THE EFFECTS OF CAPITAL STRUCTURE ON ACCRUAL- AND CASH-FLOW-BASED PERFORMANCE OF US BANKS

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DEDICATION

My thesis is dedicated to my dear parents who are my dream personalities.

ABSTRACT

This study investigates the *inverted-U* effects of capital structure on accrual- and cash-flow-based performance of US banks from 1980 to 2017. Capital structure is measured by the debt to assets ratio, accrual-based performance is measured by return on assets, and cash-flow-based performance by cash-flow on assets. We use panel data analysis - pooled ordinary least square, fixed effects, and random effects models. Collectively, our results support the *inverted-U* effects of capital structure on accrual- and cash-flow-based performance. Cash-flow-based performance is higher than accrual-based performance at all levels of debt. Cash-flow-based performance recommends a higher level of debt in the optimum capital structure. We also find that the following bank characteristics are significant in explaining the relationship between capital structure and bank performance: size, asset turnover, net loans to deposits, and loan loss reserves to assets.

Keywords: Capital Structure, Accrual-based Performance, Cash-flow-based Performance, Debt to Assets Ratio, Inverted-U Effects

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LIST OF ABBREVIATIONS

AMEX	The American Stock Exchange
ASST	Asset Turnover Ratio
BHC	Bank Holding Company
CF	Cash-Flow
CFO	Chief Financial Officer
COA	Cash-Flow on Assets
DEA	Data Envelopment Analysis
EAIT	Earnings after Interest and Tax
EBIT	Earnings before Interest and Tax
EPS	Earnings per Share
FASB	Financial Accounting and Standard Board
FE	Fixed Effects
GMM	Generalized Method of Moments
LLP	Loan Loss Provision
LLRA	Loan Loss Reserves to Assets
MM	Modigliani and Miller
NCO	Net Charge-Off
NI	Net Income
NLA	Net Loans to Assets
NLD	Net Loans to Deposits
NOI	Net Operating Income
NPV	Net Present Value
NYSE	New York Stock Exchange
OLS	Ordinary Least Square
RE	Random Effects
ROA	Return on Assets
ROE	Return on Equity
R&D	Research and Development
SA	Securities to Assets Ratio
TA	Total Assets
TDA	Total Debt to Assets ratio
WACC	Weighted Average Cost of Capital
2SLS	Two Stage Least Square

1. INTRODUCTION AND PROBLEM STATEMENT

1.1 INTRODUCTION

Capital structure decisions (that is, decisions about the proportion of debt and equity) are essential for firms to finance their assets, daily operations, and future expansions (Chadha & Sharma, 2015). It is evident that the relationship between capital structure and firm performance is a central part of corporate finance (Williamson, 1988). The effect of capital structure on firm value was first theorized by Modigliani and Miller (1958), and later extended by Donaldson (1961), Modigliani and Miller (1963), Baxter (1967), Jensen and Meckling (1976), and Myers (1984). Modigliani and Miller (1958) assert that a firm's choice of debt or equity does not affect firm value in a perfect market (with no tax, no transaction cost). After relaxing the assumption of a tax-free market, Modigliani and Miller (1963) stipulated that the higher the debt level, the higher the firm value because of the interest tax shield. This suggests that 100% debt is optimum[1].

Later, Baxter (1967) introduced bankruptcy cost[2], and Jensen and Meckling (1976) introduced agency costs[3] to the capital structure theory. They agree that debt increases the interest tax shield, however, they argue that debt also increases costs (financial distress cost: agency cost of debt and bankruptcy cost). These costs increase

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[1] The debt-equity proportion at where firm value is maximum, known as optimum capital structure. Since 100% debt is not practical, it implies a possible maximum level of debt.

[2] Bankruptcy cost is the likelihood that a firm becomes insolvent due to inability to pay its financial obligations (the debt and interests).

[3] Agency costs arise from the conflict of interests when an agent works on behalf of a principal. In a business firm, managers work as the agents of the shareholders (principal). Agency costs arise when managers are not shareholders. So, the higher the external equity, the higher the agency costs. On the other hand, debt creates a financial obligation, bankruptcy cost, and the potential loss of salary and jobs, thereby, forcing the manager to improve firm performance. However, if a firm highly depends on debt, then debt-holders may influence managers to take such decisions that are better for the debt-holders and costly for the equity-holders. Hence, capital structure decisions may affect firm performance.

with a firm's debt, thereby reducing firm value (financial distress cost is deducted from firm value). Thus, increasing debt will not increase firm value forever. They suggest that firm value would be maximum at the level of debt where the marginal benefit of tax (interest tax shield) is equal to the marginal financial distress cost. This suggests that in the presence of financial distress cost, 100% debt is not optimum. Rather, the optimum capital structure that gives maximum firm value is somewhere between zero to 100% debt. This is known as the *trade-off theory*[4]of capital structure, which suggests an *inverted-U* relationship between capital structure and firm value.

Donaldson (1961) and Myers (1984), on the other hand, propose the pecking order theory, suggesting a hierarchy (on the basis of actual costs) for financing choices. They argue that firms prefer retained earnings to external financing (issuing new debts or stocks) because financing from retained earnings has the least tangible cost while external financing involves underwriting and administrative costs. Since the cost of retained earnings is less than that of debt, the firm value would be higher if a firm finances from retained earnings rather than debt. They suggest that if a firm fails to finance from retained earnings, then the debt is preferable to equity due to the interest tax shield and less administrative costs. They suggest that when a firm finances from debt, it is consistent with the *trade-off theory* of capital structure. Donaldson (1961) and Myers (1984)conclude that if a firm follows this hierarchy for financing, the firm value would be

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[4]Jensen and Meckling (1976) discuss the agency problem in two ways: *equity-holders versus managers* and *equity-holders versus debt-holders*. In the former, they state that a higher proportion of outside equity (equity-holders other than managers) insists on managers pursuing their personal interest, e.g., managers may exercise less work effort or choose fewer output-input decisions. It reduces firm value. However, if the firm finances from debt, it creates a financial obligation, bankruptcy cost, and the potential loss of salary and jobs, thereby, forcing the manager to improve firm performance. So, debt increases firm value. In the latter, they state that if equity-holders largely depend on debt, then debt-holders may increase the interest on debt, which is better-off for the debt-holders and worse for the equity-holders. So, debt decreases firm value. The *trade-off theory* of capital structure states how much of debt a firm should choose to maximize firm value by balancing the benefits and costs that have arisen from financing decisions.

at least the same as it would be from following the *trade-off theory*. They treat equity as the last resort of financing, as it is the most expensive.

The *trade-off theory* suggests that in a real market (in the presence of financial distress cost), there is an *inverted-U* relation between capital structure (debt) and firm value, i.e., debt has a positive effect on firm value if the benefit of debt (interest tax-shield) exceeds the financial distress cost (bankruptcy cost and agency cost of debt) and a negative effect if the financial distress cost exceeds the benefit of debt. Empirically, researchers have used performance as a proxy of firm value because firm value is the present value of future income and firm value is highly correlated to its performance (Berger & Bonaccorsi di Patti, 2006). Based on this theory, we expect that there are *inverted-U* effects of capital structure on firm performance.

Since 1958, several studies have been conducted to test this theory. All empirical studies consider accrual-based performance, such as earnings per share (EPS), return on assets (ROA), return on equity (ROE), profit margin, growth, and Tobin Q. It should be noted that cash-flow (CF)[5] is also a performance measure it shows the ability to pay current expenses, the ability to pay future dividends, and the ability to pay back interest on the debt and principal. A firm failing to pay its financial obligations promotes bankruptcy cost. Therefore, stakeholders (especially investors and lenders) typically use CF as a performance indicator to predict a firm's prosperity. However, no study (either on financial nor on non-financial firms) in the capital structure has considered CF as a performance measure. Hence, evidence of the effects of capital structure on CF-based

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[5]Ross, Westerfield, and Jordan (2013) define cash-flow (CF) as the difference between how many dollars come in and how many dollars go out of a firm in a given year. It helps investors to forecast future dividends, the ability to pay off debt, interest, and other financial obligations. There are three categories of CF: operating, financing, and investment. According to the Financial Accounting Standards Board (issued 11/87), CF statements have been part of annual financial statements since July 1988. This study discusses operating CF which refers to the CF results from the firm's day-to-day operations of selling and producing.

performance (such as CF on assets (COA)[6]) would contribute to the literature. The goal of this study is to examine the *inverted-U* effects of capital structure on bank performance (both accrual- and CF-based). This study also compares the effects of capital structure on accrual-based performance (ROA) to the effects on CF-based performance (COA). Finally, this study also checks whether accrual-based performance (ROA) suggests a different optimum capital structure in comparison to CF-based performance (COA).

We consider the banking industry only, as banks are subject to similar regulatory constraints, exhibit similar agency costs, and are highly levered (Berger & Bonaccorsi di Patti, 2006; Skopljak & Luo, 2012). For example, banks would need to purchase deposit insurance, maintain a certain level of capital requirement ratios, and report a significant amount of loan loss provision (LLP) and net charge-off (NCO). Other non-banking firms are not as homogenous in characteristics as banks are. However, it is also documented that there are considerable similarities between the capital structure of banks and of non-financial firms (Gropp & Heider, 2010).

Based on the *trade-off theory* of capital structure, we expect that the relationship between capital structure and the performance of US banks is an *inverted-U* shape. We use a quadratic function to represent this *inverted-U* relation. We conduct panel regression analysis - pooled ordinary least square (OLS), fixed effects (FE), and random effects (RE) models. We find that both FE and RE models support *the inverted-U* effects of capital structure on accrual- and CF-based performance. Also, CF-based performance is higher than accrual-based performance at all levels of debt in the capital structure. In addition, we find that CF-based performance advocates a higher level of debt in the

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[6] Cash-flow (CF) on assets is measured by dividing CF by total assets where the code of CF in COMPUSTAT is [cfl].

optimum capital structure. Lastly, we check the reverse causality effects (the effects of performance on the capital structure) and find no significant results.

The outline of this thesis is as follows. Section 1 discusses the problem statement and objectives of this study, and the rationality of using CF as a performance measure. The theoretical background of and empirical literature on capital structure and firm performance are discussed in section 2. Section 3 discusses the questions this study is attempting to answer. Methods, and empirical results and discussion are presented in sections 4 and 5, respectively, and section 6 concludes the thesis.

1.2 PROBLEM STATEMENT AND OBJECTIVES

Capital structure theory relates firm value to its capital structure. However, empirical studies relate firm performance to its capital structure because firm value is the present value of future income (Berger & Bonaccorsi di Patti, 2006). Thus, income (as a performance measure) would be highly correlated with firm value[7]. This study also relates firm performance to its capital structure.

Since the emergence of the capital structure theory, several empirical studies have been conducted to look at the effects of capital structure on firm performance. A few empirical studies have focused on US banks. Akhigbe and McNulty (2003a) investigate the performance of small US banks (total assets under $500 million) in 1990 - 1996. They measure performance by earnings before interest and tax (EBIT) of bank *i* against the best performing bank. Using cross-sectional analysis, they find that relatively small banks are earning more income than large banks. They, however, do not relate performance to banks' capital structure. Berger and Bonaccorsi di Patti (2006) test agency cost theory on

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[7] Theoretically, the firm value is net income (NI) divided by weighted average cost of capital (WACC), $\frac{NI}{WACC}$. So, NI is directly related to firm value.

US banks. They use profit efficiency (ratio of profit[8] of bank *i* to that of the maximum profit among the banks) as a performance measure, and the equity to total asset ratio as a capital structure measure. They find that the higher the debt (lower equity), the higher the performance, as the introduction of debt reduces the agency cost of equity and increases pressure on the manager to perform better. On the other hand, Tregenna (2009) investigates the performance of US banks in the pre-crisis period (1994 - 2005). She measures performance by ROA and ROE. She does not relate performance to capital structure. Berger and Bouwman (2013) investigate the effects of capital structure on bank performance in the pre-crisis, crisis, and normal periods from 1984 to 2010. They measure performance by the probability of survival and market share. They also do not consider CF-based performance or the *inverted-U* relationship.

However, Sloan (1996) measures accrual-based income (net income) and CF-based income (CF) in order to predict the future returns of US firms[9]. He also does not relate performance to the capital structure.

Moreover, Akhigbe, McNulty, and Stevenson (2017) have investigated the performance of US bank holding companies (BHCs) in the pre-crisis (1996 - 2006) and post-crisis (2007 - 2010) periods. They measure performance by ROA and ROE. However, they do not consider CF as a performance measure or relate performance (ROA and ROE) to capital structure. Other studies on European commercial banks (Barry, Lepetit, & Tarazi, 2011) and on Asian developing countries banks (Lin, Doan, & Doong, 2016) only investigate ownership structure in relation to asset risk and default risk (Barry

[8] Profit is measured by deducting total expenses from total revenues.
[9] He considers all available firms data from 1962 to 1991. However, data of accruals are not available for banks, life insurance, and casualty firms. Hence, he excludes these firms.

et al., 2011) and cost efficiency (Lin et al., 2016), respectively. They do not consider the capital structure issue as it relates to accrual- and CF-based performance.

The studies on non-banking firms that investigate the effects of capital structure on performance have also used accrual-based performance measures, such as EPS (Salim & Yadav, 2012), pre-tax profit margin (Krishnan & Moyer, 1997; Salim & Yadav, 2012), sales growth (Margaritis & Psillaki, 2010), and Tobin Q (Salim & Yadav, 2012). However, there is no study (either banks or non-banks) that uses CF as a performance indicator in investigating the effects of capital structure on firm performance. This study endeavours to fill this gap in the capital structure and firm performance literature. In addition, this study looks into the *inverted-U* effects of capital structure on the accrual- and CF-based performance of US banks. In the process, this study also compares the effects on accrual-based performance versus CF-based performance. Finally, this study examines whether the accrual- or CF-based performance recommends a different optimum capital structure.

1.3 WHY CASH-FLOW (CF)?

Debt financing creates a financial obligation to pay back interest and principal. When a firm makes a payment for interest and principal, it directly affects CF. Thus, the capital structure decision affects firm CF. At the same time, CF, as a performance indicator, gives the instant financial position of a firm so that stakeholders (investors and managers) can estimate the future financial position and prospects of the firm. Thus, CF is a performance indicator. On the other hand, as long as managers' discretionary accrual items exist in a firm, managers can influence net income[10] by their decisions on those

[10] Net income, accrual based income, and accounting income are used alternatively in this study.

items. As retained earnings are a part of net income as well as ownership, there is a relation between capital structure and net income (performance). Now, we focus specifically on the grounds for using CF as a performance indicator.

Existing works have frequently considered accrual-based performance (net income), such as EPS, ROA, and ROE. Net income is defined as excess revenues over expenditures. It includes accrual items; for example, write-offs, depreciation, accounts receivable, and accounts payable. These accrual items do not expose the quality (exact time of payment) of a transaction. Particularly, interest receivable is a significant accrual item that affects the net income of banks. Since the future is always uncertain, no accrual item ensures that payment will take place. For example, if any interest receivable is not paid on time, or if it becomes bad, then the bank's performance will decline. It will adversely affect CF. However, it does not instantly affect net income. Even though it is adjusted in the time-periods that follow, interest receivables (accrual items) ignore the time value of money.

Moreover, the amount of write-off, depreciation, and LLP mostly depend on managerial decisions. Changes in those decisions affect the accrual-based income (net income) accordingly, even though firm operations and performance are unchanged. Feng, Ge, Luo, and Shevlin (2011) conclude that managers manipulate accrual items for their own interest in measuring net income. Particularly in banking firms, LLP contains a significant amount of profit and loss accounts and thereby affects accrual-based income (net income). In addition, Gombola, Ho, and Huang (2016) have documented that changes in LLP and NCO affect net income and retained earnings and, thereby owners' equity. Since accrual-based income considers accrual items and may be influenced by managers' decisions, it may not always accurately reflect the firm's actual performance.

On the other hand, CF considers only actual cash transactions in the firm's operations and presents a realistic performance indicator because it cannot be manipulated easily (Foerster, Tsagarelis, & Wang, 2017; Sloan, 1996). Furthermore, CF ensures the gain of information that stakeholders (especially shareholders and lenders) are interested in having such as availability of cash, firms' purchasing power, financial ability to pay (interests, principal, and dividends), and the ability to expand the business, so as to predict future share price and returns.

Hirshleifer, Hou, and Teoh (2009) point out that naïve investors sometimes fail to differentiate CF from net income and thus concentrate on available net income only. Highly dependent on a higher net income and lower CF, these investors become more optimistic about future returns. As a result, firms become overvalued, and investors earn a lower rate of return. Similarly, with a lower net income and higher CF, firms become undervalued, and investors enjoy the higher return.

The benefits of using CF have been shown for several circumstances in different studies:

i. CF shows the instant picture of firms' purchasing power and ability to pay its financial obligations (Kar, 2012) while accrual-based income (gross income and net income) can be manipulated by chief financial officers (CFOs) for their personal benefit (Feng et al., 2011).

ii. CF in comparison to net income is seen as a superior performance measure by stakeholders and other external and internal users (Jones, Romano, & Smyrnios, 1995) because it is harder to manipulate CF than net income.

iii. In predicting future stock returns, CF gives more consistent results than accrual-based income does (Foerster et al., 2017; Sloan, 1996), because if the accrual item changes then gross and net incomes also change as if the payments of accrual items are made, however, CF does not change until the payment is made. Due to the limitations of gross income and net income (accrual-based performance), investors consider CF as a more realistic performance indicator (Foerster et al., 2017).

2. LITERATURE REVIEW

2.1 CAPITAL STRUCTURE THEORY

Durand (1952) was the first to introduce the concept of capital structure and cost of capital in valuing a firm. He asserts that (without tax) debt has a positive effect on firm value using net income (NI)[11] and has no effect on firm value using net operating income (NOI)[12]. He also measures firm value[13] considering tax in the market and finds that debt amplifies firm value using NI and NOI.

In 1958, Modigliani and Miller hypothesized the relationship between capital structure and firm value and indigenized a cost of equity formula. They provide two propositions on capital structure theory in a perfect market (no taxes and other economic frictions)[14]. Proposition I states that the firm value is independent of its capital structure at a given level of cost of capital[15], and proposition II states that the cost of equity is positively dependent on a firm's debt at a given cost of debt. So, if the debt increases (decreases), then the cost of equity also increases (decreases). This increase in the cost of equity is fully off-set by the benefits of the relatively cheaper cost of debt, resulting in an unchanged weighted average cost of capital (WACC), therefore unchanged firm value

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[11] Net income (NI) is mostly known as earning after interest and tax (EAIT). In the NI method without tax, he subtracts the amount of interest on the debt from operating income in order to measure net income. Then, he measures the value of equity by discounting the net income at the cost of capital. For both methods, he calculates share price by dividing the value of equity by the number of shares outstanding.

[12] Net operating income (NOI) is mostly known as earnings before interest and tax (EBIT). In the NOI method without tax, he measures firm value by discounting EBIT by the cost of capital. Here, EBIT is equal to earnings before interest since tax is zero. He splits firm value into two: the value of bonds and the value of equity. The value of equity is measured by deducting the book value of debt from the firm value.

[13] He measures NI by subtracting the interest and tax from EBIT. He again adds the amount of interest and NI to find how much is available for bondholders and shareholders. Then he divides the amount by the cost of capital to find the firm value.

[14] The assumption of the perfect market: with no tax, no bankruptcy cost, stocks, and bonds are perfect substitutes, the existence of risk-free assets, and firms are homogeneous in terms of the asset.

[15] Cost of capital and weighted average cost of capital (WACC) are used alternatively.

(Modigliani & Miller, 1958). Thus, capital structure does not affect firm value in the perfect market, supporting Durand (1952) NOI approach without tax.

Durand (1959) raises questions regarding the assumptions in the perfect market. He expects to have an arbitrage opportunity for investors[16] so that they (investors) gain a profitable switching opportunity from one stock to another stock or debt, and vice-versa. Otherwise, investors would not trade in that market.

Modigliani and Miller responded in 1959 with a clarification of the above questions. They agree that there is no perfect market in the real world; however, they state that it is not mandatory to keep the assumption of a perfect market existing in the real world. They further mention that a perfect market is the standard market for learning and teaching corporate finance. In regards to arbitrage advantage, Modigliani and Miller show that investors can gain an advantage from 'home made'[17] leverage. Finally, they repeat proposition I that the value of the levered firm[18] and the unlevered firm is the same, and that there is no optimum capital structure. This suggests that capital structure does not affect firm value in the perfect market.

Later, Modigliani and Miller (1963) amended the perfect market to imperfect by introducing tax in the market. Since the interest on debt is measured before tax, and actual interest payment is nominal interest less the interest tax shield, this amount of interest tax shield is added to firm value. Thus, the value of the levered firm is the value of the unlevered firm plus the present value of all future interest tax shields. Accordingly,

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[16] Durand (1959) also mentions that Modigliani and Miller (1958) consider current earnings, not long-term future growth. He adds that investors prefer long-term growth as an investment alternative. He treats Modigliani and Miller's equilibrium market as an unrealistic and inconsistent market.

[17] Investors use homemade leverage to get the leverage (debt) advantage from an unlevered firm (has no debt). They use it as a substitute for corporate leverage.

[18] A levered firm is a firm that uses debt in its capital structure, and an unlevered firm is a firm that does not use debt.

proposition I (with tax) states that firm value is positively dependent on capital structure. It suggests that firm value increases as debt increases due to the interest tax shield[19]. Under this circumstance, 100% debt is optimum. Accordingly, in proposition II (with tax), the cost of equity will increase, however it will be less than the cost of equity without tax because the interest tax shield is added to the value of equity. Unlike without tax, the cost of capital[20] will decrease with an increased debt in the capital structure. As a result, the firm value will increase with increased debt.

Thirty years after Modigliani and Miller's propositions, Miller was invited by the editors to show where the propositions stood at that time. Since there have been some arguments over the Modigliani and Miller capital structure theory, it is necessary that those propositions be checked. Literally, Miller (1988) supports propositions I and II without tax, even though this type of market is hardly found in the real world. Empirically, Miller (1988) finds nothing new prevailing in the real world to contradict the idea that cost of equity[21] is higher than the cost of debt prevailing in the real world (with tax market). The cost of equity formulas in Modigliani and Miller proposition II (with and without tax) can solve this spread between the cost of debt and the cost of equity. Hence, firm value is positively related to debt in a tax market.

[19] This is consistent with Durand (1952) NOI method with tax, and NI method with and without tax.
[20] The WACC of a levered firm would be, $R_L = W_E R_E + W_D R_D (1 - \text{t})$; where R_L is the WACC of a levered firm.
[21] The cost of equity is measured from earning to price ratio, and the cost of debt is measured from the interest rates on corporate debts.

2.1.1 INCLUSION OF BANKRUPTCY COST

In 1967, Baxter raised an argument regarding the bankruptcy cost[22] of a firm. He states that variability in future earnings becomes higher due to fixed financial obligations (interest and principal of debt). With a high dependency on debt, a firm would not be able to pay the interest out from earnings in a bad time. If the bad time continues for years, then the firm may declare bankruptcy. He argues that the increase in firm value due to the interest tax shield would not continue at a higher level of debt. He believes that the bankruptcy cost would be much higher at higher levels of debt than at lower levels of debt because the variability of earnings increases progressively at higher levels of debt. This implies that at lower levels of debt, the marginal tax benefit is greater than the marginal bankruptcy cost, which leads to an increase in firm value. In contrast, at higher levels of debt, the marginal tax benefit becomes smaller than the marginal bankruptcy cost which leads to a decrease in the firm value. So, there is an *inverted-U* effect of debt on firm value. This is known as the *trade-off theory* of capital structure. Baxter (1967)believes that the firm value will be maximum where the bankruptcy cost is minimum (i.e., the variability of income is the least) – where the interest amount is equal to the minimum possible future earnings. This suggests that there is an *inverted-U* relationship between debt financing and firm value[23].

2.1.2 INCLUSION OF AGENCY COSTS

The concept of principal (the owners of a firm) and agent (the managers of that firm) was first introduced by Berle and Means (1932), who disclosed that if a large firm

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[22] Bankruptcy cost arises from the uncertainty (variability) of earnings to meet future financial obligations (for example, interest, principal of debt, salary, and others).

[23] In our study, we use performance measure as an alternative measure of firm value.

dilutes its equity, then the ownership and control of the firm become separated. Due to this separation, managers may take decisions to pursue their own interest instead of shareholders' interest: for example, the managers may exercise less work effort, or choose less output-input decisions. As a result, firm performance falls when managers own less than 100% versus managers who own 100% of a firm. This happens due to the agency problem between owners and managers.

Jensen and Meckling (1976) discuss agency problem in two ways: equity-holders versus managers, and equity-holders versus debt-holders. In agency costs[24] between equity-holders and managers[25], they state that a higher proportion of external equity (equity-holders outside the firm) compels managers to pursue their personal interest (e.g., managers may exercise less work effort or may choose less output-input decisions). It reduces firm value. However, the inclusion of debt creates a fixed financial obligation, bankruptcy cost, and the potential loss of salary and jobs. It compels managers to increase performance, and indicates that debt is beneficial to equity-holders. On the other hand, in agency costs between equity-holder and bond-holders, Jensen and Meckling (1976) point out that if equity-holders largely depend on debt, then debt-holders may increase the interest on debt which is better for debt-holders, and worse for equity-holders. It reduces firm value. Thus, substantial debt is costly to equity-holders.

[24]Jensen and Meckling (1976) graphically show firm value curves with 100% ownership by managers and partial ownership by managers. After a certain level of expansion, firm value with 100% ownership by managers is higher than that of partial ownership by managers. The difference between these two is the agency cost. They also believe that if the firm operates in perfectly competitive capital and product markets then the agency cost is absent.

[25] In 1986, Jensen added that agency costs may arise from using free CF. Free cash-flow is defined as the excess cash-flow after investing positive net present value (NPV) projects discounted at the relevant cost of capital. If managers have excess cash then they neither desire to pay out additional dividends nor repurchase stocks: rather they even desire to invest in loss-carrying projects because they always prefer to control more assets. This reduces firm value. Jensen (1986) believes that managers are bonding to debt-holders to pay out cash in a way that reduces free CF at managers' discretion. Hence, debt restrains them from investing in value-decaying projects. In this way, debt mitigates the agency costs of equity.

Following these paradoxical relations (beneficial versus costly) between debt and firm value, Jensen and Meckling (1976) recommend a combination of debt and equity to maximize firm value. The maximum firm value would be where the marginal benefit of debt and the marginal cost of debt are equal. This supports the *trade-off theory* that a moderate level of debt is the optimum (Baxter, 1967).

2.1.3 PECKING ORDER THEORY

In 1961, Donaldson in his study (as cited in Myers (1984)) hypothesized the pecking order theory, where he observes that large firms strongly choose internal financing (retained earnings) provided a regular dividend is paid-out, because retained earnings incur the least tangible cost. Even though firms sometimes need to finance from external sources, managers prefer issuing debt (bank borrowing or corporate bonds) first. Donaldson found that the majority of these large firms did not issue equity in the previous 20 years and that their share prices were incredibly high. Issuing equity is the last resort of financing since it incurs underwriting and administrative costs.

In 1984, Myers argued that capital structure theories from previous studies (Baxter, 1967; Durand, 1952, 1959; Modigliani & Miller, 1958, 1959, 1963) did not explain the actual financing behaviour of a firm. When a firm announces its financing strategy, investors predict inside information. Investors expect that the firm will announce the possible lowest cost financing decision. Since the cost of retained earnings is less than the cost of external financing (debt and equity), it is obvious that firm value would be higher if a firm finances from retained earnings instead of debt. Myers (1984) suggests that if a firm fails to finance from retained earnings, then debt is preferable to equity due to the interest tax-shield and lower administrative costs. He argues that when a firm finances from debt, it is consistent with the *trade-off theory* of capital structure(Baxter, 1967; Jensen & Meckling, 1976). He treats equity as the last resort of financing, as it is the most expensive.

Based on the with- and without-tax market (Modigliani & Miller, 1958, 1959, 1963), with bankruptcy cost and agency costs (Baxter, 1967; Jensen, 1986; Jensen & Meckling, 1976) and the actual cost of financing (Donaldson, 1961; Myers, 1984), it is evident that there is a debt level that would maximize firm value. Several studies have empirically tested the theory by investigating the effects of debt on firm performance. They measure performance as a proxy of firm value because firm value is the present value of future income and is highly correlated with its performance. We now turn to the empirical literature.

2.2 EMPIRICAL LITERATURE

Several empirical studies examine the capital structure theory given by Modigliani and Miller (1958, 1963), Baxter (1967), Jensen and Meckling (1976), and Jensen (1986). Few studies have included banking firms in investigating the effects of capital structure on firm performance. The reason for this might be the distinct features of banks' capital structure. In the following sub-section, we touch upon the studies we have found on banks' capital structure and performance.

2.2.1 EMPIRICAL BANKING LITERATURE

Banks have different characteristics than non-banking firms in terms of deposit insurance, loan loss provision (LLP), and capital requirements ratio (Harding, Liang, & Ross, 2013). Deposit insurance is a subsidy, like a put option, to banks that ensure moral hazard incentives because it enables banks to raise funds at an almost risk-free rate and improve profitability or performance. LLP is the reserve for bad loans. It is one of the largest components of accrual items in banks. The capital requirement ratio is the minimum proportion of equity capital to risk-taking assets that must be held by the banks. Since banks' assets are more liquid than other firms' assets, they can easily change their size of operation by shrinking or expanding assets to reach the bank's target capital structure (Lepetit, Saghi-Zedek, & Tarazi, 2015). However, Gropp and Heider (2010) found that deposit insurance and capital regulation were not determinants of the capital structure of US and European large banks from 1991 to 2004, except those banks whose capital ratio was closed to the regulatory minimum. A study on German banks from 1999 to 2009 (Berger, Bouwman, Kick, & Schaeck, 2016) found that regulatory intervention decreases liquidity creation, but that equity support does not affect liquidity creation. They showed that equity support increases liquidity on the liability side while decreasing liquidity on the assets side. Thus, both of these effects offset each other.

Several studies investigate the effects of capital structure on firm performance. However, few studies have looked at US banks. We will look first at those studies that investigate the effects of capital structure on US banks, and we will then look at other studies that investigate performance in respect to bank characteristics.

In 2006, Berger and Bonaccorsi di Patti investigated the effects of capital structure on firm performance using one observation per bank in 695 US commercial banks with data in the six years from 1990 to 1995. They used two models: direct causality and reverse causality[26]. They measured capital structure by the equity-to-capital ratio and

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[26] Reverse effects means causes and effects are reversed. Researchers usually look into the direct causality effect: how capital structure affects firm performance. Here, reversed effects also checked: how firm performance affects capital structure choices. This reverse effect is based on two hypotheses: the efficiency-risk hypothesis and the franchise-value hypothesis. The efficiency-risk hypothesis states that more efficient firms choose a lower equity ratio because the higher return of the efficient firm will add more value to the

performance by the profit efficiency ratio of the estimated profit of firm *i* to the highest estimated profit in the sample. Using two-stage least square (2SLS)[27] analysis, they found that the equity-to-capital ratio negatively affected profit efficiency over the entire sample period. They also implied that the debt-to-capital ratio positively affected bank performance. They did not deal with optimality.

Berger and Bouwman (2013) investigated the effects of capital structure on US bank performance during the banking crisis, the market crisis and normal time between 1984 and 2009. They considered the banking crisis in 1990-1992, and 2007-2009; the market crisis in 1987, 1998, and 2000-2002; and normal time in the rest of the study periods. They measured capital structure by the average equity-capital ratio in eight pre-crisis quarters, and performance by ROE. They found that equity in small banks (total assets under $100 million) increased performance in both crisis periods and normal times, while they found that in medium (total assets over $100 million and under $300 million) and large banks (total assets over $300 million) equity increased the performance only during the banking crisis time.

Other studies analyze bank performance with respect to bank characteristics. Akhigbe and McNulty (2003a) investigated the performance (ROA) of small US banks (total assets under $500 million) in 1990-1996. They found that relatively small banks

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equity. The franchise-value hypothesis states that more efficient firms prefer a higher equity ratio to protect the firm's future income. Since the results in direct causality are significant and robust, in reverse causality they are expected to have an adverse effect of profit efficiency on equity-to-capital ratio. Rather, they find the slope of the equity-to-capital ratio to profit efficiency is positive up to a certain level of efficiency and negative afterward. This supports the *efficiency risk hypothesis* as well as the *franchise value hypothesis*. Berger and Bonaccorsi di Patti (2006) believe the reasons for this inconsistency in reverse causality results are the specification of the performance measure and the use of the structural model in the analysis.

[27] One equation is for profit efficiency as a function of the equity-capital ratio and other variables, and another equation is for equity-capital ratio as a function of profit efficiency. The former is to test the agency cost hypothesis (direct causality) and the latter is to test the efficiency-risk and franchise-value hypotheses (reverse causality), what extent substitution versus income dominates the equity capital choice. Both are consistent with agency theory.

earn more profits than large banks. In other words, small US banks perform better than large banks.

Tregenna (2009) investigated how concentration (highest asset holding), operational efficiency (expenses to net income), and market size (relative net income) affect bank performance (ROA) in the US during the pre-crisis period from 1994 to 2005. She found that concentration and market size had positive effects on performance but that operational efficiency did not significantly affect performance.

Akhigbe et al. (2017) examined the effects of ownership form (private versus public BHCs) on bank performance (ROA and ROE) before and after the US financial crisis. They found that private BHCs were performing better than public BHCs in the pre-crisis period from 1996 to 2006. In the post-crisis period from 2007 to 2010, there was no significant difference in performance between private and publicly held BHCs.

In another study, Iannotta, Nocera, and Sironi (2007) investigated the effects of ownership structure (government versus private) on performance (ROA) of 181 large banks of 15 different countries in Europe from 1999 to 2004. They found that private-owned banks performed better than government-owned banks. Size and LLP were found to be positive, and liquid assets were insignificant to bank performance.

As we see in the above, only two studies (Berger & Bonaccorsi di Patti, 2006; Berger & Bouwman, 2013) have dealt with the effects of capital structure on performance. However, they do not address the relationship between capital structure and CF.

Moreover, Gropp and Heider (2010) have documented the similarities between non-banking firms' and banks' capital structure. They used the non-banking literature in explaining the capital structure of publicly traded banks in the US and Europe. This study also uses the non-banking literature to explain the relationship between the capital structure and performance of publicly traded banks in the US.

2.2.2 EMPIRICAL NON-BANKING LITERATURE

A study by Margaritis and Psillaki (2010) investigated direct causality and reverse causality[28] effects between capital structure and firm performance. They examined the French traditional manufacturing industry (textiles and chemicals firms) and growth industries (computers and related activities, and research and development firms) from 2002 to 2005. They measured capital structure by the debt to assets ratio, and performance by the EBIT to total assets ratio. They controlled[29] sales growth, ownership (as owned by family or nonfamily), and industry. Using data envelopment analysis (DEA)[30], they found a positive effect of debt on EBIT over the entire data. This implies that debt works as a disciplinary tool to reduce inefficiency, to generate CF to service debt, and thereby improve performance.

On the other hand, Salim and Yadav (2012) found that debt inversely affects firm performance. They examined 237 listed firms from six sectors (other than banking and insurance) on the Bursa Malaysia Stock exchange for the period 1995-2011. They obtained panel data from Data Stream. They measured capital structure by long-term debt, short-term debt, and total debt to asset ratios; and they measured performance by

[28] To test the reverse causality, Margaritis and Psillaki (2010) used quadratic regression. They found that performance has a positive effect on lower levels of debt. The result supports the efficiency-risk hypothesis that debt is positively related to firm performance at lower levels of debt. However, the result does not support the franchise-value hypothesis that debt is not negatively related to performance at higher levels of debt.

[29] Family firms in all except the chemical industry hold less debt in their capital structure. Compared to nonfamily firms, family firms earn more EBIT in all industries. Chemical firms have no significant difference in debt between family and nonfamily firms. The reason, they assume, is that most of the chemical firms are large in size. Growth is positively related to debt in all industries. Hence, they report that debt has a positive effect on firm performance in all industries.

[30] DEA is a deterministic non-parametric technique used to construct the industry's frontier and firm performance.

EPS, ROA, ROE, and Tobin Q. They controlled[31] firm size (log of total assets) and growth (percentage changes in total assets). They conducted a simple regression model for all four performance measures. They found that Tobin Q is positively related to short-term and long-term debt while negatively related to total debt. EPS, ROA, and ROE are negatively related to short-term, long-term, and total debt. Collectively, these results indicate that debt has a negative effect on firm performance, the reason being that the firms dealt with default risk due to higher debt.

Bradley, Jarrell, and Kim (1984) investigated the relation among firms' volatility[32], non-debt tax shield[33], debt-to-value ratio[34] and financial distress cost (bankruptcy and agency costs) with and without industry dummy variables[35]. They obtained data from 821 firms covering 25 industries from Compustat from 1962 to 1981. Firm volatility was measured by the variability in earnings before interest, tax, and depreciation. Financial distress cost was measured by the cost of variability in year-ended firm value. Using OLS regression, they found that debt is positively related to the non-debt tax shield, but negatively related to the firm's volatility and financial distress cost. This suggests that debt is beneficial if the firm finances at a lower interest rate and invests more in tangible assets to secure a stable return. Practically, it is barely possible to borrow a substantial proportion of debt at a lower interest rate in the real world. So, if a firm borrows debt at a higher rate, then the financial distress cost will be higher. By

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[31] Growth has a positive influence over performance variables in all sectors while size does not affect performance in any sector except plantation.

[32] Firm volatility is calculated as the standard deviation of the first difference in annual earnings before *interest, depreciation, and taxes* over the period 1962-1981, divided by the average value of total assets over the same time period.

[33] A reduction in tax occurs due to amortization, charitable donations, and depreciation expenses, etc.

[34] Debt is measured as the book value of long-term debt, and firm value is measured by the sum of the book value of long-term debt and the market value of equity.

[35] Bradley et al. (1984) find similar results using an industry dummy variable for 655 non regulated firms (excluding the trucking, telephone, electric, gas utility, and airline industries).

conducting a simulation analysis, Bradley et al. (1984) demonstrate that if a firm borrows debt at a higher rate, then the firm's volatility and financial distress cost will be higher hence, firm value will be adversely affected by large debt. Thus, debt is beneficial to some extent and then becomes costly. They recommend a moderate level of debt that maximizes firm value, i.e., portrayed by the *trade-off theory* of capital structure (Baxter, 1967; Bradley et al., 1984; Jensen, 1986; Jensen & Meckling, 1976).

The above studies suggest that capital structure affects firm performance. The studies find that the effects are either positive (Berger & Bonaccorsi di Patti, 2006; Margaritis & Psillaki, 2010), negative (Salim & Yadav, 2012), or *inverted-U* (i.e., positive to some extent and negative thereafter) (Bradley et al., 1984). All of these studies have measured performance based on accrual income (net income), such as EPS, EBIT, ROA, ROE, and Tobin Q.

To the best of my knowledge, there is no study that measures firm performance by CF in investigating the effects of capital structure on performance either in banking or non-banking studies. This study includes CF as a performance measure to examine the effects of capital structure on bank performance. Also, no empirical study examines the *inverted-U* effects of capital structure on firm performance. This study fills this void in the literature. Our research questions and hypotheses are presented in the following section.

3. RESEARCH QUESTIONS AND HYPOTHESES

As discussed in the previous section, Berger and Bonaccorsi di Patti (2006) and Berger and Bouwman (2013) have examined the effects of capital structure on the performance of the US banking industry. Banking firms have distinct characteristics in comparison to non-financial firms. The above studies used accrual-based income (such as EPS, ROA, ROE, profit margin, profit efficiency, etc.) as a measure of firm performance. However, none of these studies has considered CF as a performance measure. Several studies have indicated that CF reflects the exact financial position of a firm, and can predict future returns (Foerster et al., 2017; Jones et al., 1995; Sloan, 1996). Still, these studies do not exclusively examine the effects of capital structure on firm performance. Thus, our purpose here is to include CF-based performance (CF on assets (COA)) as well as accrual-based performance (return on assets (ROA)) as relating to the capital structure (total debt to assets (TDA)) of US banks. Banking studies have commonly measured performance by ROA (Akhigbe et al., 2017; Bennett, Güntay, & Unal, 2015; Tregenna, 2009). This study also uses ROA as an accrual-based performance. To make it comparable with CF-based performance, we measure CF on assets (COA).

As discussed in the previous section, there is an *inverted-U* effect of capital structure (debt) on firm value - a positive effect on firm value at lower levels of debt and a negative effect at higher levels of debt. The central thesis of this paper is whether the effects of capital structure on performance are *inverted-U*. We examine firstly the *inverted-U* effects of capital structure on accrual-based performance (ROA) and CF-based performance (COA). Secondly, we examine whether the effects are different between accrual-based performance (ROA) and CF-based performance (COA). Thirdly, we examine whether accrual-based (ROA) and CF-based (COA) performance suggest a different level of debt in the optimum capital structure. We test the following hypotheses:

H1: There is an *inverted-U* relation between capital structure and US bank performance for both ROA and COA.

H2: The effects of capital structure (TDA) on accrual-based performance (ROA) are different from the effects on CF-based performance (COA) at a given level of capital structure (TDA).

H3: The optimum capital structure (TDA) with respect to accrual-based performance (ROA) is different from the optimum capital structure with respect to CF-based performance (COA).

Now, we turn to the methods used in this study.

4. METHODS

We examine the effects of capital structure on performance for banks listed on the US stock exchanges - New York Stock Exchange (NYSE), The American Stock Exchange (AMEX), and NASDAQ. We extract data from the Compustat data source. We keep banks with available information about net income, CF, and total asset. We identify 485 banks with a total of 2,707 observations for the period 1980-2017. We use a quadratic function as we expect *inverted-U* effects of capital structure on performance. We investigate the effects of capital structure on accrual-based performance and CF-based performance. Then we analyze whether these effects are different between accrual-based performance and CF-based performance. We also check whether accrual-based performance and CF-based performance result in a different optimum capital structure.

We use ROA as accrual-based performance (Akhigbe et al., 2017; Bennett et al., 2015; Tregenna, 2009), cash-flow on assets (COA)[36] as CF-based performance (dependent variables), and the total debt to total asset (TDA) ratio as a capital structure measure (explanatory variable) (Kipesha & James, 2014; Ofek, 1993; Park & Jang, 2013). ROA is the net income after taxes as a percentage of total assets. COA is the CF as a percentage of total assets. These performance indicators (ROA and COA) are useful for lenders, owners, and managers to assess the financial strength of a firm. Both of these performance measures show how efficiently a firm is using its resources: ROA shows accrual-based performance and COA shows CF-based performance. TDA ratio indicates the percentage of total assets financed by the creditors.

[36] Since operating cash-flow is not available for banks in Compustat, this study uses cash-flow where the code of cash-flow in Compustat is [cfl].

For robustness checks[37], we include some bank characteristics, such as firm size (on an asset basis) (Berger & Bonaccorsi di Patti, 2006), asset turnover (Bokhari & Khan, 2013; Chadha & Sharma, 2015), securities to assets (Bennett et al., 2015), net loans to deposits, net loans to assets (Lepetit et al., 2015), and loan loss reserves to assets (Bennett et al., 2015; Gombola et al., 2016)[38].

Firm size (SIZE) is measured by the total assets of the firm (Berger & Bonaccorsi di Patti, 2006; Margaritis & Psillaki, 2010). Larger firms are expected to have some comparative advantages, such as diversified and better technology, easy access to the market, and large economies of scale. Thus, the effect of SIZE on performance is likely to be positive. However, Berger and Bonaccorsi di Patti (2006) find that the efficiency of US banks is inversely related to size. We therefore expect that our *inverted-U* relation may hold with different sizes of banks.

Asset turnover (ASST) is measured by net sales [sale] divided by total assets. It shows how efficiently a firm is operating to generate its revenue[39]. Higher revenue promotes higher profitability, and thereby higher performance (Chadha & Sharma, 2015). The effect of ASST on performance is expected to be positive. We check whether the *inverted-U* effects of capital structure on performance holds for banks with low or high ASST.

Securities to assets (SA) is the percentage of total assets invested in securities. It shows the liquidity position of banks(Bennett et al., 2015). Higher investment in

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[37]As we have seen in the literature, several bank characteristics have been identified in relation to performance. Due to data limitations, we are unable to consider other characteristics. However, since some of the studies have considered these characteristics, we have included them in the robustness checks.

[38] We could include special characteristics of banks as control variables (for example, reserve rate, reserve or provision for loans and losses, etc.), however we do not have the data.

[39]Tregenna (2009) measures operational efficiency by expense to net income: however, she does not find significant effects on the performance of small US banks. This study considers asset turnover as an operational efficiency measure.

securities reduces liquidity risk in crisis and earns lower returns. We check whether the *inverted-U* effects of capital structure on performance hold for banks with low or high investment in securities.

Net loans to deposit (NLD) is the percentage of total deposits invested in loans. On average, the interest paid on deposits is lower than the interest earned on loans (Iannotta et al., 2007). Thus a high NLD would increase banks' earnings, thereby increasing performance. We check whether the *inverted-U* effects of capital structure on performance hold for banks with low or high NLD.

Net loans to assets (NLA) is the percentage of total assets invested in loans. Since the investment in loans is expected to be more profitable than other investments, such as securities, a higher NLA is expected to increase bank profitability and thereby performance (Lepetit et al., 2015). We check whether the *inverted-U* effects of capital structure on performance hold for banks with low or high NLA.

Loan loss reserves to assets (LLRA) are the percentage of total assets to cover future losses on default loans. It measures the ability to sustain losses from loans outstanding(Bennett et al., 2015; Gombola et al., 2016). LLRA thus affects firm performance. We check whether the *inverted-U* effects of capital structure on performance hold for banks with low or high LLRA.

The formulas to measure these variables (brief in Appendix A) are as follows:

Table 1
Formulas to Measure the Variables

Variable	Legend	Measurement
Dependent variable:		
Return on assets	ROA	$= \frac{netincome}{totalassets} * 100$
Cash-flow on assets	COA	$= \frac{cashflow}{totalassets} * 100$
Explanatory variable:		
Total debt to assets	TDA	$= \frac{totaldebt}{totalassets} * 100$
Bank characteristics:		
Firm size	TA	total assets of the firm
Asset turnover	ASTT	$= \frac{totalsales}{totalassets}$
Security to assets	SA	$= \frac{totalsecurities}{totalassets} * 100$
Net loans to deposits	NLD	$= \frac{netloans}{totaldeposits} * 100$
Net loans to assets	NLA	$= \frac{netloans}{totalassets} * 100$
Loan loss reserves to assets	LLRA	$= \frac{totalloanlossreserves}{totalassets}$

Because our sample contains data across banks over time, we use panel data analysis: OLS, FE[40] and RE models. In simple cases (where firm-specific and time-specific effects are absent), pooled OLS is the most appropriate technique. On the other hand, the FE model estimates the intercept for each bank to vary, and restricts the slope being constant for all banks over time. Alternatively, the RE model assumes that the variation among the banks is random and uncorrelated to the explanatory variables in the

[40] We use fixed effects (FE) model controlling *firm* effects.

model. So for panel data, FE or RE models can provide more accurate estimations. We use the *Hausman specification test* to choose whether the FE or RE model is more appropriate. For robustness checks, we employ bank characteristics, such as bank size, asset turnover, investment in securities, net loans, and loan loss reserves. Given this, we expect *inverted-U* effects of capital structure on bank performance, and we use a quadratic function that represents these *inverted-U* effects (Baxter, 1967; Jensen, 1986; Jensen & Meckling, 1976). We use the following equation (Margaritis & Psillaki, 2010):

$PER_{it} = \alpha + TDA_{it}\beta_{1j} + (TDA_{it})^2\beta_{2j} + \varepsilon_{it}$ .... (1)[41]

Where, it = cross-sectional firm$i$ at a specific time t

PER_{it} = performance (ROA and COA) of firm i at time t

α = the intercept term

TDA_{it} = explanatory variables (total debt to total assets, times 100) of firm i at time t

$(TDA_{it})^2$ = the square term of TDA_{it}

β_{1j} = parameters for TDA, (*j* = 1 for ROA, *j* = 2 for COA as performance)

β_{2j} = parameters for TDA^2, (*j* = 1 for ROA, *j* = 2 for COA as performance)

ε_{it} = disturbance term (unobserved individual effect and remainder)

An *inverted-U* effect (a switch from positive to negative) of capital structure on performance would arise when the parameters of TDA and TDA^2 are $\beta_{1j} > 0$ *and* $\beta_{2j} < 0$, respectively. We conduct a *t-test* to check whether the effects of capital structure (TDA) on performance (ROA versus COA) are different. We solve the estimated

[41] We could include bank characteristics in the equation (1) as control variables, but this drops the number of observation from 2,707 to 1,255 (see Appendix D). We check the robustness by dividing the sample into two groups based on the median value for each of the bank characteristics.

regressions for the value of *TDA,* when $\beta_{1j} > 0\ and \beta_{2j} < 0$, to check which performance measure suggests a higher (or lower) level of debt in the optimum capital structure(DeAngelo & Masulis, 1980).

We take the following steps to test our hypotheses.

1. We run the quadratic equation (1) for ROA and COA to test the *inverted-U* relationship between capital structure and bank performance.

2. We take the error term for each regression (in the FE and RE models) to examine whether the bank characteristics explain the unexplained variation. This is done due to the reduction in the number of observations from 2,707 to 1,255.

3. We run equation (1) adding all the bank characteristics as the control variables.

4. We then carry out the robustness checks.

We check the robustness of our findings for different bank characteristics, such as TA, ASST, SA, NLD, NLA, and LLRA using equation (1), i.e., to check whether the results hold under each characteristic. Firstly, we divide the data set into two groups for each bank characteristic: one group carries the value less than or equal to the median, and the other group carries the value greater than the median of each respective variable. Thus, we find 12 (two of each of the six characteristics) data sets for the robustness checks. Secondly, we run equation (1) for ROA and COA with each of these data sets. Then we conduct a *t-test* to check whether the effects on ROA are different from the effects on COA. Finally, we solve the estimated equation for the optimum value of TDA in respect to ROA and COA. This checks whether our findings of the effects of capital structure on accrual- and CF-based performance hold for different bank characteristics, such as banks size, asset turnover, investment in securities, net loan size in terms of deposits, net loan size in terms of assets, and loan loss reserves.

5. EMPIRICAL RESULTS AND DISCUSSIONS

In this section, we present our findings for the research questions set out in section 3. Firstly, we run the regression equation to find the effects of capital structure on the performance of US banks. The independent variables are the TDA ratio and the square term of TDA, and the dependent variables are ROA (accrual-based performance) and COA (CF-based performance). Secondly, we compare the effects of capital structure on both accrual- and CF-based performance. Thirdly, we solve the estimated regressions to find the optimum capital structure (TDA) for both accrual-based performance (ROA) and CF-based performance (COA). Finally, for the robustness checks, we conduct the same regression to observe whether our *inverted-U* effects of capital structure on performance hold with other bank characteristics.

5.1 EFFECTS OF CAPITAL STRUCTURE ON FIRM PERFORMANCE (ROA AND COA)

Step 1:

We ran equation (1) using pooled OLS, FE, and RE models. Table 2 presents our results using these three regression equations.

In the pooled OLS regression for ROA, the results show that the coefficients of TDA and TDA^2 are $\beta_{11} = -0.000267;\ (t\text{-}value = -0.05)$ and $\beta_{21} = -0.000171;$ $(t\text{-}value = -1.51)$, respectively. For COA, the coefficients of TDA and TDA^2 are $\beta_{12} = -0.00929; (t\text{-}value = -1.56)$ and $\beta_{22} = 0.000120; (t\text{-}value = 1.01)$, respectively. The t-values in parentheses (for ROA and COA) suggest that the coefficients are not statistically different from zero, implying that TDA and TDA^2 are not significantly related to ROA or COA. This suggests that there is no significant effect of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA).

In the FE model for ROA, the estimates of the coefficients of TDA and TDA^2 are $\beta_{11} = 0.0305;$ $(t\text{-}value = 3.69)$ and $\beta_{21} = -0.000927;$ $(t\text{-}value = -6.09)$, respectively. For COA, the coefficients of TDA and TDA^2 are $\beta_{11} = 0.0350;$ $(t\text{-}value = 4.24)$ and $\beta_{21} = -0.000973;$ $(t\text{-}value = -6.39)$, respectively. The t-values in parentheses (for ROA and COA) suggest that TDA and TDA^2 are statistically related to ROA and COA, and the results are significant at 1%. As $\beta_{1j} > 0$ for both ROA and COA, this indicates that both ROA and COA increase with increased TDA; however, as $\beta_{2j} < 0$ for both ROA and COA, it indicates that both ROA and COA increase at a decreasing rate with increased TDA. This implies that there is a maximum level of ROA and COA at some point of TDA, and that both ROA and COA later decrease. This suggests that there are *inverted-U* effects of capital structure on both accrual-based performance and on CF-based performance.

In the RE models for ROA, the results show that $\beta_{11} = 0.0285;$ $(t\text{-}value = 3.74)$ and $\beta_{21} = -0.000855;$ $(t\text{-}value = -6.01)$, respectively. For COA, the coefficients of TDA and TDA^2 are $\beta_{11} = 0.0312;$ $(t\text{-}value = 4.06)$ and $\beta_{21} = -0.000868;$ $(t\text{-}value = -6.05)$, respectively. The t-values in parentheses (for ROA and COA) suggest that TDA and TDA^2 are statistically related to ROA and COA, and the results are significant at 1%. As $\beta_{1j} > 0$ for both ROA and COA, this indicates that both ROA and COA increase with increased TDA; however, as $\beta_{2j} < 0$ for both ROA and COA, this indicates that both ROA and COA increase at a decreasing rate with

Table 2
Effects of Capital Structure on Accrual- and Cash-Flow-Based Performance

	Pooled OLS		FE		RE	
	ROA	COA	ROA	COA	ROA	COA
TDA	-0.000267	-0.009290	0.030500***	0.035000***	0.028500***	0.031200***
	(-0.05)	(-1.56)	(3.69)	(4.24)	(3.74)	(4.06)
TDA^2	-0.000171	0.000120	-0.000927***	-0.000973***	-0.000855***	-0.000868***
	(-1.51)	(1.01)	(-6.09)	(-6.39)	(-6.01)	(-6.05)
_cons	0.900***	1.203***	0.717***	0.940***	0.643***	0.882***
	(15.10)	(19.20)	(8.80)	(11.53)	(5.24)	(6.94)
Year Effects	No	No	No	No	No	No
Firm Effects	No	No	Yes	Yes	No	No
N	2707	2707	2707	2707	2707	2707
R^2	0.0044	0.0012	0.0220	0.0220	0.0225	0.0222
Optimal TDA	0.7807	-38.7083	16.45	17.99	16.67	17.97

Results report in the following table indicate that the effects of total debt to assets (TDA) on return on assets (ROA) and cash-flow on assets (COA) using pooled ordinary least square (OLS), fixed effects (FE) and random effects (RE) models.
t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

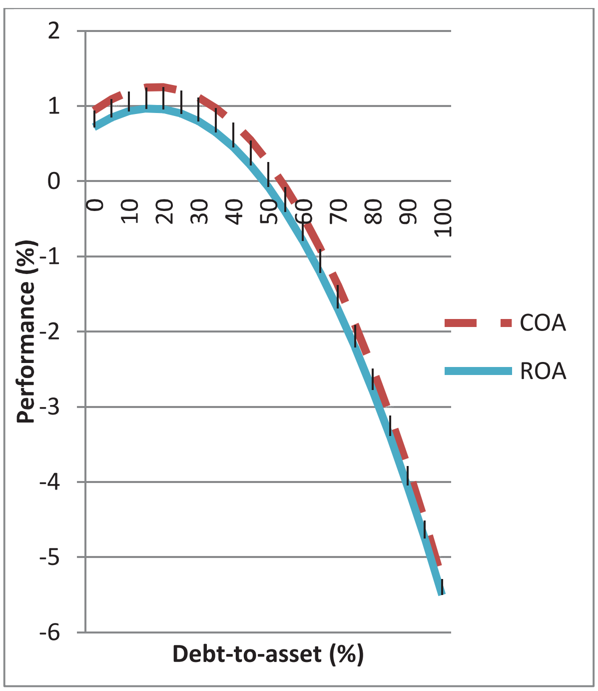

Figure 1(A): Graphical Representation of FE models. The effect of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA)

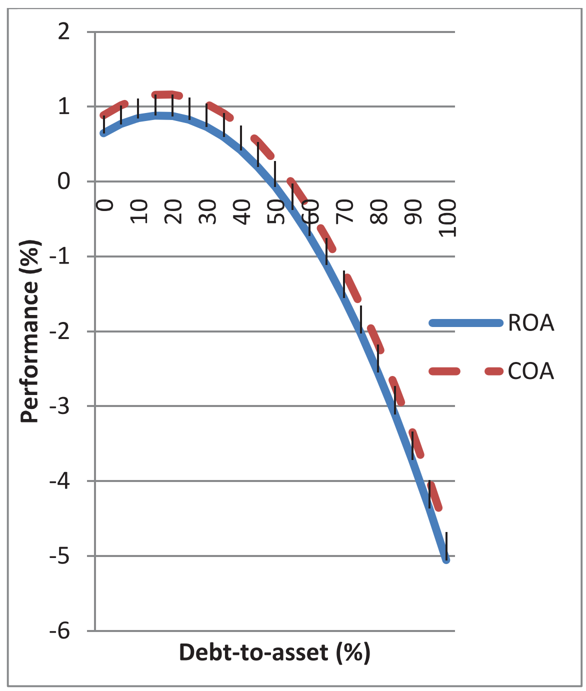

Figure 1(B): Graphical Representation of RE models. The effect of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA) increased TDA. This implies that there is a maximum level of ROA and COA at some point of TDA, and that both ROA and COA later decrease. This suggests that there are *inverted-U* effects of capital structure on both accrual-based performance and CF-based performance.

From the above, the pooled OLS suggests there is no significant effect of capital structure on either performance measure. The reason for this could be that pooled OLS ignores bank-specific effects in panel data analysis. However, the results show that both the FE and RE models satisfy the conditions ($\beta_{1j} > 0\ and \beta_{2j} < 0$) for the *inverted-U* effects of TDA on ROA and COA. This implies that TDA positively affects ROA and COA at lower levels of TDA, and negatively affects ROA and COA at higher levels of TDA suggesting that the capital structure (TDA) has a positive effect on accrual-based performance (ROA) as well as on CF-based performance (COA) at lower levels of debt, and a negative effect at higher levels of debt. Therefore, there is an optimum capital structure somewhere between zero to 100% debt in the capital structure (see sub-section 5.3). Our findings of the *inverted-U* effects of capital structure on performance are consistent with Bradley et al. (1984), i.e., debt is positively related to performance at low levels of debt and negatively related at high levels of debt. However, our findings are not consistent with Berger and Bonaccorsi di Patti (2006) who found that debt is positively related to performance at all levels of debt (they do not find an *inverted-U* relation between debt and bank performance).

Step 2:

In this step, we took the error terms to examine the error generating process of the estimated equations. In other words, we looked at whether the unexplained variation in performance could be explained by some of the bank characteristics. We ran the regression and found that the unexplained variations in the estimated regressions were explained by the bank characteristics (see Appendix C). All bank characteristics (TA, ASST, SA, NLD, NLA, and LLRA) are significant in explaining the unexplained variation of ROA in the FE model, and TA, ASST, NLD, and LLRA are significant in explaining the unexplained variation of ROA in the RE model. Similarly, TA, ASST, NLD, NLA, and LLRA are significant in explaining the unexplained variation of COA in the FE model, and TA, ASST, SA, NLD, and LLRA are significant in explaining the unexplained variation of COA in the RE model.

Step 3:

At this step, as we mention in the method, we included all bank characteristics as control variables in the same equation (1). We found that there are *inverted-U* effects of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA) hold, and most (four out of six) of the bank characteristics (TA, ASST, NLD, and LLRA) are significant (see Appendix D). Please note that we emphasize equation (1) because in this case the sample size is dropped down from 2,707 to 1,255.

It should be noted that we also checked the reverse causality (effects of performance on the capital structure) but we did not find any significant results (not shown). Next, we compared the *inverted-U* effects of the capital structure (TDA) on accrual-based performance (ROA) to the effects on CF-based performance (COA) outlined in the following sub-section.

5.2 COMPARISON OF EFFECTS OF TDA ON ROA VERSUS COA

As presented in the above sub-section (5.1), we find there are *inverted-U* effects of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA). Here, we check if there are any differences between the effects of capital structure on accrual-based performance and the effects on CF-based performance by using equation (1)[42].

According to the pooled OLS, the intercept of ROA ($\alpha = 0.900;\ t\text{-}value = 15.10$) is less than that of COA ($\alpha = 1.203;\ t\text{-}value = 19.20$ (see Table 2). This indicates that accrual-based performance (ROA) is lower than CF-based performance (COA) at the initial stage of debt in the capital structure. However, the coefficients of TDA for ROA ($\beta_{11} = -0.000267;\ t\text{-}value = -0.05$) and that for COA ($\beta_{12} = -0.00929;\ t\text{-}value = -1.56$) are not statistically different from zero. Moreover, the coefficients of TDA^2 for ROA ($\beta_{21} = -0.000171;\ t\text{-}value = -1.51$) and that for COA ($\beta_{22} = 0.000120;\ t\text{-}value = 1.01$) are not statistically different from zero. This implies that there is no significant effect of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA). The limitations of pooled OLS to explain panel data (i.e., it ignores bank-specific effects) might clarify the lack of significant results.

According to the FE model, the intercept of ROA ($\alpha = 0.717;\ t\text{-}value = 8.80$) is less than that of COA ($\alpha = 0.940;\ t\text{-}value = 11.53$) (see Table 2, and Figure 1 (A)). We conduct a *t-test* to find the difference between the value of intercepts of ROA versus that

[42] In this thesis, we use equation (1) in comparing the effects of capital structure on accrual- versus cash-flow-based performance because if we include control variables in the equation then the sample drops from 2,707 to 1,255.

of COA. These results suggest that the difference[43] is significant at 1% indicating that accrual-based performance (ROA) is lower than CF-based performance (COA) at the initial stage of debt in the capital structure. At the same time, the coefficient of TDA for ROA ($\beta_{11} = 0.0305;\ t\text{-}value = 3.69$) is less than that for COA ($\beta_{12} = 0.0350;\ t\text{-}value = 4.24$) and the difference is significant at 1%. The absolute value of the (negative) coefficient of TDA^2 for ROA ($\beta_{21} = -0.0009270;\ t\text{-}value = -6.09$) is less than that for COA ($\beta_{22} = -0.000973;\ t\text{-}value = -6.39$), and the difference is significant at 1%. These results suggest that the increasing marginal effect of capital structure (TDA) on accrual-based performance (ROA) rises at a slower rate than that on CF-based performance (COA) at lower levels of debt and falls at a slower rate at higher levels of debt. In other words, the curve for COA is steeper than the curve for ROA. This implies that the effect of capital structure (TDA) on CF-based performance (COA) is higher than the effect on accrual-based performance (ROA). Hence, CF-based performance (COA) is more sensitive to the capital structure (TDA) in comparison to accrual-based performance (ROA). The reason for this could be that banks are more attentive to their CF so that they can meet financial obligations when they finance from debt. From a graphical representation (see Figure 1(A)), the curve for COA is above the curve for ROA at all levels of debt, and the curves do not cross at any point.

According to the RE model, the intercept of ROA ($\alpha = 0.643;\ t\text{-}value = 5.24$) is less than that of COA ($\alpha = 0.882;\ t\text{-}value = 6.94$) (see Table 2 and Figure 1 (B)) and the difference is significant at 1%. This indicates that accrual-based performance (ROA) is

[43] We conduct a t-test using the Stata formula to find the difference of estimates α, β_{1j} and β_{2j} between ROA and COA: $t = \frac{\beta_{ROA} - \beta_{COA}}{\sqrt{\frac{\mathrm{Var}(\beta_{ROA})}{n_{ROA}} + \frac{\mathrm{Var}(\beta_{COA})}{n_{COA}}}}$ where β is the estimates, *var* is the variance, and *n* is the number of observations.

less than CF-based performance (COA) at the initial stage of debt in the capital structure. At the same time, the coefficient of TDA for ROA ($\beta_{11} = 0.0285$; $t\text{-}value = 3.74$) is less than that for COA ($\beta_{12} = 0.0312$; $t\text{-}value = 4.06$) and the difference is significant at 1%. The absolute value of the (negative) coefficient of TDA^2 for ROA ($\beta_{21} = -0.000855$; $t\text{-}value = -6.01$) is less than that for COA ($\beta_{22} = -0.000868$; $t\text{-}value = -6.05$) and the difference is significant at 1%. These results suggest that the increasing marginal effect of capital structure (TDA) on accrual-based performance (ROA) rises at a slower rate than that on CF-based performance (COA) at lower levels of debt and falls at a slower rate at higher levels of debt. In other words, the curve for COA is steeper[44] than the curve for ROA. This implies that the effect of capital structure (TDA) on CF-based performance (COA) is higher than the effect on accrual-based performance (ROA). Hence, the CF-based performance (COA) is more sensitive to the capital structure (TDA) in comparison to accrual-based performance (ROA). The reason for this could be that banks are more attentive to their CF so that they can meet financial obligations when they finance from debt. From a graphical representation (see Figure 1(B)), the curve for COA is above the ROA at all levels of debt, and the curves do not cross at any point.

From the above comparison, both the FE and RE models suggest that the curves for COA are above the curves for ROA at all levels of debt in the capital structure. Moreover, both models suggest that CF-based performance (COA) is more sensitive to the capital structure (TDA) in comparison to accrual-based performance (ROA). The reason for this could be that banks are more attentive to their CF so that they can meet

[44] The reason that the COA curve is steeper is that the mean and variance of COA are higher than those of ROA (see descriptive analysis in Appendix B).

financial obligations when they finance from debt. Collectively, the results (intercepts: α, and slopes: β_{1j} and β_{2j}) together indicate that the effects of the capital structure (TDA) on accrual-based performance (ROA) are statistically different from the effects on CF-based performance (COA).

Next, we checked the optimal capital structure in respect to accrual- versus CF-based performance, as outlined in the following sub-section.

5.3 COMPARISON OF OPTIMUM TDA BASED ON ROA VERSUS COA

The results of the pooled OLS show that there is no *inverted-U* effect of capital structure (TDA) on performance (ROA and COA). This implies that there is no optimum capital structure. We therefore do not use pooled OLS in our further analysis. On the other hand, the FE and RE models show that there are *inverted-U* effects of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA). We also found that the effects of capital structure (TDA) on accrual-based performance (ROA) are significantly different from the effects on CF-based performance (COA). Accordingly, we expect that we may find a different level of optimal capital structure (TDA) for accrual-based performance (ROA) versus CF-based performance (COA). To find the optimum capital structure (TDA), we solve the estimated regressions from the FE and RE models (DeAngelo & Masulis, 1980) for accrual-based performance (ROA) and CF-based performance (COA) (see Table 2).

According to the FE model, the curve for COA is above the curve for ROA at all levels of debt. After solving the estimated FE model for ROA, we find that the optimum[45]

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[45] According to the FE model, ROA = 0.717 + 0.0305TDA – 0.000927TDA^2
or, $\frac{dROA}{dTDA}$ = 0.0305 – 0.000927*2TDA = 0, or, TDA = 16.45.
Thus, the maximum value of ROA = 0.717 + 0.0305*16.45 – 0.000927*(16.45)^2 = 0.97

level of capital structure (TDA) is 16.45% where the value of accrual-based performance (ROA) is 0.97%. This suggests that the value of accrual-based performance (ROA) increases to a maximum of 0.97% up to the value of the capital structure (TDA) at 16.45%, and the value of accrual-based performance (ROA) later decreases. In other words, the value of accrual-based performance (ROA) would be less than 0.97% at any value of the capital structure (TDA) other than TDA at 16.45%. Similarly, for COA, the optimum level of the capital structure (TDA) is 17.99% at where the value of CF-based performance (COA) is 1.25%. This suggests that the value of CF-based performance (COA) increases to a maximum of 1.25% when the value of the capital structure (TDA) is 17.99%, and the value of CF-based performance (COA) later decreases. In other words, the value of CF-based performance (COA) would be less than 1.25% at any value of the capital structure (TDA) other than TDA is 17.99%. This implies that CF-based performance (COA) suggests more debt (TDA) in the optimum capital structure in comparison to accrual-based performance (ROA).

According to the RE model, the curve for COA is above the curve for ROA at all levels of debt. After solving the estimated RE model for ROA, we find that the optimum level of capital structure (TDA) is 16.67% where the value of accrual-based performance (ROA) is 0.88%. This suggests that the value of accrual-based performance (ROA) increases to a maximum of 0.88% to the value of the capital structure (TDA) is 16.67%, and the value of accrual-based performance (ROA) later decreases. In other words, the value of accrual-based performance (ROA) would be less than 0.88% at any value of the capital structure (TDA) other than TDA at 16.67%. Similarly, for COA, the optimum level of the capital structure (TDA) is 17.97% where the value of CF-based performance

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Similarly, we solve the estimated regressions to find the TDA for COA.

(COA) is 1.16%. This suggests that the value of CF-based performance (COA) increases to a maximum of 1.16% to the value of the capital structure (TDA) is 17.97%, and the value of CF-based performance (COA) later decreases. In other words, the value of CF-based performance (COA) would be less than 1.16% at any value of the capital structure (TDA) other than TDA at 17.97%. This implies that CF-based performance (COA) suggests more debt (TDA) in the optimum capital structure in comparison to accrual-based performance (ROA). Hence, according to both the FE and RE models, CF-based performance suggests a higher level of debt in the optimum capital structure.

In summary, the results of the FE and RE models suggest the following outcomes. Firstly, there are *inverted-U* effects of capital structure (TDA) on both accrual-based performance (ROA) and CF-based performance (COA). Secondly, the results (of the FE and RE models) show that the effects of capital structure on CF-based performance (COA) are statistically higher than the effects on accrual-based performance (ROA) at all levels of debt, and that CF-based performance (COA) is more sensitive to the capital structure (TDA) than the accrual-based performance (ROA). Finally, the results (of both the FE and RE models) show that the optimum level of debt under CF-based performance is higher than that under accrual-based performance.

The results of the FE and RE models show, as outlined above, that there are *inverted-U* effects of capital structure (TDA) on accrual-based performance (ROA) and CF-based performance (COA). The *Hausman specification test*[46] suggests that the FE model gives a better estimation for COA and that the RE model gives a better estimation

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[46] The *Hausman specification test* compares the consistency of these two estimators, which are the numerators (β) with the relative gain of efficiency obtained by using the RE then FE models. The formula is:

$$H = \frac{\beta_{FE} - \beta_{RE}}{\mathrm{Var}\,(\beta_{FE}) - Var(\beta_{RE})}$$

for ROA. However, considering either of the models, the results suggest that CF-based performance (COA) is better than accrual-based performance (ROA), and that CF-based performance (COA) recommends a higher level of debt in the optimum capital structure. We look into whether the *inverted-U* effects of capital structure on performance hold for other bank characteristics in the following sub-section. For simplicity, we offer detailed results for only the FE model.

5.4 ROBUSTNESS CHECKS

Step 4:

Out of curiosity, we check whether the *inverted-U* effects of capital structure (TDA) on performance (ROA and COA) hold for the following bank characteristics: bank size, asset turnover, investment in securities, loans to deposits, loans to assets and loan loss reserves to assets (the results are given in Tables 3 to 8). We divide our data set into two groups based on the median value (see Appendix B) for each of these characteristics and re-estimate equation (1) for each group. To check the *inverted-U* effects, we do not discuss the intercept term (α) as it does not affect the shape of the relationship between capital structure and performance. Rather, we emphasize that the conditions of $\beta_{1j} > 0 \ and \ \beta_{2j} < 0$ are satisfying to have the *inverted-U* effects.

Size

Berger and Bonaccorsi di Patti (2006) find that size adversely affects banks' performance. We divide the sample data into two based on the median of total assets (1,342.13 million). Table 3 shows the effects of capital structure on performance (ROA and COA) for small banks (column 1 and column 2), and for large banks (column 3 and column 4). For small banks, ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = 0.0456$; ($t\text{-}value = 2.92$) and $\beta_{21} = -0.00140$; ($t\text{-}value = -4.72$), respectively. COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = 0.0567$; ($t\text{-}value = 3.67$) and $\beta_{22} = -0.00163$; ($t\text{-}value = -5.59$), respectively. This implies that the *inverted-U* effects of the capital structure ($\beta_{1j} > 0$ $and \beta_{2j} < 0$) on both performances (ROA and COA) hold with small banks (Akhigbe & McNulty, 2003b).

Table 3
Robustness Test for Bank Size

	(1) Small TA	(2) Small TA	(3) Large TA	(4) Large TA
	ROA	COA	ROA	COA
TDA	0.045600*** (2.92)	0.056700*** (3.67)	0.01170* (1.67)	0.009980 (1.45)
TDA^2	-0.00140*** (-4.72)	-0.001630*** (-5.59)	-0.000606*** (-4.84)	-0.000561*** (-4.54)
_cons	0.672*** (5.42)	0.883*** (7.22)	0.914*** (11.06)	1.199*** (14.71)
N	1353	1353	1354	1354
R^2	0.026	0.034	0.051	0.048
Optimum TDA	16.28	17.39	9.65	8.89

Robustness test for bank size or total assets (TA) using equation (1). The table contains return on assets (ROA) and cash-flow on assets (COA) as dependent variables, debt to total assets (TDA) and square term of TDA are the explanatory variables. Column 1 and 2 are the results of small size banks (TA ≤ median of TA = 1342.13m) and column 3 and 4 are of large banks (TA > median of TA).
t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

For large banks, the ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = 0.0117$; ($t\text{-}value = 1.67$) and $\beta_{21} = -0.000606$; ($t\text{-}value = -4.84$), respectively. The

COA results show that the coefficients of TDA and TDA^2 are β_{12} = 0.00998; (t-$value$ = 1.45) and β_{22} = −0.000561; (t-$value$ = −4.54), respectively. This implies that the *inverted-U* effects of the capital structure ($\beta_{1j} > 0$ and $\beta_{2j} < 0$) on both performances (ROA and COA) hold with large banks as well. The law of diminishing marginal returns might be the reason why the results are more pronounced for small banks.

Asset turnover

Tregenna (2009) finds that operational efficiency (expense to net income) does not affect bank performance. We measure operational efficiency with a different measure, i.e., by asset turnover (Chadha & Sharma, 2015). We divide the sample data into two based on the median of asset turnover (0.076934). Table 4 shows the effects of capital structure on performance (ROA and COA) for banks with low asset turnover (column 1 and column 2), and for banks with high asset turnover (column 3 and column 4). For the banks with low asset turnover, the ROA results show that the coefficients of TDA and TDA^2 are β_{11} = 0.001270; (t-$value$ = 0.23) and β_{21} = −0.000117; (t-$value$ = −0.89), respectively. The COA results show that the coefficients of TDA and TDA^2 are β_{12} = 0.003480; (t-$value$ = 0.62) and β_{22} = −0.000161; (t-$value$ = −1.22), respectively. This implies that the *inverted-U* effects of the capital structure on either performance (ROA and COA) do not hold for banks with low asset turnover. For the banks with high asset turnover, the ROA results show that the coefficients of TDA and TDA^2 are β_{11} = 0.040000; (t-$value$ = 2.34) and β_{21} = −0.001260; (t-$value$ = −4.66), respectively. The COA results show that the coefficients of TDA and TDA^2 are β_{12} = 0.049800; (t-$value$ = 2.91) and β_{22} = −0.001380; (t-$value$ = −5.15), respectively. This implies that the *inverted-U* effects of capital structure ($\beta_{1j} > 0$ and $\beta_{2j} < 0$) on both performance (ROA and COA) hold for banks with high asset turnover as well.

Table 4
Robustness Test for Asset Turnover

	(1) Low ASST	(2) Low ASST	(3) High ASST	(4) High ASST
	ROA	COA	ROA	COA
TDA	0.001270	0.003480	0.040000**	0.049800***
	(0.23)	(0.62)	(2.34)	(2.91)
TDA^2	-0.000117	-0.000161	-0.001260***	-0.001380***
	(-0.89)	(-1.22)	(-4.66)	(-5.15)
_cons	0.646***	0.812***	0.933***	1.204***
	(13.67)	(17.06)	(5.46)	(7.08)
N	1353	1353	1354	1354
R^2	0.003	0.003	0.037	0.039
Optimum TDA	5.43	10.81	15.87	18.04

Robustness test for asset turnover (ASST) using equation (1). The table contains return on assets (ROA) and cash-flow on assets (COA) as dependent variables, debt to total assets (TDA) and square term of TDA are the explanatory variables. Column 1 and 2 are the results of banks with low ASST (ASST ≤ median of ASST = 0.076934) and column 3 and 4 are of banks with high ASST (ASST > median of ASST).
t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Investment in securities

Bennett et al. (2015) find that investment in securities negatively affects banks' performance because securities commonly earn less in comparison to other investments. We divide the sample data into two based on the median of securities to total assets (22.00). Table 5 shows the effects of capital structure on performance (ROA and COA) for banks with low investment in securities to total assets (column 1 and column 2), and for banks with high investment in securities to total assets (column 3 and column 4). For the banks with low investment in securities to total assets, the ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = 0.049000$; (t-$value = 3.28$) and $\beta_{21} = -0.001740$; (t-$value = -6.53$), respectively. The COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = 0.058100$; (t-$value = 3.96$) and $\beta_{22} = -0.001890$;

($t\text{-}value = -7.24$), respectively. This implies that the *inverted-U* effects of the capital structure ($\beta_{1j} > 0$ *and* $\beta_{2j} < 0$) on both performances (ROA and COA) hold for the banks

Table 5
Robustness Test for the Percentage of Assets in Securities

	(1) Low SA	(2) Low SA	(3) High SA	(4) High SA
	ROA	COA	ROA	COA
TDA	0.049000***	0.058100***	-0.007230	-0.006320
	(3.28)	(3.96)	(-1.26)	(-1.12)
TDA^2	-0.001740***	-0.001890***	0.000191	0.000190
	(-6.53)	(-7.24)	(1.48)	(1.50)
_cons	0.759***	0.994***	0.873***	1.092***
	(5.10)	(6.81)	(17.62)	(22.48)
N	1379	1379	1328	1328
R^2	0.065	0.071	0.002	0.003
Optimum TDA	14.08	15.37		

Robustness test for the percentage of assets in securities (SA) using equation (1). The table contains return on assets (ROA) and cash-flow on assets (COA) as dependent variables, debt to total assets (TDA) and square term of TDA are the explanatory variables. Column 1 and 2 are the results of the banks with low SA (SA ≤ median of SA = 22.00) and column 3 and 4 are of the banks with high SA (SA > median of SA).
t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

with low investment in securities to total assets. For the banks with high investment in securities to total assets, the ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = -0.007230$; ($t\text{-}value = -1.26$) and $\beta_{21} = 0.000191$; ($t\text{-}value = 1.48$), respectively. The COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = -0.006320$; ($t\text{-}value = -1.12$) and $\beta_{22} = 0.000190$; ($t\text{-}value = 1.50$), respectively. This implies that the *inverted-U* effects of the capital structure on either performance (ROA and COA) do not hold for banks with high investment in securities to total assets.

Net loans to deposits

Loans are more profitable than other investments, and thereby increase firm performance (Iannotta et al., 2007). We measure net loans relative to deposits here (and relative to assets in the following paragraph). We divide the sample data into two based on the median of NLD (86.00). Table 6 shows the effects of capital structure on performance (ROA and COA) for banks with low NLD (column 1 and column 2) and for banks with high NLD (column 3 and column 4). For the banks with low NLD, the ROA results show that the coefficients of TDA and TDA^2 are β_{11} = 0.002700; ($t\text{-}value =$ 0.32) and $\beta_{21} = -0.0000208$; ($t\text{-}value = -0.10$), respectively. The COA results show that the coefficients of TDA and TDA^2 are β_{12} = 0.002370; ($t\text{-}value = 0.28$) and $\beta_{22} =$ 0.000020; ($t\text{-}value = 0.10$), respectively. The results do not satisfy the conditions

Table 6
Robustness Test for Net Loans to Deposits

	(1) Low NLD	(2) Low NLD	(3) High NLD	(4) High NLD
	ROA	COA	ROA	COA
TDA	0.002700	0.002370	0.035600**	0.047500***
	(0.32)	(0.28)	(2.23)	(3.02)
TDA^2	-0.0000208	0.0000200	-0.0012400***	-0.0014200***
	(-0.10)	(0.10)	(-4.84)	(-5.65)
_cons	0.814***	1.079***	0.791***	0.933***
	(15.05)	(19.51)	(3.79)	(4.54)
N	1344	1344	1363	1363
R^2	0.000	0.001	0.044	0.050
Optimum TDA			14.35	16.73

Robustness test for net loans to deposits (NLD) using equation (1). The table contains return on assets (ROA) and cash-flow on assets (COA) as dependent variables, debt to total assets (TDA) and square term of TDA are the explanatory variables. Column 1 and 2 are the results from the banks with low NLD (NLD ≤ median of NLD = 86.00) and column 3 and 4 are from the banks with high NLD (NLD > median of NLD).
t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

($\beta_{1j} > 0$ $and \beta_{2j} < 0$) for the *inverted-U* effects on ROA and COA. This implies that the *inverted-U* effects of capital structure on either performance (ROA and COA) do not hold for banks with low NLD. On the other hand, for banks with high NLD, the ROA results show that the coefficients of TDA and TDA^2 are β_{11} = 0.035600; ($t\text{-}value = 2.23$) and $\beta_{21} = -0.0012400$; ($t\text{-}value = -4.84$), respectively. The COA results show that the coefficients of TDA and TDA^2 are β_{12} = 0.047500; ($t\text{-}value = 3.02$) and $\beta_{22} =$

-0.0014200; (t-$value = -5.65$), respectively. This satisfies the conditions ($\beta_{1j} > 0$ *and* $\beta_{2j} < 0$) for *inverted-U* effects on ROA and COA. This implies that the *inverted-U* effects of the capital structure on both performance (ROA and COA) hold for banks with high NLD.

Net loans to assets

Iannotta et al. (2007) find a positive association between banks' performance and their NLA. We divide the sample data into two based on the median of net loans to total assets (62.00). Table 7 shows the effects of capital structure on performance (ROA and COA) for banks with low NLA (column 1 and column 2) and for banks with high NLA (column 3 and column 4). For the banks with low NLA, the ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = 0.042700$; (t-$value = 2.64$) and $\beta_{21} = -0.001340$; (t-$value = -4.74$), respectively. The COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = 0.051000$; (t-$value = 3.21$) and $\beta_{22} = -0.001450$; (t-$value = -5.26$), respectively. This satisfies the conditions ($\beta_{1j} > 0$ *and*$\beta_{2j} < 0$) for *inverted-U* effects on ROA and COA. This implies that the *inverted-U* effects of the capital structure on both performances (ROA and COA) hold for banks with low NLA. For the banks with high NLA, ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = 0.025800$; (t-$value = 3.04$) and $\beta_{21} = -0.000596$; (t-$value = -3.15$), respectively. The COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = 0.025700$; (t-$value = 2.80$) and $\beta_{22} = -0.000509$; (t-$value = -2.48$), respectively. This satisfies the conditions ($\beta_{1j} > 0$ *and* $\beta_{2j} < 0$) for *inverted-U* effects on ROA and COA. This implies that the *inverted-U* effects of capital structure on both performances (ROA and COA) hold for the banks with high NLA as well.

Table 7
Robustness Test for Net Loans to Assets

	(1) Low NLA	(2) Low NLA	(3) High NLA	(4) High NLA
	ROA	COA	ROA	COA
TDA	0.042700***	0.051000***	0.025800***	0.025700***
	(2.64)	(3.21)	(3.04)	(2.80)
TDA^2	-0.001340***	-0.001450***	-0.000596***	-0.000509**
	(-4.74)	(-5.26)	(-3.15)	(-2.48)
_cons	0.643***	0.856***	0.739***	0.964***
	(3.85)	(5.23)	(10.17)	(12.23)
N	1376	1376	1331	1331
R^2	0.034	0.037	0.010	0.008
Optimum TDA	15.93	17.59	21.64	25.25

Robustness test for net loans to assets (NLA) using equation (1). The table contains return on assets (ROA) and cash-flow on assets (COA) as dependent variables, debt to total assets (TDA) and square term of TDA as explanatory variables. Column 1 and 2 are the results of the banks with low NLA (NLA ≤ median of NLA = 62.00) and column 3 and 4 are of the banks with high NLA (NLA > median of NLA).
t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Loan loss reserves to assets

Loan loss provision is a large part of banks' accrual, and it used to affect banks' earnings and regulatory capital (Gombola et al., 2016). We divide the sample data into two based on the median of LLRA (0.0088476). Table 8 shows the effects of capital structure on performance (ROA and COA) for banks with low LLRA (column 1 and column 2) and for banks with high LLRA (column 3 and column 4). For banks with low LLRA, the ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = -0.009160$; ($t\text{-}value = -1.35$) and $\beta_{21} = 0.000441$; ($t\text{-}value = 3.16$), respectively. The COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = -0.007610$; ($t\text{-}value = -1.01$) and $\beta_{22} = 0.000513$; ($t\text{-}value = 3.30$), respectively. The results do not satisfy the conditions ($\beta_{1j} > 0$ *and* $\beta_{2j} < 0$) for *inverted-U* effects on ROA and COA. This implies that the *inverted-U* effects of capital structure on either performance (ROA and COA) do not hold for banks with low LLRA. For banks with high LLRA, the ROA results show that the coefficients of TDA and TDA^2 are $\beta_{11} = 0.038400$; ($t\text{-}value = 2.70$) and $\beta_{21} = -0.001460$; ($t\text{-}value = -6.13$), respectively. The COA results show that the coefficients of TDA and TDA^2 are $\beta_{12} = 0.032400$; ($t\text{-}value = 2.32$) and $\beta_{22} = -0.001320$; ($t\text{-}value = -5.62$), respectively. This implies that the *inverted-U* effects of capital structure ($\beta_{1j} > 0$ $and \beta_{2j} < 0$) on both performances (ROA and COA) hold for banks with high LLRA.

Table 8
Robustness Test for Loan Loss Reserves to Assets

	(1) Low LLRA	(2) Low LLRA	(3) High LLRA	(4) High LLRA
	ROA	COA	ROA	COA
TDA	-0.009160	-0.007610	0.038400***	0.032400**
	(-1.35)	(-1.01)	(2.70)	(2.32)
TDA^2	0.000441***	0.000513***	-0.001460***	-0.001320***
	(3.16)	(3.30)	(-6.13)	(-5.62)
_cons	0.732***	0.898***	0.897***	1.226***
	(10.59)	(11.67)	(5.61)	(7.82)
N	628	628	627	627
R^2	0.053	0.075	0.166	0.152
Optimum TDA			13.15	12.27

Robustness test for loan loss reserves to assets (LLRA) using equation (1). The table contains return on assets (ROA) and cash-flow on assets (COA) as dependent variables, debt to total assets (TDA) and square term of TDA as explanatory variables. Column 1 and 2 are the results of the banks with low LLRA (LLRA ≤ median of LLRA = 0.0088476) and column 3 and 4 are of the banks with high LLRA (LLRA > median of LLRA).
t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

In sum, the *inverted-U* effects of capital structure on performance (both accrual- and CF-based) are not affected by the size of banks because they hold for both small and large banks. The effects are also not affected by NLA because they hold for both high and low NLA. However, they are affected by ASST, SA, NLD, and LLRA. The *inverted-U* effects only apply for banks with high ASST, low SA, high NLD, and high LLRA. Thus, the *inverted-U* effects of capital structure on performance (ROA and COA) hold for both small and large banks, and for banks with high ASST, low SA, high NLD, both low and high NLA, and high LLRA ratios. By conducting a *t-test*, collectively, we find that the effects of capital structure (parameters α, β_{1j} and β_{2j}) on accrual-based performance (ROA) are statistically different from the effects on CF-based performance (COA) (not shown). We also solve our estimated regressions to find the optimum capital structure (TDA). Collectively, the results also show that CF-based performance (COA) suggests a higher level of debt in the optimum capital structure (TDA) (see from Tables 3 to 8).

We also check the robustness using the RE model. The results suggest that the *inverted-U* effects of capital structure on performance (ROA and COA) hold for small banks and for banks with low SA, low NLA, and high LLRA ratios. They do not hold for banks with other groups used for robustness checks.

6. CONCLUSION

We examine the *inverted-U* effects of capital structure on the accrual- and CF-based performance of US banks for the period 1980-2017. Modigliani and Miller (1963) state that debt increases firm value due to the interest tax shield. However, Baxter (1967) includes bankruptcy cost, and Jensen and Meckling (1976) include agency cost of debt to the capital structure theory given by Modigliani and Miller (1963). Baxter (1967) argues that if a firm uses substantial levels of debt then the variability of returns becomes higher. As a result, the firm may fail to pay back interest and principal, thereby reducing firm value. Jensen and Meckling (1976) point out that if a firm largely finances from debt, then debt-holders may increase the interest on debt which is better for the debt-holders and worse for the share-holders. This reduces firm performance. Thus, debt increases firm value if the benefits of debt exceed the costs of debt, and decreases firm value if the costs of debt exceed the benefits of debt. Hence, the maximum firm value would be where the marginal benefit of debt and the marginal cost of debt are equal. This suggests that there is an *inverted-U* effect of debt (capital structure) on firm value. Many empirical studies use performance measure as a proxy of firm value since firm value is the present value of future income and performance is assumed to be highly correlated to firm value. Therefore, the effects of capital structure on performance are also expected to be an *inverted-U* implying that the effects of capital structure (debt) on performance are positive at lower levels of debt and negative at higher levels of debt.

In this study, we measure capital structure by the debt to asset ratio and performance by ROA (accrual-based performance) and COA (CF-based performance). We use a quadratic function in panel data analysis (pooled OLS, and the FE and RE models) to study the *inverted-U* effects of capital structure on accrual-based performance and CF-based performance. Then, we compare the parameters of the regressions for accrual- versus CF-based performance by conducting a *t-test*. We also solve our estimated regression to determine whether accrual-based performance and CF-based performance result in a different optimum level of capital structure.

The results from the pooled OLS suggest there is no significant effect of capital structure on accrual- and CF-based performance. However, the results from the FE and RE models suggest the following.

Firstly, there are *inverted-U* effects of capital structure on accrual- and CF-based performance – there is a positive effect of capital structure on performance at lower levels of debt, and a negative effect at higher levels of debt. These results support the relationship suggested in the *trade-off theory*.

Secondly, according to the FE and RE models, CF-based performance (COA) is greater than accrual-based performance (ROA) at all levels of debt. The results also indicate that CF-based performance (COA) is more sensitive to the capital structure (TDA) than the accrual-based performance (ROA).

Thirdly, the results (of both the FE and RE models) show that the optimum level of debt under CF-based performance (COA) is higher than that under accrual-based performance (ROA). These results are statistically significant at 1%.

Finally, the *inverted-U* effects of capital structure on performance (both accrual- and CF-based) hold for overall sample size, both small and large banks, and for banks with high ASST, low SA, high NLD, both low and high NLA, and high LLRA ratios.

The results have some implications for corporate governance, especially when financing decisions arise among stakeholders. The results will further shed light on the decisions made by investors (shareholders for pricing decisions), bondholders (out of fear of bankruptcy), and managers (for maximizing shareholders’ wealth) where agency problems arise.

This study has some limitations as well, it could include more bank characteristics in the analysis.

Future studies can include other industries and/or countries. Furthermore, this research could be extended by including other performance variables with different methods and /or for different sample periods.

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APPENDIX A: EXPLANATION OF THE VARIABLES

A brief explanation of the variables used in this study. The following table contains the definitions of all variables used in this study. Mnemonic codes in COMPUSTAT are in parentheses.

Variable	Definition
Return on assets:	Return on assets is measured net profit after tax [ni] divided by total assets [at]. Then, this is multiplied by 100. Net income represents the net profit (loss) disclosed by a firm after subtracting losses and expenses from revenues and gains for a fiscal year. Here, it includes extraordinary items and discontinued operations, and securities gains and losses.
Cash-flow on assets:	Cash-flow on assets is measured by dividing cash-flow [cfl] by total assets [at]. Then, this is multiplied by 100.
Total debt to total assets:	Total debt to total assets [dat] is defined as the sum of long-term debt and debt in current liabilities, divided by total assets. Then, this is multiplied by 100.
Firm size:	Total assets [at] is used as the size of a firm.
Asset turnover:	Asset turnover [asst] is measured by dividing net sales [sale] by total assets [at].
Securities:	Securities [sa] is the investment in securities as a percentage of total assets [at].
Net loans to deposits:	Net loans to deposit [nld] measures net loans as a percentage of total deposits.
Net loans to assets:	Net loans to assets [nla] measures net loans as a percentage of total assets [ta].
Loan loss reserves to assets:	Loan loss reserves to assets are measured by dividing loan loss reserves [llr] by total assets [at].

APPENDIX B: DESCRIPTIVE ANALYSIS

Descriptive Analysis:

The following table gives the descriptive statistics of 485 US banks in the sample. Here, we put both the mean and the median of the variables used in this study. For the robustness check, we divide the data set into two based on the median of each of the bank characteristics (such as TA, ASST, SA, NLD, NLA, and LLRA). The ROA has a mean value of 0.8335 and standard deviation of 1.58556. COA has an average of 1.10785 and standard deviation of 1.6629. It implies that CF based performance (COA) has different mean and variability in comparison to those of accrual-based performance (ROA). The risk per unit of ROA ($\frac{standard\ deviation}{mean} = 1.90$) is not equal to that of COA ($\frac{standard\ deviation}{mean}$ = 1.50). In other words, COA for per unit of risk ($\frac{mean}{standard\ deviation} = 0.67$) is not equal to ROA for per unit of risk ($\frac{mean}{standard\ deviation}$ = 0.53). It seems there is a difference between accrual-based and cash-flow-based performance and their variability. Total debt to assets (TDA) has an average value 14.9861 and standard deviation 11.94. It indicates a small proportion of total assets is financed with total debt, however, the variability of TDA is high with the range from zero to 87 %. TA (total assets) has an average of 180062.1 (million dollars) with a high standard deviation of 476708. SA has an average of 23.58259 and standard deviation of 12.93408. SA seems to be more consistent. NLD has an average of 123.2713 with a standard deviation 623.2179. It indicates that banks commonly used to invest in loans more than their deposits. On the other hand, NLA has a mean of 60.14435 and standard deviation of 14.43321. The variability of NLA is not too high. LLRA has an average of 0.011311 and standard deviation of 0.010302. It indicates that banks keep LLR around 1 % of total assets. The medians of the variables (TA, ASST, SA, NLD, NLA, and LLRA) are used to divide the data set into two for robustness checks.

Descriptive analysis. The table reports sample statistics for capital structure, firm performance, and firm characteristics for 485 US banks with 2,707 number of observations.

Variable	Overall Mean	Median	Std. Dev.	Min	Max	Observations (N)	Number of banks (n)
TDA	14.98613	14.00	11.94003	0	87	2707	485
ROA	0.833532	0.894	1.58556	-39.6310	17.237	2707	485
COA	1.10785	1.1211	1.662916	-39.6306	21.4296	2707	485
TA	180062.1	1342.13	476708.1	1.191	3000000	2707	485
ASST	0.0854033	0.076934	0.0844624	0	1.9132	2707	485
SA	23.58259	22.00	12.93408	0	80	2700*	485
NLD	123.2713	86.00	623.2179	17	15518	2672*	484*
NLA	60.14435	62.00	14.43321	3	92	2681*	485
LLRA	0.0113108	0.0088476	0.0103016	0	0.1458863	1255*	331*

*There are missing data

APPENDIX C: ERROR GENERATING PROCESS

Error ROA with the FE model: Results report in the following table indicate that the effects of the control variables (bank characteristics) on the unexplained term in estimating ROA using the FE model. Error ROA (EROA_FE) is ROA minus estimated ROA using the FE model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	EROA_FE	EROA_FE	EROA_FE	EROA_FE	EROA_FE	EROA_FE	EROA_FE
TA	-0.000000259***						-0.000000180***
	(-2.66)						(-2.67)
ASST		-5.951***					4.480***
		(-8.12)					(3.77)
SA			0.00461				0.00892**
			(1.23)				(2.10)
NLD				0.0000209			0.000444***
				(0.54)			(5.14)
NLA					0.00569		0.0134***
					(1.56)		(3.39)
LLRA						-35.76***	-39.34***
						(-10.32)	(-11.59)
_cons	0.0464*	0.508***	-0.109	-0.0104	-0.342	0.393***	-0.895***
	(1.68)	(7.69)	(-1.20)	(-0.51)	(-1.56)	(9.18)	(-2.84)
N	2707	2707	2700	2672	2681	1255	1255

t statistics in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$

Error ROA with the RE model: Results report in the following table indicate that the effects of the control variables (bank characteristics) on the unexplained term in estimating ROA using the RE model. Error ROA (EROA_RE) is ROA minus estimated ROA using the RE model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	EROA_RE	EROA_RE	EROA_RE	EROA_RE	EROA_RE	EROA_RE	EROA_RE
TA	-0.000000258***						-0.000000152***
	(-2.76)						(-2.70)
ASST		-1.805***					5.854***
		(-2.93)					(6.79)
SA			0.00142				-0.000769
			(0.42)				(-0.26)
NLD				0.0000173			0.000391***
				(0.45)			(5.51)
NLA					0.00762**		0.00167
					(2.35)		(0.60)
LLRA						-20.24***	-25.68***
						(-7.93)	(-10.03)
_cons	0.0187	0.158	-0.0352	-0.0154	-0.471**	0.265***	-0.248
	(0.18)	(1.38)	(-0.26)	(-0.15)	(-2.11)	(6.48)	(-0.97)
N	2707	2707	2700	2672	2681	1255	1255

t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Error COA with the FE model: Results report in the following table indicate that the effects of the control variables (bank characteristics) on the unexplained term in estimating COA using the FE model. Error COA (ECOA_FE) is COA minus estimated COA using the FE model.

	(1) ECOA_FE	(2) ECOA_FE	(3) ECOA_FE	(4) ECOA_FE	(5) ECOA_FE	(6) ECOA_FE	(7) ECOA_FE
TA	-0.000000353***						-0.000000258***
	(-3.62)						(-3.85)
ASST		-3.058***					7.703***
		(-4.12)					(6.54)
SA			0.00259				0.00609
			(0.69)				(1.45)
NLD				0.0000199			0.000439***
				(0.52)			(5.13)
NLA					0.00574		0.00651*
					(1.60)		(1.66)
LLRA						-32.29***	-37.50***
						(-9.22)	(-11.15)
_cons	0.0640**	0.262***	-0.0609	-0.0183	-0.348	0.327***	-0.689**
	(2.33)	(3.92)	(-0.67)	(-0.90)	(-1.61)	(7.57)	(-2.21)
N	2707	2707	2700	2672	2681	1255	1255

t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Error COA with the RE model: Results report in the following table indicate that the effects of the control variables (bank characteristics) on the unexplained term in estimating COA using the RE model. Error COA (ECOA_RE) is COA minus estimated COA using the RE model.

	(1) ECOA_RE	(2) ECOA_RE	(3) ECOA_RE	(4) ECOA_RE	(5) ECOA_RE	(6) ECOA_RE	(7) ECOA_RE
TA	-0.000000338***						-0.000000216***
	(-3.46)						(-3.87)
ASST		0.118					8.117***
		(0.18)					(9.46)
SA			-0.00175				-0.00605**
			(-0.50)				(-2.02)
NLD				0.0000147			0.000337***
				(0.36)			(4.81)
NLA					0.00619*		-0.00398
					(1.81)		(-1.44)
LLRA						-17.32***	-24.69***
						(-6.61)	(-9.69)
_cons	0.0205	-0.0120	0.0400	-0.0228	-0.388*	0.214***	0.0269
	(0.19)	(-0.10)	(0.29)	(-0.21)	(-1.66)	(5.01)	(0.11)
N	2707	2707	2700	2672	2681	1255	1255

t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01

APPENDIX D: REGRESSION INCLUDING ALL CONTROL VARIABLES

Regression results including all control variables. Results in the following table indicate that the effects of capital structure (TDA) including control variables (bank characteristics) on performance (ROA and COA) using pooled OLS, FE and RE models.

	Pooled OLS		FE		RE	
	ROA	COA	ROA	COA	ROA	COA
TDA	0.0267***	0.0244***	0.0417***	0.0399***	0.0268***	0.0243***
	(5.08)	(4.67)	(5.01)	(4.83)	(4.68)	(4.27)
TDA^2	-0.000891***	-0.000795***	-0.00130***	-0.00120***	-0.000958***	-0.000855***
	(-7.26)	(-6.52)	(-7.87)	(-7.31)	(-7.47)	(-6.71)
TA	-0.000000177***	-0.000000197***	-0.000000183***	-0.000000259***	-0.000000146***	-0.000000201***
	(-3.85)	(-4.30)	(-2.71)	(-3.86)	(-2.58)	(-3.58)
ASST	7.101***	9.899***	4.560***	7.765***	6.012***	8.767***
	(10.13)	(14.21)	(3.85)	(6.60)	(6.99)	(10.24)
SA	-0.00574**	-0.00951***	0.00789*	0.00539	-0.000706	-0.00525*
	(-2.20)	(-3.68)	(1.86)	(1.28)	(-0.23)	(-1.75)
NLD	0.000402***	0.000325***	0.000610***	0.000552***	0.000475***	0.000403***
	(4.48)	(3.64)	(5.83)	(5.31)	(5.51)	(4.70)
NLA	-0.00448*	-0.00820***	0.0113***	0.00498	0.000676	-0.00419
	(-1.82)	(-3.35)	(2.83)	(1.25)	(0.24)	(-1.49)
LLRA	-16.58***	-15.88***	-38.70***	-37.13***	-25.73***	-25.04***
	(-7.50)	(-7.23)	(-11.40)	(-11.02)	(-10.08)	(-9.85)
_cons	0.810***	1.162***	-0.0980	0.346	0.498*	0.948***
	(3.59)	(5.18)	(-0.30)	(1.07)	(1.92)	(3.68)
N	1255	1255	1255	1255	1255	1255
R^2	0.177	0.247	0.243	0.240	0.224	0.219

t statistics in parentheses. * p<0.10, ** p<0.05, *** p<0.01