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How Deposit Insurers' Fund Managers compute coverage limits

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Walden University
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Abstract

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MBA, University of the West Indies, 1997

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Dissertation Submitted in Partial Fulfillment

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Abstract

Following the 2007–2008 global financial crisis, the Financial Stability Board identified several areas of weakness in the delivery of deposit insurance, among other interventions. One of the key recommendations related to the use of data by deposit insurers to make their coverage limits more robust. The purpose of this quantitative nonexperimental cross-sectional study was to test the impact of 4 data sets—aggregate bank risk, the aggregate value of insured deposits, the DIF size, and premium levy—on the deposit insurance coverage limit. The investigation comprised a pilot study and a survey of deposit insurers from the International Association of Deposit Insurers as an international (IADI) representative group. In the pilot study of one IADI member, the Federal Deposit Insurance Corporation (FDIC), the multiple regression results indicated statistical significance for aggregate bank risk $\beta = –0.102$, $t = –3.319$, $p < 0\ .001$; the aggregate currency value of insured deposits $\beta = 0.997$, $t = 19.523$, $p < 0\ .000$; and the premium levy $\beta = 0.117$, $t = 3.694$, $p < 0\ .000$. The Pearson correlation results were aggregate bank risk 0.476, the aggregate currency value of insured deposits 0.963, and the premium levy 0.287, with statistical significance ranging from .000 to .007. The survey results of 29 International Association of Deposit Insurers (IADI) members revealed no statistical significance for any of the 4 variables. Notwithstanding the nonsignificance in the IADI survey, these findings will set the framework for deposit insurers and financial authorities to use statistical industry data to compute or change their coverage limits. This study contributes to positive social change in the development of international standards in deposit insurance.

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Dedication

I dedicate this work to my beautiful and loving wife, Joanne Stephanie Nunes, who passed away in 2018, and to my intelligent and talented son, Steffan Bonheur De Noel Nunes. None of this would have been possible without your collective love, support, and sacrifice. I also dedicate this work to my parents Irvin and Elva who would be truly appreciative that their son has earned a doctoral certification.

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Chapter 1: Introduction to the Study

Deposit insurance coverage limits are one of the key design features of an explicit deposit insurance system that plays an important role in promoting financial stability within banking systems (International Association of Deposit Insurers [IADI], 2014). *Coverage limits* represent the amount of money that depositors of a troubled bank are reimbursed for relative to the amount of eligible deposits they hold when the troubled bank is resolved (IADI, 2014). Depending on its level relative to depositors' total savings, coverage limits have the potential to either incentivize bank depositors to exercise oversight of a bank's risk-taking behavior or inveigle other depositors to withdraw their deposits in the event of potential financial distress in a banking system (Wang, 2008). Generally, the higher value amount of bank deposits held by a depositor that is insured by a deposit insurance system, the lesser the depositor's propensity to run on the bank. The obverse is also true. In this context, some governments have adopted explicit deposit insurance systems as a component of their overall financial safety net and their objective is to implement "disruption-mitigating financial policies" (Demirgüç-Kunt & Kane, 2001, p. 2) in their jurisdictional financial system. An explicit deposit insurance system is premised on the use of coverage limit, not blanket guarantees.

Consistent with the derivation of health insurance policies in a competitive premium environment, setting a coverage limit for deposit insurance requires relevant industry data (Norouzzadeh, 2012). The inclusion of such data could provide a coverage limit with a greater sensitivity toward the factors that can impact its level on an ongoing basis while at the same time provide it with more resilience from political ad hoc

interventions. Health insurance actuaries may incorporate types and frequencies of illness, age, gender, and ethnicity among other factors to quantify the amount of money an insurance company is willing to risk to provide insurance for a given individual as well as the amount of premium an insured person is likely to pay for a specific policy (Norouzzadeh, 2012). The more health risk exposure an individual possesses compared to the criteria an insurance company uses in the pricing process, the greater the risk that an individual poses to make a claim; the probability they will pay increased insurance premiums is higher (Norouzzadeh, 2012). The same principle applies to property insurance when owners reside in high-risk areas associated with dangerous elements of nature, such as storms and flooding. In the field of competitive insurance, the inclusion of such statistics is not only used to price premiums but to determine an amount a potential policyholder is likely to be reimbursed should the probability of the insured event occur (Norouzzadeh, 2012).

Deposit insurers' fund managers should consider following a similar trend and use industry data to derive their coverage limits (Valentino, 1954). Deposits are a major source of funding for some banks, and depositors may be exposed to losses if their banks fail (IADI, 2014). However, because these institutions use the deposits as funding, higher coverage limits tend to incentivize bankers to take on more risk in their bank portfolios, which could expose their banks to failure (IADI, 2014).

In this study, I evaluated the use of potential industry data by deposit insurers among members of the IADI to compute their deposit insurance coverage limits. I anticipated that a certain increase in a jurisdiction's deposit insurance system's insured

deposits could trigger an increase in the deposit insurance coverage limit. Perhaps such an increase in the aggregate value of insured deposits could lead to an increase in the value amount of the deposit insurance fund (DIF), assuming few or no resolution of troubled banks. This constitutes ways that fund managers of deposit insurance systems could use industry data to compute their coverage limits. The Financial Stability Board (FSB, 2012) made this observation following the global 2007–2008 financial crisis, noting that deposit insurance systems do not use industry data to compute their limits. This apparent absence of data usage provided the impetus for this study.

In this study, I incorporated a multiple regression analysis for the pilot study of the Federal Deposit Insurance Corporation (FDIC) from 1934 to 2019, accompanied by ordinal logistic regression analysis of a survey of IADI members (Velikova, 2006). Multiple regression analysis was performed to determine the influence of the four independent variables: aggregate bank risk, the deposit insurance premium levy, the DIF size, and the aggregate value of insured deposits on the dependent variables the deposit insurance coverage level of the FDIC (Velikova, 2006). The period for this analysis was 85 years, from 1934 to 2019. Following this, a correlation analysis was executed to determine the strength of any of the predictive relationships between the dependent and independent variables (Warner, 2012). Ordinal logistic regression analysis was used to assess the predictability of each of the independent variables on the coverage level of the IADI members' deposit insurance systems, the dependent variable, when any of the four independent variables are altered. The objective of these methodologies is to highlight the

possible changes in the coverage limits that could have occurred or been implemented had the DIF managers been using industry data to determine coverage limits.

The inclusion of industry data in the computation of deposit insurance coverage limits can present social positive changes to the financial system. From a policy perspective, the coverage limit will provide a greater representation and actuarial valuation of the deposits in the banking system (Valentino, 1954). Data-supported coverage limit figures may be more resilient to financial crises, limiting the need for governments to adopt blanket guarantees and the associated fallout in removing such mechanisms later, as was the case with a number of deposit insurance systems during the 2007–2008 global financial crisis. Bank depositors' propensity to run on their banks could be reduced, perhaps making the financial system safety net more stable (Diamond & Dybvig, 1983). Data usage could lead to the development of statistical valuation models and by extension a more robust standard for coverage limits by deposit insurers.

In this chapter, I cover the background of the study, the problem statement, purpose statement, research questions, and the theoretical framework. Subsequent to these elements, the nature of the study is discussed followed by definitions, assumptions, scope and delimitations, limitations, and the significance of the study. The chapter concludes with a summary and an overview of the structure of the study.

Background of the Study

Although deposit insurance systems have existed since the 1930s and the authorities changed their coverage limits—some more frequent than others—no research has been done to identify industry-specific factors that could be used or formulated into a

model to compute changes to deposit insurance coverage limits. This deficiency in the research became apparent after the 2007–2008 global financial crisis (FSB, 2012). During the crisis, some governments opined that the changes to the coverage limits were necessary to restore and instill consumer confidence in the banking system, which virtually came to a halt in the United States (Bitros, 2015; Calomiris & Jaremski, 2016). In some instances, the adjustments to the coverage limits were extreme; some governments implemented blanket guarantees representing 100% of total deposits in the banking system (Bitros, 2015). Removing the coverage limit during a crisis of such a global magnitude could neutralize depositors' potential to simultaneously withdraw their funds and put their banks into a liquidity crunch and eventual failure.

The downside risks associated with full coverage for deposits, particularly in response to the 2007–2008 crisis, could be significant and give rise to a number of questions. Are the financial stability authorities fully equipped to determine the appropriate end time for the crisis? How long should the authorities allow the blanket guarantees to remain in force during and after the crisis? Assuming the authorities have determined the crisis period has ended, what should the coverage level be going forward? Should the post crisis limit be restored to the same level it was pre crisis? Alternatively, should it be higher, and if so, what factors would inform such a decision for the increase? How are depositors' expectations to be addressed to this new pre crisis level? More importantly, how are depositors' expectations to be honed when new financial shocks occur in the future? And they will, according to Bitros (2015).

The occurrence of the 2007–2008 global financial crisis provided a learning opportunity. Following the crisis, the FSB (2012) highlighted the importance of standards for deposit insurance systems and noted the deficiency in administrators of deposit insurance systems regarding using statistical data to calculate deposit insurance coverage limits. Deposit insurers around the globe through the IADI took note of the coverage limit and other weaknesses that occurred and successfully moved to implement international standards for deposit insurance systems in November 2014 (IADI, 2014). Notwithstanding this effort, IADI's Principle 8 Coverage illustrated weaknesses in the guidelines for computing deposit insurance coverage limits. While the development of this standard was a positive move on IADI's part, it omitted the inclusion of relevant industry statistical data to derive coverage limits.

While the usage of industry statistical data is considered an imperative in the derivation of deposit insurance coverage limits, the relevant authorities should appreciate the nexus between deposit insurance coverage as a tool and the intended benefits to depositors. Gan and Wang (2013) argued this point and noted that timing and frequency of coverage limit changes damage the bank-depositor relationship; regular changes to the coverage limit can undermine trust in a central bank effort to maintain stability as well as consumers' expectations in terms of reimbursement.

Major banking crises that started with the Great Depression in the United States from 1929 to 1933, have been dominated by depositors with small deposits engaging in simultaneous withdrawal of funds, culminating in a liquidity crunch in the U.S. banking system and the subsequent failure of banks (Shyy, Stenbackaz, & Yankovx, 2014). In

response, the FDIC system was created when the U.S. federal government, through the Banking Act of 1933, and introduced a partial deposit insurance system with a coverage limit of $2,500, which targeted the most vulnerable, small depositor (FDIC, 1998). However, this limit of $2,500 was not clearly defined. In one instance it was suggested to be based on the criteria of rent money (Greenspan, 2003). In another case, the suggested grounding was the value of deposits held by the Postal Savings System that had the full backing of the U.S. government in the 1930s (Hogan & Luther, 2014). The acceptance of the $2,500 coverage limit was not simple (Hogan & Luther, 2014). A compromise between bankers, who wanted a lower coverage limit, and depositors, who preferred a higher limit, had to be factored into the discussions to arrive at the $2,500 coverage limit (Hogan & Luther, 2014). The deciding point that won the argument was the fact that the $2,500 covered approximately 97% of the deposits held by banks (Hogan & Luther, 2014). The derivation of the coverage limit was clearly unscientific, and it appears that not much has changed since; the FDIC limit was increased to $250,000 up from $100,000 in response to the 2007–2008 crisis (Barth & Prabha, 2014).

Governance may be a factor that led to the lack of development associated with the application of data and the introduction of financial models. The Basel Committee on Banking Supervision (BCBS) has, over time, developed criteria to regulate banks using macroprudential and microprudential data to assess the possible exposure of banks to the financial system (BCBS, 2012; Madhani, 2017). These moves led to the implementation of the capital, asset quality, management, earnings and liquidity system (CAMELS) in 1988, as well as the 29 core principles or international standards for regulating banks in

1997 (BCBS, 2012). These interventions by bank regulators suggest that industry data specifically related to bank risks was available prior to the 2007–2008 crisis and raises the question as to why such available data have not been shared with the authorities of deposit insurance systems.

Notwithstanding the gap in the absence of data usage by deposit insurance systems, as noted by FSB (2012), Markowitz's (1952) modern portfolio theory, and Merton's (1977) option pricing theory, rely on data inputs to maximize expected returns on stock investments, given the presence of risk and pricing European options, respectively. In this study, I used Markowitz's and Merton's premises to illustrate or support the need to use industry statistical data inputs to derive deposit insurance coverage limits, which may strengthen IADI international standards, provide IADI member and nonmember fund managers with a framework to compute crisis coverage limits less prone to ad hoc changes, sync with BCBS microprudential and macroprudential efforts, and enhance deposit insurance systems' corporate governance and effectiveness to contribute to financial stability (Demirgüç-Kunt, 2015; Egbuna, Oduh, Ujunwa, & Okoyeuzu, 2018; Gârbo, 2016).

The results of this study may form a framework for the enhancement of international standards for computing deposit insurance coverage limits. Policy development would be another benefit associated with the findings from this research. Positive social change could arise with less potential for political interference.

Problem Statement

The FSB (2012) noted "that few explicit deposit insurance systems collect and assess statistics necessary for monitoring the adequacy of coverage levels" (p. 5). The FSB advocated that IADI's core principles, which are the international standards for deposit insurance, could have a greater impact on financial stability if the standards included "an objective benchmark for the ongoing monitoring of the effectiveness and adequacy of coverage levels" (p. 5). This was one weakness cited by the FSB in its Thematic Review of Deposit Insurance Systems in February 2012; they emphasized the importance of "effective depositor compensation arrangements" following the 2007/2008 global financial crisis (FSB, 2012, p. X). During the crisis, the relevant authorities feared the worst and resorted to an extreme position of implementing blanket guarantee coverage limits within their deposit insurance arrangements (Chu, 2011). In response to the crisis, the IADI (2013) noted "that nineteen (19) deposit insurers implemented full depositor guarantees, twenty-two (22) introduced permanent changes while 7 implemented temporary adjustments to their deposit insurance coverage limits" (p. 20). It is unknown why the authorities in so many countries placed so much emphasis on the option to increase their deposit insurance coverage limits. Should another crisis, perhaps even of a lesser magnitude, arise in the future, it is not known how the bank depositors' expectations will be addressed or calmed.

The general problem of this study is that scholars are unaware of whether the deposit insurers in the international financial system as represented by the IADI members' association fund managers use industry statistical data to derive their deposit

insurance coverage limits. The specific problem is that we do not know what data DIF managers' use to compute coverage limits for deposit insurance systems, which can promote the ineffectiveness deposit insurance systems and instability of financial systems during banking crises or normal periods of financial distress (FSB, 2012). This study is focused on exploring the inclusion of industry statistical data to compute deposit insurance coverage limits as a measure of mitigating impromptu increases or blanket guarantees, which could potentially create more with difficulties for bank depositors (FSB, 2012). The deposit insurance field is under researched in computing deposit insurance coverage limits based on industry data similar to that used in the life insurance and health insurance industries (Valentino, 1954). Researchers have targeted other areas such as deposit insurance pricing (FSB, 2012; Velikova, 2006).

The expedient decisions and actions pursued by governments during the 2007–2008 global financial crisis (a) undermined the relevance of deposit insurance systems, (b) created psychological conundrums in the minds of bank depositors, and (c) placed a temporal but significant contingent financial burden on governments and taxpayers (Xie, 2018). The findings of this study may contribute to further research in the application of statistical data to establish international standards for computing deposit insurance coverage limits.

Purpose of the Study

The purpose of this quantitative study was to determine whether the usage of industry statistical data, such as the aggregate bank risk data, fund size, aggregate value of insured deposits, and premium levy applied by the deposit insurers fund managers in

the global financial environment, to derive their deposit insurance coverage limits could potentially lead to more objective, crisis-resilient coverage limits. Based on its institutional recognition as an international standard setter, I used IADI members as the deposit insurers for this research. I investigated significant relationships between four independent variables: (a) aggregate bank risk data, (b) fund size, (c) aggregate value of insured deposits, and (d) premium levy, and the dependent variable coverage limit. The findings could assist with the development of a standard for computing deposit insurance coverage limits and minimize the possibility of depositors engaging in bank runs. The results of this study should corroborate the FSB's (2012) advocacy for the use of statistical data by DIF managers to calculate their respective deposit insurance coverage limits. Stability within financial systems around the globe could be enhanced, placing less psychological stress on depositors (Bitros, 2015).

Research Questions and Hypotheses

Based on the problem and purpose statements, the following research questions were created:

RQ1: What effect, if any, does the aggregate bank risk have on the predictor variable deposit insurance coverage limit?

$H_0$1: There is no effect of the aggregate bank risk on the predictor variable deposit insurance coverage limit.

H_a1: There is an effect of the aggregate bank risk on the predictor variable deposit insurance coverage limit.

RQ2: What effect, if any, does a DIF's fund size have on the predictor variable deposit insurance coverage limit?

$H_0$2: There is no effect of a DIF's fund size on the predictor variable deposit insurance coverage limit.

H_a2: There is an effect of a DIF's fund size on the predictor variable deposit insurance coverage limit.

RQ3: What effect, if any, does the aggregate currency value of the insured bank deposits protected by a DIF have on the predictor variable deposit insurance coverage limit?

$H_0$3: There is no effect of the aggregate currency value of the insured bank deposits protected by a DIF on the predictor variable deposit insurance coverage limit.

H_a3: There is an effect of the aggregate currency value of the insured bank deposits protected by a DIF on the predictor variable deposit insurance coverage

RQ4: What effect, if any, does a DIF's premium levy on its member banks have on the predictor variable deposit insurance coverage limit?

$H_0$4: There is no effect of a DIF's premium levy on its member banks on the predictor variable deposit insurance coverage limit.

H_a4: There is an effect of a DIF's premium levy on its member banks on the predictor variable deposit insurance coverage limit.

The coverage limit will be the dependent variable. Data on the aggregate bank risk, the DIF size, the total value of insured deposits in the banking system, and the level of the deposit insurance premium were the independent variables. The aggregate bank

risk data were based on the Bank for International System (BIS) risk measures using the BIS rating scheme incorporating CAMELS (BCBS, 2012). The DIF size was based on the value size of the fund, and the insured deposits represented the aggregate value of the specific types of deposit instruments that the deposit insurance system is mandated to protect and/or insure. Intuitively, the higher the BIS CAMELS rating of a given bank, the higher the probability of bank failure and, by extension, the higher the likelihood that depositors may be reimbursed. The higher the value of the DIF, the greater the probability of the DIF to reimburse depositors and pay a higher coverage limit in the event of a bank failure. The higher the value of the insured deposits, the higher the likelihood of increased demands by depositors for a higher reimbursement amount or coverage limit in the event of a bank failure. Further, the higher the deposit insurance premium, the higher the likelihood that the DIF may grow and consequently make more funds available to reimburse depositors.

Theoretical Framework

Six main theories grounded this study: (a) option pricing, (b) modern portfolio, (c) deposit insurance, (d) resource dependence corporate governance, (e) insurance, and (f) bank regulations theories. Merton (1977) noted that "the properties of deposit insurance viewed as a security are isomorphic to those of a put option" (p. 4). In Merton's view, deposit insurance is similar to an option pricing, more specifically, a European put option. In this scenario, the depositor will exercise their put option to be reimbursed in the amount of the deposit insurance coverage limit if the bank's stock price was lower, signaling its possible failure. Through Merton's lens, there is an intuitive parallelism

between deposit insurance as a reimbursement action and a European put option, which seemingly hints at the need for, and use of, data.

The same principle applies to the concept of risk in an investment portfolio, as espoused by Markowitz (1952, as cited by Rutterford & Sotiropoulos, 2016). Markowitz's modern portfolio theory laid the foundation for selecting an optimal portfolio containing stocks and bonds incorporating a relationship between the risk pursued and the returns obtained from investments. Explicitly, Markowitz's modern portfolio theory enhanced the understanding of efficiency of markets, but implicitly assumes that market data are already reflected in prices of securities.

One early study that signaled the need for the inclusion of data to compute deposit insurance coverage limits was led by Valentino (1954). Valentino attempted to apply the theory of insurance to the field of deposit insurance in the early 1950s, and while he did not explicitly advocate the need for data to price deposit insurance coverage limits, he perceived a nexus between the use of factors to price insurance as well as deposit insurance. Insurance policy holders are covered for a level of protection that is reflected in their insurance premium derived by data (Valentino, 1954).

With the passage of time and building on the concept of risk in finance theory, as advocated by Markowitz (1952), the BCBS established the Basel Capital Accord or Basel I in 1988, which was introduced in 1992 as a credit risk measurement for regulating banks (Benink & Wihlborg, 2002). In 1999, the BCBS advanced their efforts and introduced Basel II, which focused on certain aspects such as capital requirements and the effective disclosure to enhance market discipline (Benink & Wihlborg, 2002). In

response to the 2007–2008 global financial crisis, the BCBS introduced Basel III, which began implementation in 2013. This effort focused on corporate governance, risk management, increased common equity, liquidity ratio, and additional impositions for systemically important banks (BCBS, 2017).

As a measure of building international best practices, the BCBS (2012) introduced 29 core principles for effective banking supervision, representing the basic standards for sound prudential regulation and supervision of banks. These standards focus on risk-based supervision and incorporated, among other items, market risk, liquidity risk, operational risk, credit risk, capital adequacy, and corporate governance (BCBS, 2012). The BCBS interventions through the Basel accords, the CAMELS, the banking standards, and the risk-based bank supervision methodology were all developed based on using bank industry data (BCBS, 2012). The adoption of the Basel bank supervisory frameworks (the Basel Accords) generated many bank data, which are executed by central banks, and the deposits of which are insured by deposit insurance systems—all comprising key financial safety net participants in many jurisdictions. These interventions suggest that industry data for deposit insurance systems are available but are not used by the practitioners. It remains unclear if a governance issue is stymying the process of data sharing. These frameworks underpin my study and set the basis to answer my research questions.

The theory of deposit insurance posited by Diamond and Dybvig (1983, as cited by Hogan & Luther, 2014) noted that in certain periods, financial contagion can cause depositors to engage in simultaneous withdrawals of deposits from their banks, otherwise

known as bank runs. To maintain confidence during periods of systemic risk and possible runs on banks, Diamond and Dybvig proffered that governments could mitigate this risk without incurring cost through the cost-less provision of deposit insurance. Diamond and Dybvig played with the notion that too high a coverage limit would diminish market discipline, and bankers may take on more business risk, exposing depositors to loss. Diamond and Dybvig also noted that too low a coverage limit could potentially trigger depositors to panic and withdraw their funds simultaneously, possibly leading to a liquidity crunch for banks and their eventual demise. The appropriate coverage limit, the derivation of which demands industry data, was therefore considered important in Diamond and Dybvig's view.

Governance may be a contributor to DIF managers' lack of application of data to derive coverage limits. While Diamond and Dybvig (1983, as cited by Hogan & Luther, 2014) noted that deposit insurance systems are established by governments, there are cases of privately owned systems in Switzerland and Italy (Hogan & Johnson, 2016). Hogan and Johnson (2016) posited from international studies on deposit insurance that, "adverse effects of deposit insurance are stronger where government has greater involvement in the deposit insurance system" (p. 438). Demirgüç-Kunt and Detragiache (2002, as cited by Hogan & Johnson, 2016) held a similar view. Hogan and Johnson argued that countries with high coverage limits coupled with government participation in the deposit insurance system tended to cause increased bank failures and financial crises. In support of the governance argument for using industry data, resource-dependence theory of corporate governance, as posited by Madhani (2017), emphasizes that the board

should source key inputs by interacting with the external environment. Such contributions gained from accessing important elements can assist a firm in attaining optimal level of performance (Madhani, 2017).

According to Hanson, Kashyap, and Stein (2011) the microprudential orientation of the bank regulatory framework prior to the 2007–2008 global financial crisis, which focused on proactively averting the failure of financial institutions on a single entity basis, failed. This traditional approach incorporated aspects, such as capital adequacy mandates, reserve requirements, and bank examination (Shive & Forster, 2017). Following the fallout of the crisis, there was greater consensus toward the adoption of a macroprudential approach to financial regulation, which emphasizes the protection of the entire financial system (Hanson et al., 2011). In Hanson et al.'s perspective, bank regulators and supervisors legislative framework needs to be expanded to capture possible systemic risks and deficiencies.

Merton's (1977) option pricing theory together with Markowitz's (1952) modern portfolio theory will support my study as both depend on the application of data to either assess the credit risk of corporate debt or to maximize returns on a portfolio simultaneously. Diamond and Dybvig (1983, as cited by Hogan & Luther, 2014), through the theory of deposit insurance, argued for the adoption of deposit insurance systems for preventing depositors' runs on banks. Madhani's (2017) resource-dependence theory of corporate governance offers a possible rationale for DIF managers to compute deposit insurance coverage limits on a fair basis as part of their fiduciary responsibility. Hanson et al.'s (2011) macroprudential theory of bank regulations adds value to the inclusion of

industry data to derive coverage limits because deposit insurance systems are part of the financial stability network adopted by the BCBS to regulate banks. These five key theories my study is built on will be explained in greater detail in Chapter 2.

Nature of the Study

The nature of this study was quantitative. As a statistical methodology, quantitative analysis was used to determine whether relationships exist between the aggregate bank risk data, the DIF size, the premium levy, the aggregate value of insured deposits, and the coverage limits of IADI members (Frankfort-Nachmias & Leon-Guerrero, 2015). The study is comprised of two segments, a pilot study and a survey. Four hypotheses were tested in each component of the study. In the pilot study, the key independent variables and the dependent variable took a scale categorization. In the main study of the IADI members, the dependent and independent variables took an ordinal variable classification.

The instrument used in this study followed a modified version of the approach adopted by Sheboy (2006) based on the similarities between the studies. Sheboy examined relationships between data usage through the concept of data-based decision making and district school administrators. In a similar vein, in this study, I focused on the search for significant relationships between statistical industry data and the computation of deposit insurance coverage limits. Drawing on the work of other similar studies, Velikova (2006) examined relationships between bank risk data and real deposit insurance coverage in the United States and to research the demographic, political,

economic, and financial factors that impact explicit deposit insurance systems' coverage limits of countries around the world. Velikova used multiple regression analysis.

As a precursor to the main study, I performed a pilot study incorporating a multiple regression analysis to examine the relationship between the four independent variables, aggregate bank risk, DIF premium levy, the DIF size, and the aggregate value of insured deposits, and the dependent variables the deposit insurance coverage level for the FDIC in the United States. The period for this analysis was 85 years from 1934 up to and including 2019, and the data were collected from the FDIC's published data on its website. The regression analysis results provide insights into associations between the variables I identified in the main study and the time series data points for purposes of forecasting.

The main and second element of the study was the search for significant relationships between the IADI members' use of industry data and significant relationships between the IADI fund managers and their use of same industry data, or specific variables, used in the pilot study. Assuming trends would be detected in the pilot study, ordinal logistic regression analysis was used in the main study to assess the predictability of the usage of each of the same independent variables to compute the coverage level for the IADI members' deposit insurance systems, the dependent variable, when any of the four independent variables were altered. One minor addition to Velikova's (2006) modality was introduced. The objective of using these methodologies was to highlight the possible changes in the coverage limits that could have occurred or

been implemented had the IADI fund managers been using industry data to derive coverage limits (Warner, 2012).

The dependent variable, coverage limits, was measured as an ordinal variable. There were five independent variables analyzed, four of which highlighted specific data sets that can be used to determine the coverage limits. The questionnaire that members were asked to respond to on these four variables incorporated the following:

- The aggregate risk profile of the DIF's member banks to identify which members have the higher or highest probability of failure within a short-term outlook. The higher the risk profile the higher the coverage limit may be;
- The actual size of the DIF. The higher the DIF, the higher the coverage limit may be;
- The aggregate value of the insured deposits within the banking system excluding corporate and government deposits. The higher the total value of insured deposits in the banking system, the higher the coverage limit may be; and
- The DIF's premium levy. The higher the premium levy, the higher the coverage limit may be.

The usage of these statistical data or lack thereof by the members was based on the IADI members' responses to a survey guided by the following: Controls were established for mediating variables that may influence the relationship between the dependent and independent variables. Mediating variables exist where Variable X can

causally influence the relationship between Variables Y and Z (Warner, 2012). It is possible that fund managers of deposit insurance systems may not have access to data on the risk profile of banks which may be held and not shared by the bank regulator or central bank due to legislative constrains. If the data cannot be shared, then this limitation could influence, and by extension restrict, the fund managers' access to use it to compute their deposit insurance coverage limits (Warner, 2012). The business model could influence the size of the coverage limit (Warner, 2012). The type of governance structure adopted may be another mediating variable because DIF managers are guided by the board's appetite for risk, transparency, robust business structure and so on (Madhani, 2017). Limited investment options for the premium collected from members of the DIF may be another mediating variable because this circumstance can restrict the growth of the DIF. The mediating variables was entered in SPSS simultaneously to determine if a combination of mediators can explain the relationship between the coverage limit and the four factors (Wagner, 2016; Warner, 2012).

Definitions

Bank: Any entity that accepts deposits or repayable funds from the public and is classified under the jurisdiction's legal framework as a deposit-taking institution (IADI, 2014).

Bank runs: A rapid and significant withdrawal of deposits from a bank by depositors following a loss of confidence, precipitated by the fear that the bank may fail and that depositors may therefore suffer losses or lose access to funds (IADI, 2014).

Bank regulation: The bank regulator that has the powers available under legal frameworks for the purposes of conducting on-site and off-site review of bank records without the consent of shareholders, creditors, and debtors in question (IADI, 2014).

Coverage limit: The maximum amount a depositor can claim from or be reimbursed by a deposit insurer in the event of a bank failure (IADI, 2014).

CAMELS rating: A system used to rate banks according to six factors represented by capital adequacy, asset quality, management capability, earnings, liquidity, and sensitivity to market risk (IADI, 2014).

Contagion: The spread of the financial problems of one bank to other banks or financial institutions, usually within the same jurisdiction, or the spread of economic and financial disturbances within a jurisdiction or across jurisdictions (IADI, 2014).

Coverage limits: The types of instruments covered, the methods for calculating depositor claims, funding arrangements, and other related matters (IADI, 2014).

Deposit: Any credit balance that derives from normal banking transactions and which a Bank must repay at par under the legal and contractual conditions applicable; any debt evidenced by a certificate issued by a bank; and any other funds or obligations defined or recognized as deposits by the law establishing the deposit insurance system (IADI, 2014).

Deposit insurance: A system established to protect depositors against the loss of their insured deposits if a bank is unable to meet its obligations to the depositors (IADI, 2014).

Deposit insurance fund (DIF): A combination of premiums collected from member banks that are invested to enhance the capacity of an insurance system to meet its obligations associated with resolving member banks in financial distress, one of which could include depositor reimbursement in the event of a bank failure (IADI, 2014).

Deposit insurance system: Refers to the deposit insurer and its relationships with the financial safety net participants that support deposit insurance functions and resolution processes (IADI, 2014).

Deposit insurer: A specific legal entity responsible for providing deposit insurance, deposit guarantees, or similar deposit protection arrangements (IADI, 2014).

Deposit reimbursement: A resolution method that involves the reimbursement of deposits to insured depositors (IADI, 2014).

Eligible deposits: deposits that fall within the scope of coverage of a deposit insurance system (i.e., they meet the requirements for coverage under a deposit insurance system and are based typically on the type(s) of depositor and/or deposit; IADI, 2014).

Explicit deposit insurance system: A system, expressly laid down by statutes or other legal instruments, that stipulates the amount of reimbursement that depositors can expect in the event of a bank failure (IADI, 2014)

Financial safety net: A framework that includes the functions of prudential regulation, supervision, resolution, lender of last resort, and deposit insurance. In many jurisdictions, a department of government (generally a ministry of finance or treasury responsible for financial sector policy) is included in the financial safety net (IADI, 2014). The Central bank, bank regulator, deposit insurance systems, other financial

regulators (insurance and securities) and a government ministry are the institutions that fall into this group.

Indexed coverage: Limited coverage level that is determined or adjusted by the inflation rate or the change in another relevant price index of a jurisdiction (IADI, 2014).

Insolvency: A situation in which a bank can no longer meet its financial obligations when due and/or the value of its assets is less than the total of its liabilities (IADI, 2014).

Insured depositors: Holders of eligible deposits that do not exceed the maximum coverage level provided by a deposit insurance system (IADI, 2014).

Insured deposits: Eligible deposits that do not exceed the maximum coverage level provided by a deposit insurance system (IADI, 2014).

Loss minimizer: A mandate in which the deposit insurer actively engages in a selection from a range of least-cost resolution strategies (IADI, 2014).

Mandate: A set of official instructions describing the deposit insurer's roles and responsibilities. There is no single mandate or set of mandates suitable for all deposit insurers. When assigning a mandate to a deposit insurer, jurisdiction-specific circumstances must be considered. Mandates can range from narrow *paybox* systems to those with extensive responsibilities, such as preventive action and loss or risk minimization/management, with a variety of combinations in between. These can be broadly classified into four categories: (a) paybox, (b) paybox plus, (c) loss minimizer, and (d) risk minimizer (IADI, 2014).

Market discipline: A situation in which depositors, creditors, or investors assess the risk characteristics of a bank and can influence the bank's risk-taking behavior by threatening to withdraw funds from the institution (IADI, 2014).

Paybox: A mandate in which the deposit insurer is only responsible for the reimbursement of insured deposits (IADI, 2014).

Paybox plus: A mandate in which the deposit insurer has additional responsibilities, such as certain resolution functions (e.g., financial support; IADI, 2014).

Risk minimizer: A mandate in which a deposit insurer has comprehensive risk minimization functions, including risk assessment/ management, a full suite of early intervention and resolution powers, and in some cases, prudential oversight responsibilities (IADI, 2014).

Scope of coverage: The types of deposits and depositors eligible for deposit insurance coverage (IADI, 2014).

Statistical industry data: Regulated banks are required under legislation by bank regulators to prepare and submit returns that contain financial results of bank performance. These data usually include aspects of the banks' capital, deposits, capital risk, the size distribution of deposits in both quantity of accounts and currency value of deposits, risk profiles of the member banks for premium levy, and liquidity. DIFs also generate elements of such data, including periodic reviews of the size of the DIF.

Systemic risk: A risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy (IADI, 2014).

Systemically important financial institution (SIFI): A financial institution or a group that, because of its size, complexity, and systemic interconnectedness, would, in the view of the relevant authorities, cause significant disruption to the domestic or broader financial system and economic activity if it were to fail in a disorderly manner (IADI, 2014).

Troubled bank: A bank that has, or will have, impaired liquidity or solvency unless there is a major improvement in its financial resources, risk profile, strategic business direction, risk management capabilities, and/or quality of management (IADI, 2014).

Uninsured deposits: The types or amounts of deposits that are not covered by a deposit insurance system (IADI, 2014).

Assumptions

I made the following assumptions in this study:

- The banking system in many jurisdictions follows all the BCBS principles and is regulated by a bank supervisory authority empowered by a legislative mandate.
- All banks are required by law to make submissions of financial reports of their balance sheets, income statements, and other data to their respective banking regulator.
- The bank regulator adopts the international banking standards contained in the BIS' 29 core principles for effective bank supervision.

- The bank regulator consistently exercises its legislative powers to collect and assess key statistical data of individual banks' risks and performance over which the regulator has supervisory authority.
- Bank regulators adopt the BIS CAMELS rating system to assess and rate bank risk profiles.
- The bank regulator can share the key statistical data about bank risks and performance with the deposit insurance institutions.
- The bank depositors are aware of the role of deposit insurance institutions, including the amount of the deposit insurance coverage limit that they may be entitled to in the event of a bank failure.
- All bank depositors possess a propensity to engage in simultaneous withdrawals of deposits from their banks if information, whether true or false, about the uncertainty of the viability of their banks is known.
- All participants in the financial services sector are aware that confidence is the economic lifeline of the financial system.
- The financial services safety net participants work collaboratively toward maintaining financial stability;.
- The financial systems in most jurisdictions have either an official or unofficial safety net that works collaboratively toward maintaining financial stability.

- DIF managers have the requisite knowledge, experience, and competencies to understand the import of using their industry statistical data to derive their deposit insurance coverage limits.
- DIF managers are guided by the international standards contained in IADI's 16 core principles for effective deposit insurance systems.
- The assumptions of multiple regression analysis will hold given that this methodology would be used in this analysis;.
- That no formal statistical model for deriving deposit insurance coverage limits using industry statistical data exists or is known by the DIF managers in the international arena.
- Deposit funding makes up the majority of the supply of bank liquidity.

These assumptions are considered important to illustrate the context in which the DIF managers function and the possible nexus between their lack of industry data usage and the factors that may promote or constrain their ability to use industry statistical data to derive coverage limits.

Scope and Delimitations

Delimitations are the characteristics that limit the scope and describe the boundaries of a study (Medrano, López-Perea, & Herrera, 2014). The scope of this study was restricted to examining the use of deposit insurance industry data by DIF managers using the IADI members' association as the international target group to derive their deposit insurance coverage limits and suggest four variables that could be used in this computation. The scope also incorporated an investigation into the IADI's four mandate

types and the capacity of these to allow access to and usage of the industry statistical data. Using elements of Velikova's (2006) perspective on coverage limits as well as aspects of Valentino's (1954) application of the insurance principle to deposit insurance, four constructs were used, namely, industry statistical data sets such as bank risk data, the size and growth of the DIF, the growth in the DIF's insured deposits within the banking system, and the DIF premium data. There are no prior studies on deposit insurance coverage limits to support the use of these four specific factors, and I was guided partially by Vilevoka's study on coverage limits and the actuarial lens for the application of the insurance principle to deposit insurance by Valentino.

The scope limited testing to four variables as possible factors that can impact deposit insurance coverage limits. Intuitively, the following reasoning informs these choices:

- Bank liquidity in many jurisdictions is dependent on the supply of deposit funding (Ngalawa, Tchana, & Viegi 2016).
- The aggregate value of insured deposits may be associated with the need to increase the deposit insurance coverage limit.
- As deposit insurance premium increase, assuming no demands on the DIF for treating with troubled banks, the DIF may grow.
- The higher the risk profile of member banks of the DIF, a metric that can be measured by using regulatory accounting data (Pruitt, 2017), the higher the probability of for troubled banks and by extension the potential usage of the DIF.

Valentino (1954) noted that the criteria for insurance are: (a) a large, homogeneous group of exposure units, permitting accurate prediction of average loss through the use of the law of large numbers; (b) definite loss; (c) accidental loss; (d) avoidance of the catastrophe hazard; (e) large loss; and (f) economically reasonable cost.

The scope was also restricted to focus on coverage limits related to explicit deposit insurance systems that are either government or private sector owned in jurisdictions around the world. I attempted to gather information in an impartial manner to answer my research question through a survey of IADI fund managers. SurveyMonkey was used to enhance objectivity and reach the target deposit insurance systems' fund managers who are physically located in different geographic locations around the world.

Limitations

Limitations are potential study weaknesses that the researcher cannot address because they are out of the researcher's control (Denscombe, 2013). My decision to use four independent data set variables for this study limited the depth of the analytical work as there may be other data set, perhaps more substantive or reliable, factors that could be used to calculate coverage limits. Given the absence of previous scholarly research efforts to identify possible industry statistical data as well as financial models to compute coverage limits, validity had to be addressed. I relied on Markowitz's (1952) modern portfolio theory and Merton's (1977) option pricing theory to support the inclusion of industry data. The selected four industry statistical data sets were (a) aggregate bank risk data, (b) the size of the DIF, (c) the aggregate value of insured deposits within the banking system, and (d) the DIF premium levy, which were considered to be the main

determining predictors that IADI members' fund managers can use to derive their deposit insurance coverage limits.

As scholarly research in the deposit insurance field in general is also limited, the results of this study may be affected by researcher bias associated with the sampling process and data collection (Lavrakas, 2011). The survey questions were designed to reduce the difficulty of participants to respond and follow-up calls were planned to ensure adequacy of responses (Lavrakas, 2011). These measures minimized the impact of bias. As no scholarly work on the derivation of coverage limits currently exists, I adopted the theoretical lenses of Markowitz (1952), Merton (1977), Diamond and Dybvig (1983), Valentino (1954), and Madhani (2017), plus practitioners in the bank regulation and deposit insurance fields, including the FSB, the IADI, the BCBS, the BIS, Hanson et al. (2011), and Velikova (2006) to guide this research.

Significance of the Study

This research will (a) contribute to the advancement in the theory, (b) enhance the relevance of deposit insurance systems, and (c) promote positive social change through minimizing political influence in financial processes. The main objective was to identify the relevant industry statistical data that IADI members can use to derive their coverage limits.

Significance to Theory

This study will contribute to Merton's (1977) pricing theory of deposit insurance as a put option as deposit insurance coverage limits are the deposit amounts that depositors exercise in a bank failure, consistent with Merton's put option. Each coverage

limit should contain an element or elements of risk such that the inclusion of the statistical data, as suggested by FSB (2012), will align more with Markowitz's (1952) effort to establish a link between risk and return in modern portfolio theory. Building on this understanding, conformity with theories underpinning bank regulatory frameworks will be enhanced as the inclusion of data in the derivation of coverage limits will be consistent with the microprudental and macroprudential theories of bank regulation (BCBS, 2012; Hanson et al., 2011; Kashyap & Stein, 2011).

Significance to Social Change

The findings of this study have the potential to influence positive social change by allowing policymakers to be more informed about technical statistical data considerations that can be used to derive deposit insurance coverage limits. Such an effort can contribute more effectively to the development of coverage limit models and increase financial stability in the international arena, particularly during banking crises. The ad hoc decisions to change the coverage limits that are not informed by relevant industry statistical data can be minimized for the next financial crisis (Schoen, 2017; Xie, 2018). The data generated by this study could contribute to a system more likely to garner depositor trust, improve ethical behavior, produce more dependable and perhaps crisis-resistant coverage limits that are supported by relevant industry statistical data, and stabilize the banking system over time in different regions around the globe. The results may limit political interference and may lead IADI members with explicit deposit insurance systems to consider the adoption of broader data sets to generate acceptable

deposit insurance coverage limits as part of IADI international standards for effective deposit insurance systems.

Types and Sources of Data

The possible types and sources of data will be used to address the research question will be subdivided into Primary and Secondary sources.

Primary Sources

The survey was a newly created survey of IADI members to collect information on the possible use of DIF member bank risk, fund size, insured deposits and premium data that may be used by the DIF Managers to calculate coverage limits; the different mandate-types and their access to statistical industry data.

Secondary Sources

- Information supporting the use of statistics in deposit insurance from deposit insurance literature produced by the Bank for International Settlements, the Financial Stability Board (FSB), the International Monetary Fund (IMF) and the World Bank (WB).
- Insurance core principles produced by the International Association of Insurance Supervisors to explore the guidelines on the statistical data sets for determination of life and general insurance coverage.
- The Federal Deposit Insurance Corporation (FDIC) annual reports plus their member banks annual reports.
- Bank for International Settlements for guidance literature in computing deposit insurance coverage limits.

- International Association of Deposit Insurers (IADI, 2014) which contain the deposit insurance standards and associated essential criteria based on IADI core principles for effective deposit insurance systems will show the gaps in the process to compute coverage limits.

The guide for executing the survey was based upon the work of Check and Schutt (2012). The formative theory for deposit insurance was extracted from the literature of Diamond and Dybvig (1983). The guidance for using SPSS statistics in this study was guided by Wagner (2016) while the appropriate quantitative statistical methodology was based on the work of Warner (2012).

Summary

The application of data to determine deposit insurance coverage limits offers a framework for enhancing the international standards put forward by the IADI. It has the potential to make the deposit insurance systems coverage limits less prone to political ad hoc decisions. Despite the advantages that can be obtained from implementing the application of statistical data to compute coverage limits, concerns exist about governance with regards to the four different types of deposit insurance systems and their individual capability and resource capacity to adopt this methodology. This chapter illustrated basic knowledge of the deposit insurance coverage limit and the important role it plays in financial stability.

To investigate the possible data sets that can be used to compute coverage limits, I conducted a quantitative study drawing on the following theories: Markowitz's (1952) modern portfolio theory; Merton's (1977) option pricing theory; the BCBS Basel Capital

Accords and CAMELS; Diamond and Dybvig's (1983) theory of deposit insurance; Madhani's (2017) resource-dependence theory of corporate governance; and Hanson et al.'s (2011) macroprudential and microprudential theory of bank regulations.

I used Velikova's (2006) framework by first conducting a multiple regression analysis in the pilot study of deposit insurance coverage limit, the dependent variable, and four independent variables, namely, bank risk data, the DIF size and its growth rates, the DIF size and growth rates of insured deposits, and the level and growth in the DIF's premium. The results may indicate some as possible variables that can be used to compute the coverage limit. Following this, I will conduct an ordinal logistic regression analysis of IADI members to assess the predictability of the independent variables (Warner, 2012).

In Chapter 2, I present a detailed review of deposit insurance coverage together with the theories grounding this study. In Chapter 3, I highlight the research design and methodology using the framework of Velivoka (2006) in a similar study.

Chapter 2: Literature Review

Introduction

While studies in the field of explicit deposit insurance systems have covered a broad spectrum of issues, such as premium pricing (Merton,1977), politics according to Diamond and Dybvig (1983, as cited by Hogan & Luther, 2014), and risk-based premiums (FDIC, 2006) among others, studies specifically related to deposit insurance coverage limits and their determination are limited. Manz (2009) focused on optimal coverage, and Velikova (2006) looked at coverage limits with regards to moral hazard. Based on the studies done by FSB (2012) and IADI (2014), coverage limits play a key role in limiting depositors' propensity to make simultaneous and significant deposit withdrawals and at the same time constrain bankers' risk-taking behaviors in how they conduct their business of banking. In Kleftouri's (2015) perspective, the deposit insurance coverage limit is the most significant and technically challenging element for policy makers in the design and implementation process of an explicit deposit insurance system.

From a broader topical perspective, explicit deposit insurance remains a contentious matter among scholars and policy makers (Hogan & Johnson, 2016). Demirguc-Kunt and Kane (2002, as cited by Hogan & Johnson, 2016) found that "explicit insurance makes banking crises more likely and that countries with highest coverage limits in the sample. … are five times more fragile than countries that impose the lowest coverage limits" (p. 438). When the coverage limit is factored into the analysis of explicit systems, the view is that a higher coverage limit is associated with higher

moral hazard where bankers take on more risk that leads to increased bank failures (Hogan & Johnson, 2016). Like explicit systems in general, there is apparently no consensus on coverage limits. In a subsequent study on moral hazard, Velikova (2006) suggested that while changes in the real coverage limit are related to insured bank deposits and the potential demands on the DIF, the changes are not associated with deviations in bank risks, which intuitively intensify the moral hazard debate.

Although the deposit insurance system has existed since the 1930s, with the FDIC in the United States being the first established system spanning a period of approximately 85 years, the application of industry statistics by past deposit insurance systems fund managers, and more recently by IADI members' fund managers to compute their deposit insurance coverage limits appears to be lacking and needs to be addressed (FSB, 2012). This observation was noted following the involuntary actions taken by fund managers and governments to raise their deposit insurance coverage limits in response to the 2007–2008 global financial crisis (FSB, 2012). The specific problem is that it remains unclear what data IADI members' fund managers use to compute coverage limits for deposit insurance systems, which can promote the ineffectiveness deposit insurance systems and instability of financial systems during banking crises or normal distress periods (FSB, 2012). The purpose of this quantitative study was to determine whether the usage of industry statistical data, such as aggregate bank risk data, fund size, aggregate value of insured deposits, and premium levy, by IADI members' fund managers to derive their deposit insurance coverage limits could potentially lead to more objective, crisis-resilient coverage limits.

The availability of literature on the application of industry data to derive deposit insurance coverage limits is extremely sparse. Notwithstanding this limitation, I used the published material from the IMF and the BCBS. To clarify the importance of using industry data to derive coverage limits, I highlight the experiences of coverage limit changes by the FDIC, one of IADI's members, from its inception to 2019. Information in the broader arena on deposit insurance coverage limits, where available, was used to add depth and balance. In this chapter, I provide a background on Diamond and Dybvig's (1983, as cited by Hogan & Luther, 2014) theory of deposit insurance, incorporating illustrative changes in the deposit insurance coverage limits of the FDIC since its inception; linkages to the theory of banking supervision related to the BCBS microprudential and macroprudential bank regulatory guidance/practices as well as the BCBS 29 core principles for banking supervision and the data sets that these processes generate, which can be used to either establish or guide the determination of coverage limits; the resource-dependence theory of corporate governance which supports the argument that the board should source key inputs by interacting with the external environment (Madhani, 2017). Merton's (1977) option pricing theory together with Markowitz's (1952) modern portfolio theory were adopted to emphasize the application of data to either assess the credit risk of corporate debt or to maximize returns on a portfolio simultaneously. The findings could potentially lead to the derivation of more objective, politically neutral, and perhaps more actuarial representative deposit insurance coverage limits around the world, which may lower the probability of depositor panic runs and mitigate moral hazard.

Literature Search Strategy

In my literature search, I used the following online databases to obtain peer-reviewed articles and industry research papers published within the last 5 years: ProQuest Central, ProQuest Dissertations & Theses Global, Scholar Works, Business Source Complete, Dissertations & Theses Walden University, IMF, BCBS, FSI, FDIC, EBSCO, Thoreau Walden University Library, ERIC, and PsycINFO. The following search terms were used: *deposit insurance, coverage limits, bank risk, bank runs, bank failures, banking crises, instrumentation, predictors of bank failure, corporate governance, modern portfolio, option pricing theory, statistics in insurance, theories of financial regulation, theories of financial regulation. BIS, CAMELS, risk based premium pricing,* and *optimal deposit insurance.*

The literature review incorporates seminal literature to build on the concept of data use in deriving coverage for life and general insurance as well as the compatibility with deposit insurance. Peer-reviewed journals were included and focused on theories of deposit insurance, options pricing, modern portfolio, bank regulation, and resource-dependent governance. Research material on the derivation of deposit insurance coverage limits were limited and reliance was placed on dissertations and conference proceedings.

Theoretical Foundation

Deposit Insurance Theory

Banks' funding or liquidity is primarily sourced from depositors, which fundamentally exposes such an institution to panics or bank runs (Dijk, 2017). Diamond and Dybvig, (1983) argued that deposit insurance functions as a key mechanism for

mitigating depositor behavior associated with panic-based bank runs and by extension bank failures (as cited by Hogan & Luther, 2014). Alternatively, other scholars took a diametrically opposing perspective that deposit insurance increases moral hazard and consequently increases bank failures Demirguc-Kunt and Kane (2002, as cited by Hogan & Johnson, 2016). Bédard (2016) noted that using an option clause, "a bank could, at its discretion, pay the bearer of its notes within 6 months rather than immediately, compensating him by paying what was then the maximum interest rate allowed by usury laws" (p. 287–288). This perspective reflects an alternative to deposit insurance (Bédard, 2016). The concept of a deposit insurance coverage limit underlies these two views because the presence of deposit insurance, whether in the form of an explicit amount or full coverage guarantees, does influence either depositor or banker behavior.

Deposit insurance, as posited by Calomiris and Jaremski (2016), is premised on two theoretical constructs: an economic and a political framework. In both instances, theories have been put forward to explain the formation and growth of bank liability insurance. The liability in banks arises mainly from the borrowing of short-term funds from depositors at given interest rates. Decisions are executed to lend the same funds long term at higher interest rates to generate income—a maturity mismatch or liquidity risk that is a fundamental feature of banking (Dijk, 2017).

The economic slant is based on Diamond and Dybvig's (1983, as cited by Hogan & Luther, 2014) theory that explains that deposit liability provides for a more cost-effective source of liquidity to banks, which limits or restricts systemic liquidity risk (Calomiris & Jaremski, 2016). In Diamond and Dybvig's view, deposit insurance

nullifies liquidity risk posed by depositors who may withdraw their funds in the event of a bank run and the losses bankers incur from liquidating their longer-term investments to satisfy the unexpected short-term large depositors' demands. The use of deposit insurance makes the early depositors who withdraw their funds from their banks independent of other depositors eliminating their motivation to engage in a run.

Scholars have critiqued the Diamond and Dybvig (1983) model on the grounds that banks' liability that makes up the short-term component can be substituted for longer-term liability in the form of bonds or equity to finance their investments, according to Jacklin and Bhattacharya (1988, as cited by Calomiris & Jaremski, 2016). Demirguc-Kunt and Kane (2002, as cited by Hogan & Johnson, 2016) argued that deposit insurance increases the probability of bank failure and, by extension, depositors' loss through increased risk taking on the part of bankers, otherwise known as the *moral hazard principle*.

The political theory of deposit insurance, according to Calomiris and Jaremski (2016), is based on the principle that deposit insurance is designed to favor "a winning coalition of bankers, depositors, and also borrowers" (p. 7). This theory incorporates the principle that there is a strong association between deposit insurance and prudential regulation produced by the political equilibrium (Calomiris & Jaremski, 2016). Given that prudential regulation relates to the oversight of banks, the political theory necessitates that consistency must exist between prudential regulation and deposit insurance to ensure that risky lending to politically favored borrowers is not compromised (Calomiris & Jaremski, 2016). The persistent unsuccessful or ineffective

use of regulation in Calomiris and Jaremski's view supports the political argument that deposit insurance is set up to provide a government grant. The IMF (2014) agreed with this perspective, noting that,

> Country authorities and financial regulators reacted to the extraordinary circumstances of the crisis (2007/2008) by expanding the coverage offered in existing deposit insurance arrangements or adopting deposit insurance where it was not already in place. This pattern of policy response the adverse distributional effects of generous schemes and underscored the strengths and weaknesses of different DIS features. (p. 3)

Put Option Theory to Price Deposit Insurance Premium

Merton (1977) saw parallels between the elements of pricing deposit insurance and those of a put option and pursued the opportunity to use option pricing theory together with the Black Scholes (1973) model (as cited by Chinwe, 2018) to derive the cost of deposit insurance premium. A *put* is an option contract that provides the writer with the choice, but not the commitment, to sell an underlying asset at a specific price, referred to as the exercise or strike price, at a precise time (Chinwe, 2018). The writer of a put option anticipates a decline in the price of the underlying asset, the exercise price, while the buyer of the put option expects an increase (Chinwe, 2018). If the price of the underlying asset increases relative to the strike price, then the value of the put option will decline (Chinwe, 2018). The same principle applies as the option approaches the expiration date. Alternatively, if the price of the underlying asset declines, then value of

the put option will appreciate (Chinwe, 2018). Put options are prepared or used for assets such as commodities and stocks.

Scholars have raised the question in terms of the modality that should be used to price deposit insurance. A suggested approach was that "the price should reflect the risk that the bank presents to the deposit insurance system" (FDIC, 2000, p.6). The concept of the put option has embedded risks which suggest that its price can increase, decrease or remain unchanged depending on the direction certain factors in the environment take which supports the parallel for its use to price deposit insurance. Bank risks in terms of probable exposures to failure, loss of earnings, liquidity strains and so on like put option can follow a similar pattern necessitating the consideration of certain factors to determine the deposit insurance premium price.

The Black Scholes (1973) model that Merton (1977) deployed to value an European put option on stocks required specific data namely an interest rate, the exercise price, the current stock price, the duration of time up to expiration, and the variance rate on the stock price (Merton, 1977). The main assumption of the Black Scholes model, which contributes to a weakness, is that the underlying stock volatility remains fixed throughout the duration of the option contract (Chinwe, 2018). Notwithstanding this limitation, practitioners, including the FDIC, applied the principle to deposit insurance. To establish the premium pricing for the FDIC using the option pricing methodology, considered several factors such as bank supervisory ratings based on CAMELS, bank risk differentiation profiles, financial reports, credit ratings and subordinated debt among others all of which constitute statistical industry data (FDIC, 2000).

From an insurance theoretical perspective in Valentino's (1954) view, the deposit insurance premium price is connected to the deposit insurance coverage limit as the key funding source to meet pay-outs to depositors consistent with the overall design of the deposit insurance system (IADI, 2014). It is against this backdrop and following the same logic of pricing premium based on the concept of put options Merton (1977) that the deposit insurance coverage limit should be determined using the same principle of incorporating industry statistical data (FDIC, 2000).

Yhere is some merit in Merton's (1977) application of the Black Scholes (1973) model that allows for derivation of the deposit insurance premium. One mismatch with the model though is that deposits held in the banking system are not homogeneous as there is a myriad of variation in the deposit amounts as well as the respective maturity dates in any given bank which would be a constraint in the full application of the Black Scholes model (Merton, 1977). Apart from this disparity, the model necessitates the use of data to compute the premium and while there is no apparent model yet in the literature to derive coverage limits for deposit insurance, the process suggests a dependency on the use of data inputs.

Modern Portfolio Theory

Modern portfolio theory (MPT), as posited by Markowitz's (1952) was built on the mean-variance model to guide risk-averse investors to construct their investment portfolios in a manner that will optimize expected returns while recognizing a certain level of market risk (as cited by Rutterford & Sotiropoulos, 2016). The Markowitz theory incorporated the philosophy that an efficient frontier exists containing an optimal

portfolio of assets selected risk-averse investors to generate maximum expected returns for a given level of risk (as cited by Rutterford & Sotiropoulos, 2016). Each asset in the portfolio has a history of variance of returns which investors use to estimate the securities risks. At the portfolio level, investors select the preferred assets and pursue a diversification strategy through a combination of the assets' related variances and covariances. Put another way, investors treat with overall portfolio risk by considering the correlation and the impact of combined asset risk on the portfolio.

Markowitz's (1952) MPT came under major criticism during the 2007/2008 global financial crisis notwithstanding the general identified limitations of assumptions of trades with no transaction cost, unimpeded liquidity, the persistent availability of risk-free investment options in the market and the existence of investors who make decisions in the best interest of the system (Lyndeberg, 2016; Rutterford & Sotiropoulos, 2016). The buildup to the crisis conflicted with rational decision makers and during the crisis liquidity came to a halt exposing Markowitz's MPT to questions (Lyndeberg, 2016; Rutterford & Sotiropoulos, 2016).

While the deposit insurance coverage limit does not specifically represent an asset in a DIF portfolio, its coverage level and affordability in terms of capacity to meet depositors' reimbursements when a bank fails is inextricably linked to the capacity of the fund to pay, returns generated from the collection of premium from banks; the investment income derived from the placement of such funds in specified assets; and the amount reimbursed to depositors in the event of member banks failure or financial distress. The major challenge with the application of Markowitz's (1952) MPT to the IADI members'

investment objectives is that diversification may be limited (Rutterford & Sotiropoulos, 2016). The rationale for this is that the investment objects are defined in their legislation which has a tendency to be risk averse, focus primarily on protecting the principal of the DIF through investments in government paper (IADI, 2014).

The capacity of a DIF to meet a specific coverage limit is therefore tied actuarially to the net growth of the fund (Valentino, 1954). This principle is not dissimilar to those associated with the actuarial science principle applied to other types of insurance such as the life and general insurance and their respective funds.

Resource-Dependent Governance Theory

Madhani's (2017) resource-dependent governance theory is premised on board decisions that can be implemented to achieve optimal performance through the establishment of the appropriate links between a firm and the key resource requirements (Chidziva, 2016; Fauziah et al., 2012). The board should comprise directors that can provide the firm with options to collect data and build relationships to move the organization in to the realm of maximum performance (Chidziva, 2016; Fauziah et al., 2012). Interaction with the external environment is deemed to be a key strategy that board members can deploy to gain access critical resources (Madhani, 2017).

Interdependencies exist between organizations, a classic example being that of which exist between IADI members and their bank regulatory counterparts (IADI, 2014). The resource dependent theory allows IADI members to influence and control their interdependencies with bank regulators to access more industry data such as the CAMELS for purposes of deriving data-driven coverage limits. According to the FSB

(2012) Recommendation 2, there are two key elements that the boards IADI member deposit insurance systems can strategically tap into namely, “adjusting the DIA (Deposit Insurance Agency) governance arrangements to ensure adequate public oversight and to mitigate the potential for conflicts of interest,” (p. 36) and “formalizing information sharing and coordination arrangements between the DIA, other safety-net participants and foreign DIAs” (p. 36).

The role of corporate governance in strengthening stability of the financial system has also not gone unnoticed by the BCBS. Following the 2007/2008 global financial crisis, BCBS (2017) recognized the import of incorporating governance into the revised core principles for effective bank supervision one element of which focuses the governance of supervisory stress testing. The objective is twofold: (a) to develop bank supervisory capability to develop a framework for stress testing supervisory execution of assessments of bank data, and (b) to use the bank supervisory role to impart stress testing knowledge to the banks so that the banks can develop their own models and do their own stress testing (BCBS, 2017).

Explicit deposit insurance systems within the IADI grouping adopt different corporate governance modalities which tend to be linked to their mandates as well as ownership. According to IADI (2014), there are four different mandate-types of deposit insurance systems, namely pay-box, pay-box plus, loss minimizer and risk minimizer where only the latter two are more likely to have access to bank data to derive coverage limits through their respective mandates. Some IADI member deposit insurance systems are privately owned collectively by bankers in their respective jurisdictions while others

are government-owned (IADI, 2014). The pay-box and the pay-box plus deposit insurance systems with the IADI may have restricted access to key bank data held by central banks/bank regulators while the others, namely the loss minimizer and risk minimizer may have unrestricted access such as the FDIC (IADI, 2014). The FSB's recommendations do not make a distinction between the IADI members which possess four different mandate types and as such this mechanism offers a strategic opportunity for the boards of the IADI members to leverage data that can be used to compute industry data-informed deposit insurance coverage limits (IADI, 2014).

Theory of Insurance

Although the theory of insurance may be absent from the application of deposit insurance in its current format, it does have some parallels which may allow for consistency in some or perhaps many aspects of its functionality. Valentino (1954) attempted to apply the theory of insurance to the field of deposit insurance as an insurable risk using the following criteria to determine insurable risks:

- A large, homogeneous group of exposure units, permitting accurate prediction of average loss through the use of the law of large numbers
- Definite loss
- Accidental loss
- Avoidance of the catastrophe hazard
- Large loss
- Economically reasonable cost

Utilizing the FDIC as a case for his study, Valentino (1954) concluded that

> Our examination of the Federal deposit insurance program' reveals that it is an insurance system which conforms with most of the requirements of an insurable risk at least as well and in some cases better than other widely-accepted insurance systems, thus, placing the program in a more favorable light relative to the State deposit guaranty funds. (p.261)

Based on these findings which revealed parity with other types of insurance such as life, fire, accident and health, the effort of IADI fund managers to use coverage limits in deposit insurance field without the application of appropriate industry statistics suggest a major weakness in the industry.

Bank Regulation Theory

Following the pioneering work of Markowitz (1952), several measures of risk was introduced into the literature (Amarante, 2016; Rutterford & Sotiropoulos, 2016). One such example was the measures developed by the BCBS through the use of CAMELS. Theoretically, the BIS has advocated that bank capital plays a key role in bank regulation (Aiyar, Calomiris, & Wieladek, 2015). This has led to the development of BASEL I, a set of international core principles that central banks use to regulate banks. John, Saunders, and Senbet (2000) argued that bank regulation that is based on capital ratio needs as well as asset constraints identified in Basel I, does not adequately control bankers' risk-taking behavior. The BIS' CAMELS mechanism for assessing bankers' risks possess limitations since asset restrictions, for example, may negatively affect bankers' options to invest. In John et al.'s (2000) opinion, greater results in terms of mitigating bankers' risk-taking behavior will be obtained by targeting the bank management compensation schemes.

The Basel I accord was one of the initial building-block theories of banking regulation/supervision which was based on the ideology that bank capital was considered as a major buffer to a bank's potential demise. In the BCBS's (2017) perspective, the higher a bank's capital, the lower the probability of failure. Capital adequacy was a key metric that was and continues to be used by bank regulators.

The Basel I accord was subsequently superseded by Basel II and III accords as different epics of financial distress occurred at varying levels of magnitude in separate regions/jurisdictions around the world. During the period 1970–2017, there were 151 banking crises including the Tequila crisis (Mexico, 1994–2000), the Asian crisis (Thailand 1996–2001) and the United States crisis (2007–2009), among others (Anderson, 2016; Laeven & Valencia, 2008). The Basel II Accord, which was an expansion of Basel I, was centered on three main points: minimum capital requirements, supervisory review of an institution's capital adequacy and internal assessment process, and the effective use of disclosure as a lever to strengthen market discipline and encourage sound banking practices including supervisory review (BCBS, 2012).

Immediately following the 2007-2008 global financial crisis, the BCBS opted to improve the accords based on certain areas of perceived contributory weakness namely poor governance and risk management, inappropriate incentive structures and an overleveraged banking industry. In the Basel III Accord, the very large banks that were considered to have systemic implications for a financial system sometimes referred to as "too big to fail" was the main focal point. Basel III has gone through several stages. The

implementation of Basel III has been gradual and began in January 2013. It is expected to be completed by January 1, 2019.

One of the fundamental off-shoots of the Basel accords was the access to and retrieval of bank data from the banking system by the bank regulators/central banks supported by the efforts of the BCBS, consistent with its release of 29 core principles for effective banking supervision (BCBS, 2012). These standards which represent the basic standards for sound prudential regulation and supervision of banks have been, and continue to be, used to assess and monitor the viability and exposures of the regulated banks (BCBS, 2012). The main focus of these standards is risk-based supervision and incorporates, among other items, market risk, liquidity risk, operational risk, credit risk, capital adequacy and corporate governance (BCBS, 2012). Bank regulatory tools include the use of on-site and off-site bank supervision plus risk-based bank supervision. In these regulatory interventions key data is generated on the banking sector which, if accessible, can be used by the deposit insurance systems to not only price the insurance premium but derive deposit insurance coverage limits. There is evidence to support this proposition: in 1994, the FDIC introduced risk-based premium pricing using the CAMELS system and financial ratios as its basis (FDIC, 2000).

The theory of banking regulation as advocated by the proponents of the Basel accords came under further stress and this led to the introduction of microprudential and macroprudential theories. Microprudential theory focused on regulating banks with greater emphasis on protecting against the potential for costly financial distress that can be caused by the very large asset-based financial institutions referred to as systemically

important financial institutions (SIFIs) or globally systemic important banks (G-SIBs) (Hanson et al., 2011). Alternatively, macroprudential theory is more broad based which provides regulatory protection related to threats to banks of any asset size that emanate from policy decisions pursued by governments and how such choices could expose the banks to failure or financial distress (Hanson et al., 2011). Following the 2007-2008 global financial crisis there was apparent consensus among scholars that the pre-2007-2008 crisis microprudential approach to bank regulation was lacking and should be replaced by the macroprudential methodology. It appears that the protracted low interest rate policy adopted by the government to expand home ownership in the United States which scholars and policy makers admitted was the main contributor to the 2007-2008 global financial crisis set the ideology and framework for this change towards the macroprudential regulatory practice (Bitros, 2015; Calomiris & Jaremski, 2016; Hanson, et al., 2011).

This philosophical shift suggests the need for the policymakers, bank regulators to consider new data in their supervisory dimension/efforts. The BCBS microprudential CAMELS' system emanating from the Basel Capital Accord or Basel I, Basel II and Basel III from 1988, 1997 and 2013 respectively as well as the 29 core principles or international standards in 1997 for regulating banks appear to be lacking (BCBS 2012; Hanson et al., 2011).

Deposit Insurance Coverage Limits

According to Carns (2000), during discussions at the roundtable on deposit insurance reform,

> The diagram indicates that the real value of coverage was much lower during the first 30 years or so of the FDIC's operation, but the CPI's (consumer price index) only one guage, and other measures show a different result. For example, although I don't have a picture for this, the $5,000 coverage limit in 1935 was almost 10 times per capita income at that time, while the $100,000 limit today is just over three times per capita income. (Tanoue et al., 2000, p. 48)

Prior to the increase to $100,000 in 1980, the FDIC's coverage limit stood at $40,000 and when the question why such an increase arose in the discussions, no supporting data was provided. The discussions made reference to measures such as the consumer price index (CPI) and the number of times per capita income.

The IMF (2014) in its review of deposit insurance noted that coverage limits following the occurrence of the 2007/2008 global financial crisis were consistently above the pre-crisis levels which seemingly appeared to be potentially problematic. These post crisis coverage levels suggest some disconnection between the limits and the data to support the limits. Approximately 14 years prior to this IMF report, there was apparent concerns about the coverage limit, the effects of changes in the coverage limit, and the need to use data to adjust and track its levels such was the case with the FDIC.

During the FDIC's Roundtable discussions on April 2, 2000, the third item tabled focused on how to provide the right level of insurance coverage (FDIC, 2000). The consumer price index (CPI) was the main criterion used in the deliberations to assess the real coverage limit, an inflation principle grounded in economic theory as stated by Carns (Tanoue et al., 2000). As a measure of comparison, the average level of coverage relative

to other jurisdictions in the world that had explicit deposit insurance systems was included in the analysis (Tanoue et al., 2000). The consumer perspective in terms of how the limit impacted their decisions to place their retirement funds into one or more banks was considered (FDIC, 2000). There was an admission that the change from $40,000 to $100,000 in 1980 was an error (FDIC, 2000). As a departure from the CPI inference, it was posited that coverage is related to the pricing of collected bank balances (FDIC, 2000). To project the coverage limit, Smith (2000) supported the view that the coverage limit should be indexed for future inflation. There were some concerns about the fallout associated with the increase in the limit to $100,000.

The $100,000 coverage limit triggered the S&L crisis in the 1980s (FDIC, 2000) as thrifts could not compete with banks for deposits as a source of funds given the rapid rise in interest rates (FDIC, 2000). There were some opposing views on the causality of the S&L crisis. Other contributory factors were postulated as a change in the tax laws, crisis in the oil industry, the decline in the real estate market and in agriculture (Smith / FDIC, 2000). Chairman Tanoue, (FDIC 2000) admitted there was uncertainty of savers' and consumers' behavior in their response to an increase in the coverage limit. Although it was admitted that there was no collected statistical information to prove that depositors moved their deposits around from the small community banks to the larger "too big to fail" banks during periods of uncertainty, it was admitted that there was a sense or awareness that depositors did transfer their deposits to the larger banks when depositors' perceived the presence of increased risk to the banking system (FDIC, 2000). It was confirmed that enough information on deposits existed in various databases to do analysis

but the statistical analyses were not done at that point (FDIC, 2000). In light of the ad hoc change in the coverage limit to $250,000 during the 2007/2008 crisis it appears that since the FDIC Roundtable discussions in 2000, the FDIC has not tapped and or used statistical data to derive changes in its deposit insurance coverage limit.

In a study of 105 countries spanning the period 1981 to 2008, Guo (2012) examined the extent to which deposit insurance generosity leads to financial systemic risk. The generosity in this instance is a metric derived by the formula of "the effective deposit coverage limit to GDP per capita ratio"(p.4). While this measure does not represent a method to derive the coverage limit, intuitively it provides insights into the coverage limit level. Comparatively, this method is consistent with the IMF's approach to setting the coverage limit in the absence of a scholarly model.

The findings revealed that a reasonable and fair increase in the deposit insurance coverage generosity could possibly mitigate systemic risk while an excess in the generosity can potentially lead to a rise in systemic risk. This metric while workable as metric to set coverage limits it does appear to have some weaknesses. GDP per capita may have income distribution distortionary effects which may not adequately encompass the 'small unsophisticated depositor. The metric does not include specifics about the scope of the coverage including the types of deposit that are eligible for coverage.

Apart from the concept of generosity, coverage limit can be viewed from the perspective of mitigating inefficiencies in the banking system. Manz (2009) postulated that there is an optimal coverage limit that can overcome bank runs, bank managers' excessive risk-taking behavior and tendency of depositors to make substandard or

choices. In Manz's view notwithstanding the existence of several stages of equilibria, the coverage limit can reach an optimal level. To support his argument, Manz considered a "global game model of a bank that is financed by a continuum of small depositors subject to (partial) deposit insurance, by a large uninsured lender, and by a bank owner" (p. 2). In a similar stance to the FSB (2012), Manz contended that scholar papers on deposit insurance coverage levels are quite limited and current theories provide little or no assistance in the determination of an ideal partial deposit insurance coverage.

Diamond and Dybvig (1983, as cited by Hogan & Luther, 2014) claimed that the presence of government deposit insurance systems nullifies bank runs as it can impose a tax on the system to meet depositor withdrawals and this guarantee creates a disincentive for depositors to run – the costless argument. If this supposition is taken at face value then it negates the existence of an optimal coverage limit as espoused by Manz (2009). Only one of the equilibria in Manz's model exists which is the sole positive equilibrium. In reality though, there is some contradiction as the FDIC has had several coverage limits and encountered bank runs since its establishment in 1933.

Demirguc-Kunt and Detragiache (2002) conducted a study on explicit deposit insurance systems during the period 1980-1997 that covered 61 countries. While the investigation did not focus specifically on coverage limits the scholars opined that the implementation of deposit insurance can possibly lead to banking crises (Demirguc-Kunt & Detragiache, 2002). The proximity of their findings to coverage limits rests with the further extrapolation of their conclusions when they pointed out that the higher the coverage limits the greater is impact of instability on the banking system particularly

where the deposit insurance system is operated by the government (Demirguc-Kunt & Detragiache, 2002). Banking fragility follows a similar trend with increases in the coverage limits. Ngalawa, Tchana, and Viegi (2016) disagreed with this position and noted that full deposit insurance tends to neutralize depositors' inclination to run. Bradley (2000, as cited by Hogan &Luther, 2014) agreed with this perspective and posited that the increase in the FDIC's coverage limit from US $40,000 to $100,000 was the main factor that contributed to the US Savings and Loans crisis in the 1980s and 1990s. During the period 1980-1994, as many as 2,912 federally insured depository institution with a total asset base amounting to $924 billion failed (FDIC, 1998). U.S. taxpayers were required to meet the back-up funding gap which amounted to $153 billion (Curry & Shibut, 2000; Tanoue et al., 2000).

Schotter and Yorulmazer (2009) raised the question: "can partial deposit insurance be effective in mitigating the severity of bank runs?" (p. 2). The authors used a dynamic model, a four period bank-run model, in their study to determine the minimum level that deposit insurance can be used to reduce the pace at which bank runs take effect. This effort represented another search for an optimal level of coverage for deposit insurance.

The Schotter and Yorulmazer (2009) application of the game model produced three outcomes: (a) entities that have information can trigger laboratory bank-run behavior, (b) bank deposits remain in the banking system over a longer period if insider information is present, (c) the existence of partial deposit insurance can restrict the rate at which depositors withdraw their funds from their banks and by extension neutralize the

extremity of bank runs, and (d) the forces at work and magnitude of depositors' withdrawals is closely linked to the condition of the economy at the time of a crisis. The use of game theory in Schotter and Yorulmazer's study did not generate a coverage limit in the policy application of deposit insurance. While the outcomes may appear limited in terms of its application to compute coverage limits, the results did possess underlying data inputs.

Cooper and Ross (2002) hinted at the depiction of an optimal coverage limit for deposit insurance which was based on putting the depositor in a realm of indifference between monitoring and not monitoring their banks. The banks had the option to invest in safe liquid or risky illiquid and the optimal coverage limit and the greater the adequacy of the bank's capital the less there is a need for government deposit insurance (Cooper & Ross, 2002). While Cooper and Ross's approach does not identify with the need to use statistical data for computing the coverage limit, it does however intuitively points to a balance between the provision of deposit insurance and the concept of moral hazard. In simple terms, partial deposit insurance is required to reduce depositors' propensity to run on their banks. Coupled with the presence of partial deposit insurance, Cooper and Ross argued that banks should be required to hold adequate capital to mitigate the moral hazard that comes with deposit insurance.

The notion of adequacy of bank equity capital according to Cooper and Ross (2002) should be adjusted to as the economic environment changes. The idea seems consistent with the need for the banks to have access to capital equity to treat with their potential exposure in the event of changes in the economic environment. Although not

explicit, Cooper and Ross hinted at the need to incorporate the risk exposures of banks to derive deposit insurance coverage limits suggesting the need for statistical data to arrive at a better coverage limit figure and arrangement.

The idea posited by Cooper and Ross (2002) demonstrate two apparent weaknesses. In the first case, the capacity of banks to adjust equity capital could be onerous since raising equity capital funds on a stock market may not be an easy and simple undertaking. Another related point is the cost to approach the capital market and raise equity funds. The cost could be burdensome and act as a disincentive to banks. Not all banks are publicly owned and this could restrict privately owned banks from approaching the stock market to raise equity capital.

Demirgüc-Kunt and Detragiache (2002) examined the effects of deposit insurance coverage limits on bank stability. They argued that the greater the expansion in the deposit insurance coverage the higher the possibility that banking stability can become more fragile and perhaps negatively impacted. Pushing this argument further, Demirgüc-Kunt and Detragiache contended that systemic banking crises can occur at increased frequencies when bankers in different banks engage in business ventures that are highly interrelated and interconnected. This view appears consistent with the factors that led to the 2007/2008 global financial crisis as espoused by Bitros (2015). Reduced market discipline was deemed to be the main conduit for banking distress (Demirgüc-Kunt & Detragiache, 2002). The conclusion drawn by Demirgüc-Kunt and Detragiache (2002) was supported by a study they conducted on explicit deposit insurance systems that covered 61 countries that spanned the period 1980 to 1997.

Velikova (2006) took a stakeholder view to explain the differences in coverage limits that exist in different countries. The distinctions related to the proportion of high risk banks in a banking system (Velikova, 2006). According to Velikova, "coverage is higher in countries where banks with relatively low capital-to-asset ratios constitute a larger share of the banking system" (p. 60). Banks with low capital-to-asset ratios fund their assets using mainly debt and this ratio is used by bank regulators to assess to assess banks' capacity to absorb losses. Velikova investigated the impact of various variables on the coverage limit in 64 countries with explicit systems across the globe including demographic, social, economic, financial, and political. The model used by Velikova's (stated that coverage limit was a function of income across countries in terms of GDP per capita (U.S. dollars), bank size in terms of total assets as a percentage of GDP, political rights ratings, life expectancy, the percentage of urban population, the international rating applied to the ten largest banks, the average number of years of political institutions' openness during the period 1990-1999, and interbank deposits as a dummy variable.

The findings revealed the following: personal income level had a substantial influence on coverage limits in that high personal income countries had higher coverage limits. Bank size was deemed to statistically significant with negative results which showed that countries in which the contribution by banking sector to GDP was greater, the higher the coverage limit. Countries with bank-based systems carried lower coverage limits relative to countries with capital market-based systems. Countries with longer life expectancy displayed higher coverage limits. The political ratings variable indicated statistical significance which showed that the more democratic a country profile the lower

the coverage limit. The income and bank size variables were both statistically significant which indicated that countries with more developed banking systems coupled with increased wealth the higher their coverage limits. The variable life expectancy showed that countries which had a longer life expectancy possessed higher coverage limits. The political rights ratings showed statistical significance with regards to coverage limits. The countries that had more democratic systems had lower coverage limits and the obverse was true for countries that were more autocratic. Velikova (2006) set the framework for the inclusion of statistical data to derive deposit insurance coverage limits.

The FDIC's Historical Coverage Limit Changes

The FDIC was established in 1934 and started with a coverage limit of $2,500 with a commencement date of January 1, 1934 (FDIC 2000). This limit, according to Bradley (2000, as cited by Hogan & Luther, 2014) was guided and supported by two criteria: (a) the U.S. Postal Savings System which had the backing of the U.S. government with a savings limit of savings of $2,500; and (b) the proposition of $2,500 was a form of settlement between two strong opposing views, namely the bankers who did not want, and more likely could not afford, full coverage and depositors who wanted full protection for their deposits. It appears that in 1933 a crude and unsophisticated approach was adopted: to count the number of deposit accounts in the banking system which had the same value. The investigation revealed that 97% of deposit accounts held balances that were less than $2,500 (Hogan & Luther, 2014). Given the close approximation to the 100% in terms of coverage, this apparent fact drove the policy

decision to commence with the 'temporary' deposit insurance coverage limit of $2,500 (FDIC, 2000).

Table 1

FDIC's Coverage Limits 1933–2018

Year	Insurance coverage limit dollar amount	Insurance coverage limit change dollar amount
2009	250,000	150,000
1980	100,000	60,000
1974	40,000	20,000
1969	20,000	5,000
1966	15,000	5,000
1950	10,000	5,000
1935	5,000	2,500
1934	2,500	

Source: FDIC 2016 Annual Report, VII Appendices.

Since that exercise in 1933 to establish FDIC's coverage limit, not much has changed for many deposit insurance systems around the world. Some effort was made to get and use bank industry data to derive a coverage limit figure. However, one major short-coming with the FDIC's methodology in 1933 was that the $2,500 was derived at the back end of financial crisis of epic proportion, namely the great depression (Hogan and Luther, 2014). The process to arrive at the $2,500 appears not to have been based on the risk profile of the banks in the industry, the FDIC's Fund balance and its capacity to make reimbursements to depositors, the rate of growth in deposit liabilities over the previous 5-year cycle perhaps 1928-1933, and the insurance premium to be applied to the FDIC member banks and that premium capacity to build the FDIC's fund.

The FDIC fund commenced with a total of $289 million representing a subscription of $150 million from the US Treasury Department plus a Federal Reserve

Bank fund injection amounting to $139 million (FDIC, 2000). It is possible that had the policymakers applied such industry statistics, the then starting coverage limit figure of $2,500, even though a temporary one, may have been not only different but more representative of key bank industry variables. This perspective is supported by the fact that on August 31, 1935 the temporary system was extended and the coverage limit was increased to $5,000 (Hogan & Luther, 2014).

Hogan and Luther (2014) examined changes in the FDIC's coverage limit 1934 – 2008, the inflationary trends and the impact on the GDP per capita, growth trend in insured deposits and total deposits over the period 1934-2010. The results illustrated that "upward adjustments to the nominal maximum amount insured per depositor have outpaced both inflation and growth in GDP per capita" (Hogan & Luther, 2014, p. 154). These findings highlight the disparity between crude and ad hoc changes to the deposit insurance coverage limit and the usage or reliance on bank industry statistical data to derive such coverage limits.

After 15 years, the Congress increased the FDIC coverage limit from $5,000 to $10,000 in 1950 and this upward adjustment appears to have been supported using some industry data (FDIC, 2000). The increase was buoyed by the Federal Reserve Board claims of the increase in wholesale prices and the increase in the number of depositors (FDIC, 2000). The Treasury Department added its support for the increase based on their opinion of the FDIC's fund capacity to support the additional expenses (FDIC, 2000). The FDIC's rationale for the increase was based on their assessment of the protection afforded to depositors in 1950 relative to 1935 and the FDIC argued the increase in the

coverage limit to $10,000 would make percentage of insured depositors indifferent between both time points (FDIC, 2000).

While the 1950 increase in the FDIC's coverage limit to $10,000 seemingly includes elements of industry statistical data, the dependence on protecting the same percentage of depositors in 1950 relative to 1935 appeared to be wanting in many regards. The FDIC's inclination to synchronize protection suggests that any errors in 1935 coverage limit would be automatically carried over to 1950. The question that arises: what are the real grounding factors that can or should trigger an increase in the coverage limit? Part of the answer to this question according to (U.S. Senate Committee on Banking and Currency, 1935, 29) is linked to the FDIC's Chairman's comments who noted that "the greatest risk to the Corporation (FDIC) does not necessarily lie in these (small) institutions…It has been demonstrated frequently in recent years that the consequences of the failure of a large bank may be more disastrous that the failure of a number of small institutions" (FDIC, 2000, p. 10). The term risk was used in 1935 by the FDIC Chairman in reference to member banks of the FDIC as an adjunct to increasing the coverage limit which intuitively, at a minimum, suggests that such an industry statistic, either conscious or unconscious, was a possible consideration for inclusion in determining the then limit.

Approximately 16 years had passed when the Congress raised the FDIC's coverage limit from $10,000 to $15,000, up by $5,000 (FDIC, 2000). The arguments in support of the increase were associated with claims that family incomes increase twofold from 1950-1966, the U.S. national income in 1966 had surpassed the 1950 metric by

more than 100 percent, and personal savings had grown significantly from 1950-1966 (FDIC, 2000). These are key statistical industry data sets which could have been incorporated into a financial model to either derive or send a signal to change the FDIC's coverage limit. No reference is made to the existence of such modelling.

The following 3 years, 1969, the FDIC coverage limit was increased by another $5,000 to $20,000 and the premise put forward by the Congress was to restore confidence in the thrift savings and loans institutions (FDIC, 2000). Between 1965 and 1966, savings in thrift institutions declined significantly by $5.1 billion which appeared to have linked to a transfer funds from the thrift industry to the securities markets in response to a sudden and substantial increase in interest rates (FDIC, 2000). Consequently, the corollary led to a substantial decline in housing loans. The major apparent weakness with this approach was the effort to use the deposit insurance coverage as a tool to woo funds back into the thrift industry.

The next FDIC's coverage limit change by the congress was executed in 1974 and supported by one factor namely a substantial increase in inflation (FDIC, 2000). During the run up to the 1974 coverage change the Congress saw the move to increase the limit as a mechanism to stave off a potential developing crisis in the banking system (FDIC, 2000). The increase was conducted to re-instill confidence in the banking system and to stimulate personal savings (FDIC, 2000). The foregoing premises appear to be a weak framework for not only increasing the FDIC's coverage limit but to double it from $20,000 to $40,000–the first significant change beyond the $5,000 increment. The arguments for the increase put forward by the FDIC seem to be not only bereft of

industry data to derive the new coverage limit but also conflict with its (the FDIC's) position in 1935 which then advocated greater emphasis on the risk posed by the larger institutions. According to the FDIC (2000), "the Corporation (FDIC) viewed the increase as a way of putting small bankers on a more equal footing with their competitors" (p.17). The questions here are: what did the $40,000 coverage limit represent in terms of the number and value of insured deposit balances held by depositors across the banking system from 1935 to 1974? What has transpired with regards to both the profiles of bankers' risks and the changes in the capacity of the FDIC's fund to afford higher coverage limits in the context of the then volatile, crisis period? Was it prudent to increase the FDIC deposit insurance coverage limit at a time when fears of a banking crisis was building in the United States and recognized by the authorities?

Subsequently, the succeeding increase in the coverage limit came in 1980 from $40,000 to $100,000, a time lapse of 6 years (FDIC, 2000). This change had surpassed the previous $5,000 and the $10,000 increments and registered the highest historical change. According to congress, the increment was significant in terms of value but somewhat unscientific, unempirical, irrational and very repetitive with regards to countering inflation trends and the need to control the inflows and outflows of deposit funds to and out of deposit-taking and noninsured financial institutions (FDIC, 2000). The other startling similarity with this coverage increase is that it came coupled with congress's expressed intent to remove the limits that were applied to the maximum interest rates and dividends related to the Savings and Loan thrift institutions could use to attract deposit funds (FDIC, 2000). It appears that congress was anticipating a major

fallout for the removal of the limits and tried to buttress the potential impact with the largest increase in the deposit insurance coverage limit since the establishment of the FDIC.

By 2008, the global financial crisis, which originated with the near collapse of the US real estate market, had taken a foothold and subsequently morphed into the financial markets grounding to a virtual halt in transactions (Bitros, 2015). When Lehman Brothers failed, one of the previously categorized too-big-to-fail financial institutions, and other large banks, insurance companies came under threat of bankruptcy confidence was shaken to the core (Bitros, 2015). To unfreeze the financial markets and to revive lending or the availability of money in the system, the U.S. government through the Federal Reserve engaged in quantitative easing (Bitros, 2015). This measure was coupled with an initial temporary increase in the FDIC's coverage limit, the single largest increase in the history of the FDIC, up by $150,000 from $100,000 to $250,000 in September 2008 with a provision to re-instate the previous $100,000 level at some time in the future (FDIC, 2000). The $250,000 coverage limit, however, was made permanent with the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act in July 2010.

Given the historical changes in the coverage limit since its establishment, it is apparent that the FDIC did make reference to an index, the consumer price index (CPI), as a means of assessing the position of the depositor at different points in time after the changes were made to its coverage limit. This effort seems to suggest that the FDIC's application of industry data to scientifically determine the coverage limit prior to the actual implementation of the changes were not done and should be considered going

forward. Notwithstanding the FDIC's application of the CPI, the decision appears to have two main shortcomings.

The CPI appears to be an inadequate measure since it relates to purchasing power of the consumers' income over different time periods and its usage seems to be inconsistent with the principles of insurance suggested by Valentino (1954). The usage of the CPI is a backward looking indicator and it was not used to forecast the anticipated future changes. The FDIC used the CPI to assess the purchasing power of the coverage limit position of the consumers several years after the coverage limit was changed. Supporting factors in this determination were: the FDIC's significant change in the coverage limit from $40,000 to $100,000 in 1980 may have amplified the level of moral hazard possibly increasing bank failures (Demirgüç-Kunt & Detragiache, 2001; Hooks & Robinson, 2002); the coverage limit increase was deemed to exceed what was required to protect small depositors (Thomson, 2001).

An important observation to note is that the FDIC has operated as a risk minimizer since its inception (FDIC, 1984: IADI, 2014). This governance model allowed the FDIC full legislative access to statistical industry data generated by the insured banks that were protected by the FDIC's fund. The FDIC had the key broad powers to both supervise and resolve its financially distressed fund member banks. Notwithstanding Valentino's (1954) contribution the FDIC seemed to have explored the CPI as the main single intervention to compare, not compute, their coverage limit. Access to statistical industry data, however, does not necessarily equate with usage for purposes of computing coverage limits.

Other Jurisdictional Coverage Limit Changes

Demirgüç-Kunt and Detragiache (2002) conducted a study on coverage limits that covered the period 1980 to 1997 involving 61 countries showed that "results uniformly suggest that explicit deposit insurance tends to increase bank fragility, and the more so the more extensive is the coverage" (Hogan & Johnson, 2016, p. 438). Another study executed by Demirgüç-Kunt and Huizinga (2004) incorporating 30 countries during the period 1990-1997 revealed that "explicit deposit insurance is found to reduce market discipline" (p. 397) and also that "a higher coverage limit significantly reduces interest rates [paid on deposits] and weakens market discipline" (p. 393).

Gan and Wang (2013) examined the derivation of an optimal deposit insurance coverage limit to mitigate both the moral hazard challenges associated with deposit insurance as well as the failure of banks. The study incorporated a partial equilibrium model with a FDIC context that considered three specific factors namely the banking regulation of capital standards, the market discipline in the form of oversight exercised by depositors and the existence of a deposit insurance system (Gan & Wang, 2013). Utilizing the theoretical work of Gropp and Vesala (2004) and Manz (2009), Gang and Wang formulated a model incorporating full, partial and no deposit insurance with factors such as social welfare, optimal coverage limit, risk premium expected return to depositors, expected withdrawals, expected return to banks, probabilities of bank failures, the FDIC and risky assets.

The findings revealed the following: that depositor-monitoring is a key necessity for an optimal coverage limit; to mitigate bankers' risk-taking behavior necessitates the

application risk-sensitive premia to member-banks and the adoption of market discipline or oversight; the import to recognize the connectivity between changes in the coverage limit and the member bank premium to preserve the viability of the DIF; and that low income countries have a preference for implementing high coverage limits.

Gan and Wang's (2013) references to variables such as the control of bankers' risk-taking behavior, the application of risk sensitive-premia, and the preservation of the sustainability DIF points in the direction for the need to apply industry data to change the coverage limit changes. Although the Gan and Wang's model is based on the theories put forth by Gropp and Vesala (2004) and Manz (2009), it does offer value for the use of industry data to derive coverage limits. The inclusion of bankers' risk-taking business endeavors may add value to the use of data and the application of the appropriate calculus to compute the coverage limit as it may illustrate which banks are more exposed to failure coupled with the related insured deposits and the amount that the FDIC as the deposit insurer may pay-out as deposit insurance. The same principle may apply to the risk-premia whereby banks that are charged the higher premia can be deemed to be the higher risk banks and by extension the banks that carry a higher probability of failure. Gropp and Vesala's contribution to the theory related to depositor monitoring, market discipline and moral hazard does synchronize with computation of coverage limits as it supports the partial, explicit deposit insurance systems (Gan & Wang, 2013).

The support for the use of industry data in the derivation of coverage limits is strengthened by Gan and Wang's (2013) cross-country findings in their study. They noted that wealthy countries with GDPs should have moderate coverage limits.

Alternatively, Gan and Wang contended that countries with low GDPs should have higher coverage limits. The findings incorporated income distribution deficiencies illustrating that countries with high income inequality should have a limit that compensates depositors with more generous coverage (Gan & Wang, 2013). In circumstances where countries enjoy long periods of growth and stability, depositors should be afforded higher coverage limits as their tendency to monitor banks switches off (Gan & Wang, 2013).

Although the Gan and Wang's (2013) study was theoretical based as appose to industry statistical data, it did provide a coverage limit figure of $124,000 for the FDIC and supplemented this limit with a guide that the United States, as a country, should adopt a higher coverage limit. Although this guide may be viewed as nebulous, in Gan and Wang's view, the U.S. country profile fitted one that has the tendency to go through long periods of growth and maintains stability.

Although the Gan and Wang's (2013) study was theoretical-based as appose to industry statistical data reliant, it did provide an optimal FDIC coverage limit of $80,000 when all three criteria are applied. However, when the cross-country analysis is used incorporating a country's monitoring cost regarding depositors' oversight of bank-risk behaviors, the FDIC's coverage limit should be $124,000 especially if such costs are deemed to be high for depositors. The cross-country results in Gan and Wang's view categorizes the U.S. country profile as one that should carry a higher coverage limit as it has experienced long periods of economic growth coupled with financial stability and depositor inertia to monitor banks.

The question that arises here is: how does the Gan and Wang's (2013) coverage limit ranges between $80,000 and $124,000 stack up against the FDIC's (2000) coverage limit of $250,000? If the Gan and Wang's theoretical study is used, then the FDIC's coverage limit of $250,000 may be considered too high. The same would apply if the U.S. country income profile is used as the actual limit is approximately twice as high as the Gan and Wang's model-generated limit. The main item to note when the Gan and Wang's limits are paired with the FDIC $250,000 coverage limit, is that it appears to be out-of-sync with the banking industry statistical bases.

Gan and Wang's (2013) cross-country findings suggest the need for another statistical data application process regarding coverage limits namely the use of coverage limits' data on a country by country basis to establish comparative coverage limit benchmarks. This metric could assist DIFs to be intuitively mindful when their limits are either too low or too high, and by extension how exposed their countries are to bank runs.

Bank Regulation as a Data Source for Deposit Insurers

While the link may not be direct and or apparent, innately bank regulators and supervisors role in the oversight, monitor, and control of the behaviors of bankers can limit the quantum and modality of the resolution of financially distressed banks (IADI, 2014). The more robust and responsive the regulatory framework, the lower the potential for bank failures, the lower the frequency of deposit insurance pay-outs and the lesser the concerns surrounding the coverage limit regarding depositor reimbursements. To emphasize the interconnection between these issues, two key questions must be addressed: what were the bank regulatory and supervision factors that may have

contributed to the 2007-2008 global financial crisis; and why did governments resort to increasing their deposit insurance coverage limits?

The role of bank regulation and supervision and its contribution to the crisis remain highly contentious though as scholars have put forward different perspectives on this matter. Hanson et al. (2011) posited that in the 2007-2008 global financial crisis was evidence of bank regulatory failure in different jurisdictions around the world. They noted that the precrisis regulatory framework was deficient based on the principle that it was biased towards a microprudential orientation (Hanson et al., 2011). According to Kan and Bagheri (2015), notwithstanding the presence of global banks in many jurisdictions, their regulatory frameworks paid little or no attention to the potential knock-on effects in the global banking and economic systems. The supervisory authorities did not share their experiences and challenges as well as harmonized their efforts towards a global solution (Kan & Bagheri, 2015).

Kim (2016) posited that in the United States there is a change in the bank regulatory philosophy following the 2007/2008 crisis. Like Hanson et al. (2011), Kim noted that there is a shift from the microprudential regulatory methodology which focused on banks holding capital to withstand the pressure of failure to a macroprudential approach which attempts to curtail the occurrence of another systemic failure. To accomplish this objective, Kim noted that new philosophy, that focuses on the larger/largest banks in particular, is much more data-driven which requires banks to hold a much higher levels of capital, living wills and data on stress tests.

Banking supervisors have relied on the Basel Committee for Banking Supervision (BCBS) CAMELS rating system which is primarily based on financial data extracted from banks' to monitor the banks' financial condition (BCBS, 2012). Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, and Sensitivity to Market Risk. Scholars have explored the usefulness of CAMELS. According to Barker and Holdworth (1993), CAMELS ratings were considered to be a powerful tool to capture and forecast the probability of bank failure (as cited by Baek, Balasubramanian & Lee, 2015). As a measure of reliance and support, Baek et al. (2015) noted that "during the bailout of the U.S. financial system after the 2008 financial meltdown, the U.S. Treasury used the CAMELS as a yard stick to identify banks that qualified for the bailout" (p. 96). The major challenge though is that while CAMELS provide a valuable data source on banks financial condition its shelf life is very short (Cole & Gunther, 1998). Although the relative temporal nature of the CAMELS data is linked to the infrequency associated with the execution of bank on-site examinations that are tied to bank supervision budgetary constraints as espoused by Baek et al., its relevance and usefulness as a data source for several areas of bank monitoring including the potential to, combined with other elements, determine coverage limits cannot be discounted. From a rational standpoint, the likelihood of bank failure based on the application of the BCBS' CAMELS rating system together with selected macroprudential factors can collectively produce the exposure of the banks' insured deposits. Assuming that this analysis can be done as proposed by Barker and Holdworth, then the possibility exists to estimate the optimal deposit

insurance payable and by extension the related deposit insurance coverage limit (Baek et al., 2015).

Alongside the CAMELS, bank supervisors are also guided by the BCBS 29 Core Principles for Effective Bank Supervision referred to as the "de facto minimum standard for sound prudential regulation and supervision of banks and banking system" (BCBS, 2012, p. 1). Following the 2007/2008, supervisors and regulatory authorities recognized gaps associated and the microprudential oriented standards were expanded to include macroprudential elements (BCBS, 2012). Based on the macroprudential updates to the BCBS Standards, supervisors are now required to consider "the prevailing macroeconomic environment, business trends, and the build-up and concentration of risk across the banking sector and, indeed, outside of it" (BCBS, 2012, p. 6). This move on the part of the BCBS is positive to some extent as the capacity to reap real benefits can only be derived from the appropriate enforcement.

According to IADI (2014), a country's bank regulatory framework, being one of the key pre-requisites and design features of explicit deposit insurance systems, has a major role to play in the determination of coverage limits. Klomp and Haan (2014) noted that higher levels of bank capital together with stronger bank supervision tend to reduce the level of risk banks pose to the financial system. Bank capital acts as a first line of protection to cushion the institution during a period of financial distress.

Post-2007–2008 Financial Crisis Review

In 2012, the FDIC Office of the Inspector General (FDIC OIG) conducted 50 Material Loss Reviews to ascertain misgivings if any, by the FDIC related to the impact

of the 2007/2008 global financial crisis on America Garcia (2010). The findings of the audit revealed that the FDIC had regulatory flaws which in the estimation of the FDIC OIG did play a role in impact of the crisis on America Garcia. While overall the examination/review contained a number of shortcomings, for purposes of this analysis one major breach would be highlighted, that is, the FDIC failed to enforce the legislative provisions contained in the FDIC Improvement Act 1991including discretionary powers associated with prompt corrective action.

There were instances of failing banks which the regulators failed to place into undercapitalized, significantly undercapitalized, or critically undercapitalized groupings. This was the same regulatory forbearance which contributed to the demise of the thrift institutions in the 1980s (Savings and Loan Debacle) that subsequently led to the enactment of the FDICIA 1991. Based on the non-implementation of prompt corrective action there was no incentive for these weak banks to recapitalize and stave off insolvency. Calomiris (2011) argued that bank supervisors incorrectly relied on two undependable sources in an effort to assess and measure banks' risks accurately namely the rating agencies' debt profiles of banks and banks internal risk assessment systems. Taking the point of non-enforcement further, the supervisory agencies did not penalize the failed institutions for violating restrictions outlined in the Prompt Corrective Action provisions (Garcia, 2010; Masciandaro, Pansini, & Quintyn, 2011; Schoen, 2017).

Regulatory Nonenforcement

The FDIC OIG in its 2012 review suggested reasons for the nonenforcement of the regulations by the FDIC as: bankers' rejection of the FDICs' supervisors' findings,

political criticism targeted at supervisors' actions, and the poaching of FDIC supervisory staff by the bankers that the FDIC regulate.

The bankers' rejection argument appears weak. The bank regulatory function is filled with conflict which the FDIC regulators are trained to handle. Bankers are driven by the profit motive to reward their shareholders and earn a bonus for themselves in the process. Regulators are mandated to maintain financial stability through constant monitoring and controlling the excessive risk-taking behavior of bankers. Regulation is perceived by bankers as a cost to the industry and this drives the bankers to take all necessary measures to minimize its impact. It conflicts with their profit motive. Another area where conflict would arise is in the interpretation of the banking legislation, its understanding and application by both the regulators and the regulated, namely the insured banks. Often the wording of legislation inherently lacks clarity and it is this ambiguity that sets the basis for various interpretations and dispute by extension.

To counter these arguments though, it is possible that the FDIC may have suffered from a staff reduction program that was introduced in 1995 which may have led to a depletion of their highly trained human resource. The FDIC offered their employees enticements to retire or seek other employment willingly based on the premise that there was a reduction in the workload following the aftermath of the Savings and Loan debacle in the 1980-1990. This is one of the idiosyncrasies that bank regulators experience - ebbs and flows in work flow/volume closely associated with the financial stability levels in the banking sector. When instability is high bank failures follow the same pattern or trend, that is, bank failures increase. The opposite is true when the sector is strong and stable -

bank failures decline. When instability rises and there is an uptick in bank failures the FDIC hires more staff to deal with greater demands placed on their human resources to resolve distressed banks. When the financial system recovers, as usually obtains, the FDIC would be left with surplus staff nudging the management to consider staff reduction programs. The major challenge with these ebbs and flows unique situation is that there would be a loss in staff expertise which would leave the FDIC exposed when the next period of instability arises at some time in the future, an expectation with a high level of certainty.

Political criticism targeted at supervisors' actions was another factor cited by the FDIC OIG that contrived to disrupt the FDIC's regulators from enforcing the FDICIA 1991. This suggestion may have some merit. The genesis of the 2007-2008 crisis was placed at the doorstep of the American government when it pursued a policy of home ownership expansion with low interest rates over a protracted period. Given that many regulated banks were involved in the execution of this policy which were forced to lower their lending standards to increase affordability to low income earners and make the policy a success in the process, it appears unfair for the bank regulators to be the target of criticism. In light of this conflict it may be that the regulators either lost enthusiasm to enforce the FDICIA 1991 or accepted the banks' exposure to penalties if they did not finance the home ownership of many individuals who would not have been able to purchase a house under normal circumstances (Calomiris, 2011).

Staff poaching by regulated bankers of the FDIC supervisory staff was another reason cited in the FDIC OIG (2004) report for the nonimplementation of the FDICIA

1991 by the FDIC regulators. On the surface, this sounds as a reasonable explanation since the package offered by the private sector banks would be more generous than government FDIC compensation schemes. When highly trained FDIC supervisors are offered more competitive packages including bonuses by the bankers it is possible that the Supervisors would be bought out. The immediate impact of such a move on the FDIC would be the loss of staff with the appropriate competencies to understand and enforce legislation. This raises an issue of conflict of interest in the system though.

FDIC supervisors would come into contact with highly confidential bank data in their day to day work activities. The retention of such confidential data of the many different banks would give a supervisor a fair understanding of their lines of business, products offered, markets served as well as the strategies they use and so on. This may be a reason why they appear so attractive to the bankers and sought after by the banking community. An FDIC supervisor in possession of bank data can take up a job at one of the regulated banks he/she previously supervised and subsequently provide information on the competitors as well as the FDIC's operational secrets.

The foregoing arguments put forward by the FDIC OIG (2012) to support the non-enforcement of the regulations contained in the FDICIA 1991 by the FDIC regulators do possess a systems thinking orientation (Garcia, 2010). Having gone through the Savings and Loan crisis in the 1980s and the FDIC Fund went into negative territory legislation was passed, specifically the FDICIA 1991, to avoid a repeat of the pressures placed on the public purse, the taxpayers. The impact of the 2007-2008 global financial

crisis on America was a repeat of the 1980s debacle but of a more significant magnitude. The rationale for these events may be associated with the concept of governance.

Moral Hazard and Optimality

In Gan and Wang's (2013) view, partial deposit insurance has three objectives namely to depositors who do not possess the knowledge to monitor banks, to main a consistent level of liquidity and to curtail depositors propensity to run on their banks in panic mode and make withdrawals. The real challenge though or downside to the deposit insurance coverage limit is that when it is too high the coverage limit reduces market discipline and simultaneously increases moral hazard (Gan & Wang, 2013). Scholars have argued that too much risk-taking by bankers was the main contributor to the Savings and Loans crisis in the United States 1980-1990 (Kim, Kim, & Han, 2014). Kim et al. (2014) showed that in the ASEAN countries moral hazard rose when deposit insurance was established. Alternatively, the study revealed that moral hazard is minimized or restrained when the quality of bank regulation and supervision increases to higher levels (Kim et al., 2014).

The challenge that arises with the process of deriving coverage limits even if industry data is available and accessible to fund managers is that there may not be a consensus on a measurable metric to assess an increase or decrease in risk-taking. Kim et al. (2014) intuitive adopted the ratio of bank's capital to total assets deploying the BCBS (2017) principle that higher capital serves as a cushion to absorb losses. In light of this a higher and or an increasing ratio of capital to total assets suggests reduced risk-taking by bankers while a lower or decreasing ratio illustrates increased risk-taking behavior.

To manage and or control the level of moral hazard therefore necessitates the monitoring of bankers' risk-taking behavior as the deposit insurance coverage limit changes over time. Optimality of coverage limits therefore suggests the need for authorities to leave some proportion of deposits uninsured as a mechanism to persuade depositors to monitor their banks (IADI, 2014). In an attempt to protect those depositors that do not possess the skills and competencies to understand banks' data to take appropriate action, IADI fund managers should adopt the practice of tracking the risk behavior of bankers on an on-going basis. The CAMELS data on banks extracted through supervisors' on-site and off-site examination provides a good data source to get an appropriate balance between the optimal coverage limit and the level of moral hazard within the banking system.

Panic Runs and Coverage Limits

Bank runs are deemed to be self-fulfilling events (Brown, Trautmann, & Vlahu, 2016; Chabot & Moul, 2014; Davis & Reilly, 2016; Diamond & Dybvig, 1983). Almost any circumstance can prompt a bank run (Djik, 2017). In Iyer and Puri's (2012) view, depositors with balances that are larger than the deposit insurance coverage, the uninsured depositors have a greater inclination to run on their banks Kiss, Rodriguez-Lara, and Rosa-Garcia, (2012) examined the behavior of depositors based on the observation of the actions of other depositors. Consistent with the findings of similar studies, Kiss et al. noted that bank runs are triggered by banks' fundamentals including solid liquidity or problems with severe illiquidity as well as coordination problems

between depositors. Loss-aversion was exhibited by depositors which ignited panic behavior to run on their banks (Kiss et al., 2012).

Despite the broad context of panic runs, Ngalawa, Tchana, and Viegi (2016) argued that while the uninsured demand deposits supplied banks with liquidity, this form of funding can alternatively leave banks exposed to panic runs and by extension insolvency. This perspective seems to support the view that a coverage limit that is too low can inveigle depositors to engage in panic runs.

The Deposit Insurance Fund

The value or size of the DIF may impact depositors' decisions to make rapid withdrawals. Peia and Vranceanu (2017) saw a link between the DIF size and the frequency of deposit withdrawals and argued that the higher the dollar value of the DIF, the greater the tendency that depositors are likely to increase the regularity of withdrawals. O'Keefe and Ufier (2017) posited the importance of having an ex-ante fund as appose to an ex-post fund since the ex-ante fund can strengthen public confidence in the banking system. Some DIF managers took a further step by introducing a target fund ratio. O'Keefe and Ufier noted that the FDIC established its target ratio based on "an analysis of historical FDIC losses, income and insurance fund levels" (p.26)

Corporate Governance's Role

To stimulate the application of the industry data that may be held by a bank regulator which the DIF can use to compute deposit insurance coverage limits, the notion resource dependence governance theory becomes applicable. Madhani (2017) argued that corporate boards, including those of DIFs, are obligated to: (a) organize and control those

dependencies such as relationships with bank regulators that may be outside of DIFs' mandates, (b) minimize the possible risks of bank runs in the banking industry context, and (c) decrease the potential for DIFs to duplicate cost to gather industry data that is produced by the bank regulatory process which DIFs can use to compute coverage limits.

Networking with social and business contacts by boards is considered a key attribute that allows board members to build relationships to strategically take advantage of opportunities for improved access to information among others (Madhani, 2017). The boards of IADI members can use this mechanism or philosophy to play a greater role in their jurisdictional financial safety nets which could trigger appropriate data sharing arrangements (FSB 2012). This gap was one of the key recommendations cited by the FSB (2012) that arose from the 2007/2008 global financial crisis.

There are four different mandates under which IADI fund managers function, namely the pure pay-box, pay-box plus, loss minimizer, and risk minimizer (IADI, 2014). Each of these systems has dissimilar governance arrangements as some may be privately owned by the banking system or publicly owned by governments (IADI, 2014). Some of IADI members, such as the FDIC which has a risk minimizer's mandate, conduct both bank regulatory functions including on-site and off-site examinations as well as deposit insurance operations (IADI, 2014). The lower down the mandate scale that DIFs operate like the pure pay-box and the pay-box plus, the less connected these systems tend to be to the bank regulatory functions and by extension less access to key industry data related to the banking system (IADI, 2014).

Statistics to Determine Deposit Insurance Coverage Limits

Statistics have an important role in the insurance industry, including deposit insurance. Drekic (2011) argued that "there are many deterministic and stochastic influences at play, and the precise prediction of the future claims experience necessitates that all such influences and their effects be identified" (p.1). In the general insurance industry for example, assuming detailed data is collected, probability distributions such as the Poisson distribution can be deployed to respond to many queries (Derkic, 2011). The law of large numbers coupled with the application of the Central Limit Theorem provides the foundation for creation of insurance (Cummins, 1991). Integration in Cummins' (1991) view given the "highly specialized and technical" differences in key elements of the insurance industry that has slowed the application of models and data in the industry (p.261). Ajemunigbohun, Aduloju, Sogunro and Azeez (2017) investigated specific socioeconomic and demographic variables plus the impact on the availability and needs of health insurance in Nigeria. The researchers collected and analyzed data using multiple regression the findings of which revealed that education, income gender and age were the main triggers for the demand for health insurance (Ajemunigbohun et al., 2017). Given the foregoing, it appears that Cummins's view, in terms of lack of integration holds and the deposit insurance industry has not been integrated with other elements of the insurance industry. Should this continue though?

Deposit insurance coverage limits can be impacted by several variables and there is a clear need, according to FSB (2012) for IADI fund managers to search for the relevant data that can influence the level of the deposit insurance coverage. Although the

banks pay the premium and not depositors directly, inherently if no banks fail then the reimbursement of deposit insurance as a coverage limit will not come into question. The same principle should apply to the capacity or size of the fund, the total insured deposits in the banking system, and the payment of premium as well. The search for the impact of these and perhaps other variables on the deposit insurance coverage limit is therefore necessary not only for the next financial crisis as suggested by Bitros (2015) but for the normal level of financial distress that shows up in the banking system in many jurisdictions around the world.

While from one perspective the application of industry statistical data by IADI fund managers may be limited by their access to industry information depending on the deposit insurance mandate-type or business model, another view is that the lack of industry statistical data usage may be stymied by the broad institutional appreciation for data use as a driver for decision making. The data-driven decision-making (DDDM) concept although grounded in education (Schroeder, 2012), may be at play as a factor that constrains industrial data use by IADI fund managers which perhaps may be inextricably linked to Madhani's (2017) resource dependence governance issue (West 2019).

Summary and Conclusions

There are ample industry data that the IADI fund managers can use to compute deposit insurance coverage limits which can satisfy a number of potential outcomes namely the pacification of depositors propensity to engage in panic runs on their banks, limit politicians' influence to make ad hoc changes that suits their agendas, and mitigate bankers' inclination to take on more business risk, the moral hazard conundrum. The

bank regulatory process which employs the BCBS's CAMELS and core principles tends to compliment deposit insurance systems in many jurisdictions financial systems' architecture does generate a broad set of bank data that DIF managers, with the appropriate legislative backing, can use to compute industry data-driven coverage limits.

The deposit insurance industry has been in existence for approximately 86 years and, according to Valentino (1954), is consistent with the mainstream insurance that employs data and actuarial science to derive insurance premium, policies and other aspects of insurance business. Deposit insurance theory as espoused by Diamond and Dybvig (1983, as cited by Hogan & Luther, 2014), is in some measure connected to the finance theories such as Merton's (1977) options pricing theory and Markowitz's (1952) modern portfolio theory since the banks pay a premium for deposit insurance which are invested to build the DIF.

This is the first research study to survey IADI members which will focus of an examination of the applicability of certain data such as bank risk, the DIF size and growth, the DIF's insured deposits and growth and the premium to derive the deposit insurance coverage limit. My study involved a search for and application of industry statistical data to derive deposit insurance coverage limits that are more representative of key trigger variables plus more resistant to political interference. I anticipate that this study will be useful to policymakers in the financial services sector.

The use of quantitative methods for this study provided the support for the theoretical approaches linked to the searches for the derivation of an optimal coverage limit. A quantitative study was suitable for this study because it offered the option to

empirically identify industry related data that cab be associated with the derivation of deposit insurance coverage limits. In Chapter 3, I will detail the quantitative methodology for this study. It will usher in a new dynamic into the deposit insurance field coupled with the elements for initiating social change. The IADI, the Financial Stability Board and the international multilateral lending agencies such as the IMF and World Bank IADI' will appreciate data-driven coverage limits.

Chapter 3: Research Method

Introduction

The purpose of this quantitative study was to investigate the relationship between the use of statistical data, specifically aggregate bank risk data, fund size, aggregated insured deposits, and the premium levy rate by the IADI Members' Fund Managers and the changes in their deposit insurance coverage limits. As discussed in previous chapters, as a follow up to the 2007–2008 global financial crisis, the FSB (2012) noted the deficiency of IADI members to use data to derive their coverage limits. Although researchers have assessed coverage limits in different spheres (FDIC, 2000; Manz, 2009; Velikova, 2006), little is known with regards to the use of industry data to compute deposit insurance coverage limits (FSB, 2012). The exploration of the use of such data could potentially lead to more objective and crisis-resilient coverage limits.

In this chapter, I define the research variables, highlight the hypotheses, and present the methodology used to gather and analyze the data. I critically analyze the instrument to capture and analyze the data and the process to assess my findings. I outline the design procedures used to provide comprehensive coverage of this study's population, the ethical procedures to safeguard the privacy of the research participants, and the measures that I will adopt to strengthen the lucidity of my study.

Research Design and Rationale

I followed a traditional quantitative research methodology to examine whether relationships exist between the independent variables, aggregate bank risk data, fund size, aggregate insured deposits, and the premium levy rate, and the dependent variable

coverage limit (Frankfort-Nachmias & Leon-Guerrero, 2015). The lack of the use of industry statistical data by DIF managers to derive and or change their deposit insurance coverage limits brought about this study (FSB, 2012). I used a cross-sectional research design in this study. This methodology is used by empirical researchers at one designated time to record information to describe attributes of the population, including data such as their education levels, weight, and ethnicity (Allen, 2017). In a cross-sectional research design, the variables are not manipulated (Allen, 2017).

The independent variables are the data on the aggregate bank risk, the DIF size, the aggregate currency value of insured bank deposits, and the DIF premium levy rate. The aggregate bank risk data were guided by BCBS Core Principle 16, Capital Adequacy, which emphasizes the role of capital to absorb losses as a mechanism to prevent or slow down the process of bank insolvency (BCBS, 2012). The DIF size was conceptualized as the values expressed in the currencies of the deposit insurance systems, and the aggregate insured deposits represent the currency value of the specific types of deposit instruments that the deposit insurance system is mandated to protect or insure. Intuitively, the higher the risk rating of a given bank, the higher the probability of bank failure and, by extension, the higher the likelihood that depositors may be reimbursed. The higher the dollar value of the DIF, the greater the capacity may be of the DIF to reimburse depositors and pay a higher coverage limit in the event of a bank failure. The higher the currency value of the insured deposits, the higher the likelihood may be of increased demands by depositors for a higher reimbursement amount or coverage limit in the event of a bank failure. The higher the deposit insurance premium, the higher the

likelihood that the DIF may grow and consequently make more funds available to reimburse depositors in the event of a bank failure.

Research Design

This study followed the traditional quantitative research approach and incorporated a cross-sectional survey design methodology to examine the usage of industry statistical data by DIF managers in the international arena to derive their deposit insurance systems coverage limits. The benefit of this approach is that I could investigate the impact of possible data usage on the value of the coverage limits of the DIF managers at one period and conserve on resources associated with longitudinal research (Allen, 2017; Frankfort-Nachmias & Leon-Guerrero, 2015; Salkind, 2010).

The cross-sectional survey design was implemented to examine the relationship between each of the four independent variables and the dependent variable. The independent variables' data set comprised aggregate bank risk, the DIF size, the currency value of the aggregate insured deposits, and the premium levy rate on member banks. The dependent variable was the deposit insurance coverage limit. A cross-sectional survey design allows researchers to gather data and make inferences with some level of confidence about the IADI fund managers of explicit deposit insurance systems' larger population at a specific point in time (Allen, 2017). This approach provided the framework to test the possible subsequent adherence to the use of data to compute coverage limits since the FSB's (2012) post-2007–2008 global financial crisis review. The cross-sectional approach is more feasible for this study than experimental or quasi-experimental designs due to time and cost savings (Ruel, Wagner, & Gillespie, 2016).

The experimental design was not considered appropriate for this study because this study has neither randomized experimental nor controlled groups (Mujis, 2013). The quasi-experimental design was also eliminated because nonrandomized, experimental, nor controlled groups exist in this study (Mujis, 2013).

A quantitative, predictive approach is deemed to be more appropriate, as the purpose of this study was to determine whether the predictor variables predict the coverage limits at a statistically significant level and, by extension, advance the knowledge in deposit insurance (Frankfort-Nachmias & Leon-Guerrero, 2015). Multiple regression was used to assess the predictability of the application of aggregate bank risk data, the DIF size data, the aggregate currency value of insured deposits data, and the premium levy rates on member banks data of the FDIC in a pilot study. The survey of the IADI members were followed up with ordinal logistic regression to determine the influence of the four independent factors on the dependent variable based on survey of the IADI members (Warner, 2012).

As this study of the IADI members was conducted using a cross-sectional design, both time and resources was positively impacted in terms of savings (Cummings, 2018). The cross-sectional design can facilitate the identification of patterns, correlations, and the frequency in the extent of results from the data collected at one point in time (Allen, 2017). The one-time intervention would minimize the completion time for the research and by extension reduce the costs to gather data (Allen, 2017). The cross-sectional design does cater to the collection of data through the Internet. The survey questions for this

study were distributed to the IADI fund managers who are in different jurisdictions around the world through the online SurveyMonkey survey system.

The emphasis of this study was to seek the potential relationships between the four independent variables and the dependent variable. To this end, a nonexperimental research design was deemed suitable. Based on the approximate 17 years of experience I possess in the deposit insurance industry, I sensed that the independent variables, the aggregate bank risk, the fund size, the aggregate currency value of insured deposits, and the level of the premium levy rates, could influence the dependent variable deposit insurance coverage limits. Cross-sectional research provides the opportunity to measure these variables that are seemingly related and expand the theoretical development in this field of study (Allen, 2017).

The sample in this study was random based on the quantum of the IADI members disclosed by the members in the IADI Annual Survey in 2017 (IADI, n.d.). The cross-sectional design allowed for insights into the use of statistical data by these members. Given the range of legislative powers between deposit insurance systems with limited and expanded mandates, as exist between paybox and risk minimizer modalities, patterns in the usage of statistical industry data may differ across the subgroups. Knowledge of these differences in the application of data by mandate type could provide the financial authorities in jurisdictions around the world with insights to enhance their systems' fund managers' capacity to apply industry data to derive their coverage limits.

The cross-sectional design optimizes a researcher's capability to detect patterns, relationships, frequent occurrences of a matter investigated within a population (Allen,

2017). Khorossani (2000, as cited by Velikova, 2006), in a cross-sectional study of the US commercial banks during the period mid-1980s to 1990s, revealed the existence of greater sensitivity between depositors and bank risk. Drawing from Khorossani's (2000) study, U.S. depositors, depending on the coverage limit at a point in time, may or may not respond to protect their savings should knowledge of bank collapse get into the public domain. It is these results that informed my exploration for a relation between aggregate bank risk and the deposit insurance coverage limit in this study.

Methodology

I used the traditional quantitative research method which incorporated a cross-sectional design to investigate the potential impact of specific industry data on the deposit insurance coverage limits of the IADI members. No effort was made to support and or develop any computational model to derive coverage limit figures. The cross-sectional design allowed for cost and time savings since it focuses on research at one point in time to describe the IADI member population (Cummings, 2018; Frankfort-Nachmias & Leon-Guerrero, 2015).

A pilot study, utilizing the FDIC's experience from 1934 to 2019 was adopted to assess the applicability/relevance of the four independent variables namely the aggregate bank risk, the DIF size, the aggregate currency value of the insured deposits protected by the DIF and the DIF premium levy data on the independent variable, the deposit insurance coverage limit through the application of time series analysis. This inquiry was complimented with a survey of the IADI members' fund managers to examine the relationship between each independent variable and the dependent variable. Multiple

regression analysis was incorporated to determine the existence of predictability of each of the independent variables on the dependent variable in the pilot study.

This was followed up with the application of multiple correlation to determine the strength of any of the predictive relationships between the dependent and independent variables (Warner, 2012). The main study of the IADI members incorporated ordinal logistic regression to predict the IADI members' usage the same four variables adopted in the pilot study. This overall approach is consistent with the framework of Velikova (2006) in a similar study.

Target Population for the Study

A population comprises the complete group of people or items of which a researcher seeks to formulate generalizations (Warner, 2012). The cost in terms of time money and effort limit researchers' capacity to survey an entire population and this often leads to reliance on a sample (Warner, 2012). The sample consists of a subset of the members of the population (Warner, 2012). The target population comprising 91 members that will consist of the IADI members' fund managers who function in deposit insurance systems in different geographical regions around the world. The IADI members have different mandates and powers to resolve banks as and when they encounter financial distress. The deposit insurance systems will be restricted to explicit deposit insurance systems that are either government or private-sector owned in the IADI defined geographical jurisdictions around the world. The estimated population of deposit insurance systems consist of 143 systems around the world (IMF, 2014) of which an estimated 91 insurance systems are members of the IADI a portion of which would be

explicit deposit insurance systems. According to the IADI (2014), an explicit deposit insurance system is defined as "a system, expressly laid down by statutes or other legal instruments, that stipulates the amount of reimbursement which depositors can expect in the event of a Bank failure, with rules concerning Coverage Limits, the types of instruments covered, the methods for calculating depositor Claims, Funding arrangements and other related matters" (IADI, 2014; p.x).

Sampling and Sampling Procedures

In the process of conducting a study, researchers are often incapable of observing all the entities or units that make up the population of interest (Frankfort-Nachmias & Leon-Guerrero, 2015). To ascertain whether a correlation exist between the four independent variables namely aggregate bank risk of a DIF's member banks, a DIF size, the aggregate currency value of insured deposits protected by the DIF in the banking system, DIF premium levy on member banks and the independent variable, the deposit insurance coverage limit, I conducted a random survey of a sample of IADI fund managers based on the four mandate types as defined by IADI. The targeted respondents will comprise expert fund managers of explicit deposit insurance systems that are members within the IADI (IADI, 2014).

The paybox and paybox plus mandates are generally limited in terms of the resolution powers to empower officials to treat with banks during financial distress or an eventual bank failure (IADI 2014). In light of this circumstance, it is possible that the IADI fund managers in these mandate types may not have access to data on the aggregate risk profile of the banks which may be confined to the bank regulator or central bank due

to legislative constraints. The limited access to data may potentially restrict the powers of the IADI fund managers who oversee paybox and paybox plus systems perhaps limiting their capacity to use industrial statistical data to compute their deposit insurance coverage limits

I used SurveyMonkey as the main tool to reach retrieve data utilizing a random systematic survey of the intended participants from the SurveyMonkey Audience service pool. SurveyMonkey allows researchers access to a global pool to collect survey responses which facilitated my reach to the IADI fund managers located in different geographical regions around the world (SurveyMonkey.com, n.d.). The survey underwent internal filters by the SurveyMonkey which guided the researchers through the survey process (SurveyMonkey.com, n.d.).

The names and e-mail contacts of the current 91 IADI fund members were included in the SurveyMonkey audience to optimize the responses from the intended survey participants and to mitigate possible data quality risks that could potentially arise from low or incomplete responses (Ruel, Wagner III, & Gillespie, 2016). The IADI fund members represent the senior officers of the target population of the deposit insurance systems in the world, who would have either conducted research or have the responsibility to supervise research work.

Prior to the commencement of the survey, the participants were required to read, fill out an online consent form and submit it to the SurveyMonkey Audience system. The survey was estimated to take approximately 20 minutes to complete. The IADI website was accessed to get the names of the deposit insurance systems and the mandate type of

each system. The names of the deposit insurance systems and the mandate type will be submitted to SurveyMonkey. The SurveyMonkey system and invited the participants via email.

Some of the IADI members are Associates and Partners. Associates with deposit insurance systems, even though the systems may be a department within a central bank were included in the survey and those that do not were excluded. Associates that did not yet have established deposit insurance systems were excluded. All Partners were excluded since these institutions do not have deposit insurance systems and by extension deposit insurance coverage.

The required sample size was determined by the G*Power 3.1.9 software (Tassin, 2019). The selected benchmarks incorporated a conventional power of 0.80, a two-sided test, a significance level of $\alpha = 0.05$, the number of predictors 4, and a medium effect size, $\rho = 0.30$. Based on the aforesaid factors, a minimum number of 23 participants was required for the sample size.

In the preparation stages of my Proposal, the initial selected benchmarks incorporated a conventional power of 0.90, a two-sided test, a significance level of $\alpha = 0.05$, the number of predictors 4, and a medium effect size, $\rho = 0.15$. Based on the aforesaid factors, a minimum number of 74 participants would be required for the sample size. However, given the fallout from the COVID-19 Pandemic and its global impact, the anticipated responses had been negatively impacted. The start date of my survey was March 7, 2020 and the responses have been slow. As at June 21, 2020, I had received 35 responses from the total population of 91 members. It was apparent that the senior

officers of the deposit insurance systems in the international arena were and still are working remotely which affected their capacity to access their office e-mails which was my survey strategy. In light of the uncertainty and further delays, I sought and obtained approval from my Committee to work with the sample size of 23 participants.

Procedures for Recruitment, Participation, and Data Collection

The application of quantitative research methods necessitates the adoption of procedures to collect data, apply statistical methodologies to investigate relationships and then utilize the results to draw inferences (Warner, 2012). A cross-sectional survey was used as the method for data collection in this study. I administered the survey questions through SurveyMonkey to collect the appropriate research data needed to investigate and evaluate IADI fund managers' application of industry data to derive their deposit insurance systems' coverage limits. This approach was preferred based on the need to collect unbiased data to accurately measure the responses for the eventual application of quantitative statistical methods such as multiple regression. The benefit associated with these interventions is that it will make this study replicable for future researchers. The IADI members' funds managers, the target population for this study, are located in many different countries around the world and SurveyMonkey offers an excellent medium to gain possible access to the highest potential reach. The fund managers were drawn from the IADI members who have full and associate member status with explicit deposit insurance systems for banks.

Prior to the start of the survey through the SurveyMonkey, the participants, the IADI members' fund managers, were informed about the intent of the study and the need

for them to complete a consent form. The consent form alerted participants about the risks and potential advantages of this study to the IADI membership including the protection protocols which I implemented to protect them from loss of privacy psychological distress and physical harm. Some of the stated protocols included the use of password protected measures to safeguard the collected data, the nondisclosure of the IADI member institutions, the use of coding of collected data in the SPSS among others. Participants were requested to sign the form prior to their participation in the survey. The consent form advised the participants that the study would be voluntary; that no personal information concerning their identification should be disclosed; and that they could either avoid and or end their participation in the survey if they are not comfortable with the study (Darley, Latane, Milgram Webb, Campbell, & Zimbbardo, 2009; Israel 2015; Salkind, 2012).

The data for this cross-sectional study was collected through the issue of survey questions through the SurveyMonkey audience system to the IADI members' fund managers who are located in different jurisdictions around the world. The intended participants were targeted based on specific criteria such as their skills or education levels to extract and analyze data; authority level in their deposit insurance system; and their capacity to initiate, produce and or review research work among others. The survey participants' were required to respond to a number of questions, including but not limited to, the number of years that their deposit insurance system has been in operation; the type of fund that their system is legislated to oversee; their knowledge and or experience in changing their systems' coverage limits; the use of data to compute changes in their

deposit insurance coverage limits; and the types of business mandates in which their deposit insurance system operates such as paybox, paybox plus, loss minimizer and risk minimizer.

The survey questions explicitly provided the option to either participate or decline participation with reference to the yes or no responses. Participants that selected yes, were expected to complete the survey. Alternatively, the participants that selected no, were allowed to end the survey immediately. Some open-ended questions were incorporated in the survey that permitted the participants the option to indicate the specific data that are used to compute their systems' coverage limits outside of the four identified for investigation in this study namely aggregate bank risk data, the DIF's fund size, the aggregate dollar value of insured deposits and the DIF premium levy.

Pilot Study

The deposit insurance industry is under-researched in the area of using industry statistical data to compute deposit insurance coverage limits similar to the approaches used in the life and general insurance industry (Valentino, 1954). I explored the application of certain variables that are considered appropriate to use to compute deposit insurance coverage limits based on my experience in the industry. To examine the relevance of these inputs, I utilized a pilot study of the banks in the United States of America supervised by the FDIC during the period 1934 to 2019.

A pilot study is a small-scale version of the investigation involving the use of a small sample as a forerunner to the execution of the main study (Allen, 2017). The pilot study was adopted to provide greater insights about the core study given the absence of

prior exploratory research in the area of applying industry data to compute coverage limits (Allen, 2017). No previous studies exist in the application of industry statistics to derive deposit insurance coverage limits.

A pilot study allows a researcher the opportunity to identify probable difficulties or challenges prior to the main study (Allen, 2017). By applying multiple regression analysis utilizing the four independent variables namely aggregate bank risk, the DIF's fund size, the aggregate currency value of insured deposits, and premium levy rates of the banks supervised by the FDIC any unanticipated measurement issues can arise and be mitigated. A comparison between the findings of both the pilot study and the main study would offer insights into the selection of the variables (Allen, 2017).

Instrumentation and Operationalization of Constructs

A comprehensive and thorough review of the existing literature in data usage to compute deposit insurance coverage limits revealed the absence of an appropriate instrument for this study. The research instrument used for this study was a modified version of the Administrator Data Use Survey (ADUS) instrument originally developed in Sheboy's dissertation (2006; Appendix A), which has been used as a valid and reliable instrument to accurately collect data on the perceptions of school administrators. The Sheboy's (2006) ADUS survey instrument focused on three themes namely building level administrator, data-based decision making, and school district administrators. While the ADUS survey instrument is premised in data use for educational administrators, it has a broader appeal for data use by administrators in different fields. This is supported by the

more recent adoption of the DDDM concept in other fields of endeavor including organizational performance (Bishop, 2018; West, 2019).

Bishop (2018) argued that "organizations understand the importance of data and technology, but now it is about finding a way to leverage this and adopt data-driven processes of decision-making that can improve organizational performance' (p. 10). Foley (2007) focused on the collection and use of data to strengthen organizational competencies and support academic programs applied the DDDM model. The data-driven decision making concept is a multifaceted and broad model that is used in many aspects of research such as education, information technology, business intelligence, social services, engineering and institutional capacity building to name a few (West 2019). In light of this development, and for purposes of my study, the Sheboy's (2006) survey instrument was modified to focus on data use by DIF managers.

The survey instrument was modified to assess the strict application of industry data as well as the factors that may hinder or promote the IADI fund managers' ability to gather and use the data that could impact the derivation of the coverage limit. Such factors may include the internal or external access to the necessary skills to research, analyze and use the data as well as the managerial appreciation or lack thereof for the value in the use of data to improve their decision making to change coverage limit. I have modified the educational admission questions used by Sheboy (2006) to align it with my deposit insurance coverage limit research survey questions (Appendix A). Based on the alterations, permission and or prior consent was sought via email dated September 23, 2019 to use the modified survey questions and approval was granted by Sheboy via e-

mail dated September 24, 2019 (Appendix D I and D II). The adapted Sheboy data-driven decision-making survey questions were sub-divided using similar components adapted by Schroeder (2012). These sections synchronized with the purpose of this study as a mechanism to test the IADI fund managers' application of industry data to derive changes in their deposit insurance coverage limits.

The first section of the instrument focused on the importance of data for staff and institutional performance. The next section targeted data use/tasks by officials. The following segment emphasized data use and the assessment by deposit insurance administrative preparation/training programs. The fourth section focused on data use and the requisite skills to apply the data. Section focused on the four research questions in terms of data use for computing/changing deposit insurance coverage limits. The sixth segment targeted demographic questions to collect information on the participants' job titles, basic information on the profile of their deposit insurance systems. The final segment comprised four open response questions. Sections 1-5 of the instrument utilized Likert-scaled 5-point questions (ranging from strongly disagree to strongly agree). The IADI Members' fund managers' usage of statistical industry data to compute and or change their coverage limits were assessed via a single Likert-scale question.

An altered research instrument for any study would generate issues relating to validity and reliability which must be addressed. This is symptomatic of research whereby measuring instruments must be tested to improve the validity and reliability of investigations to cater for precision as well as usage by other researchers (Drucker-Godard, Ehlinger, & Grenier, 2001). Based on my modification of the survey questions to

focus on data usage to compute coverage limits, I conducted several layers scrutiny to boost quality (Ornstein, 2013).

Reliability

Reliability related to a research measurement instrument is built on the notion that different observers can measure the same object with the same instrument at similar or different times and arrive at the same results (Drucker-Godard et al., 2001). To achieve reliability, this study used a modified version of the ADUS instrument adopted by Sheboy (2006) to examine the relationship between the usage of data and data-based decision making.

Validity

Although several measures can be deployed to test for validity, construct validity was deployed to assess the operationalization of the measurement variables. This instrument is intended to measure exactly what it purports to measure and at the same time provide accurate measures of the object under study (Drucker-Godard et al., 2001). To this end, I confirm that the variables used in this study to measure the same concept namely industry data usage converged and differed from variables that measure different concepts (Drucker-Godard et al., 2001).

Sufficiency to Answer Research Questions

The survey questions were divided into components which were used to collect demographic information, data driven decision making influences, the data collection skills-sets and the data used to compute coverage limits related to IADI members' fund

managers. The survey was random. The survey questions contained the independent variables and the dependent variable to answer the research questions namely:

RQ1: What effect, if any, does the aggregate bank risk have on the predictor variable deposit insurance coverage limit?

$H_0$1: There is no effect of the aggregate bank risk on the predictor variable deposit insurance coverage limit.

H_a1: There is an effect of the aggregate bank risk on the predictor variable deposit insurance coverage limit.

RQ2: What effect, if any, does a DIF's fund size have on the predictor variable deposit insurance coverage limit?

$H_0$2: There is no effect of a DIF's fund size on the predictor variable deposit insurance coverage limit.

H_a2: There is an effect of a DIF's fund size on the predictor variable deposit insurance coverage limit.

RQ3: What effect, if any, does the aggregate currency value of the insured bank deposits protected by a DIF have on the predictor variable deposit insurance coverage limit?

$H_0$3: There is no effect of the aggregate currency value of the insured bank deposits protected by a DIF on the predictor variable deposit insurance coverage limit.

H_a3: There is an effect of the aggregate currency value of the insured bank deposits protected by a DIF on the predictor variable deposit insurance coverage limit.

RQ4: What effect, if any, does a DIF's premium levy on its member banks have on the predictor variable deposit insurance coverage limit?

$H_0$4: There is no effect of a DIF's premium levy on its member banks on the predictor variable deposit insurance coverage limit.

H_a4: There is an effect of a DIF's premium levy on its member banks on the predictor variable deposit insurance coverage limit.

The survey included a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) to assess participants' skills in using data, the importance of data usage to influence decisions, the types of data usage tasks undertaken with regards to working with data to compute the coverage limit. The participants were allowed to indicate different data-driven intensities/application of the IADI members' fund managers to compute their coverage limits.

One limitation of the survey methodology is that the investigation's results have a high dependency on the participants' honesty. Another limitation is that some IADI Members' fund managers' first language is not the English language, the language in which the survey will be worded. Notwithstanding this limitation though, all the IADI written and or published material is done in English on its website. The application of the appropriate validity and reliability metrics would strengthen the modified research instrument to adequately answer the research questions in this study (Warner, 2012).

Operational Definitions

In this study, I attempted to measure four independent variables that can impact the computation of coverage limits. The independent variables are aggregate bank risk,

the currency value of aggregate insured deposits, the DIF value and the premium levy rates. The dependent variable is the deposit insurance coverage limit.

Coverage Limit: The maximum amount which a depositor can claim from or be reimbursed by a Deposit Insurer in the event of a Bank failure. Changes in the coverage limit are influenced by a number of factors. The four independent variables selected for this study are the factors identified for exploring the possible impact on the coverage limit. Intuitively, the larger the DIF and the higher the premium rates the lower may be the coverage limit. Alternatively, and innately, the higher the level of insured deposits and the higher the aggregate level of bank risk, the higher may be the coverage limit.

Currency value of aggregate insured deposits: the Eligible Deposits in the DIF jurisdictional currency that do not exceed the Maximum Coverage Level provided by a Deposit Insurance System. Higher levels of insured deposits may warrant the need for a higher level of deposit insurance coverage as the potential for bank runs by depositors could increase given the fact that depositors may have more to lose in the event of a bank failure. While this dichotomy may support the moral hazard argument, if the uninsured portion of eligible deposits is too low due to low coverage limits, stability in the banking system could decline (IADI, 2014). In this study insured deposits is an independent variable.

Premium levy rates: The prescribed amount of fees that are levied by the deposit insurer on the member institutions which are paid in a manner and time frames specified in the DIFs' legislation (IADI, 2014). Higher deposit insurance premium rates, assuming no bank failures, no deposit insurance payouts and the presence of good investment

options, could provide the opportunity for a DIF to grow. In deposit insurance systems where differential premium arrangements are enforced, banks are encouraged to manage and control their risks as an incentive to pay lower premium. The premium rate is an independent variable in this study.

Aggregate bank risk: The risk profile or the nature and scale of the risk exposures pursued by a bank (BCBS, 2014). The BCBS conceptualization of bank risks "include both qualitative and quantitative aspects of a bank's financial performance financial position, risk management strategies and practices risk exposures aggregate exposures to related parties transactions with related parties accounting policies and basic business management governance and remuneration" (p.70). Under the Basel III, Principle 16 Capital Adequacy bank capital is considered as a key measure in a bank's capacity to absorb losses and minimize the risk of failure (BCBS 2014). Consistent with this principle, I used the ratio of bank equity to total assets as a proxy for bank risk similar to Velikova (2006). The higher the quotient of this ratio, the greater the capacity of banks to absorb losses and by extension the lower would be the aggregate bank risk of failure to the system. Lower levels of aggregate bank risk could potentially reduce the need to pay out deposit insurance and this could signal the need for a lower coverage limit. I have classified aggregate bank risk as an independent variable.

The DIF represents a combination of the premium collected by the DIF from the member banks plus the earnings generated from the DIF's investment of the premium and interest earned to meet the future obligations associated with resolving banks in financial distress one of which includes reimbursing depositors in the event of a bank

failure. The fund is also used to meet the deposit insurance system's operational and related costs. A DIF can take two forms, either an ex ante or an ex post form. The ex ante reflects the establishment of the fund that is managed by designated authorities and exists under a deposit insurance system that offers explicit protection. The ex post fund, however, is generally collected from surviving banks to meet deposit reimbursements after a bank has failed.

With regards to the DIF, this study focused on the ex ante fund given its emphasis on explicit deposit insurance systems. An ex ante DIF provides a fund manager with the resource capacity to reimburse depositors at a coverage level that can maintain the solvency of the fund. Intuitively, the higher the value of the fund and assuming no bank failures or relatively low-value bank failures as well as strong growth, the greater may be the capacity of the fund to reimburse depositors with a higher coverage limit while at the same time conforming to the moral hazard principle.

The survey participants' responses to the four ordinal independent variables namely aggregate bank risk, premium rates, the currency value of aggregate insured deposits and the DIF size would be regressed on the one dependent variable, coverage limits, to explore any relationship and by extension answer the research questions. The overall findings of the survey responses would then be compared with the pilot study findings for consistency.

Data Analysis Plan

SPSS Version 25 was used in the analysis segment of this study. With this software I identified a clear representation of the connections between the use of data and

the derivation/computation of IADI fund managers deposit insurance coverage limits. This study was divided into two components a pilot study of the U.S. banking system coupled with an investigation in to the IADI Members fund managers application of data to compute their coverage limits. The pilot study of the U.S. banking system incorporated multiple regression analysis to examine the possible relationships between aggregate bank risk in the U. S. banking system, the FDIC's fund size, the insured deposits using the FDIC's coverage limits, the FDIC's premium rate, and the FDIC's coverage limits. In this instance, I used a cross-section of data from 1934-2019.

The data were obtained from the FDIC's Insured Institutions Statistics at a glance and the FDIC's Quarterly Banking Profile provided on the FDIC's website. Approval to use this data was sought and the FDIC confirmed that no authorization was required as the data was placed in the public domain (Appendix B). Access to the data can be found at https://www.fdic.gov/bank/statistical/stats/.

To determine aggregate bank risk in the pilot study, I used a bank risk proxy incorporating a ratio of bank equity to total assets that considers all the banks that have been supervised by the FDIC (Velikova 2006). This metric is reasonable based on the BCBS (2012) reliance on bank equity or capital to absorb losses as noted in BCBS Core Principle 16 Capital Adequacy. The higher the level of bank capital, the greater is the capacity of a bank to absorb losses and such a bank is deemed to have a lower risk profile. The obverse is true in that the lower the capital/equity of a bank the lower is the bank's capacity to absorb losses and is deemed to have a higher risk profile. The greater the overall aggregate bank risk profile the more exposed would be the DIC's fund to

potential depositors' reimbursement (IADI, 2014). In circumstances such as the latter, coverage limits should be lower placing a larger burden on depositors to exercise oversight, the moral hazard concept.

The investigation in to the IADI Members fund managers application of data incorporated a random sampling approach based on the IADI defined mandate-type. I used the IADI annual survey data of its Members located on their website to identify which systems fall into the mandate categories of paybox, paybox plus, loss minimizer and risk minimizer as shown in Table 2, I sought the IADI's approval to use these data but was advised that no authorization was required since this specific data set was placed in the public domain (Appendix C). Access to the data can be found at https://www.iadi.org/en/core-principles-and-research/deposit-insurance-surveys/.

The 49 survey questions to the IADI Fund Managers were adapted to emphasize the use of statistical industry data to derive and or change coverage limits. SPSS Version 25 was used in this component of this study to search for possible relationships and the potential strengths of theses between the IADI members fund managers use of the four independent variables and the dependent variables. The four independent variables are the aggregate bank risk, the DIF's fund size, the aggregate currency value of insured deposits, and the DIF's premium levy rate, while the dependent variable is the coverage limit.

After entering the data on the SPSS certain checks were done utilizing the descriptive statistics under the explore feature to assess the data for normality, accuracy of the data as well as missing or completeness of the data. The normality plots with tests

together with the descriptive histogram and factor levels were deployed to generate the output to assess the survey response issues with normality. The scores for skewness and kurtosis were examined and analyzed. The Kolmogorov-Smirnov and the Shapiro-Wilk test results would be used to determine the expected or normal range of score in the data.

Ordinal logistic regression was used to assess the predictability of the usage of bank risk data, the DIF data, the currency value of aggregated insured deposits data and premium rates data by the fund managers. After the data sets were collected and cleaned, ordinal regression analysis was used to assess the predictability of the IADI fund managers usage of each of the four independent variables to determine their coverage levels, the dependent variable. The four independent variables are the aggregate bank risk, the DIF size, the currency value of the aggregate insured deposit as well as the premium levy rate/(s). The key independent variables took an ordinal categorization; and the dependent variable took an ordinal variable classification.

Prior to the determination of the existence of possible relationships exist between the four independent variables namely the aggregate bank risk, the DIF size, the currency value of the aggregate insured deposits and the premium levy rate and the dependent variable, the coverage limit specific tests were performed to determine whether the data would meet the assumptions required for the application of multiple regression hypothesis testing.

The assumptions for using multiple regression in this study:

- Dependent variables should be measured on a continuous scale (interval or ratio variable). The coverage limit will be used in this analysis as a scale variable.
- Need two or more independent variables, which can be continuous or categorical. This study has four independent variables which would be categorical.
- Must have independence of observations. The Durbin-Watson statistic will be used to test for independence of observations.
- Linear relationship should exist between (a) the dependent variable and each independent variable. Scatterplots will be used to test for linearity between the dependent and the independent variables.
- Homoscedasticity should be present in the data. Homoscedasticity will be tested through scatterplot and the differences or distances of the residual values from the line of best fit. The distances could be scattered on either side of the line but remain consistent or linear. The presence of a funnel or cone indicates that Homoscedasticity is not present.
- Multicollinearity should not exist in the data. The variance inflation factor for all the independent variables are expected to be well away from the danger zone of close to and above 10.
- There should be no significant outliers, high leverage points or highly influential points.

- The residual errors should be approximately normally distributed. Cooks' distance statistic will be used to assess residual errors (Warner, 2013)

Threats to Validity

The growth and development of modern social systems are inextricably linked to research (Frey, 2018). The issue of the quality research or the lack thereof, plays a critical role in determining whether there is progression, stagnation or regression in social systems (Frey, 2018). As a strategy to reap the benefits of this quantitative study the appropriate measures were deployed to ensure that the findings are construed and discerned in a precise manner. Salkind (2012) contended that validity attempts to ensure that the substance remains consistent during the process of transitioning from premise to conclusion.

External Validity

Investigators attempt to ensure that the findings of their research efforts are generalizable to other participants, settings and materials (Warner, 2012). Assuming the results can be replicated or applied outside of a study then external validity would hold (Ruel et al., 2016). While this study incorporated a pilot study, the pretesting of the survey questions was tested on experts outside of the target population of IADI fund managers. To neutralize testing reactivity, I utilized staff from the IMF and World Bank with high level expertise and competencies in deposit insurance.

Decisions within the IADI member deposit insurance systems with regards to coverage limits may extend upward to government level as was demonstrated during the 2007/2008 global financial crisis. This fact raises the concern in this study about the

interaction effects of selection and experimental variables. Notwithstanding this threat, the IADI fund manager in this study was either the organization head or a member of the board of directors. Based on my experience in the industry, the staff at the senior managerial level was considered the most appropriate to respond to questions surrounding the problem statement in this study.

Testing reactivity. Testing reactivity refers to the impact on a study that originates from either the instruments or the individuals who execute the study in a manner that leads to variation in the results (Lavrakas, 2008). The instrument that was used in this study was a questionnaire which as tested rigorously with industry experts under a pilot study prior to the actual use in my study. SurveyMonkey was the interface between the researcher and the subjects in my study reducing the potential for individual influence on the results.

Interaction effects of selection and experimental arrangements. The interaction effect of selection biases and experimental arrangements refers to the effects that of a selection factor associated with a group may have or generate when it interacts with the experimental treatment (Salkind, 2010). This effect was mitigated through the random selection of participants. In this study, while the groups were established by their mandates, the selection of the participant IADI members' fund managers was randomly selected.

Specificity of variables. A researcher's ability to generalize the results from his/her study was affected by the uniqueness of the variables, the measuring instruments, types of subjects and other aspects under study (Salkind, 2010). If the characteristics are

too exclusive about the population that is being studied, then my ability to generalize outside this group would be compromised (Salkind, 2010). The obverse is true whereby the broader the aspects of the components of the study the greater the opportunity for generalization of the findings (Salkind, 2010). Although the elements of my study were restricted to the field of deposit insurance, the characteristics of the variables, subjects, measuring instruments and other aspects were not narrowly defined to restrict generalizability of the results.

Reactive effects of experimental arrangements. The reactive effects of experimental arrangements represent the effects that are associated with subjects' awareness of their participation in an experiment may have on the results (Frey, 2018.). This effect is also known as the Hawthorne effect. There were no experimental arrangements in this study and therefore the possibility of such an impact of this nature was nil.

Multiple-treatment interference. Multiple treatment interference refers to the impacts where repeated testing is done on similar participants and these resulting effects are transferred from one treatment to another limiting the capability to generalize the results to a single treatment (Salkind, 2010). As there was only one survey arrangement in this study there was no opportunity for carry-over effect or negative related effect on the generalization of the results.

Internal Validity

Internal validity according to Campbell and Stanley (1963), focuses on causal relationship between the independent variables namely aggregate bank risk data, the DIF

size, currency value of aggregate insured deposits and premium levy and the dependent variable, the coverage limit (Frey, 2018). Certain internal validity threats such as ambiguous temporal precedence, history, regression effect, selection, and mortality were expected in this study. The cause and effect challenge in terms of determining which variable is the cause and which is the effect was minimized through the use of randomly assigning sample participants to each of the four strata paybox, paybox-plus, loss minimizer and risk minimizer business models. In this way, participant biases were equally distributed in each of the four groups (Salkind, 2012).

History. History threat refers to an event that is not related to any of the specified variables of interest in this study that occurs between the pretest and posttest time period and impacts the dependent variable (Salkind, 2012). My investigation into industry data independent variables that can impact the dependent variable, coverage limit, is a new area of research limiting the probability of such an occurrence. To add another layer of protection, the survey instrument allowed potential participants to specify any independent variable outside of the four to be tested in this study. The time difference between the pretest and posttest was restricted to minimize any possible non-related event occurrences that can impact the participants.

Maturation. Maturation threat refers to the effect on the dependent variable that is triggered by physical or mental developmental changes in the participants over time (Salkind, 2012). The participants in my study were surveyed at one specific time interval. This one-time approach eliminated the potential for such changes in participants to influence the dependent variable.

Testing instrumentation. The threat of testing instrumentation refers to the impact that participants' familiarity may have on the dependent variable when they become aware it after multiple uses (Salkind, 2012). The modified survey instrument chosen for my investigation was vetted by industry experts who are retirees from their employment posts as former fund managers of deposit insurance systems that are members of the IADI. This group is different and separated from the population reducing the prospects for familiarity that could enhance participant performance (Pett, Lackey, & Sullivan, 2011).

Statistical regression. Statistical regression threat refers to the statistical impact that participants' pretest scores may have on posttests results after manipulating the treatment variable in a one group design (Salkind, 2012). In such a circumstance, a researcher may in error attribute the change in the posttest to changes in the treatment variable when the change may have been attributed to the pretest survey design. The pilot test group and the actual target population were different restricting the potential for such an occurrence in my study. The targeted population staff in each IADI member organization was equally tested to negate the threat of statistical regression.

Selection-maturation interaction. The threat of selection-maturation interaction refers to the effect that the differences in groups maturation rates coupled with their interaction can have on the dependent variable (Salkind, 2012). This possibility exists with the IADI that comprises several deposit insurance systems from around the world. Given that the participants were surveyed at one specific point in time, the threat of selection-maturation interaction did not arise.

Ethical Considerations

It is imperative that researchers comply with the adoption of proper ethical standards (Salkind, 2012). These standards are defined in the form of ethics' codes produced by professional organizations to guide individuals who participate in research and academic study (Bradford, 2018). Some of the guidelines place emphasis on protecting research participants from different forms of potential ill-treatments, abuse, harm, or injury among others (Bradford, 2018). My study was a cross-sectional investigation the collection of data from individuals of the IADI member population, human respondents, at a single point in time (Cummings, 2018). The interaction with the intended IADI participants created the potential for the occurrence of breaches of research ethics.

During the conduct of my investigation, I managed the data procurement, control, safety, confidentiality, and analysis requirements in tandem with Walden University's IRB guidelines. I obtained IRB approval prior to the data collection process. In the interest of maintaining proper ethical standards in this study I protected the participants by applying proper ethical controls such as disclosure of objective of the study for purposes of protecting and securing the participants' data; indication of the rights to consent and or withdraw. I also applied ethical procedures such as alerting the participants of their rights in a consent agreement which I asked each participant to sign before the survey commences.

To demonstrate deference to the IADI participants, I indicated to the population that they are free to participate voluntarily and or decline should they opt. I was forthright

and honest about purpose of the pilot study and the survey. I applied the principle of justice and ensured that the IADI participants are treated equally (Israel, 2015). Although my effort to reach the IADI participants was done through a relatively harm-free mechanism, to minimize the risk and maximize the benefits to the IADI participants, I indicated that there is no threat of physical injury or mischief (Israel, 2015).

To protect the intended participants, I implemented the following measures consistent with the ethical statements laid out in Belmont Report (1979) and incorporated within the Walden University's IRB statements of ethics. All the documents that would be used to collect and store data from the IADI fund managers would meet all aspects of confidentiality through encryptions and password-protected files. Neither the participants' names nor other information were disclosed or revealed in any form. This process involved the use of codes and not names to ensure that no part of the study will shed any light on the identity of the participants.

I gave my intended participants adequate advance notice and time to respond to the survey questions and material was provided to clarify the purpose of the research study (Israel, 2015). I ensured that my professional work experience in the field of deposit insurance will not influence any bias on the responses of the intended participants (Israel, 2015). I used the Walden University's IRB disclosure form that incorporates the provisions to protect participants' confidentiality through the non-recording of names and avoid using subordinates to participate in my study; The data collected from the survey will neither be used for purposes of anything related to the development of the organization for which I work nor for any other intervention or activity other than the

investigation (Israel, 2015). I remained alert during the data collection process to detect any discrete adverse events plus general or unanticipated problems which should such occur, the IRB would have been informed within one week of such occurrence (Israel, 2015).

Summary

I adopted a quantitative cross-section design that covers the study of the application of industry data by IADI Fund managers in the derivation of their deposit insurance coverage limits. Drawing on the literature that identified experiences involving the use of data in the insurance industry in the broadest sense coupled with the ideology that deposit insurance was no different to other types of insurance, this chapter has provided a scholarly framework to explore the first and distinctive suggestions of the data usage in deriving coverage limits. Although scholars have explored the possible existence of an intuitive optimal coverage limit, no investigations focused on the types and extent of specific industry data to quantify the coverage limits. This study attempts to set the groundwork for initiating industry data usage in the derivation of deposit insurance coverage limits.

In this study, I appraised the application of four specific data types using the FDIC's data related to some banks in the United States. The findings will assist in the identification of a standard data set application process to compute coverage limits in the deposit insurance industry. Chapter 4 will present a detailed analysis and discussion of the results of the study.

Chapter 4: Results

Introduction

The purpose of this quantitative cross-sectional study was to evaluate the use of banking and deposit insurance industry and statistical data by deposit insurers in the international arena to compute their deposit insurance coverage limits. The research questions focused on four banking and deposit insurance industry statistical data factors comprising the independent variables: (a) aggregate bank risk, (b) premium levy, (c) the size of the DIF, and (d) aggregate currency value of insured bank deposits and the premium levy. The purpose of the study was to measure the use of the independent variables by the IADI members compute their deposit insurance coverage limits, the dependent variable. I established four hypotheses to answer these questions (Frankfort-Nachmias & Leon-Guerrero, 2015). In this chapter, I highlight the findings of the pilot study, participants' demographics, the steps to execute and procure the survey material as well as the SPSS statistical outputs of the research data of the IADI members.

Pilot Study

Pilot studies perform a key role in the design of quantitative studies (Allen, 2017). Such studies offer researchers the opportunity to conduct a preliminary or exploratory study to obtain better insights about the main study (Allen, 2017). Due to the lack of empirical evidence related to causative factors that influence deposit insurance coverage limits, I executed a multiple regression analysis using four independent variables: aggregate bank risk, DIF size, the aggregate value of currency of insured deposits, and the premium levy. The pilot study sample data were extracted from the FDIC from 1934

to 2019. The findings of this pilot study were intended to provide direction to the choice of factors to include in my sample survey to unearth the causative factors that may influence coverage limits.

Multiple regression analysis was used in this pilot study. The variable used for prediction in the model was the dependent variable, coverage limit, while the variables used to predict its value or outcome are the independent variables. namely, aggregate bank risk, DIF size, the aggregate value of currency of insured deposits, and the premium levy (Warner, 2013). I explored possible predictability of a deposit insurance system's coverage limit using four variables from bank and deposit industry data.

The follow assumptions for using multiple regression were met: Dependent variables should be measured on a continuous scale (interval or ratio variable). Coverage limit was used in this analysis. It is a scale variable and therefore conforms with this assumption. I needed two or more independent variables, which can be continuous or categorical. The variables reported aggregate bank risk, DIF size, the aggregate currency value of insured deposits, and the premium levy are also continuous. There must be independence of observations. The Durbin-Watson statistic shown for aggregate bank risk, DIF size, the aggregate currency value of insured deposits, and the premium levy respectively was 0.736, which fell within the acceptable range of 0.0 to 4.0 and supports the view that there was independence of observations in the survey process.

Linear relationships should exist between the dependent variable and each independent variable. Scatterplot 1 in Appendix A illustrates some linearity between the dependent variable, coverage limit, and the independent variables, aggregate bank risk,

DIF size, the aggregate currency value of insured deposits, and the premium levy. Homoscedasticity should be present in the data. Homoscedasticity is present when the dependent and independent variables are plotted on a scatterplot and the differences or distances of the residual values from the line of best fit show a tendency toward consistency, not the formation of a cone or funnel shape. In simple terms, the distances could be scattered on either side of the line but remain consistent or linear. The presence of a funnel or cone indicates that homoscedasticity is not present. The distances of the residuals from the line of best fit on either side show consistency in each case, which suggests that homoscedasticity is present in the data, thereby conforming with this assumption.

Multicollinearity should not exist in the data. The variance inflation factor (VIF) ranged in values from 1.480 to 4.051 for all the independent variables. The variables are well away from the danger zone of close to and above 10, indicating compliance with this assumption. There should be no significant outliers, high leverage points, or highly influential points. The residual errors should be approximately normally distributed.

Given the foregoing results, there appears to be no undue influence and as such the residual errors are approximately normally distributed. A thorough review of the assumptions underpinning the execution of the multiple regression analysis to ensure acceptance for usage was conducted. Accordingly, no violations of the assumptions of normality or linearity were discovered. The model summary results illustrate an R square = 0.948, an adjusted R square = 0.945; $F(85, 368.163)$; $p < .000$. Based on the criterion $\alpha = .05$ two-tailed for statistical significance, the summary results illustrate significance for

the predictor variables. An R square value greater than 0.3 is considered acceptable. The R square amounted to 0.948, which indicates that 94.8% of the variation in the coverage limit, the independent variable, is explained by variation in the four independent variables. When the four independent variables are examined individually, the following results were revealed: DIF size, $\beta = 0.004$, $t = 0.087$, $p < 0$ .931; aggregate currency value of insured deposits, $\beta = 0.997$, $t = 19.523$, $p < 0$ .000; premium levy, $\beta = 0.117$, $t = 3.694$, $p < 0$ .000; and aggregate bank risk, $\beta = -0.102$, $t = -3.319$, $p < 0$ .001. Overall, the predictor variables, aggregate currency value of insured deposits, premium levy, and aggregate bank risk, indicated statistical significance, which is less than the $\alpha = .05$. The DIF size, however, appears to demonstrate no significance. The residuals indicate a mean coverage limit of $71,831.40, which is well below the current coverage limit of $250,000, which suggests that the FDIC's authorities did not apply bank and deposit insurance industry data to derive the coverage limit. A Pearson correlation analysis was conducted using the coverage limit as the dependent variable against/for each independent variable to test their individual contributory strengths as predictor variables.

As shown in Table 2, the aggregate currency value of insured deposits appears to be the most significant data set for usage in computing the deposit insurance coverage limit with a factor of 0.963. This is expected in a material sense since the insured deposit data is the target for establishing and changing the coverage limit. Aggregate bank risk was moderate with a factor of 0.476 suggesting some worth as a possible data set for influencing the coverage limit. Premium levy was the weakest influencer with a correlation factor of 0.287 and although somewhat soft, it was positive again supporting

the need for consideration as a data set. All the correlation factors were significant at the alpha 0.05 level. Overall, the four independent variables appeared to have been a reasonably good choice and would be tested further with the survey of the IADI members.

Table 2

Correlation Results

Independent variables	Correlations	Test of significance
Aggregate bank risk	0.476	.000
Aggregate currency value of insured deposits	0.963	.000
Premium levy	0.287	.007

Data Collection

IADI Members' Study

The survey questions for this cross-sectional study of the IADI Members were administered through the SurveyMonkey's online target audience tool to collect the research data required for evaluating their use of data to compute their deposit insurance coverage limits. Organization Membership within IADI was the main criteria for the survey participants and based more specifically on work status, job function, IADI geographic zones and organizational fund type among other factors. The participants were requested to chooses between five responses specifically, strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree.

I followed the Walden's IRB compliance requirements for survey participants by issuing invitation and consent letters through SurveyMonkey. The participants were advised of the risks, benefits, protections protocols to prevent against loss of privacy,

psychological distress, and physical harm. The survey participants were advised via the consent letter that their responses were anonymous and that their relationships with the researcher through previous interactions at the IADI events were protected whether or not they participated in the survey.

In the consent letter, participants were provided with a sample of the survey questions to build their familiarity with type and level of questions that they would be required to answer. If they encountered any issues or concerns requiring redress during the survey, participants were advised to make contact with either the researcher, the Walden IRB, or my supervising committee whose contact information were made available in the consent letter. In keeping with the IRB requirements no incentives were offered to encourage participation. Participants were also informed that they could end and or withdraw from participating in the survey at any time they so choose.

Research Question and Hypotheses

My research inquiry was triggered by the recommendations of the FSB and I developed these five questions and hypotheses:

RQ1: What effect, if any, does the aggregate bank risk have on the predictor variable deposit insurance coverage limit?

$H_0$1: There is no effect of the aggregate bank risk on the predictor variable deposit insurance coverage limit.

H_a1: There is an effect of the aggregate bank risk on the predictor variable deposit insurance coverage limit.

RQ2: What effect, if any, does a DIF's fund size have on the predictor variable deposit insurance coverage limit?

$H_0$2: There is no effect of a DIF's fund size on the predictor variable deposit insurance coverage limit.

H_a2: There is an effect of a DIF's fund size on the predictor variable deposit insurance coverage limit.

RQ3: What effect, if any, does the aggregate currency value of the insured bank deposits protected by a DIF have on the predictor variable deposit insurance coverage limit?

$H_0$3: There is no effect of the aggregate currency value of the insured bank deposits protected by a DIF on the predictor variable deposit insurance coverage limit.

H_a3: There is an effect of the aggregate currency value of the insured bank deposits protected by a DIF on the predictor variable deposit insurance coverage

RQ4: What effect, if any, does a DIF's premium levy on its member banks have on the predictor variable deposit insurance coverage limit?

$H_0$4: There is no effect of a DIF's premium levy on its member banks on the predictor variable deposit insurance coverage limit.

H_a4: There is an effect of a DIF's premium levy on its member banks on the predictor variable deposit insurance coverage limit.

In addition to the research questions and hypotheses, I will highlight a comprehensive review of the data collection processes for both the pilot study and the deposit insurers' survey responses, including data cleaning and accurate representation of

the surveyed data. The results will illustrate the critical assumptions made in data analyses, descriptive statistics, tables with figures, statistical outputs produced by SPSS and its interpretation.

Participants' Demographics

Data were collected from a sample of 91 IADI deposit insurers' member institutions (now 86 members) from different jurisdictions around the world via the SurveyMonkey online audience. The SurveyMonkey data collection was launched on the March 7, 2020, and closed on June 23, 2020. I sought and obtained approval from my supervising committee to extend the survey due to the initial slow survey responses. Given the need to respond online, many participants had limited access to their office computer systems as they were working remotely at home because of the implementation of the COVID-19 measures worldwide.

The initial benchmarks of this study incorporated a conventional G power of 0.90, a two-sided test, a significance level of $\alpha = 0.05$, the number of predictors 4, and a medium effect size, $\rho = 0.15$. Based on the aforesaid factors, a minimum number of 74 participants would be required for the sample size. Given the occurrence of the COVID-19 and the negative impact on the survey responses, I subsequently made alterations to the survey sample size. The altered benchmarks incorporated a conventional G power of 0.80, a two-sided test, a significance level of $\alpha = 0.05$, the number of predictors 4, and a medium effect size, $\rho = 0.30$ (Tassin, 2019). Based on the aforesaid factors, a minimum number of 23 participants would be required for the sample size (Tassin, 2019). The selected statistical test was the linear multiple regression.

At closure of the survey, I obtained 37 responses of which two were not useful and were rejected based on a relatively large number of incomplete responses. The remaining 36 were further cleaned and due to a lack of responses, were reduced to the working volume of 29 responses. Analyses were executed using the 29 responses through the different segments of the IADI survey. The responses accounted for 33.7% of the population which currently stands at 86 members.

To test the four hypotheses, an ordinal logistic regression, based on proportional odds model, was conducted to determine if a correlation exist between the independent variables, (aggregate bank risk, the DIF size, the aggregate currency value of insured deposits and the DIF premium levy) and the dependent variable (coverage limit).

The initial four independent variables were increased by two representing the IADI's members' aggregate bank risk, a DIF's fund size, the aggregate currency value of the insured bank deposits, the DIF's premium levy on its member banks, the modal domestic currency value of insured deposits, and the average domestic currency value of insured deposits. The additional variables were included to broaden the industry statistical data set that participants could choose from to change and or compute their coverage limits A 5-point Likert scale was used with scores ranging from 1 as strongly agree to 5 as strongly disagree for the independent variables (Sheboy, 2006).

Before the execution of the ordinal logistic regression, the four key assumptions were examined including the following:

- There should be one dependent variable that is measured at the ordinal level. The dependent variable, coverage limit, is measured as an ordinal with categories such as never, minimal, moderate and frequent.
- There should be one or more independent variables that are continuous, ordinal or categorical. The four independent variables are measured as ordinal, strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree.
- There should be no multicollinearity.
- Proportional odds.

The logit link model was used to test the model adequacy. The initial five Likert scale responses were adjusted down to a three Likert response from strongly agree, agree, neither agree nor disagree, disagree and strongly disagree to agree, neither agree nor disagree and disagree. The out produced a warning that 12 (42.9%) cells (dependent variable levels by observed combinations of predictor variable values) with zero frequencies.

Results

There were 29 clean responses to the four thesis questions in the survey. The case processing summary illustrated that six members never changed their limits while 23 made changes to their coverage limits. As shown in Table 3, 31% of the participants agreed to include aggregate bank risk in the computation of coverage limits while 37.9% neither agreed nor disagreed and 31% disagreed. When added the neither agree nor disagree together with the disagree decision were above 50%, indicating a preference for

non-inclusion of the variable. The same pattern followed for the research questions the size of the DIF and the premium levy. The research question, aggregate domestic currency value of insured deposits had responses at 58.6%.

Table 3

Frequency and Percentages of Deposit Insurers

Variables	Agree		Neither agree nor Disagree		Disagree	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
RQ1: Aggregate bank risk	5	31.0	11	37.9	9	31.0
RQ2: Size of DIF	13	44.8	8	27.6	8	27.6
RQ3: Aggregate domestic currency value of insured deposits	17	58.6	10	34.5	2	6.9
RQ4: Premium levy rate	12	41.4	9	31.0	8	27.6

The SPSS outputs illustrated the following information. Two key metrics indicated a good fit of the model for this analysis: The deviance goodness-of-fit test indicated that the model was a good fit to the surveyed data, $X^2(5) = .000$, $\rho = 1.000$. The Pearson goodness-of-fit test indicated that the model was a good fit to the surveyed data, $X^2(5) = .000$, $\rho = 1.000$. The likelihood ratio is another measure of the model fit. The spread between the-2 log likelihood provides some indication of the relationship between the independent and dependent variables (Laerd, n.d.). The larger the spread, the stronger the explanatory links between the independent and dependent variables (Laerd, n.d.). The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2(8) = 16.524$, $\rho < 0.05$.

The Pseudo R^2 -Square is a measure of variance in ordinary least-squares linear regression (Laerd, n.d.). The results displayed the Nagelkerke of 0.679, Cox and Snell 0.434 and McFadden 0.559 (Warner, 2013). The parameter estimates sums all the variables and their significance. In all cases the results of the ordinal logistic regression analysis were not significant and indicated no relationship between the perceptions of the use of statistical industry data such as aggregate bank risk, the DIF size, the aggregate currency value of insured deposits and the premium levy and the computation of the deposit insurance coverage limit.

As shown in Table 4, the findings indicate that the omnibus test results for the aggregate bank risk profile, the size of the DIF, the aggregate domestic currency value of insured deposits and the premium levy rate using the Wald test statistic. In the opinion of the participants, the use of four independent variables (data sets), namely the aggregate bank risk profile, the size of the DIF, the aggregate domestic currency value of insured deposits and the premium levy rate have no statistical significant effect on the prediction of the computation or changes in the deposit insurance coverage limit, Wald X2(2) = .000, ρ =1.000.

Table 4

Tests of Model Effects

Source	Wald Chi-Square	*df*	Sig.
Aggregate risk profile of fund member banks	.000	2	1.00
Size of deposit insurance fund	.000	2	1.00
Aggregate domestic currency value of insured deposits	.000	2	1.00
Premium level rate	.000	2	1.00

Dependent variable: Number of times DIF Coverage Limit changed model: (threshold), Aggregate risk profile of fund member banks, Size of deposit insurance fund, Aggregate domestic currency value of insured deposits. Premium levy rate

I looked at the possible influence that the DIF Funding type as a factor may have had on the derivation of the coverage limit. There are three main funding types in the deposit insurance industry namely ex ante, ex post, and hybrid. According to IADI (2014),

- Ex ante funding: The regular collection of Premiums, with the aim of accumulating a fund to meet future obligations (e.g. reimbursing depositors) and cover the operational and related costs of the Deposit Insurer.
- Ex post funding: A system in which funds to cover deposit insurance obligations are only collected from surviving Banks after a Bank failure.
- Hybrid: A system that combines elements of both the ex ante and ex post funding arrangements.

The ordinal logistic regression analysis showed that fund type had no statistical significant effect on the prediction of the computation or changes in the deposit insurance coverage limit, Wald $X2(1) = .916$, $\rho = .338$ and Wald $X2(1) = .000$, $\rho = 1.000$ for the ex ante and the ex post funding types respectively. The result for the ex post funding type was not unexpected since such a model does not indicate or commit to a specific coverage limit prior to the failure of a bank. The hybrid funding type had no impact on the ordinal logistic model. Based on the foregoing results the DIF funding type had no influence on the use of statistical data to compute the deposit insurance coverage limit.

Although the research questions showed no evidence of statistical significance, an examination of the IADI members by region was conducted. The ordinal logistic

regression analysis showed that regional members (Euro Asia, Latin America, Asia, Europe, Africa, Americas and the Caribbean) had no statistical significant effect on the prediction of the use of statistical industry data to compute and or change the deposit insurance coverage limits, Wald X2(6) = .872, ρ =.990. The IADI regional members' opinions to use industry statistical data did not show any preference by region.

A similar inquiry was done for the factor IADI mandate type notwithstanding the research questions showed no evidence of statistical significance. The ordinal logistic regression analysis showed that the IADI mandate types (paybox, paybox plus, loss minimizer, and risk minimizer) had no statistical significant effect on the prediction of the use of statistical industry data to compute and or change deposit insurance coverage limits, Wald X2(3) = .206, ρ =.997. The IADI members' opinions to use industry statistical data did not show any preference by the IADI mandate type.

Using the ordinal regression analysis to assess the international deposit insurers' perspective on the use of statistical industry data predictability of each of the independent variables on the coverage level, the findings are not statistically significant. These results illustrate that deposit insurers do not opine that the four independent variables tested as predictors of the statistical industry data that can be used to compute and or change their deposit insurance coverage limits. Except for the variable the DIF size, the FDIC's pilot study results conflict with the findings of the survey study. The four independent variables were statistically significant supporting the need for inclusion in determining the coverage limits. In the correlation analysis, the aggregate currency value of insured

deposits posited the strongest predictability as an independent variable at 0.963 followed by the DIF size at 0.697 that could be used as a factor to compute the coverage limit.

Descriptive statistical analyses were adopted to assess the frequency of the participants' responses. The first segment of the survey attempted to get the respondents' opinions on data use; the importance of data. In this section on the question related to deposit insurance systems that effectively use data to improve staff and institutional performance or achievement to become high performing deposit insurance systems, the respondents' opinions ranged between 82.1% to 92.9% to the four questions as shown in Table 5. Overall, the majority of responses were in agreement with the view that data use and the importance of data were key factors in the operational aspects of deposit insurance systems.

Table 5

Data Use: The Importance of Data

	Deposit insurance systems which effectively use data to improve staff/institutional performance/achievement are better able to become high performing systems	One of the most important tools for improving staff/institutional performance/achievement is data use	Data use is important to closing staff/institutional performance/achievement gaps	Data use has become more important for staff/institutional performance/achievement over the past 5 to 7 years
Agree	92.9%	82.1%	85.7%	85.7%
Neither agree nor disagree	7.1%	7.1%	14.3%	10.7%
Disagree	0.0%	10.7%	0.0%	3.6%

The segment of survey questions related to data use: data tasks the trend followed a similar pattern to the first segment of the questionnaire. As shown in Table 6, the participants selection to agree were substantially larger (69.0% to 75.9%) than the alternates supporting the view that the execution of tasks requires the use of data within deposit insurance systems.

Table 6

Data Use: The Importance of Data

	In my current position, I work with fellow-staff to analyze statistical industry assessment data to develop prescriptive plans	In my current position, I interpret data frequently	In my current position, I interpret data from industry/institutional sources	In my current position, I analyze data from industry/institutional sources
Agree	75.9%	69.0%	75.9%	72.4%
Neither agree nor disagree	10.3%	24.1%	6.9%	24.1%
Disagree	13.8%	6.9%	17.2%	3.4%

The responses to the survey questions that fell into the segment Data Use: Assessment of Deposit Insurance Administrative Preparation Programs was much weaker in terms of agreement and much stronger with regards to disagreement than the responses to the previous groupings. Table 7 showed that the agreed responses ranged from 28.6% to 65.5% while the disagreed responses were lower than the previous groups ranging from 10.3% to 42.9%. The neither agree nor disagree responses also showed an uptick, significantly ranging from 24.1% to 34.5%. These responses indicate consensus on views related to the organizational training/preparation to analyze data and to interpret data.

Table 7

Data Use: Assessment of Deposit Insurance Administrative Preparation Program

	Organizational training/preparation in deposit insurance administration prepared me for analysis of data from industry sources	Organizational training/preparation in deposit insurance administration allowed me to learn to use statistics software programs to analyze data	Organizational training/preparation in deposit insurance prepared me to effectively use data for computing the deposit insurance coverage limit	Organizational training/preparation in deposit insurance administration allowed me to learn to interpret data reports from industry sources
Agree	65.5%	28.6%	48.3%	62.1%
Neither agree nor disagree	24.1%	28.6%	34.5%	24.1%
Disagree	10.3%	42.9%	17.2%	13.8%

The questions related to organizational training/preparation on communication, planning, and learning on the job illustrated that participants were in agreement in all instances. As shown in Table 8, the agree responses ranged from 58.6% to 89.3% while the neither agree nor disagree and the disagree options ranged from 7.1% to 27.6% and 3.6% and 13.8% respectively. The participants' views support the use of programs as well as learning on the job to build their competencies to conduct the analysis of industry data for computing the deposit insurance coverage limits.

Table 8

Data Use: Assessment of Deposit Insurance Administrative Preparation Program

	Organizational training/preparation in deposit insurance administration prepared me for data analysis interpretation and communication challenges related to the IADI and FSB	Organizational training/preparation in deposit insurance prepared me to effectively use data for planning	Organizational training/preparation in deposit insurance prepared me to communicate data analysis	In order to meet the data use requirements of my current position, I had to learn on the job
Agree	58.6%	62.1%	72.4%	89.3%
Neither agree nor disagree	27.6%	24.1%	13.8%	7.1%
Disagree	13.8%	13.8%	13.8%	3.6%

With respect to coursework in statistics and or data analysis, the participants' responses were collectively higher for neither agree nor disagree and disagree. The responses as illustrated in Table 9 indicate that the organizational training/preparation did not place an emphasis on this particular skill set as a requisite for data analysis. The findings suggest that the organizational training and preparation programs appear to be a contributory factor to staff members' soft opinions regarding the use of the four variables identified in the research questions to compute and or change the coverage limits.

Table 9

Data Use: Assessment of Deposit Insurance Administrative Preparation Program

	Organizational training/preparation in deposit insurance required that I take coursework in statistics and or data analysis	Organizational training/preparation in deposit insurance administration, took one or more courses in statistics and or data analysis
Agree	44.8%	34.5%
Neither agree nor disagree	24.1%	20.7%
Disagree	31.0%	44.8%

The responses to the survey questions that fell into the segment Data Use: Requisite Skills were different to the grouping on training and preparatory programs but consistent with the segments on data use: the importance of data and data use: data tasks. As shown in Table 10, the participants agree responses ranged from 75.9% to 85.7% while the neither agree nor disagree and the disagree responses ranged from 10.7% to 20.7% and 3.4% to 3.6% respectively. These opinions indicate that the participants place greater emphasis on statistical analysis, data analysis, data use and communication of data analysis as key skills to prepare them to use data for the coverage limit computation.

Table 10

Data Use: Requisite Skills

	Statistical analysis for deposit insurance coverage limit evaluation should be taught in deposit insurance programs	Data analysis for deposit insurance coverage limit evaluation should be taught in deposit insurance programs	Data use for deposit insurance coverage limit evaluation should be taught in deposit insurance programs	Communication of data analysis for deposit insurance coverage limit evaluation should be taught in deposit insurance programs
Agree	75.9%	82.1%	82.1%	85.7%
Neither agree nor disagree	20.7%	14.3%	14.3%	10.7%
Disagree	3.4%	3.6%	3.6%	3.6%

The participants' agree responses to the requisite skills to present the data analysis and data use for coverage limits were both at 85.7%. As shown in Table 11, the participants opined that these two areas were key areas related to the coverage limit evaluation and that such programs should be taught in their deposit insurance systems. These opinions suggest that having the requisite skills to compute the coverage limit may not be the only aspect of the computation of coverage limit effort but the skills to present and plan are other relevant areas.

Table 11

Data Use: Requisite Skills

	Presentation of data analysis for deposit insurance coverage limit evaluation in multiple formats should be taught in deposit insurance programs	Data use for deposit insurance coverage limit planning should be taught in deposit insurance programs
Agree	85.7%	85.7%
Neither agree nor disagree	10.7%	10.7%
Disagree	3.6%	3.6%

An examination was conducted on the participants' acknowledgement of their educational degrees that best prepared them to use data in the deposit insurance industry. Using frequency analysis, the master's degree was the single largest degree that in the opinion of the participants best prepared them to use statistical industry data. As shown in Table 12, only two of the six participants, or 33% that has doctorates noted that this level of qualification prepared them to use statistical industry data. Overall, the participants seemingly do not possess the appropriate qualification to use the deposit industry data. This finding on the educational capacity coupled with the soft opinions on the organizational training/preparatory programs may be contributory factors to the acceptance of the null hypotheses for the four research questions.

Table 12

Respondents' First Ranking of Educational Degrees That Best Prepare Them to Use Data

Bachelor's		Master's		Post Master's		Doctorate	
Qty	%	Qty	%	Qty	%	Qty	%
8	36%	9	53%	4	36%	2	33%
22		17		11		6	

The survey incorporated open-ended questions to incorporate participants' suggestions outside of the closed-ended questions. These factors include; (a) other statistical industry data other than the variables tested in the research hypotheses that could be used to compute the coverage limit, (b) other modes of organizational training to use data to compute the coverage limit, (c) the actions pursued with the actual statistical industry data related to the coverage limit, and (d) the limiting factors that restricts the organization's capacity to use statistical industry data.

The alternative data sets to compute the deposit insurance coverage limit that the participants suggested are disclosed in Figure 1. The major factors outside of the aggregate bank risk, fund size, aggregate values of insured deposit and the premium levy include the bank deposit data on the type of depositor-group, the number of deposit accounts and the total value of deposits among others. It may be that that the participants held the view that different depositor groups may reveal the dispersion of the currency-holdings of depositors and perhaps can be used to discriminate which group the emphasis of coverage should be placed and by extension the amount of the coverage limit. The number of deposit accounts appears too abstract on its own and may be used with another factor such as the total value of deposits. The types of deposit instruments may be worthy

of consideration since deposit insurance systems tend to cover some deposit instruments such as domestic deposits and not foreign currency deposits (IADI, 2014).

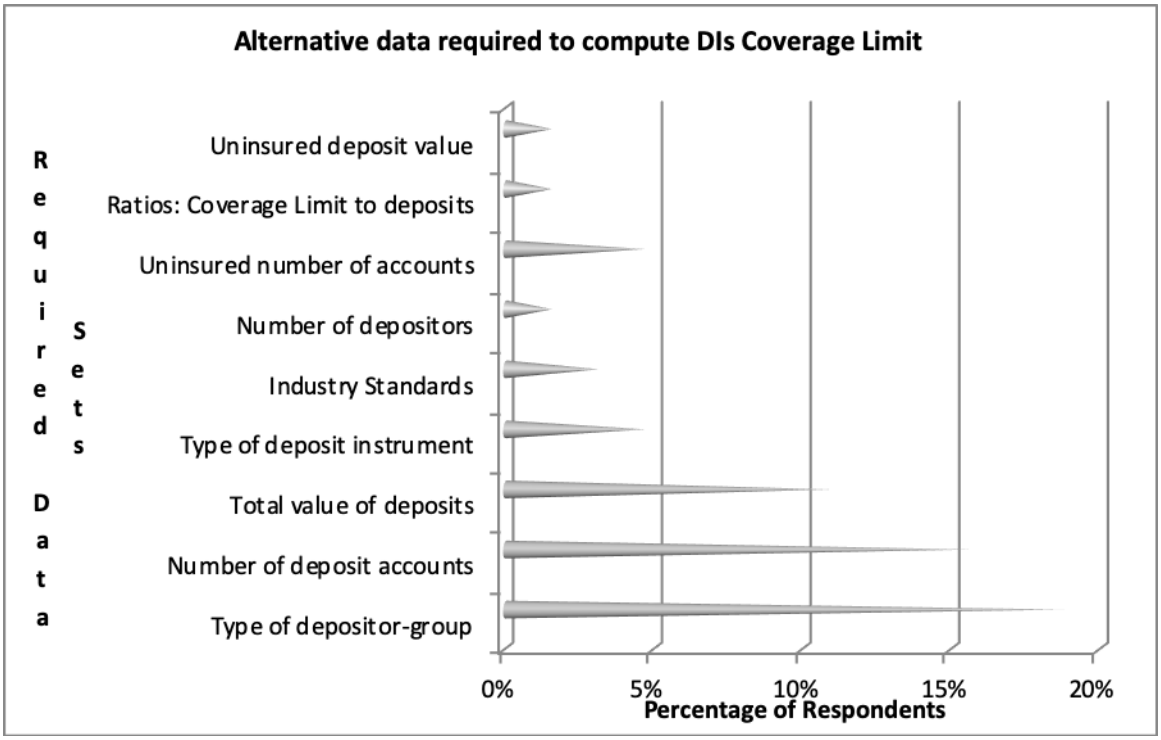

Figure 1. Alternative data required to compute DIs coverage limit.

The participants' consideration for organizational training focused on three main areas namely statistics, outreach programs and economics as illustrated in Figure 2. The computation of the coverage limit may necessitate the application of regression, time series and other statistical methodologies to industry data which is seemingly lacking within the deposit insurance systems. The outreach programs appear to be a mechanism that deposit insurance systems can use to perhaps discuss the possible practical approaches to derive coverage limits.

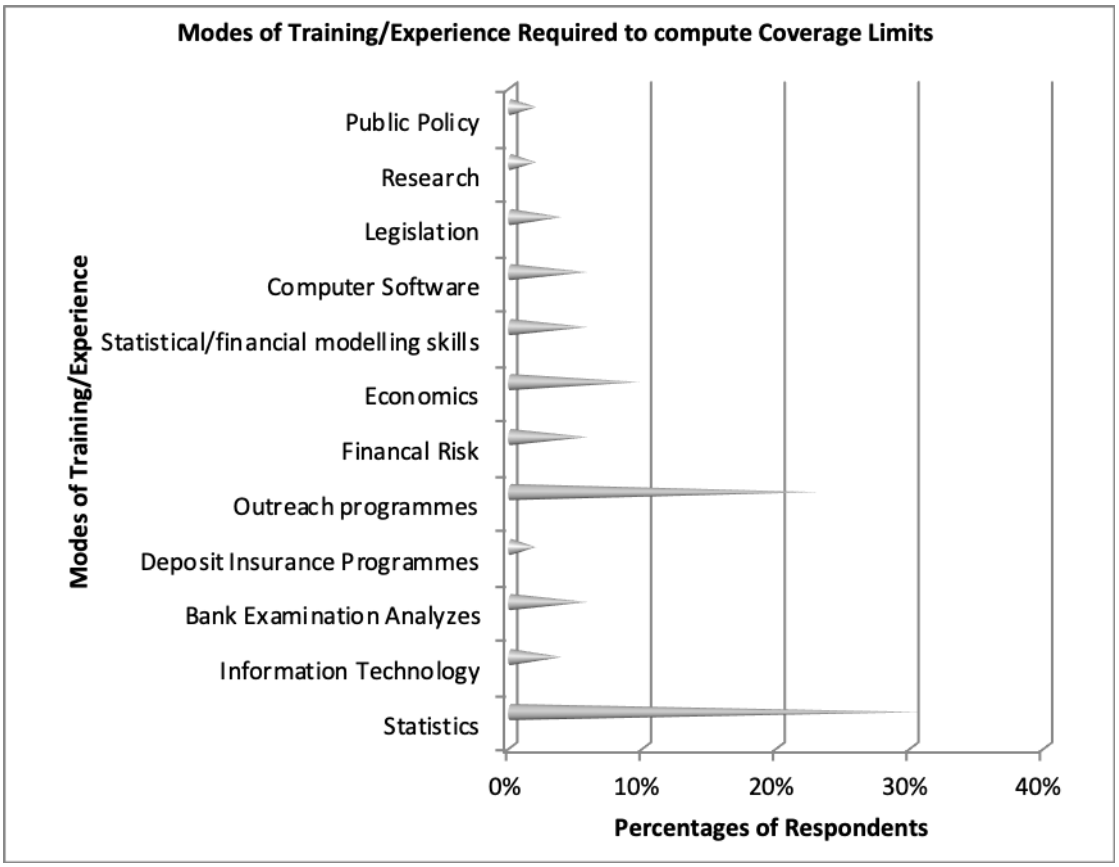

Figure 2. Modes of training/experience required to compute coverage limits.

The FDIC is one of the few deposit insurance systems that perform the functions of both bank regulator and deposit insurer and by virtue of this combined effort is legislatively empowered to receive a broad range of statistical industry data on the US banking system. In other instances, some deposit insurance systems may not have that same level of access to the wide range as is the case of the FDIC. In light of the differences in access to data, the survey participants were asked to comment on their use of statistical industry data, whether limited or broad.

Analysis of the coverage limit level was the major activity concerning the use of the statistical industry data as shown in Figure 3, accounting for 53%. This is followed by

Research and Board Reports which stood at 13% in each instance. Assessing bank risk for provisioning funds, submissions to the bank supervisor and guiding the investment portfolio make up the balance of the uses of the data with each recording a 7% usage factor. These findings are notable on two points. One, it suggests that some level of use is made of the data by some deposit insurers perhaps by those systems that have more access than others. Alternatively, while the Fund Managers may use the data to analyze coverage limits, it seems that the data is neither used to computer nor change the levels. Arguably, while some deposit insurance systems such as those that operate under a Risk Minimizer business model (IADI, 2014), for example the FDIC in the USA, little or no effort appears to be put towards using the data to influence the coverage limit.

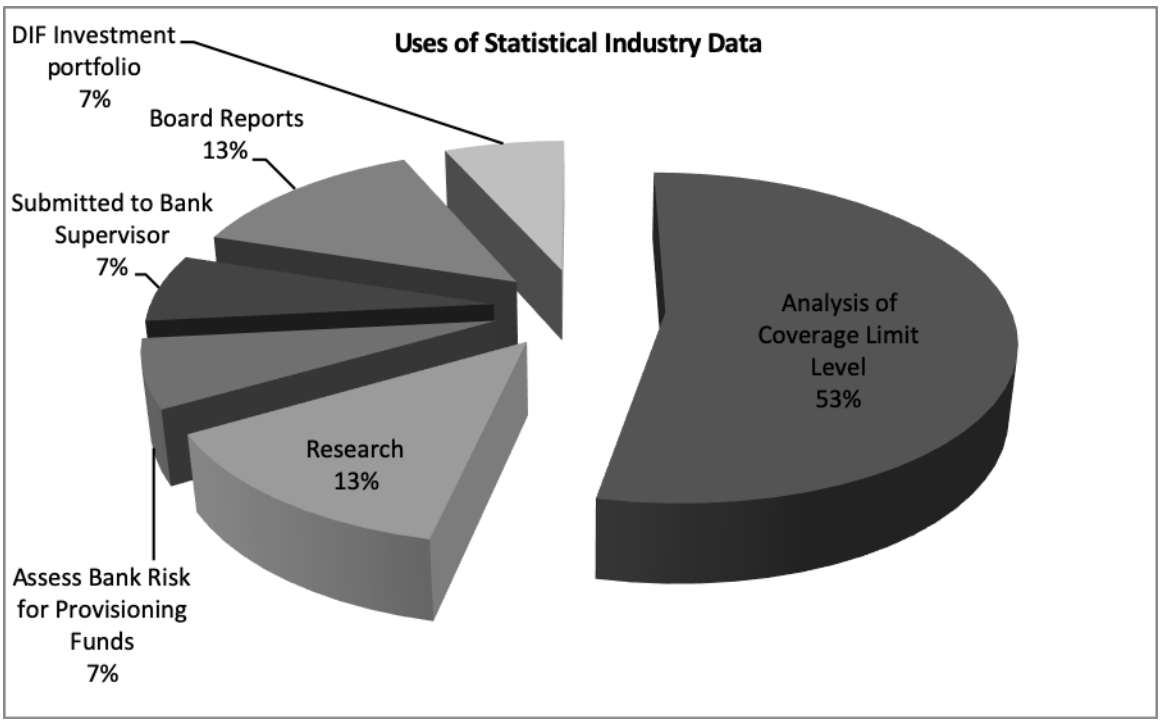

Figure 3. Uses of statistical industry data.

The participants identified several factors that contributed to their lack of data use to compute their coverage limits as shown in Figure 4. The restricted access to bank financial data held by the bank regulator, legislation that limits the deposit insurers' power to use data, and the unreliability of the quality of bank data appears to be the major factors that perhaps have constricted deposit insurers to use data to compute their coverage limits. Other contributory factors include cost, outdated data and the lack of institutional skill to engage statistical and financial modelling. With respect to restricted data access, in some jurisdictions, the data on banks are held by the bank regulator, which may be a separate legal entity than the deposit insurance system that exists in Jamaica where the Bank of Jamaica is the bank regulator (Section 34A of the Bank of Jamaica Act) and the Jamaica Deposit Insurance Corporation is the deposit insurance system. The statistical industry data on the banking system is received and maintained by the Bank of Jamaica.

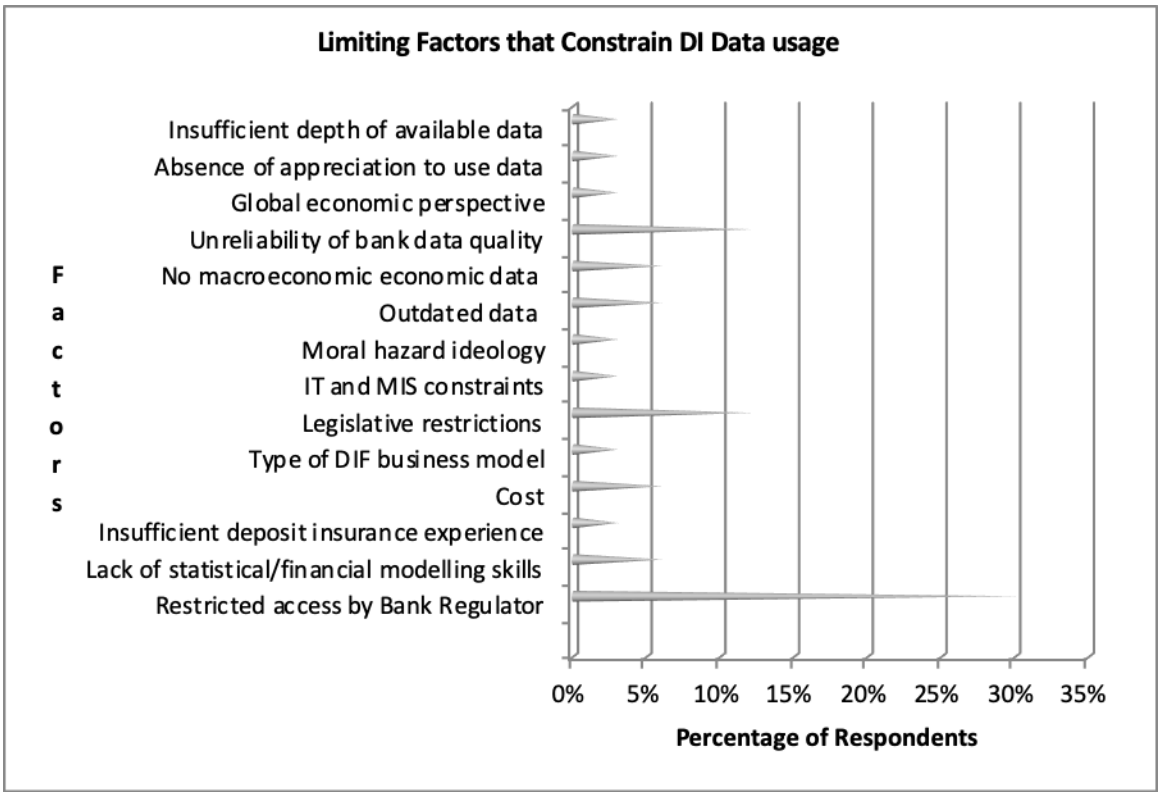

Figure 4. Limiting factors that constrain DI data usage.

Within the European Union, the deposit insurance coverage limits for each jurisdiction within the Union is determined by the European Union Directive 2014/49/EU. This directive seeks to protect depositors of all credit institutions that emphasize a harmonized coverage limit level across the Union. At the establishment of the Directive the coverage limit was €100,000.00. This form of legislative intervention, in the opinion of the European participants, may limit their fund managers' authority to influence the coverage limit within their respective jurisdictions in the European Union and by extension their opinions on the use of statistical industry data. As shown in Figure 5, the IADI members who belong to the European Union that responded to the survey was above 25%.

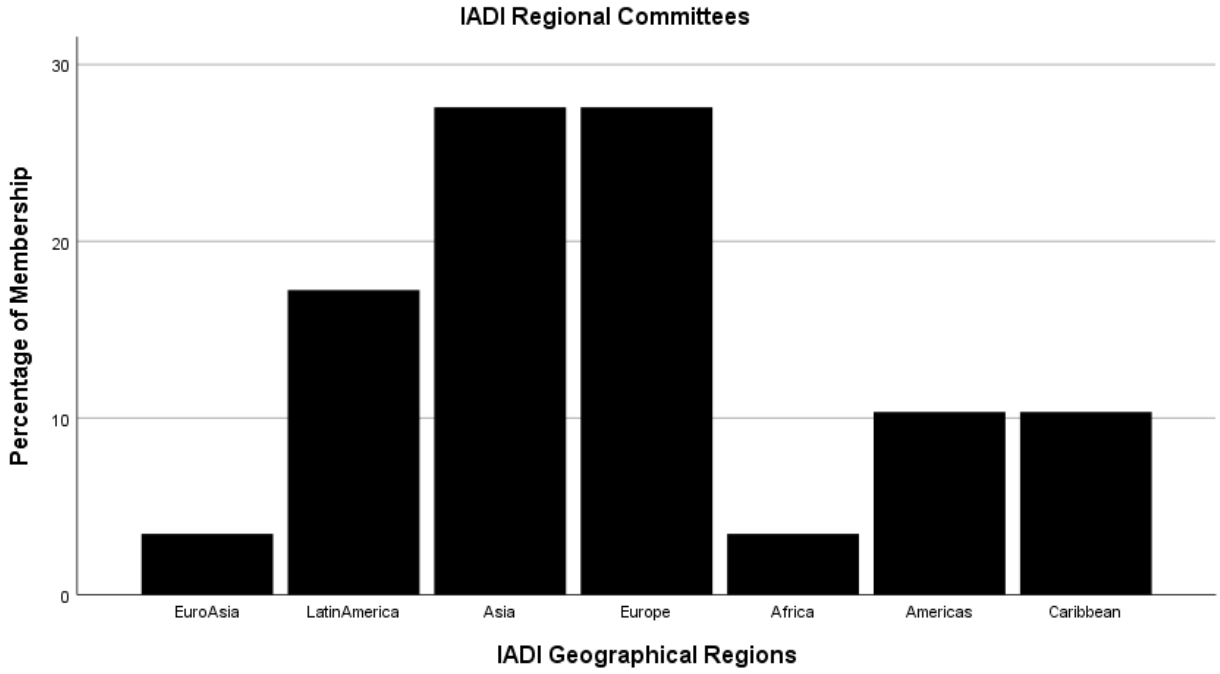

Figure 5. IADI Regional Committees.

Deposit insurance systems are categorized into four groups as defined by the IADI namely the paybox, the paybox plus, the loss minimizer and the risk minimizer (IADI, 2014). These groups are graded by extent of their legislative powers to engage in bank resolutions' methodologies, including deposit insurance payouts (IADI, 2014). These groupings, and by extension their legislative powers, may also influence the level of access to statistical industry data and the use of such data. The paybox system generally has a very narrow mandate and as such may not have access to statistical industry data. The Table 13 shows that only three of the participants were from this group and may have had some minimal impact on the absence of statistical significance related to the four research questions.

Table 13

Mandate Type

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Paybox	3	10.3	10.3	10.3
	Paybox plus	15	51.7	51.7	62.1
	Loss minimizer	7	24.1	24.1	86.2
	Risk minimizer	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

Summary

The findings of the pilot study were statistically significant for the predictor variables namely aggregate currency value of insured deposits, premium levy and aggregate bank risk indicated statistical significance which is less than the $\alpha = .05$. The DIF size, however, appears to demonstrate no significance. The correlation analysis for aggregate currency value of insured deposits, premium levy and aggregate bank risk showed reasonable strength for inclusion in a data set to compute coverage limits. Except for the DIF size, the pilot study results were not consistent with the findings of the four research questions in the survey of the IADI members none of which showed statistical significance. This conflict seems to be influenced by externalities such as lack of access to: (a) the statistical industrial data due to restrictions associated either with legislation or bank regulation, and (b) the appropriate training and or experience in the use of data to compute coverage limits. In Chapter 5, I will highlight the factors that require attention to address these limitations given the import link in contributing to financial stability.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Following the 2007–2008 global financial crisis, the FSB (2012) reached out to financial regulators, including deposit insurance systems, about using industry statistical data to make their deposit insurance coverage limits more reflective of the jurisdictional financial and economic circumstances. The purpose of this cross-sectional study was to examine the relationship between deposit insurance coverage limits and key data variables, the aggregate bank risk, the size of the DIF, the premium levy, and the aggregate currency value of insured deposits of deposit insurance systems within the international arena, using IADI members as the data source. The pilot study component was adopted to test the four predictor variables using FDIC statistical industry data with the dependent variable, coverage limits, during the period 1934 to 2019. In the survey segment of the study, I used a slightly modified version of Sheboy's (2006) administrators' data use survey (ADUS) with a 5-point Likert scale to survey the IADI members from the eight IADI geographical regions: (a) Africa, (b) Asia-Pacific, (c) Caribbean, (d) Eurasia, (e) Europe, (f) Latin America, (g) Middle East and North Africa, and (h) North America (IADI, 2014). The IADI members were invited to participate via the online SurveyMonkey audience pool. The survey spanned 109 days (March 7, 2020 to June 23, 2020) and received 36 responses, which in the cleaning process was adjusted to 29. The extended period allowed for this survey was due to the COVID-19 pandemic remote-work measures implemented by the officers of the IADI member deposit insurance systems. The research used the same four predictor data variables in the pilot

study: (a) aggregate bank risk, (b) DIF size, (c) DIF premium levy, and (d) DIF aggregate currency value of insured deposits. The dependent variable was the deposit insurance coverage limit. Given the exploratory nature of this study, I included three additional predictor variables.

The nature of the pilot study was to use a quantitative nonexperimental cross-sectional study of the FDIC to seek out relationships between the aggregate bank risk, the DIF size, the aggregate currency value of insured deposits, and the premium levy on the dependent variable coverage limit. Multiple regression analysis was used in the pilot study coupled with a correlation analysis, which unveiled statistical significance in explaining the relationship between three of four independent variables and the coverage limit. The relationships between the independent variables aggregate bank risk, the aggregate currency value of insured deposits, and the premium levy and the dependent variable coverage limit indicated that these three variables could be considered as possible inclusions in a statistical or financial model to compute or change the deposit insurance coverage limits of deposit insurance systems.

The main study was a quantitative nonexperimental cross-sectional study of the deposit insurance systems in the global environment. I surveyed members of the IADI to seek out relationships between the participants' opinions on the use of aggregate bank risk, the DIF size, the aggregate currency value of insured deposits, and the premium levy on the dependent variable, coverage limit. A 5-point Likert scale was used in the survey and ordinal regression analysis was applied in the pilot study. The findings revealed no statistical significance for the possible effect of the four independent variables on the

coverage limit. These relationships indicated, in the opinion of the participants, these four variables could not be considered as possible inputs to compute or change the deposit insurance coverage limits of deposit insurance systems.

Interpretation of the Findings

The deposit insurance industry appears to be lacking in the area of using industry statistical data to compute deposit insurance coverage limits, which is done in life and health insurance industries (Valentino, 1954). The lack of statistical industry data at the DIF institutional level weakens the factual representation of the coverage limit and may contradict Diamond & Dybvig's (1983, as cited by Hogan & Luther, 2014) perspective that deposit insurance can mitigate depositors' panic behavior but support the alternative view of increasing moral hazard and consequently bank failures as espoused by Demirguc-Kunt and Kane (2002, as cited by Hogan & Johnson, 2016). Based on the findings, each depositor may instinctively hold to the Merton's (1977) put option ideology and exercise their option to withdraw their deposits at a time when there is an apparent exposure of loss.

The impact of data-driven decision-making on the performance of organizations has taken precedence to incentivize organizational leaders to adopt an evidence-based approach in the conduct of their business affairs (West, 2019). Although there is increasing support for the use of data collection, data analysis, data interpretation, and data-driven decision making in the field of education, there is momentum for a similar philosophy in organizations (Bishop, 2018). The coverage limit in such circumstances would not reflect an optimal level supported by data consistent with the efficient frontier

in the Markowitz (1952) modern portfolio theory (as cited by Rutterford & Sotiropoulos, 2016).

This study examined the use of four variables namely aggregate bank risk, the DIF size, the aggregate currency value of insured deposits and the premium levy on the dependent variable, coverage limit. The FSB made an intervention in its 2012 peer review following the 2007-2008 global financial crisis for deposit insurance systems to make use of industry data to enhance their capacity to respond to financial crises (FSB, 2012). Notwithstanding the fact that data usage to compute deposit insurance coverage limits has been under researched, reference was made to research within the realm of DDDM concept.

The independent variables identified in the four hypotheses for the pilot study of the FDIC except for the DIF size showed statistical significance. The Pearson correlation in the pilot study supported the predictability with the aggregate currency value of insured deposits illustrated the strongest. The study of the IADI members association indicated that their opinions do not support the use of the same four variables which were inconsistent with the findings of the pilot study on the FDIC which was part of the sampled survey respondents. The findings of the survey, except for that associated with the variable the DIF size, are inconsistent with the findings of the pilot study.

The findings of the ordinal logistical regression on the DDDM segments of the survey showed no statistical significance. These findings suggest that the DIF managers do not use statistical industry data for decision making including those related to computing their deposit insurance coverage limits. The lack of use is based on restricted

access to data that is being held by the bank regulator, legislative constraints, and the unreliability of the data produced by the DIF member banks.

The inconsistency between the findings of the pilot study and main study of the IADI participants may be influenced the participants' lack of access to data held by the bank regulator and the legislative factors such as those experienced by DIFs in the EU. DIFs that operate with a paybox mandate had either limited or no access to statistical industry data. This restriction would inhibit the fund managers of paybox and perhaps paybox plus systems to use data to compute coverage limits.

Another limiting factor was the dated and poor quality of the data. The statistical industry data on the banking system is prepared by the member banks of the deposit insurance systems but such data is submitted to the bank regulator that is not timely. While the survey did not identify the specific factors that contributed to the poor quality of the data, the bankers' emphasis on meeting their business objectives may not always align with data requirements of the bank regulator. Given the fact that bank regulators appear to be the main repository of data on the banking system, one of the key statistical industry inputs that can be used to compute coverage limits, the BCBS (2012) bank regulation theory apparently does not fully support the deposit insurance systems to use the data at this time.

Neither the four different types of DIFs as defined by their mandate types (paybox, paybox plus, loss minimizer and risk minimizer) nor the DIFs geographical location within the IADI defined jurisdictions does not seem to have an influence with regards to the use of the statistical industry data to compute and or change the coverage

limit. The pilot study that incorporated the FDIC, which is a risk minimizer, did not consider the use of statistical industry data. Occasionally, mention was made of monitoring trends in the inflation rate along with trends in the coverage limit since its inception in 1933. The FDIC as a risk minimizer does collect statistical industry data but showed no indication of using it to either establish or change it during its 84-year history (which was changed 8 times since its inception in 1934).

Limitations of the Study

The number of responses to the survey was small which was affected by remote working policies adopted by organizations including deposit insurance systems due to the COVID-19 virus that is affecting the world. The IADI population comprised 91 deposit insurers' members (now 86) and the initial G*Power of 74 members was adjusted down to 23 members. A total of 35 were received and after the cleaning process 29 were deemed usable.

While the influence of legislation such as the EU Directive sets a coverage limit for the European Union, this study does not consider the type and level of data used that were used by the appropriate authorities to establish the coverage limit of €100,000.00. The same principle applies to deposit insurance systems which may have limited resolution powers and by extension access to and usage of statistical industry data. This study does not consider whether any and if yes to data use, what specific statistical industry data by the other authorities outside of the European Union region including the financial regulatory system in general that may impact the deposit insurance coverage limit.

I investigated four variables for possible inclusion in the determination of the coverage limit. There may be other variables which may require the intervention of actuaries to examine these and other possible variables that can be used to compute coverage limits. The banking industry is a one area that represents a good starting point to locate the relevant data.

Recommendations

At the organizational level, there is a need to lobby the financial authorities to get their buy-in to the philosophy/concept of data collection, data analysis, data interpretation and data driven decision making a the DIF institutional level to compute and or change the coverage limit. In instances where the deposit insurance system is limited by legislative powers with regards to access to and usage of statistical industry data, some authority within the bank regulatory realm should be empowered to collect, analyze and interpret the data as well as provide the appropriate outputs for decision making particularly with regards to the coverage limits.

During the 2007/2008, some governments around the world opted to increase their coverage limits to 100% of the value of eligible deposits in their respective banking systems (Bitros, 2015; Calomiris & Jaremski, 2016). This reaction, although may have calmed depositors to avoid large simultaneous withdrawals of deposit funds, the strategy's real success cannot be evaluated. Such a measure carried then, and still carries now, huge risks associated with: (a) depositors' expectations post crisis when the coverage limits are adjusted downward or back to their precrisis levels, and (b) depositors' expectations when financial crises arise in the future crises. The application

of data could potentially restrict the usage of such risky, ad hoc, ill-informed measures to stymie the anxiety in the financial markets.

I explored four possible data sets for computing and or changing deposit insurance coverage limits. This investigation does lay the base for future research in more possible data sets and the development of financial and or mathematical models similar to those used in the life and general insurance industry. There is sufficient literature in the life and general insurance industry to support such exploratory work.

Organizational emphasis on training and skills development in the area of the use of industry is another intervention that this study recommends. Collecting, analyzing, interpreting and using the data to inform decisions are the basic elements of ADUS principle. To optimize the benefit of the data usage, however, can really be exploited when the appropriate skill sets are available which should be present within the bank regulatory function assuming it is too costly to execute in the deposit insurance arm of the financial safety net.

Further research is required to explore the four variables used in this study as well as other variables that can be used to compute coverage limits. The policymakers should acknowledge the findings of the FSB 2012 Peer review and take the appropriate actions to execute the recommendations associated with deposit insurance systems.

Implications

This study offers potential for positive social change at the jurisdictions' governance, organization, employee and depositors'/consumers' levels. Jurisdictions at the governance level seem to have a preference to make alterations to the coverage levels

without the use of the DIFs application, or understudy, of the data. This is inconsistent with Madhani (2017) resource-dependent governance theory that advocates the requirement for boards to collect data and build relationships to move the organization in to the realm of maximum performance. The acceptance or full embrace of the DDDM concept is important for policymakers at all levels of the financial services sector. The decisions to change or compute coverage limits that are backed by the use of statistical industry data can result in positive fiscal outcomes with less downside risks. Notwithstanding the fact that the FDIC functions collectively as both a bank regulator and deposit insurer, the adoption of statistical industry data use to derive the deposit insurance coverage limits can enhance bank regulation (BCBS, 2017).

At the organizational level, the purpose of the DIF can be strengthened when the product that is being offered, deposit protection at a certain coverage limit, can be duly supported by application of statistical industry data. Such an organizational framework or practice, can also build consumer and depositor interest in how they save and allocate their funds between the various savings'/investment institutions that make up the financial services sector. The literature on statistical and mathematical models does exist and simply requires further research to explore the appropriate models for the coverage limit.

The IADI can also benefit through the enhancement of international standards for determining the coverage limit. The current IADI standard, Core Principle - Coverage – offers general guidance on the banks that should be covered, the volume of depositors, the credibility of the system and its limited value among others (IADI, 2014). The

principle does not include the use of the industrial statistical data that would inform the level or the limit of the coverage in value terms. This study could reshape this form of thinking and set the framework for developments in valuing the coverage limit.

The investment in training and build-up of the appropriate skills and competencies would create opportunities for employees within the DIFs to execute work in the area of computing the coverage limit. The possible application of the ADUS principle on the employees of the DIF may result in more positive responses related to the importance of data, the importance of data tasks, the importance of deposit insurance administrative preparation programs and the requisite skills.

This study would build on the literature in the field of deposit insurance, particularly in the specific area of the determination of coverage limits. The deposit insurance field in general is under researched and this springboard to put deposit insurance on a stronger footing in the field of academia. Greater research work has the potential to provide the field with more recognition and importance to policymakers going forward.

Conclusion

In my study, I investigated the use of industrial statistical data namely the independent variables aggregate bank risk, the DIF size, the aggregate currency value of insured deposits and the premium levy by deposit insurers in the international arena on the dependent variable, coverage limit. This investigation was executed following a pilot study of the FDIC using the same variables for the period 1934 to 2019. In the pilot study, I utilized multiple regression analysis coupled with correlation analysis. The four

variables showed statistical significance and positive correlation with the independent variable, the coverage limit.

The findings of my study on the IADI members' opinions regarding the use of the same four variables in the pilot study were in direct contradiction of three from the pilot study, which revealed no statistical differences. The null hypotheses were accepted indicating that the IADI members opined that the four variables did not have any influence on the computation of coverage limit. The participants also opined that the use of data was not an important factor to consider in the determination of the coverage limit and there were constraints they encountered in applying the data including limited training, legislative hurdles, and regulatory restrictions.

Despite the contradictions in the findings between the pilot study and the survey of the IADI members with regards to the use of statistical industry data, my study revealed that three of statistical industry data is key to compute and or change deposit insurance coverage limits. It supports the need for future research on other variables including three of the four used in this study to derive deposit insurance coverage limits. The future research could also be expanded to include statistical, mathematical and or financial models to compute the deposit insurance coverage limits.

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Appendix A: IADI Fund Managers Survey Instrument

Sheboy Modified: Data Use: Deposit Insurance Administrators Perspective
Deposit Insurance System/Scheme/Fund Administrator Data Use Survey – modified (Sheboy, 2006)
Directions

Thank you for taking time to complete this survey that should only take 20 minutes of your time.

- Participation in the study is voluntary and all of your responses will be anonymous and will be kept completely confidential.
- You will be asked to indicate the extent of your perceptions regarding data use data tasks, your formal preparation to use data and which skills should be taught in preparation programs.
- Please record your response by clicking on the choice that best represents the extent of your perception regarding data use. The choices include: 1 – strongly disagree, 2 – disagree, 3 – neither disagree or agree, 4 – agree, or 5 – strongly agree.
- The demographic information near the end of the survey will be used for data analysis purposes only and not for identification.
- At the end of the survey, there will be 4 open response questions asking for your input regarding data use.

<u>Data Use: The importance of data</u>

1. I believe that deposit insurance systems which effectively use data to improve staff/institutional performance/achievement are better able to become high performing deposit insurance systems.

   Strongly disagree disagree neither disagree or agree agree strongly agree

2. I believe that one of the most important tools for improving staff/institutional performance/achievement is data use.
   Strongly disagree disagree neither disagree or agree agree strongly agree

3. I believe that data use is important to helping all staff/institution achieve.
   Strongly disagree disagree neither disagree or agree agree strongly agree

4. I believe that data use is important to closing staff/institutional performance/achievement gaps.
   Strongly disagree disagree neither disagree or agree agree strongly agree

5. I believe that data use has become more important for staff/institutional performance/achievement over the past 5 to 7 years.
   Strongly disagree disagree neither disagree or agree agree strongly agree

Data Use: Data Tasks

For your reference:

- *Data analysis* is the manipulation and examination of data to identify patterns, trends, or relationships;
- *Statistical analysis* applies statistical techniques to numerical data analysis;
- *Data interpretation* is to explain or make meaning of the findings from the data analysis to determine the implications, significance, priorities and next steps.

6. In my current position, I work with fellow-staff to analyze statistical industry assessment data to develop prescriptive plans for improvement.
   Strongly disagree disagree neither disagree or agree agree strongly agree

7. In my current position, I interpret data frequently.
   Strongly disagree disagree neither disagree or agree agree strongly agree

8. In my current position, I interpret data from industry/institutional sources.
   Strongly disagree disagree neither disagree or agree agree strongly agree

9. In my current position, I analyze data from industry/institutional sources.
   Strongly disagree disagree neither disagree or agree agree strongly agree

10. I believe that data use has become more important for staff/institutional performance/achievement over the past 5 to 7 years.
    Strongly disagree disagree neither disagree or agree agree strongly agree

Data Use: Assessment of Deposit Insurance Administrative Preparation Programs

For your reference:

- *Data analysis* is the manipulation and examination of data to identify patterns, trends, or relationships;
- *Statistical analysis* applies statistical techniques to numerical data analysis;
- *Data interpretation* is to explain or make meaning of the findings from the data analysis to determine the implications, significance, priorities and next steps.

11. I believe that my organizational training / preparation in deposit insurance administration prepared me for analysis of data from industry/institutional sources.
    Strongly disagree disagree neither disagree or agree agree strongly agree

12. As part of my organizational training / preparation in deposit insurance administration, I learned to use a statistics software program to analyze data.
    Strongly disagree disagree neither disagree or agree agree strongly agree

13. I believe that my organizational training / preparation in deposit insurance, prepared me to effectively use data for computing the deposit insurance coverage limit.
    Strongly disagree disagree neither disagree or agree agree strongly agree

14. As part of my organizational training / preparation in deposit insurance administration, I learned to interpret data reports from industry/institutional sources.
    Strongly disagree disagree neither disagree or agree agree strongly agree

15. I believe that my organizational training / preparation in deposit insurance administration prepared me for the data analysis interpretation and communication challenges in deposit insurance/coverage limits brought about by the IADI standards and/or the FSB Peer Review post the 2007/2008 global financial crisis.
    Strongly disagree disagree neither disagree or agree agree strongly agree

16. I believe that my organizational training / preparation in deposit insurance prepared me to effectively use data for planning.
    Strongly disagree disagree neither disagree or agree agree strongly agree

17. I believe that my organizational training / preparation in deposit insurance prepared me to communicate data analysis to multiple constituencies/stakeholders.
    Strongly disagree disagree neither disagree or agree agree strongly agree

18. I believe that in order to meet the data use (analysis, interpretation, and communication) requirements of my current position, I had to learn on the job.
    Strongly disagree disagree neither disagree or agree agree strongly agree

19. I believe that my organizational training / preparation in deposit insurance administration required that I take coursework in statistics and/or data analysis.
    Strongly disagree disagree neither disagree or agree agree strongly agree

20. As part of my organizational training / preparation in deposit insurance administration, I took one or more courses in statistics and/or data analysis.
    Strongly disagree disagree neither disagree or agree agree strongly agree

Data Use: Requisite Skills

For your reference:

- *Data analysis* is the manipulation and examination of data to identify patterns, trends, or relationships;
- *Statistical analysis* applies statistical techniques to numerical data analysis;
- *Data interpretation* is to explain or make meaning of the findings from the data analysis to determine the implications, significance, priorities and next steps.

21. The following skill should be taught in deposit insurance administration preparation programs – statistical analysis for deposit insurance coverage limit evaluation.
    Strongly disagree disagree neither disagree or agree agree strongly agree

22. The following skill should be taught in deposit insurance administration preparation programs – data analysis for deposit insurance coverage limit evaluation.
    Strongly disagree disagree neither disagree or agree agree strongly agree

23. The following skill should be taught in deposit insurance administration preparation programs – data use for deposit insurance coverage limit evaluation.
    Strongly disagree disagree neither disagree or agree agree strongly agree

24. The following skill should be taught in deposit insurance administration preparation programs – communication of data analysis for deposit insurance coverage limit evaluation.
    Strongly disagree disagree neither disagree or agree agree strongly agree

25. The following skill should be taught in deposit insurance administration preparation programs – presentation of data analysis for deposit insurance coverage limit evaluation in multiple formats (e.g. written reports, graphs).
    Strongly disagree disagree neither disagree or agree agree strongly agree

26. The following skill should be taught in deposit insurance administration preparation programs – data use for deposit insurance coverage limit planning.
    Strongly disagree disagree neither disagree or agree agree strongly agree

Data Use: Computing/Changing Deposit Insurance Coverage Limits

The following focuses only on the computation/derivation of the value of the coverage limit as the legislative power to change the limit may reside in a higher authority and not the deposit insurance system.

27. Based on my current position and experience, the following statistical deposit insurance statistical industry datum, **the aggregate risk profile of the fund member banks**, can be used to compute and/or change the deposit insurance coverage limit:
    Strongly disagree disagree neither disagree or agree agree strongly agree

28. Based on my current position and experience, the following statistical deposit insurance statistical industry datum, **the size of the deposit insurance fund**, can be used to compute and/or change the deposit insurance coverage limit:
    Strongly disagree disagree neither disagree or agree agree strongly agree

29. Based on my current position and experience, the following statistical deposit insurance statistical industry datum, **the aggregate domestic currency value of insured deposits**, can be used to compute and/or change the deposit insurance coverage limit:
    Strongly disagree disagree neither disagree or agree agree strongly agree

30. Based on my current position and experience, the following statistical deposit insurance statistical industry datum, **the premium levy rate**, can be used to compute and/or change the deposit insurance coverage limit:
    Strongly disagree disagree neither disagree or agree agree strongly agree

31. Based on my current position and experience, the following statistical deposit insurance statistical industry datum, **the modal domestic currency value of insured deposits (the deposit value that appears the most frequent across the fund member banking system)**, can be used to compute and/or change the deposit insurance coverage limit:
    Strongly disagree disagree neither disagree or agree agree strongly agree

32. Based on my current position and experience, the following statistical deposit insurance statistical industry datum, **the average domestic currency value of insured deposits (the total domestic currency value of insured deposits divided by the associate number of accounts to arrive at an average domestic currency value of insured deposits)**, can be used to compute and/or change the deposit insurance coverage limit:
    Strongly disagree disagree neither disagree or agree agree strongly agree

Demographic Information

Please answer as many questions as you feel comfortable. The demographic information will be used for data analysis purposes only and not for identification in order to understand the responses more fully.

33. Indicate your job title in your deposit insurance organization?
    Director
    Chief Executive Officer / General Manager
    Head, Research and Development
    Other (please specify)

34. Insert the year that your deposit insurance organization was created/established by legislation?

35. Which organization's ownership and or control type best describes your deposit insurance system?
    Privately established and administered
    Government legislated and administered
    Government legislated and privately administered
    Central Bank administered
    Other (please specify)

36. Indicate the type of deposit insurance mandate of your deposit insurance system
    Pay-Box
    Pay-Box Plus
    Loss Minimizer
    Risk Minimizer
    Other (please specify)

37. How many years of work-experience do you have (including this year) with your deposit insurance system?
    0-5
    6-10
    11-15
    16-20
    21 or more

38. Please check all the educational degrees you have attained:
    Bachelors
    Masters

Specialist (post-Masters) or second Masters
Doctorate

39. What type of deposit insurance funding does your deposit insurance system uses?
Ex Ante
Ex Post
Other (please specify)

40. Which **primary** IADI Regional Committee does your deposit insurance system represent? (Select one only)
Africa
Americas
Asia
Caribbean
Europe
Euro-Asia
Latin America

41. Please rank your educational degree(s) in the order that represents the best preparation to use data with 1 being the best, 2 the second best, etc.
Bachelors
Masters
Specialist (post-Masters) or second Masters
Doctorate

42. Who is primarily responsible for analyzing deposit insurance coverage data in your organiation?
Director
Chief Executive Officer / General Manager
Head, Research and Development
Other (please specify)

43. Since the legal establishment of your deposit insurance system, how many times has the deposit insurance coverage limit been changed?
Times

44. In what year was the last change made to your deposit insurance system's coverage limit?

45. Who is **primarily** responsible for interpreting deposit insurance coverage data in your organization?
    Director
    Chief Executive Officer / General Manager
    Head, Research and Development
    Other (please specify)

Open Response Questions

Please consider providing additional, specific feedback regarding data use in deposit insurance. Thank you in advance for your willingness to provide additional information and thank you for taking time to complete this survey.

46. Considering the use of data to compute and or change deposit insurance coverage limits, what other specific statistical industry data do you think deposit insurance administrators need to know more about or to use to compute their deposit insurance organization's coverage limits? State only 5 industry data sets.

    Data set 1.

    Data set 2.

    Data set 3.

    Data set 4.

    Data set 5.

47. In addition to your formal deposit insurance administrative preparation program/(s), what other modes of training or experiences (educational, professional or personal) contributed to your preparation to use data to compute your deposit insurance organization's coverage limit? State only 5 training programs or experiences.

    Training Program/Experience 1.

    Training Program/Experience 2.

    Training Program/Experience 3.

    Training Program/Experience 4.

    Training Program/Experience 5.

48. At your deposit insurance organization, what is done with statistical industry data related to your deposit insurance organization's coverage limit and how are they used?

What is done with statistical industry data:

How are they used:

49. What are the limiting factors, if any, that restricts or constrains your organization's capacity and your ability to use statistical industry data to compute your organization's deposit insurance coverage limit? Identify 5 limiting factors, should these exist.

Limiting Factor 1.

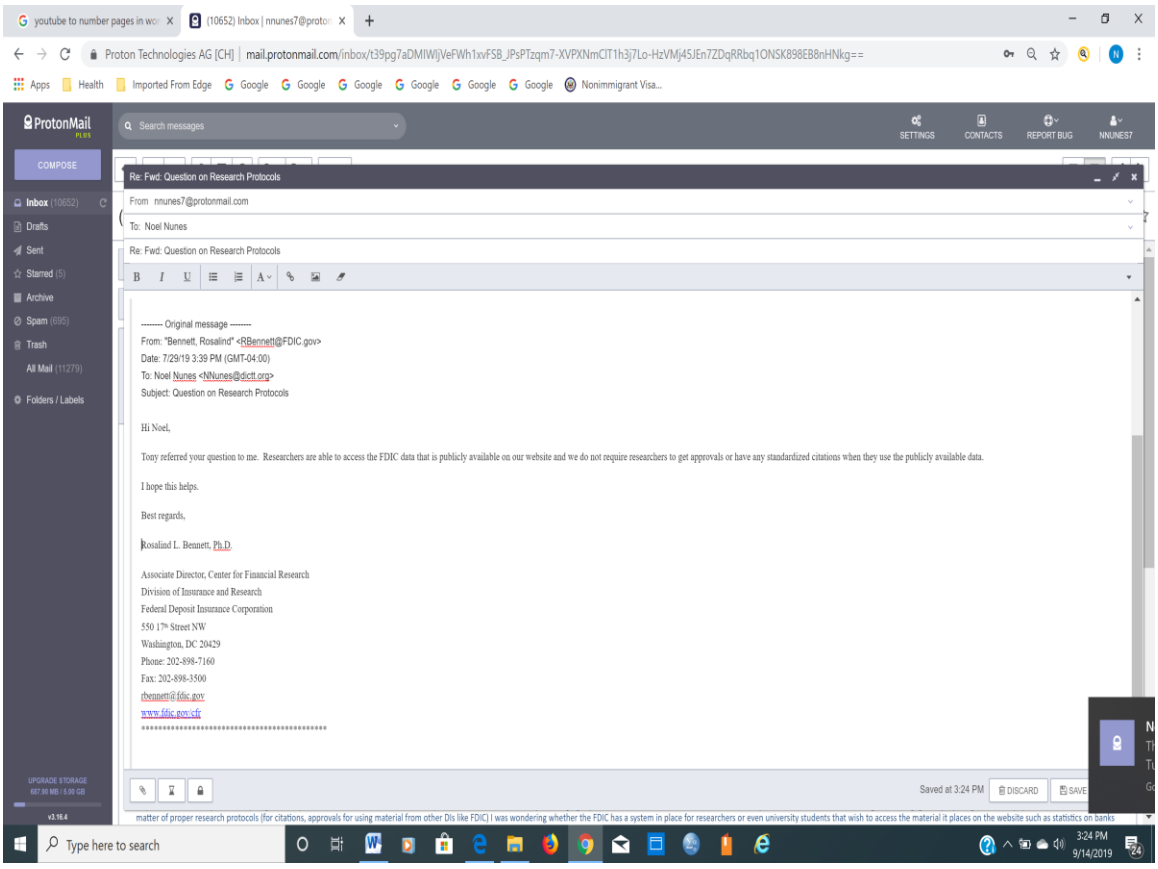
Limiting Factor 2.

Limiting Factor 3.

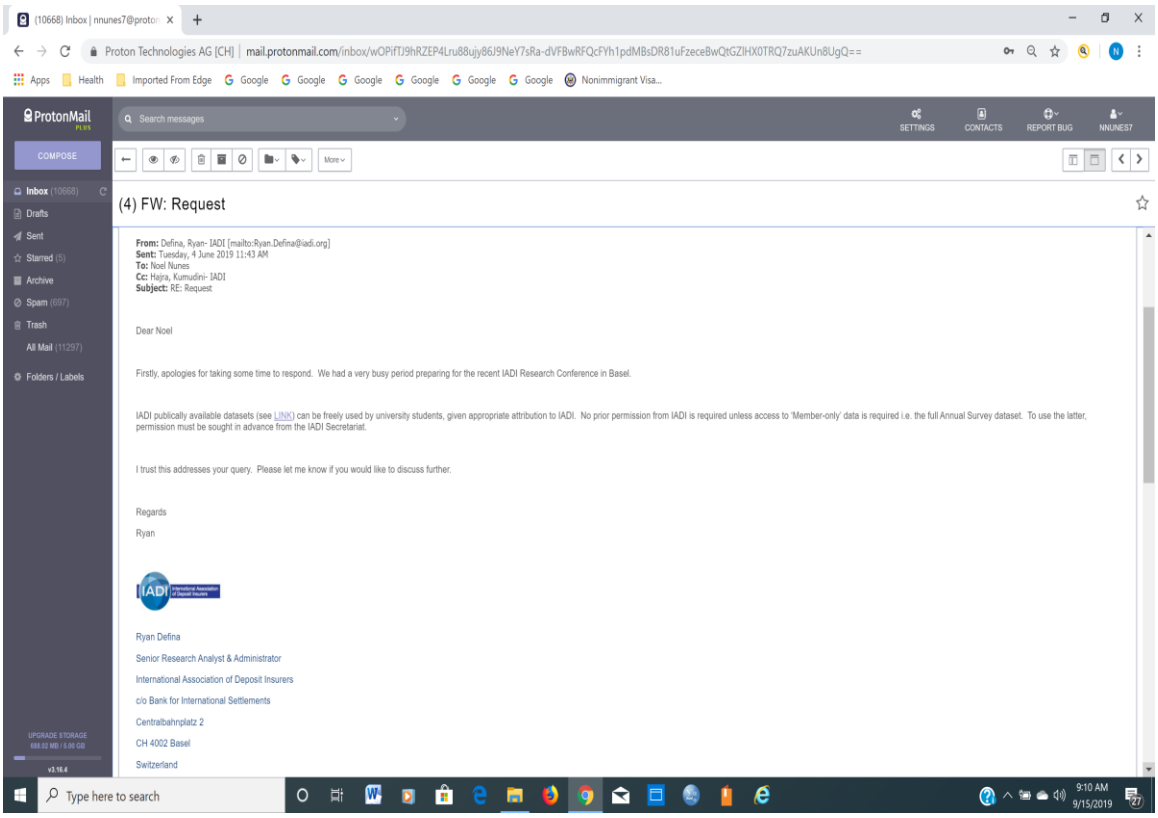
Limiting Factor 4.

Limiting Factor 5.

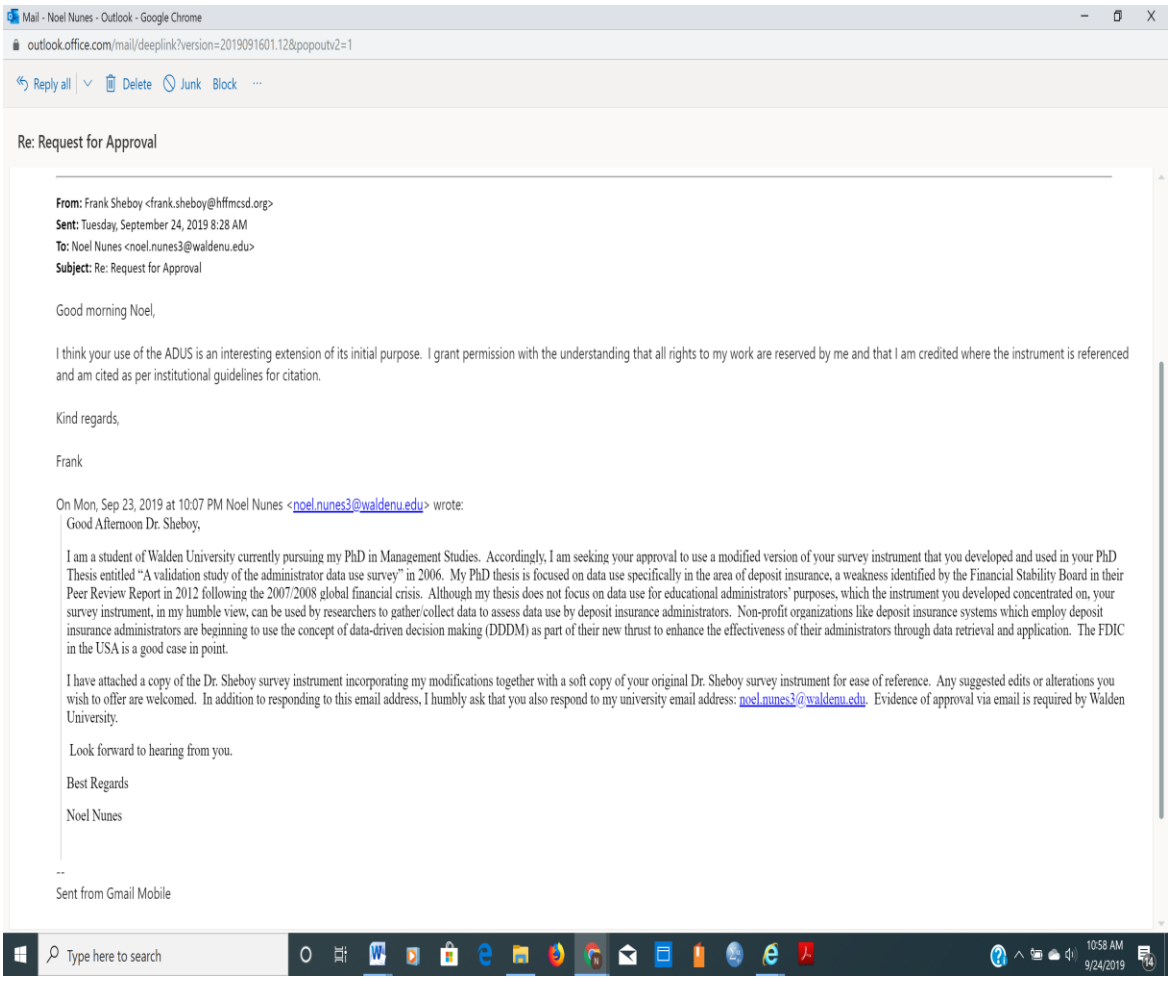
Appendix B: FDIC Approval for Data Use



Appendix C: IADI Approval for Data Use



Appendix D: Approval for Survey Instrument Use



Mail - Noel Nunes - Outlook - Google Chrome

outlook.office.com/mail/deeplink?version=2019091601.12&popoutv2=1

Reply all | Delete | Junk | Block | ...

Re: Request for Approval

From: Frank Sheboy <frank.sheboy@hffmcsd.org>
Sent: Tuesday, September 24, 2019 8:28 AM
To: Noel Nunes <noel.nunes3@waldenu.edu>
Subject: Re: Request for Approval

Good morning Noel,

I think your use of the ADUS is an interesting extension of its initial purpose. I grant permission with the understanding that all rights to my work are reserved by me and that I am credited where the instrument is referenced and am cited as per institutional guidelines for citation.

Kind regards,

Frank

On Mon, Sep 23, 2019 at 10:07 PM Noel Nunes <noel.nunes3@waldenu.edu> wrote:

Good Afternoon Dr. Sheboy,

I am a student of Walden University currently pursuing my PhD in Management Studies. Accordingly, I am seeking your approval to use a modified version of your survey instrument that you developed and used in your PhD Thesis entitled "A validation study of the administrator data use survey" in 2006. My PhD thesis is focused on data use specifically in the area of deposit insurance, a weakness identified by the Financial Stability Board in their Peer Review Report in 2012 following the 2007/2008 global financial crisis. Although my thesis does not focus on data use for educational administrators' purposes, which the instrument you developed concentrated on, your survey instrument, in my humble view, can be used by researchers to gather/collect data to assess data use by deposit insurance administrators. Non-profit organizations like deposit insurance systems which employ deposit insurance administrators are beginning to use the concept of data-driven decision making (DDDM) as part of their new thrust to enhance the effectiveness of their administrators through data retrieval and application. The FDIC in the USA is a good case in point.

I have attached a copy of the Dr. Sheboy survey instrument incorporating my modifications together with a soft copy of your original Dr. Sheboy survey instrument for ease of reference. Any suggested edits or alterations you wish to offer are welcomed. In addition to responding to this email address, I humbly ask that you also respond to my university email address: noel.nunes3@waldenu.edu. Evidence of approval via email is required by Walden University.

Look forward to hearing from you.

Best Regards

Noel Nunes

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Sent from Gmail Mobile

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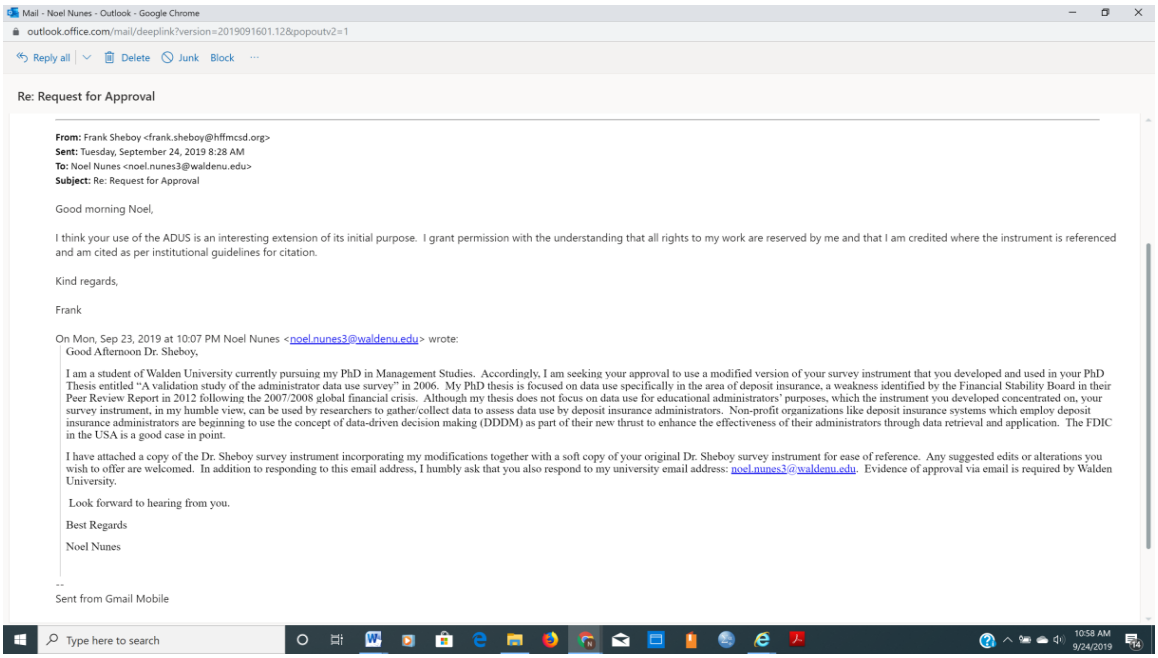
9/24/2019



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9/24/2019