007	0.024
	[0.307]	[0.321]	[0.960]
Observations	30	30	30
R-squared	0.207	0.207	0.218

*** p<0.01, ** p<0.05, * p<0.1

[Robust t-statistics in brackets]

DO FINANCIAL DERIVATIVES MAKE BANKS SOUNDER? – EVIDENCE FROM

ELEVEN DEVELOPED MARKETS

Abstract

This paper seeks to answer the question concerning to what extent the use of financial derivatives makes banks sounder. We carry out this investigation by examining the relationship between equity risk and the use of financial derivatives using a sample of 613 banks from eleven developed markets from 2005 to 2014. The main result of the analysis suggests that banks' overall equity risk increases when they use derivatives. A fixed effects model reveals that this relationship is nonlinear in nature, as we find that 184 banks reduce risk and 245 banks assume additional risk by using derivatives. A comparison between the highest realized risk-reducing portfolio and the highest realized risk-increasing portfolio suggests that the banks featured in our study achieved better results in reducing risk than they did in increasing risk by using derivatives. A key implication of our findings is that the ability of capital adequacy to discipline bank behavior is limited, as banks can use financial reporting discretion to circumvent capital adequacy requirements and assume additional risk. We call for new rules on derivatives and the reconciliation between accounting and prudential regulation, as the widely applied capital adequacy regulation appears to be insufficient in addressing the issue of risk.

1. INTRODUCTION

The primary objective of this study is to investigate empirically whether the use of financial derivatives makes banks sounder. In order to address this objective, we examine the impact of banks' use of derivatives on their equity risk. The derivatives market has grown substantially over the past fifteen years, the total notional amount of outstanding over-the-counter (OTC) derivatives reached $630 trillion by the end of 2014, an increase of more than 570 percent over the year 2000 (Figure 1). In fact, as Figure 1 shows, banks are in their most risky period in history, as over the past decade derivatives' gross market value has not changed drastically, while their notional value has increased sharply, a gap that peaked just prior to the 2008 financial crisis. The widening gap can be seen as an indicator of derivatives' frequency of use and/or simply the notional amount of contracts. The quick expansion of the derivatives market is stimulated primarily–apart from financial innovation (interest rate swap, or IRS[50])– by the wave of financial market deregulation that sprang up in the UK in October 1986 through what was known as the "Big Bang" (The Financial Services Act 1986), which encouraged banks, including retail banks, to increase their activities in the securities market. In the US, two landmark pieces of legislation–the Financial Services Modernization Act of 1999 and the Commodity Futures Modernization Act of 2000–repealed the Glass-Steagall Act that once separated commercial banking from investment banking and, in doing so, legitimized banks' gambling in securities. Banks have since been the major player in the OTC market and have held a significant portion of these derivatives, acting as intermediaries in the interactions between non-bank participants, carrying out interbank trading as part of day-to-day business, and clearing positions created by making markets for their clients. The largest banks also provide OTC derivatives to both nonfinancial firms and other banks.

Conventionally, the underlying assumption of using derivatives is linked to risk management by complementing traditional lending activity (Brewer et al., 2001), smoothing earnings (Barton, 2001), and managing equity risk directly and indirectly (Abdel-Khalik & Chen,

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[50] Interest Rate Swap is considered "one of the most innovative financial products of the late twentieth century" (Corb, 2012).

2015). If banks use derivatives primarily to hedge their exposure, their risk should be reduced, but in some scenarios banks have strong incentives to take on additional risk by using financial derivatives. For instance, banks that are likely to face financial distress use derivatives more aggressively than those that are not (Purnanandam, 2007). In day-to-day business, banks utilize the advantage their book-managing and market-making roles provide them in seeing the flows of OTC derivatives trading, and carry out proprietary trading accordingly. In fact, it is an open secret that some, if not all, banks use financial derivatives to bet on future changes in the prices of underlying securities. As one of numerous examples of the direct negatives of financial institutions' using derivatives for gambling and speculation, traders for "The London Whale," JP Morgan Chase trader Bruno Iksil, gambled heavily on an obscure corner of the credit default swaps (CDS) market and lost $6.2 billion. Banks have also been caught manipulating benchmark rates–including LIBOR, FOREX, and Isdafix, which determine the payout of financial derivatives–to benefit their own trading positions.

All of these events are in line with the theory that banks speculate to increase their profits based on what they consider private information. Allowing them to undertake the market-making function and to trade derivatives at the same time has created strong incentives for misbehavior, with the moral hazard of taking on additional risk as one of the direct consequences. Therefore, the critical question concerns to what extent the use of financial derivatives makes banks sounder or less sound?

Relying on a large sample of 613 banks from eleven developed markets during the period 2005–2014, we document a positive association between using derivatives and banks' equity risk. However, this relationship is nonlinear in nature. We use a fixed effects model that contains ten portfolios obtained from portioning our sample at each 10th percentile to find that 184 banks reduced risk while 245 banks increased risk. Comparing the highest realized risk-reducing portfolio and the highest realized risk-increasing portfolio suggests that the banks featured in our study achieved better results in reducing risk by using derivatives than they did in increasing risk. In addition, in all ten portfolios, bank risk started to increase when banks' holdings of derivatives exceeded 2.26 percent of total assets. This finding is important

in cautioning against the consequences of aggressive use of derivatives. The most compelling challenge in the empirical design is due to a potential endogeneity problem–that is, the difficulty in knowing whether a high level of risk exposure drives banks to use derivatives or vice versa. To address this issue, at least partially, we used lagged variables and the results are substantially the same.

This paper extends the literature on the consequences of banks' use of derivatives in several important ways. First, it is among the first to analyze the relationship between the use of derivatives and bank risk. To the extent that derivatives lead to an overall increase in bank risk, our study lends support to Nguyen and Faff's (2010) finding that this relationship is nonlinear and extends it to the banking sector. Second, existing literature specifies two primary motives behind the use of derivatives: hedging and speculation. However, other possible motives related to the interplay of discretion in financial reporting and capital regulations have not been explored. We argue that banks can take advantage of financial derivatives by using financial reporting discretion to circumvent capital adequacy requirements. Third, our sample consists of 613 banks from eleven developed markets from 2005 to 2014, which is a much larger sample and longer sample period than those previously used in this line of research. The main advantage of such a large sample is that the results generated and conclusions drawn are likely to be more representative than are those that derive from a smaller sample, while the use of recent data provides information about the current state of risk management in the banking sector.

Finally, our empirical method is of interest to policy makers in the ongoing process of rewriting derivatives rules to prevent the recurrence of failures like that of Lehman Brothers, as the method we employ in this study can be used to determine the threshold that identifies excessive risk-taking behavior. Our evidence also raises critical questions concerning the interplay between accounting and prudential regulation and its impact on bank behavior.

The remainder of the paper proceeds as follows: Section 2 discusses the implications of the interplay among accounting, capital regulation, and risk management. Section 3 reviews the

literature on bank risk and derivatives usage. Section 4 identifies the data sources and selection, defines the variables, and establishes the empirical methods used in the analysis. Section 5 presents our results, and Section 6 concludes.

2. ACCOUNTING, CAPITAL REGULATION AND RISK MANAGEMENT

The interplay between accounting and financial regulation became an important topic of discussion after the 2008 global financial crisis. A broad consensus is that accounting rules are an important determinant of bank behavior, but the specific mechanisms and their interaction with regulatory requirements are less well understood (Argimon et al., 2015). The topic gained wide attention in the context of the re-regulation that took place with the growing complexity of the financial environment. In essence, accounting plays the role of technical mediator that facilitates the implementation of capital adequacy regulations and disclosure rules by bridging the financial system and financial institutions' day-to-day operation (Sawabe, 2002). Although accounting standard-setters' and financial regulators' common goal is to manage risk, financial accounting tends primarily to support existing and potential investors' decision-making, while capital regulation protects creditors. Financial regulators also pursue objectives in relation to accounting standard-setters in determining rules for banks' loan loss provisions, as financial regulators also ensure the safety and soundness of the banking system, while accounting standard-setters ensure that banks disclose transparent and informative financial information (Barth & Landsman, 2010). These distinctions often produce conflicts between the two sets of rules (Argimon et al., 2015).

Indeed, capital adequacy is limited in its ability to discipline bank behavior, as banks use their financial reporting discretion in provisioning to circumvent capital adequacy requirements. Bushman and Landsman (2010) point out that discretion in financial reporting can directly affect regulatory forbearance, and banks consider the ex-post effects of accounting discretion on regulatory forbearance when selecting their ex-ante capital levels. As the dominant accrual for banks and the heart of the banking literature, loan loss provisions can decrease capital in

the current regulatory regime.[51] Thus, the negative relationship between loan loss provisions and capital ratios can provide managers with significant incentives and means to manage capital to reduce the expected regulatory costs that could arise from violating capital requirements (Moyer, 1990; Beatty et al., 1995; Kim & Kross, 1998; Ahmed et al., 1999). As a numeric example, under the existing regulatory regime, a £1 decrease in loan loss provisions increases Tier 1 capital by £1(1 – UK tax rate for banks of 33.7%), or approximately £0.66.

A bank can use capital management to reduce its reported loan loss provisions using financial derivatives (e.g., IRS), which increases the core equity reflected in the balance sheet. The same mechanism holds for items like net charge-offs when financial instruments (e.g., CDS) are used to hedge credit risk (Beatty et al., 1995). This process can be parallel or alternative to the means of financial reporting discretion in capital management discussed above. As a consequence, although the goal of capital adequacy regulation to prevent banks from taking on excessive risk and becoming insolvent is sometimes achieved, banks can still perform speculative and risky trading after satisfying the capital requirement using financial derivatives to offset the risks (as reported in the reduction in provisions and/or net charge-offs). In fact, the new standard IFRS 9 "Financial Instruments" issued by the IASB, which is expected to come into effect on 1 January 2018, will create a shift from an incurred loss model[52] to an expected loss model, as banks will be required to recognize not only the credit losses that have already occurred but also anticipated (future) losses to ensure that they are appropriately capitalized for the loans they have written. The new standard will address the problem that was revealed during the 2008 financial crisis, when banks were unable to book accounting losses until they were incurred, even though they already anticipated future losses. The new standard will also require banks to make provisions for potential credit losses for the following twelve months, so loan loss provision will increase sharply. The US FASB is also considering requiring banks to make provisions over the lifetime of a loan, rather than

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[51] The introduction of the BASEL accord changed the interpretation of the correlation between provision and regulatory capital and the identification of capital management behavior. Beatty and Liao (2014) divide this line of research into a Pre-BASEL period and a Post-BASEL period.

[52] Both IASB and FASB currently employ incurred-loss models that require banks to assess whether there is a loss event that impairs a loan. The provisioning takes place only when there is objective evidence that an impairment loss on a loan has been incurred.

for only twelve months, a change that will lead to timelier provisioning. As banking history makes clear, capital adequacy regulation has failed many times and experienced many setbacks. This repeated failure, in conjunction with the contemporary issues reflected in our study, suggests that regulating bank behavior demands reconciling accounting standards with financial regulations while acknowledging the differences in their objectives and functions and the conflicts between the two sets of regulations.

3. LITERATURE REVIEW

In this section, we review three key areas that address this topic in the existing literature: modern theory of financial intermediation and derivatives; motives behind the use of derivatives; and derivatives, risk, and financial characteristics, and discuss critical empirical issues and challenges.

Modern theory of financial intermediation explains how derivative contracting and lending can be complementary activities in banking. Diamond's (1984) model shows that banks have monitoring advantages over small depositors, as they can reduce their exposure to systematic risk by using derivatives to resolve mismatches in their assets' and liabilities' sensitivities to interest rates. In this way, interest-rate derivative activity can complement lending activity, but derivatives can also be used to replace lending activities. A bank may alter its business model and move away from traditional business lines in order to improve its financial performance. Brewer et al. (2000) document an increasing trend in FDIC-insured commercial banks' use of derivatives, a trend that is accompanied by a downward trend in traditional lending activity, suggesting a substituting role for derivatives.

In brief, there are two primary sources of revenue for banks that participate in interest-rate derivatives markets: one comes from using derivatives as speculative vehicles, and the other is generated when banks act as OTC dealers and charge fees to institutions that are placing derivative positions (Brewer et al., 2001). The former is considered one of the main motives

for using financial derivatives, a view that is well established in the literature. A frequently asked question in this line of study concerns whether firms use derivatives to hedge or to speculate. Most of these studies are based on nonfinancial industries and treat hedging and speculation as two opposite motives behind the use of derivatives. Chernenko and Faulkender (2011) refer to hedging and speculating as the two sides of derivatives use, while Hentschel and Kothari (2001) provide detailed definitions that distinguish one from the other: "risk management that reduces [stock] return volatility is frequently termed hedging, and risk management that increases [stock] return volatility is called speculation." According to O'Conner et al. (2011), hedging takes place when companies protect themselves against unexpected changes in rates that affect the returns they obtain from their underlying business, while speculation is associated with firms' profit-seeking behavior through trading against a mispriced market. The two sets of definitions are similar, as both state that speculation takes place when the motive for using derivatives is not directly associated with hedging risk but, instead, to additional risk-taking driven by profit-seeking. The key underlying assumption in these studies is that the motive behind the decision to hold derivatives is to hedge risk rather than to speculate, but there are other reasons for using derivatives that may or may not reduce risk, including reducing the expected cost of financial distress (Smith & Stulz, 1985), lowering the expected cost of financial distress under a convex tax schedule (Smith & Stulz, 1985), avoiding costly external financing by improving the match between internal cash flow and financing needs (Froot et al., 1993), reducing the volatility of executive compensation (DeMarzo & Duffie, 1995), and speculating on movements in interest rates and earnings management (Bodnar et al., 1998; Faulkender, 2005; Geczy et al., 2007).

With regard to the relationship between derivatives usage and their impact on firm risk, Guay (1999) examines the impact of derivatives on firm risk among new users of derivatives and finds evidence that firm risk declines following the initial use of derivatives. Hentschel and Kothari (2001) study 425 large US corporations and find that, although many firms manage exposure with large positions in derivatives, the use of derivatives does not necessarily reduce firm risk below that of firms that do not use financial derivatives. Based on a sample of Australian firms, Nguyen and Faff (2010) show a nonlinear relationship between derivative

use and firm risk, finding that moderate users of derivatives reduce risk, while extensive users increase firm risk. Based on a large sample of nonfinancial firms from forty-seven countries, Bartram et al.'s (2011) findings suggest that the use of financial derivatives reduces both total risk and systematic risk and that derivative use was associated with significantly higher firm value, higher abnormal returns, and larger profits during the economic downturn in 2001-2002, when firms were hedging downside risk. In the context of the banking industry, Hirtle (1997) argues that derivatives have played a significant role in shaping US bank holding companies' (BHCs) exposure to interest rate risk and that the positive association between the use of derivatives and exposure to interest rate risk is particularly strong for smaller banks, end-user banks, and BHCs that act as dealers. Choi and Elyasiani (1996) also establish a link between derivatives transactions and a bank's overall risk exposure, which link indicates that derivatives can be a source of increased solvency exposure. Venkatachalam (1996) contends that the average bank during 1993-1994 reduced its risk exposure by using derivatives, although more than half of the banks in Venkatachalam's study appeared to use derivatives to assume additional risk rather than to reduce it. Minton et al. (2009) examine the extent to which US BHCs with assets in excess of $1 billion used credit derivatives to hedge in the decade from 1995 to 2005. These banks' use of credit derivatives was primarily for the purpose of dealer activities, rather than for hedging credit exposure from loans. The use of derivatives to hedge bank loans is limited by adverse selection and moral hazard problems and by banks' inability to apply hedge accounting when they use credit derivatives. More recently, Abdel-Khalik and Chen (2015) argue that US BHCs' use of non-trading derivatives during 1995-2012 was significantly and positively connected to equity risk.

Another avenue of research on this topic focuses on the financial characteristics of banks that use derivatives. Purnanandam (2007) points out that banks that are likely to face financial distress manage their interest-rate risk more aggressively than do those that are not. Carter and Sinkey (1998) find that a community bank's decision to use interest-rate derivatives is positively associated with size and find a positive relationship between the use of IRS and capital position, which they interpret as the effect of regulatory and/or market discipline on banks' obedience to capital adequacy requirements. However, Sinkey and Carter's (2000)

later study of US commercial banks' use of derivatives reveals no evidence of an association between banks' capital positions and derivatives activities. They also find that banks that use derivatives have riskier capital structures, larger maturity mismatches between assets and liabilities, lower net interest margins, and greater loan charge-offs than do those that do not use derivatives. However, based on our discussion of the interplay of accounting and financial regulation and its impact on bank behavior in Section 2, we predict a negative association between a bank's capital position and its use of derivatives because of the incentive to use financial reporting discretion to undertake capital management. Therefore, banks' equity risk will rise if such is the case.

4. DATA AND METHODOLOGY

4.1. Data and Sample Selection

To investigate the effects of derivatives use on bank risk, we collected data from Bankscope on the amounts of derivatives held at the end of each fiscal year during our sampling period (2005-2014) and other accounting data for banks from eleven countries, and daily stock price data from Compustat from January 2005 to December 2014. Rather than using stock indices as the proxy for market return, we constructed a market portfolio for the financial services sector (SIC codes ranging from 6000 to 6500) in each country to calculate the capitalization-weighted market return.

Specifically, we employed the following risk measures:
- Total risk (TR): The variance in daily stock returns in the fiscal year that derivatives were reported.
- Systematic risk (SR): The product of the variance between the financial services sector's daily market return and bank i's market beta (β_m) squared. β_m is obtained from a market model as follows:

$$R_{it} = \beta_0 + \beta_m R_{mt} + \varepsilon_{it}$$

R_{it}: Daily stock return of bank i

R_{mt}: Daily return on the financial sector

ε_{it}: Error term

- Idiosyncratic risk (IR): Variance in the residuals ε_{it} from the market model above.

After merging the two datasets and dropping observations with missing data, we obtained a final sample of 613 banks with 4,047 bank-year observations. Table 1 reports the sample composition by country and year. A substantial part of our sample consists of US banks, while Canada has the least number of observations of derivatives use by banks. This difference reflects the differences in the two countries' banking regulations: the US has a relatively weak, fragmented, and crisis-prone system that led to the rise of the shadow banking system combined with multiple regulatory authorities, while Canada's brokers are all owned by large banks, with the consolidated entity tightly regulated by one overarching regulator (Bordo et al., 2015).

Insert Table 1 about here

4.2. Empirical Design

The main empirical challenge that is critical to our study's empirical design is the endogeneity problem induced by the reverse causality between the use of derivatives and bank risk. This methodological concern is aggravated by the difficulties in finding an ideal exogenous instrument that is correlated to derivatives use but uncorrelated to the error term. This problem is partially addressed in the robustness tests section of this paper.

To determine whether the use of derivatives helps to reduce bank risk, we estimated three models:

$$TR = \alpha_0 + \alpha_1 DETA + \alpha_2 SIZE + \alpha_3 MTB + \alpha_4 NPA + \alpha_5 LIQUID + \alpha_6 EQRATIO + \alpha_7 NETCO + \alpha_8 NIM + \alpha_9 INCO + FE + \varepsilon \qquad (1)$$

$$ER = \beta_0 + \beta_1 DETA + \beta_2 SIZE + \beta_3 MTB + \beta_4 NPA + \beta_5 LIQUID + \beta_6 EQRATIO +$$
$$\beta_7 NETCO + \beta_8 NIM + \beta_9 INCO + FE + \varepsilon \qquad (2)$$

$$IR = \gamma_0 + \gamma_1 DETA + \gamma_2 SIZE + \gamma_3 MTB + \gamma_4 NPA + \gamma_5 LIQUID + \gamma_6 EQRATIO +$$
$$\gamma_7 NETCO + \gamma_8 NIM + \gamma_9 INCO + FE + \varepsilon \qquad (3)$$

Model (1) attempts to evaluate the impact of the extent of derivative use on banks' TR, while Model (2) and Model (3) are estimated to answer the question concerning whether the use of financial derivatives reduces SR or IR. DETA, which measures the extent of derivatives use, is the notional value of a bank's derivatives scaled by total assets. Nguyen and Faff (2010) document that it is not derivatives use but the extent of derivatives use that affects firm risk. The coefficients of interest are α_1, β_1, and γ_1. We expect that banks that used more derivatives were subject to higher level of risk. We also include a number of control variables that are considered to be relevant in explaining bank risk: We calculate SIZE by taking the natural logarithm of total assets. Extant studies suggest that larger firms are more likely to engage in risk-reducing behavior than smaller firms are (Nance et al., 1993; Geczy et al., 1997), so we expect that larger bank size is associated with a lower level of risk. MTB (market-to-book ratio) is a proxy for the availability of growth options. NPA (non-performing assets) is calculated by scaling non-performing assets by total assets. Banks with higher NPA are more likely to be financially distressed than are those with lower NPA (Purnanandam, 2007), so we expect a positive relationship between NPA and TR. LIQUID, which measures liquidity, is calculated by scaling the sum of liquid assets, cash and due from banks, and other securities by total assets. Since more liquid banks are less likely to be financially distressed than less liquid banks are (Purnanandam, 2007), we expect a negative association between LIQUID and TR. EQRATIO, which measures a bank's capital position, is the book value of equity to total assets. Since banks with stronger capital positions are less likely to face financial distress than are those with weaker capital positions (Minton and Williamson, 2009), we expect a negative relationship between EQRATIO and TR. NETCO, a proxy for credit risk exposure, is calculated by dividing net loan charge-offs by total assets. We anticipate a positive association between NETCO and TR. NIM (net interest margin) is calculated by dividing net interest income by total assets. INCO (interest coverage) is calculated as EBIT

divided by total interest expense to provide a pre-derivative measure of exposure to interest rate risk. All variables in the final sample are winsorized at 1% in both tails to account for extreme observations. We also include FE (fixed effects) in our analysis to account for country- and year-specific effects.

We use a fixed effects model to examine the relationship between the use of derivatives and bank risk in more detail because of Nguyen and Faff's (2010) findings of a nonlinear relationship between firm risk and derivatives use. We attempt to show the marginal effect of derivatives use on bank risk by partitioning our sample into eleven portfolios and include them in the same regression. Portfolio 0 is the baseline portfolio that contains banks that did not use derivatives. Portfolios $1-10$ are generated by partitioning the sample at each 10th percentile, such that Portfolio 1 contains the lowest level of nonzero derivatives use in our sample and Portfolio 10 the highest level. The fixed effects model is expressed as follows:

$$TR = \delta_0 + \sum_{j=1}^{10} \delta_j \, DETA_j + \delta_{11}SIZE + \delta_{12}MTB + \delta_{13}NPA + \delta_{14}LIQUID + \delta_{15}EQRATIO + \delta_{16}NETCO + \delta_{17}NIM + \delta_{18}INCO + FE + \varepsilon \qquad (4)$$

The coefficient of interest is δ_j. $DETA_j$ is the derivatives use by banks in each of the eleven portfolios. Therefore, a negative δ_j indicates a risk-reducing effect of derivatives use in comparison to the baseline portfolio, while a positive δ_j suggests a risk-inducing effect. All other control variables are identical to the definitions given above.

4.3. Descriptive Statistics

Table 2 provides summary statistics of the variables used in the empirical analysis. Out of more than 600 banks in eleven countries, 243 banks used derivatives. The average total assets of all banks in our sample was $113,451 million, but the total assets of banks that used derivatives was $407,141 million. Banks that used derivatives tended to be larger primarily because large banks are more willing to invest in learning required to use derivatives, as the fixed costs associated with learning can be spread among opportunities offered by using a

large number of derivatives (Brewer et al., 2001). In addition, our sample includes G14 banks–the fourteen most active derivative dealer banks–the average total assets of which was $1.823,762 trillion during the period studied. The mean interest coverage ratio of our sample was 2.7, suggesting that, on average, these banks can easily make the interest payments on outstanding debt with their EBIT. Table 3 reports the correlation for each of the variables. Univariate analysis shows a significant and negative correlation between TR and SIZE, TR and LIQUIDITY, and TR and EQRATIO, as well as a significant and positive correlation between TR and NPA and between TR and NETCO, providing preliminary support for our anticipated relationship between TR and these control variables. The significant and negative association between DETA and EQRATIO provides preliminary support for the view that low-capital banks have greater incentives for capital management facilitated by the use of derivatives under financial reporting discretion than other banks do. This finding contrasts Carter and Sinkey's (1998) finding of a positive relationship and Sinkey and Carter's (2000) finding of no relationship.

Insert Table 2 about here

Insert Table 3 about here

5. RESULTS

5.1. OLS Regression Results

Table 4 reports the results of the OLS regression of bank risk on the extent of derivatives use and the control variables. All explanatory variables in the regression are scaled by 100 for ease of presentation. As Table 4 shows, bank risk is an increasing function of the extent of derivatives use, the extent of derivatives use is associated with an increase in banks' idiosyncratic risk, and there is no evidence for a link between derivative use and systematic risk, the last of which is consistent with the conventional finding that idiosyncratic risk is more relevant than systematic risk in explaining the variation in the risk of an individual stock

over time. In addition, considering that idiosyncratic risk is easier to mitigate or eliminate by hedging or adequate diversification, our findings indicate that banks' use of financial derivatives to manage risk was not effective. The key message is that, on an aggregate level, banks' use of financial derivatives increased their risk level, rather than reducing it.

Insert Table 4 about here

5.2. Fixed Effects Model Results

The results of the fixed effects model regression, reported in Table 5, suggest that Portfolios 1, 2, and 3 (184 banks of the 613 in our sample) reduced their risk compared to the baseline portfolio; Portfolios 7, 8, 9, and 10 (245 banks of the 613 in our sample) increased their risk compared to the baseline portfolio; and the risk level of Portfolios 4, 5, and 6 was not statistically significantly different from that of the baseline portfolio. Among the risk-reducing Portfolios, Portfolio 1 realized the highest level of risk reduction, as its daily stock return variance on average was 18.48 percent lower than the daily stock return variance of the baseline portfolio. Among the risk-increasing portfolios, Portfolio 7 had the highest increase in risk, with a daily stock return variance averaging 0.25 percent higher than that of the baseline portfolio. This figure is considerably lower than that of Portfolio 1, which suggests that the banks featured in our study achieved better results in reducing risk than they did in increasing risk by using derivatives.

Our results suggest that a substantial number of banks in our sample increased risk by using derivatives but that their use of derivatives was more effective in reducing risk than it was in increasing risk. In general, our results confirm the nonlinear relationship between bank risk and the use of derivatives. In particular, bank risk started to increase when a bank's use of derivatives exceeded 3.53 percent, corresponding with the lower bound of the average level of derivatives use in Portfolio 7. In Portfolios 8, 9, and 10, there was a tendency for the increase in bank risk to be a decreasing function of the level of derivatives use. Banks in these three

segments of our sample are large banks with average total assets of $633,570 million, $840,918 million, and $1,668,260 million, respectively, which, together with the significant and negative coefficient of SIZE, reaffirms that larger banks have more expertise in risk management than smaller banks do. On the other hand, banks in the three risk-reducing portfolios are relatively smaller banks, which, in conjunction with the higher coefficients of these portfolios, provides support for the conventional view that smaller banks benefit the most from hedging with financial derivatives since the costs of bankruptcy are proportionally greater for these firms (Warner, 1977).

Insert Table 5 about here

5.3. Robustness Tests

We performed a number of additional analyses to check the robustness of these models' estimations. Results for the OLS regression are presented in Table 6. We first excluded the financial crisis period (2007, 2008, and 2009) to rule out the excessive stock return volatility the crisis caused, which reduced the number of banks to 607 and the number of observation to 3,023 but led to consistent results on TR and IR. Then we excluded the G14 banks to account for these banks' extreme levels of risk, as in addition to derivatives trading they also undertake market-making and underwriting activities, and obtained similar results. We excluded US banks, which account for the largest number of banks that used derivatives in our sample, and the results persisted. Then we based our estimation on the sample that contains only banks that used derivatives and obtained similar, albeit statistically weaker, results. The statistical significance of the coefficient of DETA is 10%, while this variable is significant at the 1% level across all other tests. The coefficient is smaller than it is in other tests, and the effect on idiosyncratic risk disappears. The main implication of these results is that banks that used derivatives experienced more increase in risk than those that did not, and this effect is still present in the sample of only banks that used derivatives. Although we cannot conclude from these results that banks were speculating, the increase in the equity risk

of banks that used derivatives suggests that banks did not adequately achieve their objectives if their motive for using derivatives was hedging.

Insert Table 6 about here

We also performed the first two exclusions (i.e., exclusion of the financial crisis period and that of G14 banks) for the fixed effects model, as excluding the other two groups (US banks and banks that did not use derivatives) reduces our sample size too much. Table 7 shows that, when the financial crisis period is excluded, Portfolios 1 and 2 were risk-reducing, while Portfolios 9 and 10 increased their risk, which result is consistent with results from the previous analysis. The results after excluding the G14 banks are similar to the results from our main test; in a sample of 599 non-G14 banks, 239 banks reduced risk, while 180 banks increased risk.

Insert Table 7 about here

As we discussed in Section 4.2, a key empirical challenge is the problem that arises from reverse causality between the use of derivatives and bank risk: since risk and the use of derivatives are two contemporaneous variables, whether it is the risk level that drives banks to use derivatives or use of derivatives that drives the increase in bank risk is unclear. In robustness tests, we attempt to at least partially address this problem by estimating our models measuring risk at time t+1 and controlling for contemporaneous risk. In other words, it is unlikely that the risk level at time t+1 drives banks' use of derivatives at time t. The models are presented below:

$$TR_{t+1} = x_0 + x_1 DETA_t + x_2 SIZE_t + x_3 MTB_t + x_4 NPA_t + x_5 LIQUID_t + x_6 EQRATIO_t + x_7 NETCO_t + x_8 NIM_t + x_9 INCO_t + x_{10} TR_t + FE + \varepsilon \qquad (5)$$

$$SR_{t+1} = y_0 + y_1 DETA_t + y_2 SIZE_t + y_3 MTB_t + y_4 NPA_t + y_5 LIQUID_t + y_6 EQRATIO_t + y_7 NETCO_t + y_8 NIM_t + y_9 INCO_t + y_{10} SR_t + FE + \varepsilon \qquad (6)$$

$$IR_{t+1} = z_0 + z_1 DETA_t + z_2 SIZE_t + z_3 MTB_t + z_4 NPA_t + z_5 LIQUID_t + z_6 EQRATIO_t + z_7 NETCO_t + z_8 NIM_t + z_9 INCO_t + z_{10} IR_t + FE + \varepsilon \qquad (7)$$

TR_{t+1}, SR_{t+1} and IR_{t+1} are total risk, systematic risk, and idiosyncratic risk at year t+1, respectively, and TR_t, SR_t and IR_t are the same set of risk measures at year t, respectively. All other control variables are the same as defined in Section 4.2. The results from estimating these models, presented in Table 8, are consistent with those in previous estimations.

Insert Table 8 about here

6. CONCLUSION

To what extent does the use of financial derivatives make banks sounder? Our results provide mixed evidence. We observe an overall positive association between the use of derivatives and bank equity risk from OLS regression, suggesting that banks in general increase risk, rather than reducing it, by using derivatives, which is interpreted as speculation (following Hentschel and Kothari's (2001) definition). However, the fixed effects model that examines this relationship in more detail reveals nonlinearity in this relationship, which is consistent with Nguyen and Faff's (2010) finding that nonfinancial firms use derivatives for hedging purposes. However, the story changes when it comes to the banking industry. As evident in our results generated from the fixed effects model, a substantial number of banks assumed additional risk by using derivatives while other banks reduced risk by using derivatives. We believe that this difference is driven primarily by the differences in banks' and nonfinancial firms' business models. In addition, we find that derivatives' ability to reduce risk diminishes after a certain point, which relates to a key issue in international banking regulation at the current stage–that is, excessive risk-taking. New regulations should be set to address this problem, as the current widely applied capital adequacy regulation appears to be insufficient in addressing this issue. We illustrate this issue by demonstrating how banks can take advantage of financial derivatives to circumvent capital adequacy requirements by means of financial reporting discretion. Finally, little is known about the main driver of the nonlinear

relationship between the use of derivatives and bank risk, so an explicit analysis of the factors that contribute to this nonlinear relationship would be a useful extension of our work.

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Figure 1. Global OTC Derivatives 1998-2014 (USD billion)
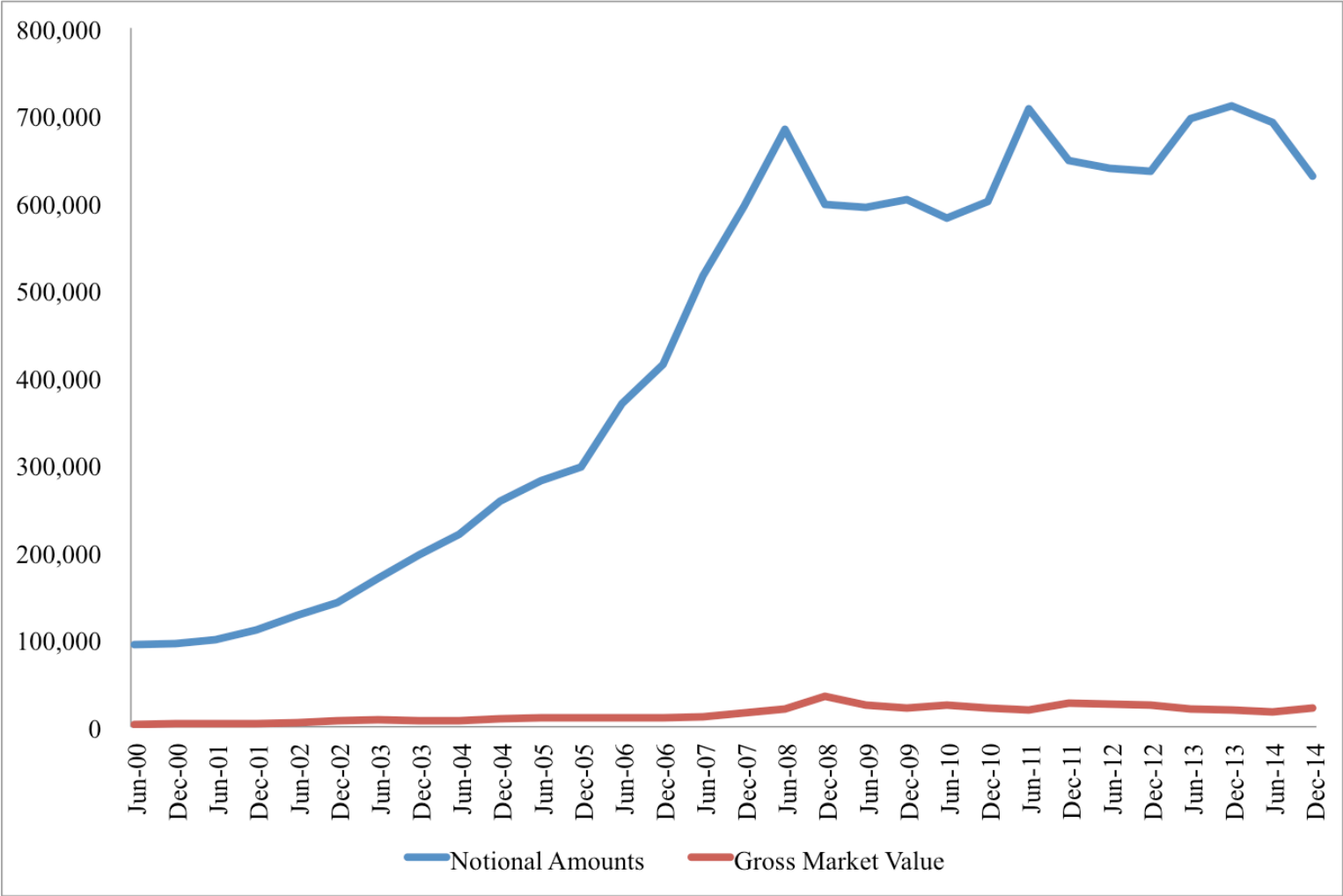
Source: BIS Derivatives Statistics

Table 1. Sample Composition

Country	Observations	Percent		Year	Observations	Percent
Canada	20	0.49				
Netherlands	25	0.62		2005	282	6.97
Sweden	29	0.72		2006	271	6.70
Switzerland	35	0.86		2007	292	7.22
Spain	44	1.09		2008	329	8.13
Germany	72	1.78		2009	403	9.96
UK	90	2.22		2010	465	11.49
Italy	116	2.87		2011	485	11.98
France	129	3.19		2012	498	12.31
Japan	540	13.34		2013	502	12.40
USA	2,947	72.82		2014	520	12.85
Total	4,047	100		Total	4,047	100

Table 2. Descriptive Statistics

	Count	Mean	S.D.	25th	Median	75th
TR	4,047	0.001	0.001	0.000	0.000	0.001
DETA	4,047	0.015	0.049	0.000	0.000	0.000
SIZE	4,047	8.753	2.219	6.949	8.183	10.144
MTB	4,047	8.343	22.660	0.724	1.124	1.784
NPA	4,047	0.078	0.055	0.049	0.067	0.093
LIQUID	4,047	0.332	0.178	0.214	0.298	0.398
EQRATIO	4,047	0.094	0.046	0.069	0.092	0.113
NETCO	4,047	0.004	0.007	0.000	0.001	0.004
NIM	4,047	0.027	0.012	0.018	0.029	0.034
INCO	4,047	2.709	3.294	1.328	1.860	3.261

Table 3. Correlation Between Variables

	TR	DETA	SIZE	MTB	NPA	LIQUID	EQRATIO	NETCO	NIM
DETA	−0.015	1							
SIZE	−0.119***	0.560***	1						
MTB	−0.078***	−0.073***	0.271***	1					
NPA	0.064***	0.012	0.160***	0.084***	1				
LIQUID	−0.118***	0.390***	0.387***	0.155***	0.331***	1			
EQRATIO	−0.053***	−0.227***	−0.266***	−0.211***	0.351***	−0.091***	1		
NETCO	0.524***	−0.083***	−0.091***	−0.124***	0.107***	−0.151***	0.041**	1	
NIM	0.137***	−0.397***	− 0.583***	−0.330***	−0.008	−0.445***	0.348***	0.316***	1
INCO	−0.296***	−0.093***	0.096***	0.141***	0.215***	0.227***	0.333***	−0.285***	−0.107***

*$p<0.05$, ** $p<0.01$, *** $p<0.001$*

Table 4. Impact of Derivatives Use on Bank Risk – OLS Regression Results

VARIABLEES	All (N=613)		
	(1)	(2)	(3)
	TR	SR	IR
DETA	0.1184***	0.0231	0.0950***
	[3.904]	[1.323]	[3.875]
SIZE	−0.0036***	0.0034***	−0.0070***
	[−4.942]	[15.856]	[−10.327]
MTB	−0.0000	0.0001***	−0.0001
	[−0.079]	[4.062]	[−1.545]
NPA	0.1018***	0.0167**	0.0830***
	[3.781]	[2.453]	[3.399]
LIQUID	−0.0192***	−0.0022	−0.0165***
	[−2.809]	[−0.900]	[−2.700]
EQRATIO	−0.1402***	0.0199**	−0.1597***
	[−4.486]	[2.473]	[−5.131]
NETCO	3.4071***	0.2882***	3.1281***
	[11.485]	[5.541]	[10.803]
NIM	−0.3892	0.1148***	−0.5044**
	[−1.446]	[2.937]	[−1.981]
INCO	−0.0004	−0.0002*	−0.0002
	[−1.030]	[−1.893]	[−0.628]
Constant	0.0004***	−0.0005***	0.0008***
	[2.815]	[−13.832]	[6.787]
Country Fixed Effect	YES	YES	YES
Year Fixed Effect	YES	YES	YES
Observations	4,047	4,047	4,047
R-squared	0.631	0.472	0.618

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ [Robust t-statistics in brackets]

Table 5. Impact of Derivatives Use on Bank Risk – Fixed Effects Model Results

VARIABLES	All (N=613)	
	TR	t-stat
Portfolio 1	−18.3729***	−3.869
Portfolio 2	−3.9988***	−3.583
Portfolio 3	−1.6997**	−2.564
Portfolio 4	−0.6454	−1.076
Portfolio 5	−0.2209	−0.615
Portfolio 6	0.0947	0.483
Portfolio 7	0.2453**	2.188
Portfolio 8	0.1430*	1.928
Portfolio 9	0.1022**	2.480
Portfolio 10	0.1030***	3.133
SIZE	−0.0033***	−4.057
MTB	−0.0000	−0.040
NPA	0.1008***	3.760
LIQUID	−0.0196***	−2.838
EQRATIO	−0.1391***	−4.525
NETCO	3.3879***	11.406
NIM	−0.3647	−1.360
INCO	−0.0004	−0.937
Constant	0.0003**	2.461
Country Fixed Effect	YES	−
Year Fixed Effect	YES	−
Observations	4,047	−
R-squared	0.633	−

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6. Robustness Tests Results – OLS

VARIABLEES	Exclude Financial Crisis Period (N=607)			Exclude G14 (N=599)		
	(1)	(2)	(3)	(4)	(5)	(6)
	TR	SR	IR	TR	SR	IR
DETA	0.1198***	0.0373***	0.0819***	0.1081***	0.0368*	0.0706***
	[3.922]	[2.605]	[3.240]	[3.079]	[1.865]	[2.844]
SIZE	−0.0059***	0.0017***	−0.0076***	−0.0037***	0.0037***	−0.0075***
	[−7.772]	[10.179]	[−10.629]	[−4.650]	[16.528]	[−10.237]
MTB	0.0002***	0.0001***	0.0001*	−0.0000	0.0001***	−0.0001
	[2.695]	[4.688]	[1.896]	[−0.059]	[4.092]	[−1.513]
NPA	0.0864***	0.0107**	0.0741***	0.0992***	0.0107*	0.0881***
	[3.070]	[2.420]	[2.784]	[3.583]	[1.649]	[3.503]
LIQUID	−0.0031	−0.0009	−0.0017	−0.0168**	0.0007	−0.0175***
	[−0.463]	[−0.419]	[−0.291]	[−2.222]	[0.316]	[−2.606]
EQRATIO	−0.1518***	0.0058	−0.1571***	−0.1386***	0.0223***	−0.1613***
	[−4.612]	[1.036]	[−4.890]	[−4.444]	[2.970]	[−5.229]
NETCO	2.9216***	0.0437	2.8832***	3.4193***	0.2892***	3.1334***
	[8.656]	[1.176]	[8.701]	[11.474]	[5.615]	[10.841]
NIM	−0.2282	0.0932***	−0.3211	−0.3766	0.1137***	−0.4903*
	[−0.791]	[3.072]	[−1.197]	[−1.388]	[2.863]	[−1.937]
INCO	−0.0003	−0.0000	−0.0002	−0.0004	−0.0002***	−0.0002
	[−0.724]	[−0.177]	[−0.740]	[−1.039]	[−2.634]	[−0.494]
Constant	0.0007***	−0.0002***	0.0008***	0.0004***	−0.0006***	0.0009***
	[5.152]	[−4.910]	[7.061]	[2.796]	[−13.238]	[7.347]
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	3,023	3,023	3,023	3,926	3,926	3,926
R-squared	0.468	0.460	0.493	0.627	0.479	0.616

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ [Robust t-statistics in brackets]

	Exclude US (N=212)			User Only (N=243)		
	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	TR	SR	IR	TR	SR	IR
DETA	0.0781***	0.0117	0.0657***	0.0431*	0.0262	0.0156
	[2.883]	[0.629]	[3.551]	[1.662]	[1.409]	[0.968]
SIZE	0.0034***	0.0051***	−0.0017**	0.0006	0.0032***	−0.0025***
	[3.137]	[7.988]	[−2.075]	[0.611]	[5.923]	[−3.125]
MTB	0.0001	0.0001***	−0.0000	0.0002	0.0002*	0.0000
	[1.348]	[2.698]	[−0.123]	[1.103]	[1.736]	[0.030]
NPA	0.0715***	0.0334***	0.0324*	0.0671***	0.0386***	0.0223
	[3.284]	[2.786]	[1.885]	[3.483]	[3.417]	[1.610]
LIQUID	−0.0297***	−0.0071	−0.0211***	−0.0247***	−0.0090**	−0.0140**
	[−3.151]	[−1.397]	[−3.338]	[−2.964]	[−2.077]	[−2.101]
EQRATIO	−0.0377	0.0416	−0.0795**	−0.1656**	−0.0325	−0.1270**
	[−0.716]	[1.496]	[−2.159]	[−2.451]	[−0.934]	[−2.477]
NETCO	0.3457	0.4215***	−0.0168	2.5794***	0.6369***	1.9907***
	[0.786]	[3.513]	[−0.040]	[5.813]	[4.514]	[5.229]
NIM	0.4652	0.1637**	0.3028	−0.6404***	0.0523	−0.6979***
	[1.224]	[2.131]	[0.834]	[−3.378]	[0.567]	[−4.720]
INCO	−0.0004	−0.0000	−0.0004*	−0.0015***	−0.0003	−0.0013***
	[−1.118]	[−0.030]	[−1.692]	[−3.205]	[−1.489]	[−3.444]
Constant	−0.0003*	−0.0006***	0.0003*	−0.0001	−0.0005***	0.0004***
	[−1.664]	[−6.088]	[1.939]	[−0.338]	[−6.077]	[3.103]
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	1,100	1,100	1,100	998	998	998
R-squared	0.471	0.434	0.419	0.615	0.498	0.583

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ [Robust t-statistics in brackets]

Table 7. Robustness Tests Results – Fixed Effects Model

VARIABLES	Exclude Financial Crisis Period (N=607)		Exclude G14 (N=599)	
	(1)		(2)	
	TR	t-stat	TR	t-stat
Portfolio 1	−20.5334***	[−4.503]	−20.0017***	[−4.499]
Portfolio 2	−5.0560***	[−3.575]	−4.7812***	[−3.454]
Portfolio 3	0.0027	[0.004]	−1.9215**	[−2.385]
Portfolio 4	−0.8775*	[−1.744]	−1.0071	[−1.638]
Portfolio 5	−0.0954	[−0.165]	−0.2676	[−0.683]
Portfolio 6	−0.1020	[−0.245]	0.1820	[0.515]
Portfolio 7	0.1418	[0.965]	0.2578	[1.621]
Portfolio 8	0.2169	[1.531]	0.2417**	[2.470]
Portfolio 9	0.1655***	[2.672]	0.1204*	[1.884]
Portfolio 10	0.0923**	[2.409]	0.0935**	[2.563]
SIZE	−0.0059***	[−6.749]	−0.0034***	[−3.971]
MTB	0.0002***	[2.654]	−0.0000	[−0.033]
NPA	0.0848***	[2.945]	0.0976***	[3.537]
LIQUID	−0.0017	[−0.238]	−0.0164**	[−2.194]
EQRATIO	−0.1500***	[−4.590]	−0.1367***	[−4.428]
NETCO	2.9221***	[8.614]	3.3897***	[11.344]
NIM	−0.1994	[−0.683]	−0.3450	[−1.275]
INCO	−0.0002	[−0.643]	−0.0004	[−1.030]
Constant	0.0006***	[2.718]	0.0003**	[2.395]
Country Fixed Effect	YES	–	YES	–
Year Fixed Effect	YES	–	YES	–
Observations	2,940	–	3,926	–
R-squared	0.469	–	0.630	–

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ [Robust t-statistics in brackets]

Table 8. Robustness Tests Results – Endogeneity

VARIABLES	TR_{t+1}	SR_{t+1}	IR_{t+1}
	N=572		
$DETA_t$	0.0360*	−0.0024	0.0359**
	[1.895]	[−0.196]	[2.447]
$SIZE_t$	−0.0010**	0.0023***	−0.0021***
	[−2.537]	[15.422]	[−6.623]
MTB_t	−0.0002***	0.0000	−0.0002***
	[−2.815]	[0.295]	[−5.343]
NPA_t	0.0632***	0.0115**	0.0488***
	[4.801]	[2.331]	[4.511]
$LIQUID_t$	−0.0247***	−0.0003	−0.0235***
	[−5.364]	[−0.151]	[−5.976]
$EQRATIO_t$	−0.0972***	0.0013	−0.0835***
	[−4.820]	[0.240]	[−4.825]
$NETCO_t$	0.7176***	0.0303	0.5934***
	[4.716]	[1.092]	[4.352]
NIM_t	−0.1354	0.0927***	−0.1771*
	[−1.129]	[2.997]	[−1.946]
$INCO_t$	0.0003	−0.0001*	0.0004
	[1.099]	[−1.661]	[1.519]
TR_t	0.5939***	–	–
	[30.111]	–	–
SR_t	–	0.3911***	–
	–	[26.754]	–
IR_t	–	–	0.6427***
	–	–	[31.984]
Constant	0.0004***	−0.0003***	0.0005***
	[5.887]	[−11.023]	[9.586]
Country Fixed Effect	YES	YES	YES
Year Fixed Effect	YES	YES	YES
Observations	3,351	3,351	3,351
R-squared	0.718	0.552	0.740

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ [Robust t-statistics in brackets]

AFTERWORD

In the classical work "Capitalism, Socialism and Democracy", Joseph Schumpeter epitomizes industrial capitalism as "an evolutionary process", and the process of creative destruction as the essential fact about capitalism. A key point drawn from recent research and history is just how much creative destruction goes on in financial world. As mentioned many times throughout this dissertation, an old question that has been asked since August 2007 is how far implicit and explicit government bailout of banks creates a problem of moral hazard. In fact, either the LIBOR scandal or the aggressive derivatives usage by large banks represents unethical and excessive risk-taking behavior associated with this problem. At the closure of the book "The Ascent of Money", Niall Ferguson relates the erratic path of financial history to the theory of evolution. In fact, this work has been deeply influenced by Ferguson's view and built upon the following points:

– An understanding of the origin of modern financial institutions is a prerequisite to understanding the fundamental truth about its present-day role.
– An alternative view of problems in financial world is to consider institutions as spices that goes through evolutionary processes and are all subject to survival rules.
– It eventually directs all the problems to human, who populate the financial world, design the financial system, write the rules, innovate instruments and tools, and fail to learn from history; who are smart, noble, pretty, ugly, arrogant, humble, selfish, greedy, generous, yet always human.

Looking forward, although a call for new rules and new systems appears to be appropriate here, I would rather close this work with the summation by Ferguson: "…financial markets are like the mirror of mankind, revealing every hour of every working day the way we value ourselves and the resources of the world around us. It is not the fault of the mirror if it reflects our blemishes as clearly as our beauty".