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The effect of the accounting expertise of chief financial officers on corporate credit ratings

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ABSTRACT

Corporate credit ratings (CRs) are closely related to companies' cost of debt financing. Recent research has drawn wide attention to how non-financial as well as financial factors may affect ratings. By manually collecting information about the profiles of chief financial officers (CFOs) of US companies, we examine the effect of CFOs' accounting expertise on corporate CRs. The results show that firms with accounting expert CFOs are more likely to receive higher CRs and that the effect of CFOs' accounting expertise on the ratings is more pronounced for firms with higher default risk, suggesting that the accounting expertise of CFOs may be an important factor that affects CRs. Moreover, we find a dynamic relation between accounting expert CFOs and CRs such that a downgrade in a firm's CR in a prior year affects the subsequent selection of an accounting expert CFO.

KEYWORDS

Accounting expertise; chief financial officer; credit rating

I. Introduction

Debt financing accounts for a major part of U.S. corporate finance and has significantly risen over the past five years (Thomas Franck 2018/6/27). A borrowing company strives to have the highest possible credit rating (CR) because CRs have a major impact on the interest rates charged by lenders (Zhang 2018). A firm's CR reflects the financial risks and debt-paying ability of the firm (Standard & Poor's, 2002). Prior studies have documented the effects of firms' financial characteristics on CRs (Sengupta 1998; Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006; Gupta, Gupta, and Chahal 2017). However, non-financial characteristics may also affect firms' CRs by affecting the quality and communicating of financial reporting, especially in an economic environment in which financial reporting requires considerable professional judgments. In recent years, global financial reporting standards, including both the International Financial Reporting Standard (IFRS) and the U.S. Generally Accepted Accounting Principles (GAAP), have substantially shifted toward principle-based accounting and converted from historical cost principle to fair value accounting, demanding more professional judgments in financial reporting than before. Standards, such as Financial Instruments (IFRS 9 and ASC 825) and Leases (IFRS 16 and ASC 842), specify that some items, including the lease term, lease payments, discount rate, business model, contractual cash flow characteristics, etc., rely on significant judgments. Thus, the person responsible for financial reporting with or without the accounting profession may be a critical factor affecting firms' financial reporting quality and, thereby, the results of CRs.

Prior studies show that corporate financial strength and financial reporting quality are important determinants of CRs (Sengupta 1998; Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and

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LaFond 2006; Jiang 2008; Liu et al. 2018; Zhang 2018; Hill, Korczak, and Wang 2019). Corporate CFOs significantly influence both factors because they are the primary executives responsible for planning corporate financial activities and overseeing financial reporting processes and the quality of financial statements (Mian 2001; Geiger and North 2006). Geiger and North (2006) find that firms' discretionary accruals change with the recruitment of a new CFO and that the finding holds regardless of concurrent CEO appointments, suggesting that CFO turnovers may be associated with a change in the quality of financial reporting. In the context of legal liability, CFOs are liable for the true and fair presentation of financial statements. For example, Sarbanes-Oxley Act Section 302 states that '*the CEO and CFO are directly responsible for the accuracy, documentation, and submission of all financial reports as well as the internal control structure to the Securities and Exchange Commission (SEC).*' In addition, the SEC requests that a CFO sign his/her name in the financial report to indicate the CFO's responsibility for ensuring that the financial reporting is free of material misstatements. Similar to financial analysts, credit rating agencies heavily rely on financial reporting in evaluating firms' credit risks since financial reporting is a major source of firms' financial information available to the public. However, extant research has not examined whether rating agencies incorporate the characteristics of firms' CFOs in their credit rating process, especially in the current financial reporting environment.

The upper echelons theory posits that top executives' personal characteristics, such as education, work experience, and demographic background, influence their firms' various strategies, operating results, and financial reporting quality (Hambrick and Mason 1984; Bantel and Jackson 1989; Bertrand and Schoar 2003;; Ge, Matsumoto, and Zhang 2011). For example, recent studies have documented the effects of CFOs on corporate financial reporting quality, indicating that firms with accounting expert CFOs are likely to have a better financial reporting quality than firms without such a CFO (Aier et al. 2005; Matsunaga and Yeung 2008; Rakhman 2009; Li, Sun, and Ettredge 2010). Gao, Lee, and Shin (2019) find that firms with accountant CFOs are less likely to conduct income-increasing earnings management to manipulate firms' earnings because CFOs with accounting expertise are more concerned about their long-term reputations. In addition, Brochet and Welch (2011) find that stock market investors consider the prior knowledge and experience of CFOs and that this concern is reflected in stock prices. The results of these prior studies suggest that the expertise of CFOs may affect the corporate financial reporting quality and stakeholders' evaluation of the results presented in financial statements. We, therefore, conjecture that the accounting expertise of CFOs is likely to have an impact on CR agencies when evaluating firms' CRs. Therefore, the purpose of this paper is to empirically investigate whether the accounting expertise of CFOs affects their firms' CRs.

By manually collecting the profiles of the CFOs of US companies, we find that firms with accounting expert CFOs are more likely to receive higher CRs and that the effect of CFOs' accounting expertise on the ratings is more pronounced in firms with a higher default risk. Moreover, we find a dynamic relation between accounting expert CFOs and CRs such that a downgrade in a firm's CR in a prior year affects the subsequent selection of an accounting expert CFO. Our results are robust to various sensitivity tests and robustness checks, including the construction of an alternative numerical measure of CRs, the generation of subsamples with alternative measures of default risks, addressing the problem of self-selection, and controlling for the influence of other personal characteristics of CFOs on CRs.

Our study makes several contributions to the literature. First, we extend previous research investigating the determinants of firms' CRs. Prior documents show that the financial reporting quality affects CRs (Sengupta 1998; Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006; Jiang 2008; Liu et al. 2018; Zhang 2018; Hill, Korczak, and Wang 2019). However, research addressing whether CR agencies consider the characteristics of the individuals which affect the financial reporting quality of firms when evaluating the firms' CRs is limited. Our study fills this gap by providing evidence that the accounting expertise of CFOs is positively associated with firms' CRs. This evidence is important because the recent trend in financial accounting standards has

shifted from rule-based to principle-based accounting and from cost measurement to fair value measurement, demanding more professional judgments in financial reporting than before. Accounting regulatory authorities have also enhanced oversight over both firms' audit quality and corporate financial reporting quality, rendering both CPAs and CFOs more liable for legal duties. Hence, whether accounting expert CFOs have an advantage in overseeing the financial reporting process and communicating firms' financial results with auditors and other stakeholders, such as CR agencies, should be emphasized in the current financial reporting environment. However, the literature concerning CR mentioning the role of accounting expert CFOs in the financial reporting environment in which financial standards need professional judgments is limited. Our study provides new insight into the research area of CR by examining the effect of accounting expert CFOs.

Furthermore, our empirical findings extend the literature concerning the effect of the personal characteristics of CFOs on corporate decisions. Prior studies show that firms with CFOs with finance or accounting expertise tend to have a better financial reporting quality and internal control (Aier et al. 2005; Rakhman 2009; Brochet and Welch 2011; Li, Sun, and Ettredge 2010). However, the prior literature has not addressed the effect of the personal characteristics of CFOs on their firms' CRs. Our findings enhance the current understanding of the impact of CFOs' personal characteristics on rating agencies in evaluating firms' ratings.

The remainder of this paper proceeds as follows. Section 2 discusses the related literature. Section 3 develops the research hypotheses and describes the research design and data. Section 4 reports our empirical findings. Section 5 discusses the robustness and additional tests, and Section 6 concludes.

II. Related Literature

The upper echelons theory posits that top executives' personal characteristics, such as cognitive bases, values, age, education, work experience and demographic background, influence their firms' various strategies and operating results (Hambrick and Mason 1984). Prior studies have documented the evidence on the effects of corporate top managers' personal characteristics on firm business decisions and performance (Bantel and Jackson 1989; Bertrand and Schoar 2003; Ge, Matsumoto, and Zhang 2011). For example, Bantel and Jackson (1989) and Ge, Matsumoto, and Zhang (2011) find that the education levels of top managers are positively associated with their firms' financial performance. Bertrand and Schoar (2003) show that the age of top managers is positively associated with the conservatism of the firms' investment strategies. The findings of the previous studies suggest that the personal characteristics of executives set the tone within the companies, affecting corporate decisions and performance.

In addition to corporate financial strength, nonfinancial factors, in particular the personal characteristics of top management, have become increasingly important for determining firms' CRs in that nonfinancial factors are usually the drivers of financial results and are associated with various corporate strategies and decisions. For example, recent research has examined the effects of the accounting expertise of top executives on firms' accounting policies, earnings quality, the relevancy of financial reporting, and internal control (Aier et al. 2005; Rakhman 2009; Brochet and Welch 2011; Li, Sun, and Ettredge 2010). Aier et al. (2005) show that firms with CFOs with an MBA degree, CPA license, or work experience as a CFO in other companies tend to have a lower probability of financial restatements. Rakhman (2009) and Brochet and Welch (2011) also find that firms with accounting expert CFOs are more likely to have better-quality accruals, earnings persistence, informativeness of earnings, and relevancy of financial reporting. Li, Sun, and Ettredge (2010) show that firms with accounting expert CFOs are less likely to receive adverse opinions regarding internal control and that firms are more likely to reduce their previous internal control weakness when they have a succeeding CFO with accounting expertise. Gao, Lee, and Shin (2019) find that CFOs are more likely to use income-increasing earnings management to

manipulate firms' earnings in the early years of their tenure, and this finding is more pronounced in firms with non-accountant CFOs than firms with accountant CFOs because CFOs with accounting expertise are more concerned about their long-term reputation of financial reporting quality than their short-term career security. In addition, Brochet and Welch (2001) find that stock market investors consider the prior knowledge and experience of CFOs, and this concern is reflected in stock prices. The results of these prior studies suggest that the expertise of CFOs may affect the corporate financial reporting quality and stakeholders' evaluation of the results presented in financial statements. CR agencies relay information regarding corporate financial reporting in evaluating the rating score of firms (Ashbaugh-Skaife, Collins, and LaFond 2006; Jiang 2008; Liu et al. 2018; Zhang 2018; Hill, Korczak, and Wang 2019). If the accounting expertise of CFOs affects the corporate financial reporting quality, it may also be a consideration of CR agencies. However, the previous literature has not addressed this issue. Therefore, we seek to fill this gap in previous research by investigating the relationship between the accounting expertise of CFOs and firms' CRs.

III. Research Methods

1. Research hypothesis

The upper echelons theory (Hambrick and Mason 1984) suggests that top managers' personal characteristics, such as demographic characteristics, educational background, and work experience, may influence various firm policies, decisions, and firm risk. For Francis, Hasan, and Wu (2013, 2015) find that female CFOs are more conservative in corporate financial reporting and tax avoidance activities than male CFOs, indicating that the personal characteristics of top management affect the firm's decisions and further affect the risk of the firm.

Recent research has also documented the effects of the accounting expertise of top executives on firms' accounting policies, earnings quality, financial reporting relevancy, investment decision, and internal control (Aier et al. 2005; Rakhman 2009; Brochet and Welch 2011; Li, Sun, and Ettredge 2010; Hoitash, Hoitash, and Kurt 2014). Aier et al. (2005) find that firms with CFOs with an MBA degree, CPA license, or work experience as a CFO in other companies have a lower likelihood of financial restatements. Rakhman (2009), Brochet and Welch (2011), and Gao, Lee, and Shin (2019) also find that firms with accounting expert CFOs to have better-quality accruals, earnings persistence, informative earnings, and financial reporting relevancy. Li, Sun, and Ettredge (2010) show that firms with accounting expert CFOs are less likely to receive adverse opinions regarding internal control and that firms are more likely to reduce their previous internal control weakness when they have a succeeding CFO with accounting expertise. Moreover, Hoitash, Hoitash, and Kurt (2014) show that firms with accounting expert CFOs tend to adopt conservative investment decisions regarding external financing, R&D expenditures, and capital investment. The findings of the prior research indicate that firms with accounting expert CFOs have a better financial reporting quality and less aggressive investment policy, suggesting that CFOs with accounting expertise are likely representative of the financial reporting quality and risk of firms.

Credit rating agencies consider firms' financial reporting quality and risk in evaluating credit rating scores (Akins 2018). We conjecture that this consideration is of importance in the current environment of financial reporting. Both the IFRS and U.S. GAAP increased the professional judgment items of financial reporting. CFOs with accounting expertise may have an advantage in better communicating the firms' financial statement information to their stakeholders, including CR agencies. Therefore, we propose that rating agencies may view the accounting expertise of CFOs as a signal of firms with a better financial reporting quality because accounting standards have become increasingly complex and demand more professional judgments in presenting firms' financial statements. CFOs with accounting expertise may signal that their firms' attempt to maintain a high quality of financial reporting and better comply with accounting regulatory

requirements. Furthermore, many U.S. firms provide nonGAAP earnings in reconciliation with the results in financial statements. CFOs with accounting expertise may have a better ability to reconcile the results of nonGAAP earnings with GAAP earnings and to communication the information content of nonGAAP earnings. Finally, accounting expert CFOs tend to adopt less aggressive investment policies (Hoitash, Hoitash, and Kurt 2014). This personal characteristic of accounting expert CFOs may represent the risk of the firm and be a consideration of CR agencies. Accordingly, we propose our first hypothesis as follows:

H1: Ceteris paribus, firms having a CFO with accounting expertise are more likely to have higher CRs.

According to our first hypothesis, firms with a CFO with accounting expertise are more likely to have higher CRs. Therefore, firms may change their CFOs from a non-accounting expert to an accounting expert if they experienced a CR downgrade in the previous period or before. We conjecture that the association between accounting expert CFOs and CRs may be dynamic as a CR downgrade may lead a firm to hire a CFO with accounting expertise. Accordingly, we propose our second hypothesis as follows:

H2: Ceteris paribus, firms are more likely to hire a CFO with accounting expertise following a CR downgrade.

CR agencies are concerned about firms' default risk because high default risk will have a negative impact on firms' solvency. High default risk is likely to trigger a downgrade to firms' CR. Hence, firms with a high default risk have greater incentives to avoid downgrades in their CR. These firms may conduct earnings management to influence their CRs (Jiang 2008; Liu et al. 2018; Zhang 2018). However, Hill et al. (2019) indicate that during the credit watch period, firms can use accrual-based and real-based earnings management to avoid a CR downgrade only if they can afford the cost of earnings management such as lower earnings quality and the subsequent reversal of the managed earnings. Since CR agencies consider firms' financial reporting quality in evaluating CRs (Akins 2018), we conjecture that CR agencies may also consider the accounting expertise of CFOs. CFOs with accounting expertise can better identify whether firms can afford the reversal of earnings management and enhance firms' financial reporting quality through other accounting methods, especially in firms with a high motivation of earnings management, e.g., high default risk firms. Therefore, we posit that the association between CFOs with accounting expertise and CRs is more pronounced in firms with high financial risks than firms with low financial risks. Hence, we propose our third hypothesis as follows:

H3: Ceteris paribus, the positive effect of a CFO with accounting expertise on CR is more pronounced for firms with high default risk.

2. Empirical models and variable definitions

We construct regression Model (1) and Model (2) to test H1 and H2, respectively. To test H3, we separate our sample firms into two subsamples with high and low default risk. We classify the firms with a value of *RATING* above the median *RATING* value of all sample firms as the high default risk group, and the other firms are classified as the low default risk group. Then, we rerun Model (1) using the two subsamples separately. According to H3, we conjecture that the coefficient of *CFO_ACC* in the high default risk subsample is significantly lower than that in the low default risk subsample.[1] The model settings and variable definitions of Models (1) and (2) are as follows.

Model (1)

$$RATING_{it} = \alpha_0 + \alpha_1 CFO\_ACC_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 OCF_{it} + \alpha_5 A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7 ROA_{it} + \alpha_8 TIE_{it} + \alpha_9 LOSS_{it} + IND_j + \varepsilon_{it} \quad (1)$$

where

subscript: i = firm index, j = industry index, and t = year index;

RATING	=	Credit rating, measured by converting the S&P's ratings – AAA, AA^+, AA, AA^-, A^+, A, A^-, BBB^+, BBB, BBB^-, BB^+, BB, BB^-, B^+, B, B^-, CCC^+, CCC, CCC^-, CC, and D into numerical values of 1, 2, ……., and 21, respectively;
CFO_ACC	=	CFO with accounting expertise, a dummy variable that equals 1 if a firm has a CFO with accounting expertise, and 0 otherwise;
SIZE	=	firm size, measured as the natural log value of total assets;
LEV	=	debt ratio, measured as total debt divided by total assets;
OCF	=	cash flow from operating activities, measured as cash flow from operating activities divided by total assets;
A_STRTURE	=	tangible assets intensity, measured as properties, plants, and equipment divided by total assets;
NEG_EQ	=	negative equity, a dummy variable that equals 1 if the firm observation has a negative equity, and 0 otherwise;
ROA	=	return on assets, measured as net income divided by average total assets;
TIE	=	times interest earned, measured as operating income before depreciation and amortization divided by interest expenses;
LOSS	=	operating loss, a dummy variable that equals 1 if the firm observation has negative earnings before tax, and 0 otherwise;
IND	=	high tech industries, is a dummy variable that equals 1 if the firm is in the high-tech industries, and 0 otherwise.

Dependent variable

The measure of the dependent variable, corporate CRs (*RATING*), is based on the ratings of S&P. We convert the 21 categorical grades of S&P ratings – AAA, AA+, AA, AA–, A+, A, A–, BBB+, BBB, BBB–, BB+, BB, BB–, B+, B, B–, CCC+, CCC, CCC–, CC, and D – into numerical scores from 1 to 21, with a score of 1 indicating the highest grade of AAA.

Independent variable

Our test variable *CFO_ACC* is a dummy variable that equals 1 if the firm has a CFO with accounting expertise and 0 otherwise. Following the definition of Bedard, Hoitash, and Hoitash (2014), we identify a CFO with accounting expertise if he or she (1) has a CPA license or (2) has worked as a top financial officer for other firms. As H1 hypothesizes that companies having a CFO with accounting expertise are more likely to have higher CRs, we expect the coefficient on *CFO_ACC* to be negative. Moreover, according to the hypothesis H3, we conjecture that the coefficient on *CFO_ACC* for the high default risk subsample is significantly lower than that for the low default risk subsample.

Control variables

CR is related with firms' default risk; therefore, firms with low default risk are more likely to receive better CR while firms with high default risk are more likely to receive lower CR. The control variables in our model generally follow prior studies for the determinants of corporate CRs. *SIZE*, defined as the natural logarithm of total assets, controls for the effect of firm size on *RATING*. Prior studies show that large companies have lower default risk (Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006). Therefore, we expect the coefficient on *SIZE* to be negative. *LEV*, measured as total liabilities divided by total assets, controls for the effect of debt ratios on *RATING*. Ceteris paribus, firms with higher debt ratios tend to have higher default risk (Ashbaugh-Skaife, Collins, and LaFond 2006). Therefore, the predicted coefficient on *LEV* is positive. *OCF* is the measure of the cash flow from operating activities, scaled by the total assets. Pittman and Fortin (2004) show that firms with higher cash flow from operating activities have lower default risk. Accordingly, the coefficient on *OCF* is expected to be negative.

A_STRTURE, measured as properties, factory plants, and equipment divided by the total assets, controls for the effect of asset structure on *RATING*. Firms with greater capital intensity have more

tangible collateral for debt and thus may have less default risk (Ashbaugh-Skaife, Collins, and LaFond 2006). Therefore, the coefficient on *A_STRTURE* is expected to be negative. *NEG_EQ* is a dummy variable that equals 1 if the firm observation's equity is negative and 0 otherwise. *NEG_EQ* is used to capture the effect of negative net assets on *RATING*. Prior studies find that firms with a negative equity value have high default risk (Pittman and Fortin 2004; Kim et al. 2011). Accordingly, the coefficient on *NEG_EQ* is expected to be positive.

ROA, measured as net income divided by the average total assets, is the measure of return on assets. Profitable firms tend to have lower default risk (Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006); thus, we expect the coefficient on *ROA* to be negative. *TIE*, measured as operating income before depreciation and amortization divided by total interest expenses, is the measure of times interest earned. Firms with higher *TIE* have a greater ability to pay off the interest in debt and thus have lower default risk (Ashbaugh-Skaife, Collins, and LaFond 2006). Therefore, the coefficient on *TIE* is expected to be negative. *LOSS* is a dummy variable that equals 1 if the firm observation has negative earnings and 0 otherwise. *LOSS* is used to capture the effect of loss firms on *RATING*. Bhojraj and Sengupta (2003) and Ashbaugh-Skaife, Collins, and LaFond (2006) indicate that loss firms are more likely to default, and therefore, the coefficient on *LOSS* is expected to be positive. Finally, we incorporate industry effects, *IND*, to control for the differences in the macroeconomic conditions of industries that may influence the regression results. *IND* is a dummy variable that equals 1 if the firm is in the high-tech industry and 0 otherwise.

Model (2)

To examine the dynamic association between accounting expert CFOs and CRs, we select a subsample of firms whose CFOs changed during our sample period and conduct a logistic model, i.e., Model (2). Model (2) is as follows:

$$Non\_ACC\_to\_ACC_{it} = \alpha_0 + \alpha_1\ DOWNGRADE_{TiT} + \alpha_2\ \Delta SIZE_{it} + \alpha_3\ \Delta LEV_{it} + \alpha_4\ \Delta OCF_{it} + \alpha_5\ \Delta A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7\ \Delta ROA_{it} + \alpha_8\ \Delta TIE_{it} + \alpha_9\ LOSS_{it} + IND_j + \varepsilon_{it} \quad (2)$$

where

subscript: i = firm index, j = industry index, and t = year index; *SIZE, LEV, OCF, A_STRTURE, NEG_EQ, ROA, TIE*, and *LOSS* are as those defined in Model (1).

Non_ACC_to_ACC	=	CFO changed, which is a dummy variable that equals 1 if the firm's CFO changes from a non-accounting expert to an accounting expert at year t and 0 otherwise;
$DOWNGRADE_{TiT}$	=	CR downgrades, which is a dummy variable that equals 1 if the firm has CR downgrades in the earlier year and 0 otherwise;
ΔSIZE	=	changes in *SIZE* between the current year and prior year;
ΔLEV	=	changes in *LEV* between the current year and prior year;
ΔOCF	=	changes in *OCF* between the current year and prior year;
ΔA_STRTURE	=	changes in *A_STRTURE* between the current year and prior year;
NEG_EQ	=	negative equity, which is a dummy variable that equals 1 if the firm observation has a negative equity and 0 otherwise;
ΔROA	=	changes in *ROA* between the current year and prior year;
ΔTIE	=	changes in *TIE* between the current year and prior year;
LOSS	=	operating loss, which is a dummy variable that equals 1 if the firm observation has negative earnings before tax and 0 otherwise; and
IND	=	high tech industries, which is a dummy variable that equals 1 if the firm is in a high-tech industry and 0 otherwise.

Our dependent variable in Model (2), i.e., *Non_ACC_to_ACC*, is a dummy variable that equals 1 if the firm's CFO changes from a non-accounting expert to an accounting expert at year t and 0 otherwise. The independent variable[2] $DOWNGRADE_{TiT}$ is a dummy variable that assumes a value of 1 if firms have CR downgrades in the earlier year and 0 otherwise. We expect a lagged relation between CR downgrades and CFO turnover because contracts usually protect the tenure of CFOs. We define two measures of $DOWNGRADE_{TiT}$, i.e., CR_{t-1} minus CR_{t-2} and CR_{t-2} minus CR_{t-3}, to examine the dynamic relation between accounting expert CFOs and CRs in Model (2). Then, we

run Model (2) using the two measures of $DOWNGRADE_{TiT}$, to examine the lagged relation between CR downgrades and CFO turnover. According to hypothesis H2, we expect the coefficient of $DOWNGRADE_{TiT}$ to be positive. As prior studies show that the specific characteristics of firms influence firms' decision to hire accounting expert or non-accounting expert CFOs, we include firm characteristics in our regression.

3. Data and sample selection

We collect the biographical data of corporate CFOs from the ExecuComp and S&P Capital IQ database files for the period 2010–2015. Financial statement data are collected from the Compustat database files. Table 1 outlines the sample selection procedures. Firms in the financial industries (SIC codes 6000–6999) and utilities industries (SIC codes 4900–4999) are deleted because their regulatory constraints are different from those of other industries. Firm observations with missing data on the selected financial statements variables are also deleted. The final sample consists of 3,152 firm-year observations.

IV. Empirical results and analysis

1. Descriptive statistics and univariate analysis

Table 2 profiles the descriptive statistics of our sample firms for the selected variable of Model (1). The mean value of *CFO_ACC* is 0.6, indicating that approximately 60% of the sample firms have a CFO with accounting expertise. The mean value (median) of CR is 10.3 (10), suggesting that the average CR of the sample firms ranks at BBB−. Moreover, the mean value of *SIZE* is 8.8, suggesting that most of the sample firms are large firms. The mean value of *LEV* is 0.64, indicating that the sample firms have on average a higher leverage ratio, which is adverse to CR. The mean value of *TIE* is 15.30, meaning that the sample firms have on average enough earnings to pay off their interest expenses. The minimum value of *OCF* is negative, suggesting that some of the sample firms have negative operating cash flow.

Table 1. Sample selection procedures.

	Number of firm-year observations
Total firm-year observations selected from the Capital IQ files excluding the finance, insurance, and utility industries during 2010–2015	7,226
Less:	(238)
Firm-year observations missing CFOs' background and autobiographic information	
Firm-year observations without the Compustat financial statements data files	(3,836)
Final sample	3,152

Table 2. Descriptive statistics.

Variables	Mean	Std.	Median	Min.	Max.
RATING	10.30	3.21	10.00	1.00	21.00
CFO_ACC	0.60	0.49	1.00	0.00	1.00
SIZE	8.80	1.28	8.69	6.38	12.25
LEV	0.64	0.21	0.61	0.28	1.45
OCF	0.10	0.06	0.10	−0.07	0.28
A_STRTURE	0.57	0.42	0.47	0.03	2.02
NEG_EQ	0.06	0.23	0.00	0.00	1.00
ROA	0.07	0.09	0.07	−0.25	0.30
TIE	15.30	22.29	9.08	−3.39	152.16
LOSS	0.15	0.36	0.00	0.00	1.00

where

RATING	=	Credit rating, measured by converting the S&P ratings – AAA, AA^+, AA, AA^-, A^+, A, A^-, BBB^+, BBB, BBB^-, BB^+, BB, BB^-, B^+, B, B^-, CCC^+, CCC, CCC^-, CC, and D – into numerical values of 1, 2, ..., and 21, respectively;
CFO_ACC	=	CFO with accounting expertise, a dummy variable that equals 1 if a firm has a CFO with accounting expertise, and 0 otherwise;
SIZE	=	firm size, measured as the natural logarithm of total assets;
LEV	=	debt ratio, measured as total debt divided by total assets;
OCF	=	cash flow from operating activities, measured as cash flow from operating activities divided by total assets;
A_STRTURE	=	capital intensity, measured as properties, plants, and equipment divided by total assets;
NEG_EQ	=	negative equity, a dummy variable that equals 1 if the firm observation has negative equity, and 0 otherwise;
ROA	=	return on assets, measured as net income divided by average total assets;
TIE	=	times interest earned, measured as operating income before depreciation and amortization divided by interest expenses; and
LOSS	=	operating loss, a dummy variable that equals 1 if the firm observation has negative earnings before tax, and 0 otherwise.

Table 3 displays the difference test between firms with high and low default risk. Both groups of lower and higher default risk firms have similar means for *CFO_ACC*, suggesting that both groups may not differ in the inclination to have an accounting expert CFO. In addition, the mean value of *LEV* is significantly lower for firms with low default risk, indicating that the debt ratio is lower in these firms. The mean value of *TIE* is significantly higher for firms with low default risk, suggesting that these firms tend to have better solvency than firms with high default risk. The mean values of *OCF* and *ROA* are significantly higher for firms with low default risk, indicating that these firms have better profitability than firms with high default risk.

Tables 4, 4–1 and 4–2 report the Spearman correlations between the selected variables included in the regression models for all sample firms and the subsamples of firms with low and high default risk, respectively. The correlation coefficient between *RATING* and *CFO_ACC* is negative but nonsignificant (p-value = 0.46) for the whole sample. However, *RATING* is significantly negatively related to *CFO_ACC* in the group of firms with a high default risk but insignificant in the group of low default risk firms. This result suggests that high default risk firms with accounting expert CFOs are associated with higher CRs according to the correlation test. The univariate correlations between *RATING* and the control variables are generally in line with economic intuition and the findings of prior studies. *RATING* is negatively related to *SIZE, OCF, ROA*, and *TIE*, suggesting that large firms and firms with greater operating cash flow and profitability tend to receive higher CRs, consistent with the findings of prior studies (Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006; Jiang 2008). Furthermore, *RATING* is positively related to *LEV* and *NEG_EQ*, suggesting that firms with higher debt ratios and negative equity are more likely to receive lower

Table 3. Difference test between firms with different default risk.

	Firms with low default risk	Firms with high default risk			
Variables	Mean	Mean	Difference	t-value	p-value
RATING	7.77	13.01	−5.25	−79.73	0.00
CFO_ACC	0.60	0.60	0.00	0.21	0.83
SIZE	9.44	8.12	1.31	33.79	0.00
LEV	0.60	0.69	−0.09	−12.50	0.00
OCF	0.12	0.08	0.03	16.67	0.00
A_STRTURE	0.51	0.64	−0.13	−8.68	0.00
NEG_EQ	0.02	0.10	−0.07	−8.82	0.00
ROA	0.11	0.04	0.07	23.66	0.00
TIE	21.51	8.63	12.88	17.23	0.02
LOSS	0.05	0.25	−0.20	−17.13	0.00

Firm observations whose *RATING* is above the median value being classified into the high default risk group, and low default risk group otherwise.

Table 4. Correlation coefficients (all sampled firms).

	RATING	CFO_ACC	SIZE	LEV	OCF	A_STRTURE	NEG_EQ	ROA	TIE	LOSS
RATING	1									
CFO_ACC	−0.01	1								
	0.46									
SIZE	−0.60	−0.01	1							
	0.00	0.44								
LEV	0.28	−0.06	0.00	1						
	0.00	0.00	0.85							
OCF	−0.38	−0.05	0.08	−0.17	1					
	0.00	0.01	0.00	0.00						
A_STRTURE	0.18	−0.09	−0.06	0.08	0.21	1				
	0.00	0.00	0.00	0.00	0.00					
NEG_EQ	0.22	−0.05	−0.10	0.40	0.01	0.08	1			
	0.00	0.01	0.00	0.00	0.50	0.00				
ROA	−0.55	−0.03	0.15	−0.23	0.60	−0.14	−0.07	1		
	0.00	0.13	0.00	0.00	0.00	0.00	0.00			
TIE	−0.69	0.04	0.26	−0.46	0.54	−0.16	−0.23	0.72	1	
	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00		
LOSS	0.39	−0.01	−0.15	0.18	−0.28	0.16	0.16	−0.61	−0.47	1
	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

See Table 2 for variable definitions. The values in parentheses are *p*-values.

Table 4-1. Correlation coefficients (firms with low default risk).

	RATING	CFO_ACC	SIZE	LEV	OCF	A_STRTURE	NEG_EQ	ROA	TIE	LOSS
RATING	1									
CFO_ACC	0.04	1								
	0.10									
SIZE	−0.47	−0.04	1							
	0.00	0.07								
LEV	0.09	0.00	0.07	1						
	0.00	0.98	0.00							
OCF	−0.29	−0.02	−0.07	−0.10	1					
	0.00	0.36	0.00	0.00						
A_STRTURE	0.02	−0.06	0.02	0.01	0.25	1				
	0.41	0.01	0.49	0.70	0.00					
NEG_EQ	0.02	−0.07	−0.10	0.25	0.19	−0.03	1			
	0.53	0.01	0.00	0.00	0.00	0.22				
ROA	−0.32	−0.05	−0.14	−0.09	0.65	−0.03	0.16	1		
	0.00	0.07	0.00	0.00	0.00	0.20	0.00			
TIE	−0.46	0.01	−0.01	−0.36	0.50	−0.09	−0.06	0.61	1	
	0.00	0.63	0.76	0.00	0.00	0.00	0.01	0.00		
LOSS	0.15	0.02	0.01	0.02	−0.13	0.10	−0.03	−0.36	−0.25	1
	0.00	0.39	0.55	0.33	0.00	0.00	0.18	0.00	0.00	

See Table 2 for variable definitions. The values in parentheses are *p*-values.

CRs (Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006). As correlation is a bivariate analysis, we conduct further multivariate regression tests.

2. Multivariate regression results

Table 5 presents the regression results of Model (1). The p-value of the likelihood ratio (LR) of Model (1) is statistically significant (p-value = 0.00), suggesting that Model (1) has reasonable goodness of fit. The coefficient on *CFO_ACC* is negative and significant (p-value = 0.05), consistent with H1 that firms with accounting expert CFOs are more likely to receive higher CRs. Prior research shows that the accounting expertise of CFOs is related with financial reporting quality and that financial reporting quality affects the firms' CRs (Jiang 2008; Liu et al. 2018; Zhang 2018; Hill,

Table 4-2. Correlation coefficients (firms with high default risk).

	RATING	CFO_ACC	SIZE	LEV	OCF	A_STRTURE	NEG_EQ	ROA	TIE	LOSS
RATING	1									
CFO_ACC	−0.09	1								
	0.00									
SIZE	−0.25	−0.01	1							
	0.00	0.78								
LEV	0.34	−0.11	0.16	1						
	0.00	0.00	0.00							
OCF	−0.25	−0.07	−0.10	−0.14	1					
	0.00	0.01	0.00	0.00						
A_STRTURE	0.19	−0.13	0.00	0.09	0.27	1				
	0.00	0.00	0.87	0.00	0.00					
NEG_EQ	0.27	−0.04	0.00	0.50	−0.01	0.11	1			
	0.00	0.09	0.94	0.00	0.77	0.00				
ROA	−0.45	0.00	−0.03	−0.24	0.45	−0.15	−0.11	1		
	0.00	0.90	0.24	0.00	0.00	0.00	0.00			
TIE	−0.58	0.08	−0.03	−0.48	0.48	−0.11	−0.28	0.68	1	
	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00		
LOSS	0.38	−0.02	−0.02	0.19	−0.28	0.15	0.16	−0.75	−0.51	1
	0.00	0.37	0.42	0.00	0.00	0.00	0.00	0.00	0.00	

See Table 2 for variable definitions. The values in parentheses are *p*-values.

Table 5. Test of the effect of CFOs with accounting expertise on CRs.

$RATING_{it} = \alpha_0 + \alpha_1 CFO\_ACC_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 OCF_{it} + \alpha_5 A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7 ROA_{it} + \alpha_8 TIE_{it} + \alpha_9 LOSS_{it} + IND + \varepsilon_{it}$ (1)

Variables	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.07 **	0.04	3.80	0.05
SIZE	−0.69 ***	0.02	1605.71	0.00
LEV	1.34 ***	0.12	115.43	0.00
OCF	−5.75 ***	0.42	183.96	0.00
A_STRTURE	0.56 ***	0.05	121.76	0.00
NEG_EQ	0.35 ***	0.11	10.93	0.00
ROA	−3.01 ***	0.36	69.37	0.00
TIE	−0.01 ***	0.00	80.07	0.00
LOSS	0.35 ***	0.07	25.23	0.00
IND	YES			
Log Likelihood	−6421.27			
Pseudo R^2	0.20			

See Table 2 for variable definitions.
*, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Korczak, and Wang 2019). Our empirical results further suggest that CR agencies take into account the accounting expertise of CFOs in evaluating firms' CRs. The results extend prior research on the determinants of firms' CRs by providing evidence on CR agencies incorporating the personal characteristics of key executives such as CFOs in determining their firms' CRs. A firm's credit rating is closely related with its cost of borrowing. It is a critical task for a firm with higher financial risk to improve its CR to access financial markets to lower financing costs. Our results suggest that an accounting expert CFO may help signal the firm's attempt to improve financial reporting quality and to better communicate financial information to the stakeholders.

The coefficient on *SIZE* is negative and significant, consistent with the notion that large firms tend to have higher CRs than small firms (Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006). The coefficients on *LEV*, *NEG_EQ* and *LOSS* are significantly positive, suggesting that firms with greater debt ratio, negative equity or negative earnings are more likely to receive low CRs. In contrast, the coefficients on *OCF* and *TIE* are significantly negative, indicating that firms with greater operating cash flow or higher interest coverage ratios tend to have higher CRs.

Table 6. Tests of the dynamic relation between CFO turnover and changes in CRs.

$Non\_ACC\_to\_ACC_{it} = \alpha_0 + \alpha_1\ DOWNGRADE_{TiT} + \alpha_2\ \Delta SIZE_{it} + \alpha_3\ \Delta LEV_{it} + \alpha_4\ \Delta OCF_{it} + \alpha_5\ \Delta A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7\ \Delta ROA_{it} + \alpha_8\ \Delta TIE_{it} + \alpha_9\ LOSS_{it} + IND + \varepsilon_{it}$ (2)

Panel A (Defining $DOWNGRADE_T$ as CR_{t-1} minus CR_{t-2})

Variables	Coefficient	Std. Dev.	Chi-Square	*p*-value
Intercept	−3.35***	0.17	−20.24	0.00
$DOWNGRADE_T$	0.38	0.43	0.87	0.38
ΔSIZE	−1.30	0.81	−1.62	0.11
ΔLEV	−0.37	1.78	−0.21	0.84
ΔOCF	−2.87	3.11	−0.92	0.36
ΔA_STRTURE	−1.60	1.53	−1.04	0.30
NEG_EQ	−1.08	0.76	−1.42	0.16
ΔROA	−0.05	0.22	−0.22	0.83
ΔTIE	−0.02**	0.01	−2.34	0.02
LOSS	0.61**	0.30	2.03	0.04
IND	YES			
Log Likelihood	−280.01			
Pseudo R^2	0.03			

Panel B (Defining $DOWNGRADE_T$ as CR_{t-2} minus CR_{t-3})

Variables	Coefficient	Std. Dev.	Chi-Square	*p*-value
Intercept	−3.55***	0.21	288.40	0.00
$DOWNGRADE_T$	1.14***	0.45	6.49	0.01
ΔSIZE	1.43	0.89	2.59	0.11
ΔLEV	−3.62	2.38	2.31	0.13
ΔOCF	1.51	3.67	0.17	0.68
ΔA_STRTURE	4.80*	2.74	3.07	0.08
NEG_EQ	−12.86	353.20	0.00	0.97
ΔROA	−0.02	0.26	0.01	0.93
ΔTIE	−0.02**	0.01	5.35	0.02
LOSS	−0.10	0.43	0.06	0.81
IND	YES			
Log Likelihood	−191.98			
Pseudo R^2	0.04			

Non_ACC_to_ACC is a dummy variable that equals 1 if the firm's CFO changes from a non-accounting expert to an accounting expert at year t and 0 otherwise. $DOWNGRADE_{TiT}$ is a dummy variable that equals 1 if the firm has CR downgrades in the earlier year and 0 otherwise. *ΔSIZE* is the changes in *SIZE* between the current year and prior year. *ΔLEV* is the changes in *LEV* between the current year and prior year. *ΔOCF* is the changes in *OCF* between the current year and prior year. *ΔA_STRTURE* is the changes in *A_STRTURE* between the current year and prior year. *NEG_EQ* is a dummy variable that equals 1 if the firm observation has negative equity and 0 otherwise. *ΔROA* is the changes in *ROA* between the current year and prior year. *ΔTIE* is the changes in *TIE* between the current year and prior year. *LOSS* is a dummy variable that equals 1 if the firm observation has negative earnings before tax and 0 otherwise. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

The results, in general, are consistent with those found in prior studies (Bhojraj and Sengupta 2003; Ashbaugh-Skaife, Collins, and LaFond 2006).

Panels A and B in Table 6 present the regression results of Model (2) using the measures CR_{t-1} minus CR_{t-2} and CR_{t-2} minus CR_{t-3} as $DOWNGRADE_{TiT,}$ respectively. The coefficient of $DOWNGRADE_{TiT}$ in Panel A is positive but insignificant (*p*-value = 0.38); however, the coefficient of $DOWNGRADE_{TiT}$ shown in Panel B is positive and significant (*p*-value = 0.01). The results lend support to a dynamic relation between accounting expert CFOs and CRs such that a downgrade in a firm's CR in a prior year affects the subsequent selection of an accounting expert CFO.[3] However, the result suggest that the dynamic relation between accounting expert CFOs and CRs only reflect the downgrade measurement of CR_{t-2} minus CR_{t-3}, possibly due to the fact that the tenure of CFOs is usually protected by contracts and thus constrains firms from changing CFOs more promptly. Previous research finds that top management turnover results from earnings restatement (Jayaraman, Mulford, and Wedge 2004; Desai, Hogan, and Wilkins 2006) and firm performance (Chakraborty and Sheikh 2008; Huson, Malatesta, and Parrino 2004; Wang, Davidson, and Wang

Table 7. Test of the effect of CFOs with accounting expertise on CRs – For firms with high and low default risk.

$RATING_{it} = \alpha_0 + \alpha_1 CFO\_ACC_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 OCF_{it} + \alpha_5 A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7 ROA_{it} + \alpha_8 LOSS_{it} + IND + \varepsilon_{it}$ (1)

	firms with high default risk				firms with low default risk			
Variable	Coefficient	Std. Dev.	Chi-Square	*p*-value	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.19***	0.06	11.16	0.00	0.02	0.05	0.19	0.66
SIZE	−0.35***	0.03	154.70	0.00	−0.65***	0.03	618.43	0.00
LEV	1.65***	0.18	82.75	0.00	0.43**	0.19	5.25	0.02
OCF	−5.02***	0.55	83.18	0.00	−3.09***	0.78	15.76	0.00
A_STRTURE	0.50***	0.07	48.11	0.00	0.30***	0.08	14.07	0.00
NEG_EQ	0.20	0.13	2.09	0.15	−0.09	0.21	0.19	0.66
ROA	−1.89***	0.50	14.30	0.00	−3.42***	0.62	30.52	0.00
TIE	0.00	0.00	0.75	0.39	−0.01***	0.00	79.39	0.00
LOSS	0.45***	0.09	26.44	0.00	0.10	0.16	0.44	0.51
IND	YES				YES			
Log Likelihood	−2355.31				−2662.28			
Pseudo R^2	0.14				0.15			

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

2010). Our finding extends previous studies by exhibiting the influence of CR downgrades on CFO turnover.[4]

Table 7 reports the test results of H3 by presenting the regression results of Model (1) separately for firms with high default risk and firms with low default risk. Consistent with H3, the coefficient on *CFO_ACC* is significantly negative (p-value = 0.00) for firms with high default risk but is nonsignificant (p-value = 0.66) for firms with low default risk. The result suggests that the positive effect of accounting expert CFOs on CRs is more pronounced for firms with high default risk. Previous studies show that firms with a high default risk have greater incentives to conduct earnings management to influence their CRs (Jiang 2008; Liu et al. 2018; Zhang 2018). Moreover, firms with accounting expert CFOs have a better financial reporting quality and internal control (Aier et al. 2005; Rakhman 2009; Brochet and Welch 2011; Li, Sun, and Ettredge 2010). Our finding relates to these two lines of research and provides empirical evidence showing that CFOs with accounting expertise have the advantage of better communicating the firms' financial reporting to CR agencies and receiving better CRs, especially in firms with a high default risk.

V. Sensitivity analyses

We conduct four sensitivity tests and robustness checks that include defining an alternative numerical measure of CRs, addressing the problem of self-selection, constructing alternative measure of default risk, and controlling for other personal characteristics of CFOs.

1. Constructing alternative measures of CRs

Our dependent variable *RATING* is measured by converting S&P's 21 categorical CRs into numerical values from 1 to 21. Ashbaugh-Skaife, Collins, and LaFond (2006), however, construct the variable of CRs by converting S&P's categorical ratings into numerical values from 1 to 7 as follows: AAA = 7; AA+, AA, or AA- = 6; A+, A, or A- = 5; BBB+, BBB, or BBB- = 4; BB+, BB, or BB- = 3; B+, B, or B- = 2; and CCC+, CCC, CCC-, CC, or D = 1. We hence reconstruct the dependent variable (*RATING_NEW*) by using Ashbaugh-Skaife et al.'s conversion scale and rerun the regression Model (1). Tables 8 and 9 report the test results of H1 and H2, respectively. Table 8 shows that the coefficient on *CFO_ACC* is significantly positive for all sample regression results, consistent with H1. Table 9 shows that the coefficient on *CFO_ACC* is significantly positive for the subsample with high default risk and is nonsignificant for the subsample with low default risk, consistent with H3. The coefficients on the other independent variables of Table 8 (Table 9) is consistent with the

Table 8. Test of the effect of CFOs with accounting expertise on CRs – Alternative scheme for converting CRs.

$RATING\_NEW_{it} = \alpha_0 + \alpha_1 CFO\_ACC_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 OCF_{it} + \alpha_5 A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7 ROA_{it} + \alpha_8 TIE_{it} + \alpha_9 LOSS_{it} + IND + \varepsilon_{it}$

Variables	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	0.09**	0.04	4.57	0.03
SIZE	0.70***	0.02	1328.08	0.00
LEV	−1.26***	0.14	86.15	0.00
OCF	5.93***	0.47	159.36	0.00
A_STRTURE	−0.61***	0.06	117.52	0.00
NEG_EQ	−0.44***	0.12	13.35	0.00
ROA	2.70***	0.40	46.07	0.00
TIE	0.01***	0.00	75.99	0.00
LOSS	−0.35***	0.08	19.65	0.00
IND	YES			
Log Likelihood	−3260.71			
Pseudo R^2	0.31			

RATING_NEW is the measure of CRs, with converting the categorical grades into numerical values as follows: AAA = 7; AA+, AA, or AA- = 6; A+, A, or A- = 5; BBB+, BBB, or BBB- = 4; BB+, BB, or BB- = 3; B+, B, or B- = 2; and CCC+, CCC, CCC-, CC, or D = 1. See Table 2 for other variable definitions.
*, **and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 9. Test of the effect of CFOs with accounting expertise on CRs for firms with high and low default risk – Alternative scheme for converting CRs.

$RATING\_NEW_{it} = \alpha_0 + \alpha_1 CFO\_ACC_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 OCF_{it} + {}_5 A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7 ROA_{it} + \alpha_8 TIE_{it} + \alpha_9 LOSS_{it} + IND + \varepsilon_{it}$

	firms with high default risk				firms with low default risk			
Variable	Coefficient	Std. Dev.	Chi-Square	*p*-value	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	0.20***	0.07	7.21	0.01	0.08	0.07	1.20	0.27
SIZE	0.33***	0.04	78.55	0.00	0.73***	0.03	445.96	0.00
LEV	−1.76***	0.24	54.25	0.00	−0.28	0.24	1.42	0.23
OCF	6.51***	0.72	80.74	0.00	2.32**	1.02	5.20	0.02
A_STRTURE	−0.67***	0.09	51.27	0.00	−0.45***	0.10	18.75	0.00
NEG_EQ	−0.20	0.17	1.34	0.25	−0.19	0.30	0.42	0.52
ROA	0.99	0.65	2.30	0.13	3.94***	0.81	23.69	0.00
TIE	0.01**	0.00	4.81	0.03	0.01***	0.00	73.02	0.00
LOSS	−0.50***	0.11	20.67	0.00	0.23	0.22	1.10	0.30
IND	YES				YES			
Log Likelihood	−817.94				−1021.61			
Pseudo R^2	0.27				0.28			

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

finding in Table 5 (Table 7). The results suggest that our results are robust to the alternative scheme for converting firms' CRs.

2. Constructing an alternative measure of firms' default risk

We test H3 by separating our sample into two subsamples with high and low financial default risk. As a sensitivity check, we use the Z-score of Altman (1968) as an alternative measure to classify the two subsamples with high and low financial default risk. Z-score uses five financial ratios, namely profitability, leverage, liquidity, solvency and activity, to calculate a comprehensive measure and thus can be indicative of a firm's overall financial strength. Z-score has widely adopted by previous studies as a measure to predict whether a company has a high probability of becoming insolvent. (Ferrier et al. 2002; Aziz and Dar 2006; Bellovary, Giacomino, and Akers 2007; Platt and Platt 2006).

Altman et al. (2017) also show that the Z-score model of bankruptcy prediction is better than other bankruptcy prediction models in the context of an international sample from 31 European and three non-European countries. Hence, we choose the Z-score as an alternative measure of the firms' default risk.

We calculate Altman's Z-score for each firm observation and then classify the firm observation into the high default risk group if its Z-score is below the median value of all sample Z-scores and as the low default risk group if its Z-score is above the median. Table 10 reports the regression test results of H3 separately for the subsamples with high and low default risk classified by the alternative measure of financial default risk. Table 10 shows that the coefficient on *CFO_ACC* remains significantly negative for the subsample with high default risk and is nonsignificant for the subsample with low default risk, consistent with H3. The coefficients on the other independent variables of Table 10 are qualitatively similar to the results in Table 5. The results suggest that our results are robust to the alternative classification of subsamples with high and low default risk.[5]

3. Considering the problem of self-selection

We conduct an ordered probit model to test our H1 and H3. However, firms may self-select their CFOs with accounting expertise. To address the potential self-selection problem of CFOs with/without accounting expertise within firms, we conduct Heckman's (1979) two-stage regression estimation. We first estimate the inverse Mills ratio (*MILLS*) by constructing Model (3). Following Chen, Chang, and Lee (2019), in addition to controlling for firms' financial factors, we also include *GENDER* and *AGE* in Mode (3) to control for other personal characteristics of CFOs in selecting an accounting expert CFO. We then include *MILLS* in Model (4) as a variable to correct the self-selection bias. The two-stage regression models are as follows.

Table 10. Test of the effect of CFOs with accounting expertise on CRs for firms with high and low default risk – Alternative classification of firms with high and low default risks.

$RATING_{it} = \alpha_0 + \alpha_1 CFO\_ACC_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 OCF_{it} + \alpha_5 A\_STRTURE_{it} + \alpha_6 NEG\_EQ_{it} + \alpha_7 ROA_{it} + \alpha_8 TIE_{it} + \alpha_9 LOSS_{it} + IND + \varepsilon_{it}$

	firms with high default risk				firms with low default risk			
Variable	Coefficient	Std. Dev.	Chi-Square	*p*-value	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.10*	0.05	3.29	0.07	−0.06	0.06	1.00	0.32
SIZE	−0.73***	0.03	801.48	0.00	−0.76***	0.03	773.42	0.00
LEV	1.93***	0.18	111.10	0.00	1.35***	0.19	50.35	0.00
OCF	−6.73***	0.67	101.80	0.00	−5.02***	0.63	63.59	0.00
A_STRTURE	0.78***	0.07	120.42	0.00	0.37***	0.09	18.40	0.00
NEG_EQ	0.12	0.18	0.43	0.51	0.45***	0.14	9.75	0.00
ROA	−0.68	0.52	1.71	0.19	−4.69***	0.56	70.51	0.00
TIE	−0.02***	0.00	74.35	0.00	−0.01***	0.00	14.50	0.00
LOSS	0.41***	0.10	17.47	0.00	0.31***	0.11	8.37	0.00
IND	YES				0.38***	0.06	38.17	0.00
Log Likelihood	−2054.96				−3010.78			
Pseudo R^2	0.14				0.15			

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Stage 1: Probit estimation of firms' selection of a CFO with accounting expertise

$$CFO\_ACC_{it} = \gamma_0 + \gamma_1 SIZE_{it} + \gamma_2 NOL_{it} + \gamma_3 FOREIGN_{it} + \gamma_4 BTM_{it} + \gamma_5 GENDER_{it} + \gamma_6 AGE_{it} + \varepsilon_{it} \quad (3)$$

where

SIZE	=	firm size, measured as the natural log value of total assets;
NOL	=	a dummy variable that equals 1 if the firm has net operating loss carryforward and 0 otherwise;
FOREIGN	=	foreign earnings, measured as foreign earnings divided by total assets at year t-1;
BTM	=	book to market ratio, measured as the book value of shareholder equity divided by the market value of shareholder equity;
GENDER	=	a dummy variable that equals 1 if the firm's CFO is male and 0 otherwise; and
AGE	=	age of the CFO, measured by the value of the CFO's age.

Stage 2: Effects of CFOs with accounting expertise on CRs

$$RATING_{it} = \delta_0 + \delta_1 CFO\_ACC_{it} + \delta_2 SIZE_{it} + \delta_3 LEV_{it} + \delta_4 OCF_{it} + \delta_5 A\_STRTURE_{it} + \delta_6 NEG\_EQ_{it} + \delta_7 ROA_{it} + \delta_8 TIE_{it} + \delta_9 LOSS_{it} + \delta_{10} MILLS_{it} + IND + \varepsilon_{it} \quad (4)$$

Tables 11 and 12 present the results of Models (3) and (4), respectively. Table 13 represents the results of Model (4) separately by firms with high and low default risks. The coefficients on *MILLS* in both Tables 12 and 13 are all nonsignificant, meaning that the regression results are not subject to selection bias. Table 12 shows that the coefficient on *CFO_ACC* remains significantly negative, consistent with H1. Table 13 shows that the coefficient on *CFO_ACC* is significantly negative for the firms with high default risk and is nonsignificant for the firms with low default risk, consistent with H3. Therefore, our results remain robust after controlling for potential self-selection bias.

4. Considering the personal characteristics of CFOs

The upper echelons theory posits that top executives' personal characteristics, such as cognitive bases, values, age, education, work experience and demographic background, influence their firms' various strategies and operating results (Hambrick and Mason 1984). Prior literature also indicates that the personal characteristics of top executives, such as gender and age, significantly affect the aggressiveness of corporate financial reporting and tax compliance (Barua et al. 2010; Francis, Hasan, and Wu 2013; Francis et al. 2015; Law and Mills 2015). Since the personal characteristics of top executives affect firms' financial reporting quality, they may also have an influence on CRs. Therefore, we include CFOs' gender and age as additional control variables in our Model (1) to control for the influence of the personal characteristics of CFOs on CRs.

Table 14 and Table 15 report the results of the effect of CFOs with accounting expertise on CRs after controlling for the CFOs' gender and age. The results shown in Table 14 reveal that the

Table 11. Probit estimation of firms' selection of a CFO with accounting expertise.

$CFO\_ACC_{it} = \gamma_0 + \gamma_1 SIZE_{it} + \gamma_2 NOL_{it} + \gamma_3 FOREIGN_{it} + \gamma_4 BTM_{it} + \gamma_5 GENDER_{it} + \gamma_6 AGE_{it} + \varepsilon_{it}$ (3)

	Coeff.	Std. error	*t*-statistic	*p*-value
Intercept	−0.26	0.27	−0.95	0.34
SIZE	−0.03*	0.02	−1.78	0.08
NOL	0.36***	0.09	4.06	0.00
FORIGN	0.54	0.38	1.44	0.15
BTM	0.13***	0.05	2.64	0.01
GENDER	0.04	0.08	0.55	0.58
AGE	0.01*	0.00	1.82	0.07
Log likelihood	−2104 (*p*-value = 0.00)			

*, **and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 12. Test of the effect of CFOs with accounting expertise on CRs – Controlling for the problem of endogeneity.

$RATING_{it} = \delta_0 + \delta_1 CFO\_ACC_{it} + \delta_2 SIZE_{it} + \delta_3 LEV_{it} + \delta_4 OCF_{it} + \delta_5 A\_STRTURE_{it} + \delta_6 NEG\_EQ_{it} + \delta_7 ROA_{it} + \delta_8 TIE_{it} + \delta_9 LOSS_{it} + \delta_{10} MILLS_{it} + IND + \varepsilon_{it}$ (4)

Variables	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.07*	0.04	3.68	0.06
SIZE	−0.69***	0.02	1517.33	0.00
LEV	1.33***	0.13	111.11	0.00
OCF	−5.75***	0.42	184.02	0.00
A_STRTURE	0.56***	0.05	120.92	0.00
NEG_EQ	0.35***	0.11	10.67	0.00
ROA	−3.02***	0.36	69.43	0.00
TIE	−0.01***	0.00	80.17	0.00
LOSS	0.36***	0.07	25.30	0.00
MILLS	0.08	0.26	0.10	0.75
IND	YES			
Log Likelihood	−6421.22			
Pseudo R^2	0.21			

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 13. Test of the effect of CFOs with accounting expertise on CRs for firms with high and low default risk – Controlling for the problem of endogeneity.

$RATING_{it} = \delta_0 + \delta_1 CFO\_ACC_{it} + \delta_2 SIZE_{it} + \delta_3 LEV_{it} + \delta_4 OCF_{it} + \delta_5 A\_STRTURE_{it} + \delta_6 NEG\_EQ_{it} + \delta_7 ROA_{it} + \delta_8 TIE_{it} + \delta_9 LOSS_{it} + \delta_{10} MILLS_{it} + IND + \varepsilon_{it}$ (4)

	firms with high default risk				firms with low default risk			
Variable	Coefficient	Std. Dev.	Chi-Square	*p*-value	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.17***	0.05	11.74	0.00	−0.02	0.06	0.12	0.73
SIZE	−0.45***	0.03	303.89	0.00	−0.67***	0.03	454.25	0.00
LEV	1.59***	0.17	87.8	0.00	0.3	0.22	1.88	0.17
OCF	−5.2***	0.51	104.08	0.00	−1.96**	0.94	4.32	0.04
A_STRTURE	0.57***	0.07	75.17	0.00	0.45***	0.09	22.77	0.00
NEG_EQ	0.33***	0.13	6.43	0.01	0.24	0.24	0.95	0.33
ROA	−1.54***	0.46	11.36	0.00	−3.66***	0.74	24.75	0.00
TIE	0.00**	0	4.33	0.04	−0.01***	0	71.29	0.00
LOSS	0.41***	0.08	26.25	0.00	−0.34	0.22	2.45	0.12
MILLS	0.11	0.36	0.09	0.77	0.47	0.41	1.29	0.26
IND	YES				YES			
Log Likelihood	−3108.48				−1936.02			
Pseudo R^2	0.14				0.16			

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

coefficient of *CFO_ACC* remains negative and significant (p-value = 0.07) and that the coefficient of *CFO_ACC* is negative and significant in high default risk firms, indicating that our findings are robust after controlling for the personal characteristics of CFOs.[6] Moreover, the coefficients of *GENDER* and *AGE* are both negative and significant, suggesting that firms with female CFOs and older CFOs are more likely to have better CRs. Previous studies investigating top management's personal characteristics indicate that female CFOs tend to be more conservative in corporate financial reporting and tax aggressiveness (Francis, Hasan, and Wu 2013; Francis et al. 2015). Our findings extend the literature and provide evidence suggesting that a firm's CR is associated with the gender and age of its CFO.

VI. Conclusion

This study examines the effect of CFOs with accounting expertise on CRs. Previous CR studies have mostly determined the correlations between CRs and corporate characteristics, such as quality of

Table 14. Test of the effect of CFOs with accounting expertise on CRs – Controlling for the personal characteristics of CFOs.

$RATING_{it} = \theta_0 + \theta_1 CFO\_ACC_{it} + \theta_2 SIZE_{it} + \theta_3 LEV_{it} + \theta_4 OCF_{it} + \theta_5 A\_STRTURE_{it} + \theta_6 NEG\_EQ_{it} + \theta_7 ROA_{it} + \theta_8 TIE_{it} + \theta_9 LOSS_{it} + \theta_{10} GENDER_{it} + \theta_{11} AGE_{it} + IND + \varepsilon_{it}$

Variable	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.07*	0.04	3.35	0.07
SIZE	−0.69***	0.02	1603.29	0.00
LEV	1.33***	0.13	113.16	0.00
OCF	−5.74***	0.42	183.58	0.00
A_STRTURE	0.56***	0.05	122.24	0.00
NEG_EQ	0.35***	0.11	10.31	0.00
ROA	−3.06***	0.36	71.32	0.00
TIE	−0.01***	0.00	81.88	0.00
LOSS	0.34***	0.07	23.66	0.00
GENDER	−0.15**	0.06	5.81	0.02
AGE	−0.01***	0.00	9.97	0.00
IND		YES		
Log Likelihood		−6413.35		
Pseudo R^2		0.20		

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 15. Test of the effect of CFOs with accounting expertise on CRs for firms with high and low default risk – Controlling for the personal characteristics of CFOs.

$RATING_{it} = \theta_0 + \theta_1 CFO\_ACC_{it} + \theta_2 SIZE_{it} + \theta_3 LEV_{it} + \theta_4 OCF_{it} + \theta_5 A\_STRTURE_{it} + \theta_6 NEG\_EQ_{it} + \theta_7 ROA_{it} + \theta_8 TIE_{it} + \theta_9 LOSS_{it} + \theta_{10} GENDER_{it} + \theta_{11} AGE_{it} + IND + \varepsilon_{it}$

	firms with high default risk				firms with low default risk			
Variable	Coefficient	Std. Dev.	Chi-Square	*p*-value	Coefficient	Std. Dev.	Chi-Square	*p*-value
CFO_ACC	−0.18***	0.06	10.65	0.00	0.05	0.05	0.82	0.37
SIZE	−0.35***	0.03	154.41	0.00	−0.65***	0.03	614.10	0.00
LEV	1.67***	0.18	84.36	0.00	0.46**	0.19	5.80	0.02
OCF	−5.00***	0.55	82.54	0.00	−2.91***	0.78	13.93	0.00
A_STRTURE	0.50***	0.07	48.29	0.00	0.29***	0.08	13.53	0.00
NEG_EQ	0.19	0.14	1.98	0.16	−0.09	0.21	0.19	0.67
ROA	−1.89***	0.50	14.28	0.00	−3.65***	0.62	34.38	0.00
TIE	−0.00	0.00	0.69	0.41	−0.01***	0.00	79.89	0.00
LOSS	0.45***	0.09	26.46	0.00	0.05	0.16	0.11	0.74
GENDER	−0.01	0.10	0.01	0.92	−0.31***	0.09	11.51	0.00
AGE	0.01	0.00	2.34	0.13	−0.02***	0.01	9.60	0.00
IND	YES				YES			
Log Likelihood	−2354.14				−2651.54			
Pseudo R^2	0.14				0.15			

See Table 2 for variable definitions. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

financial reporting, corporate governance, and information transparency. A limited number of studies have identified the effect of CFOs with accounting expertise on CRs. We argue that the accounting expertise of CFOs may affect the CRs of firms by means of their professional accounting expertise or their specific characteristics. Thus, the findings of this study serve as a supplement to those of previous studies.

The results show that firms with accounting expert CFOs are more likely to receive higher CRs and that the effect of CFOs' accounting expertise on CRs is more pronounced for firms with higher default risk. Our results are robust to various sensitivity tests and robustness checks that include constructing an alternative numerical measure of CRs, forming subsamples with alternative measures of default risks, controlling for the self-selection bias, and controlling for some personal characteristics of CFOs.

CFOs are responsible for controlling financial reporting quality, CPA selection, and accounting policy development. The accounting expertise of CFOs can strongly affect the correctness of financial statements and in turn affect corporate CRs. By using the data of US firms between 2010 and 2015 as a research sample, this study examines the effect of CFO accounting expertise on CRs. The empirical results can be a reference for investors and creditors when assessing risk premiums.

Notes

1. A low CR score indicates a higher CR grade.
2. We choose to use the dummy variable $DOWNGRADE_{TiT}$ as the test variable rather than the value of CR changes because the result of the dummy variable has a more instinctive explanation.
3. We thank the reviewer for the suggestion to conduct this insightful analysis.
4. We also examined whether the change from a non-accountant CFO to an accountant CFO is associated with the subsequent credit rating during the CFO turnover period as an extending test to H2. We regress a dummy variable (equals 1 if the firm changes a non-accountant CFO to an accountant one at year t) on the changes in CR from t-1 to t + 1 or t + 2. We expect the dummy variable to be negative if succeeding CFOs with accounting expertise positively influence subsequent CRs. We, however, do not find evidence suggesting that succeeding CFOs with accounting expertise affect the CRs of firms in the subsequent two years, possibly due to the short research period after the CFO turnover. Prior research suggests that top management needs at least three years to imprint their mark on a firm (Bertrand and Schoar 2003; Dyreng, Hanlon, and Maydew 2010). However, we would lose too many observations if we constrain the measurement of changes in CR to three years after the CFO turnover.
5. We also include an interaction term to verify the results for H3. We modify Model (1) by including two variables, Z_SCORE and the interaction term of *CFO_ACC* and Z_SCORE, into the model. The results show that the coefficient on the interaction term of *CFO_ACC* and Z_SCORE is negative and significant, suggesting that CFOs with accounting expertise can better utilize their specialty in firms with high default risk.
6. In addition, we include *CFO_ACC*×*GENDER* and *CFO_ACC*×*AGE* in Model (1) to examine whether the CRs derived from a CFO_ACC depend on his/her personal characteristics. The results show that both coefficients of *CFO_ACC*×*GENDER* and *CFO_ACC*×*AGE* are insignificant, suggesting that our results are not conditional on the CFOs' personal characteristics.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix A. Variable definitions

Variable name		Variable definitions
RATING	=	Credit rating, measured by converting the S&P ratings – AAA, AA^+, AA, AA^-, A^+, A, A^-, BBB^+, BBB, BBB^-, BB^+, BB, BB^-, B^+, B, B^-, CCC^+, CCC, CCC^-, CC, and D – into numerical values of 1, 2, ……., and 21, respectively;
CFO_ACC	=	a dummy variable that equals 1 if a firm has a CFO with accounting expertise, and 0 otherwise;
SIZE	=	the natural logarithm of total assets;
LEV	=	total debt divided by total assets;
OCF	=	cash flow from operating activities divided by total assets;
A_STRTURE	=	properties, plants, and equipment divided by total assets;
NEG_EQ	=	a dummy variable that equals 1 if the firm observation has negative equity, and 0 otherwise;
ROA	=	net income divided by average total assets;
TIE	=	operating income before depreciation and amortization divided by interest expenses;
LOSS	=	a dummy variable that equals 1 if the firm observation has negative earnings before tax, and 0 otherwise.
IND	=	a dummy variable that equals 1 if the firm is in the high-tech industries, and 0 otherwise.
Non_ACC_to_ACC	=	a dummy variable that equals 1 if the firm's CFO changes from a non-accounting expert to an accounting expert at year t and 0 otherwise;
$DOWNGRADE_{TiT}$	=	a dummy variable that equals 1 if the firm has CR downgrades in the earlier year and 0 otherwise;
ΔSIZE	=	changes in *SIZE* between the current year and prior year;
ΔLEV	=	changes in *LEV* between the current year and prior year;
ΔOCF	=	changes in *OCF* between the current year and prior year;
ΔA_STRTURE	=	changes in *A_STRTURE* between the current year and prior year;
ΔROA	=	changes in *ROA* between the current year and prior year;
ΔTIE	=	changes in *TIE* between the current year and prior year;
RATING_NEW	=	Credit rating, the categorical grades into numerical values as follows: AAA = 7; AA+, AA, or AA- = 6; A+, A, or A- = 5; BBB+, BBB, or BBB- = 4; BB+, BB, or BB- = 3; B+, B, or B- = 2; and CCC+, CCC, CCC-, CC, or D = 1.
NOL	=	a dummy variable that equals 1 if the firm has net operating loss carryforward and 0 otherwise;
FOREIGN	=	foreign earnings divided by total assets at year t-1;
BTM	=	the book value of shareholder equity divided by the market value of shareholder equity;
GENDER	=	a dummy variable that equals 1 if the firm's CFO is male and 0 otherwise; and
AGE	=	the value of the CFO's age.