NON-AUDIT SERVICE FEES AND STOCK PRICE CRASH RISK

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CERTIFICATE OF ORIGINALITY

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Abstract

The paper investigates the relationship between non-audit service fees received by the firm's incumbent auditor and the client firm's stock price crash risk. I partition the sample into three subsamples based on the ratio of non-audit service fees to total fees (NASFEERATIO) and then regress NASFEERATIO on three proxies for stock price crash risk. I find that for firms with medium level of NAS fee ratio, the coefficients of NASFEERATIO are significantly negative. However, for firms with a high NAS fee ratio, the coefficients of NAS fee ratio are significantly positive. Further analysis shows that for firms with a high NAS fee ratio, the positive coefficients of NAS fee ratio are only significant for firms with lower institutional ownership and lower quality of corporate governance. Besides, for firms with a medium level of NAS fee ratio, the coefficients of NAS fee ratio are only significantly negative for firms with lower institutional ownership and whose auditors provide service to more clients. The results suggest that the effect of NAS fees on stock price crash risk depends on the trade-off of knowledge spillover effect and economic bond effect. For firms with medium level of NAS fees, knowledge spillover effect dominates and increased knowledge help prevent managers from withholding bad news and thus reduces future stock price crashes, while for firms with high level of NAS fees, economic bond effect dominates and auditors compromise to the managers' pressure and thus have less incentive to prevent the bad news hoarding behavior of managers, which increases stock price crash risk. The findings also suggest that higher percentage of institutional ownership and high quality of corporate governance can mitigate the economic bond effect for the sample with high level of NAS fee ratio. Besides, a higher percentage of institutional ownership substitutes for the knowledge spillover effect and auditor experience can enhance the knowledge spillover effect for the sample with a medium

level of NAS fee ratio. The results contribute to the literature on non-audit service and demonstrate the non-linear relationship between non-audit service fees ratio and stock price crash risk. The findings of the paper provide implications for investors and regulators and can help investors to better understand the economic consequences of the joint provision of audit service and non-audit service.

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Chapter 1 Introduction

This study investigates how non-audit service fees (NAS fees) received by the firm's incumbent auditors are related to the client firm's stock price crash risk. The joint provision of non-audit service and audit service by audit firms to the same client is a quite prevalent phenomenon and has raised a long-going debating on the impact of NAS on the audit outcome as well as auditor independence. Auditors provide audit service to ensure the credibility of their client's financial report (Defond and Zhang, 2014). At the same time, some client firms also purchase other non-auditing services such as tax planning and consultancy from their auditors. Since the 1990s, the ratio of NAS fees to total fees paid to auditors has increased vastly. Although, the practitioners justify their joint provision of audit service and non-audit service by arguing that the auditors are specialist and can provide their clients with benefits, regulators and the academic express worries that the increase of NAS fees enhances the economic bond between auditors and their clients and thus impairs the auditor's independence (Simunic 1984, Beck et al. 1988a, Beeler and Hunton 2001, Frankel et al. 2002). The impairment of auditor independence will ultimately reduce the audit quality and harm the investor's interest.

Although a large body of literature has examined the impact of NAS on audit quality or auditor behavior, limited studies have directly investigated how NAS impact the investor's interests. It is important to know how NAS fees affect investors because the purpose of providing a credible financial report is to help investors to make investment decisions.

Recently, there is a hot debate on whether audit firms should be prohibited from providing non-audit services to their clients. The stock price of Carillion, which is UK's second-largest construct company, dropped from 190 to 55.45 pounds per share

within just 6 days in July 2017 and the company went liquidation in 2018. The media blames KPMG UK to be "complicit" in signing off Carillion's "increasingly fantastical figures". The public calls for potential Big4 audit firms' break-up or splitting audit functions from non-audit services. KPMG is considering ceasing undertaking non-audit work for the FTSE-350 companies and KPMG UK earned large amounts of NAS Fees ((£79m per year, 40 percent of audit fees) from providing non-audit service. This case further demonstrates that auditors play an essential role in managers' bad news hoarding behavior and the joint provision of non-audit service raise the issue of lack of independence and auditors may lose their function and thus leads to the increasing probability of stock price crashes.

Krishnan, Sami, Zhang (2005) investigates whether the investors perceive NAS as impairing auditor independence by examining the relation between NAS fees and earnings response coefficient (ERC) after the release of the quarterly report and find a negative relation between NAS fees and ERC. However, Higgs and Skantz (2006) examine similar questions and find limited support that investors perceive NAS as an impairment of auditor independence. It is not clear how NAS is related to the risk of large and sudden declines in firms' stock prices, which is referred to as stock price crash risk (Jin and Myers, 2006; Hutton et al. 2009). The question is important because investors pay attention to the downside risk of equity prices, especially after the 2008 financial crisis (Kim et al. 2016a). Downside risk brings investors with a huge loss. It is also suggested that investors confronted with a large and sudden decline in stock price are more prone to sue the auditors if they perceive the auditors simultaneously providing non-audit service because of loss of independence (Schmidt, 2012). On one hand, it is important for investors to understand how NAS provided by the incumbent auditor will impact stock crash risk; on the other hand, it is also essential for the

regulators and auditors to pay attention to the potential harm of providing NAS. The paper investigates the association between NAS fees and stock price crash risk to provide evidence on the economic consequences of NAS service from the stock market perspective.

Jin and Myers (2006) posits that stock price crashes are the consequences of managers' withholding bad news and releasing it all at once when the bad condition cannot be hidden from the public anymore. The auditor is an important external monitor who can detect and constrain managers' opportunistic behavior such as withholding bad news. Callen and Fang (2017) investigates how auditor tenure is related to future stock price crash risk. Although auditor tenure and non-audit service can both have a knowledge effect and economic bond effect, the trad-off of the two effects can be quite different for auditor tenure and non-audit service. Prior literature generally finds that the knowledge effect of auditor tenure dominates, and the reason may be that the auditor tenure of most firms is less than the number of years necessary for lack of independence effect to work (Brooks et al. 2017). Thus, it cannot be inferred how providing non-audit service affect stock price crash risk from the relation between auditor tenure and stock price crash risk.

On the one hand, non-audit service provided by auditors may enhance the economic bond between auditors and their clients and therefore the auditors compromise to managers' pressure and have less incentive to detect and deter managers from opportunistically hiding bad news from the public, which leads to the increase of stock price crash risk. Prior research points out the problem that the non-audit service profit is more luxury than that of audit service (Levitt, 2000). Some audit firm partners' compensation or bonus is related to the NAS provided to their clients. Thus, the auditors have the incentive to obtain and maintain the NAS and will

compromise with managers' pressure (Knapp 1995, Frankel et al. 2002) to turn a blind eye to managers' bad news hoarding behavior and thus NAS is positively related to future stock price risk. I refer to this effect as the economic bond effect and the economic bond effect leads to a positive association between the NAS fee ratio and stock price crash risk. On the other hand, NAS can create knowledge spillover effects (Beck et al. 1988a 1988b, Beck et al. 2006) and by learning from the process of providing non-audit service, the auditors are more capable of discovering the bad news hoarding behavior and thus decrease future stock crash risk. I refer to this effect as knowledge spillover effect and the knowledge spillover effect leads to negative association between NAS fee ratio and stock price crash risk. By examining the effect of NAS on future stock price crashes, the results can also provide evidence on the trade-off of the economic bond effect and knowledge spillover effect of NAS provided by the incumbent auditor.

I examine the association between NAS fee ratio and stock price crash risk by using a sample of 41,802 client-year observations spanning the period from 2000-2016. Similar to prior literature, I consider a stock price crash to be a firm-specific weekly stock return of more than 3.09 standard deviations below the mean firm-specific weekly stock return for the year (Hutton et al., 2009). I also use the negative coefficient of skewness of firm-specific weekly returns (NCSKEW) and down-to-up volatility ratio (DUVOL) as alternative measures of stock price crash risk (Kim and Zhang, 2016). I measure the non-audit service fee ratio (NASFEERATIO) as the ratio of the total non-audit service fees to the total fees paid to the auditor.

I split the sample into three subsamples of a low, medium, and high level of NAS fee ratio based on the NASFEERATIO. I then regress the three measures of stock price crash risk on the NASFEETATIO for each subsample. The results show that for

the sample of low NAS fee ratio, the coefficients of NASFEERATIO is not significantly different from zero. For the sample of medium NAS fee ratio, the coefficient of NASFEERATIO is significantly negative, which indicates that the knowledge spillover effect dominates the economic bond effect and NAS fee ratio reduces stock price crash risk. For the sample of high NAS fee ratio, the coefficient of NASFEERATIO is significantly positive, which indicates that the economic bond effect dominates the knowledge spillover effect and the NAS fee ratio increases stock price crash risk when NAS fee ratio is at a high level.

In additional analyses, I consider the cross-sectional effect of institutional ownership. Institutional owners are sophisticated investors and can act as a monitor through voting with their feet or active proxy engagement (Chen, Harford and Li 2007, Hadani, Goranova, and Khan 2011, Callen and Fang 2013). Thus, higher institutional ownership can mitigate the economic bond effect. I expect that for firms with a high ratio of NAS fees, the positive association between NASFEERATIO and stock price crash risk is mitigated by the institutional ownership. Besides, sophisticated investors would have additional knowledge which will help constrain the bad news hoarding behavior of managers. For firms with a medium ratio of NAS fee, the knowledge spillover effect is more important for firms with lower institutional ownership. Thus, the negative association between NASFEERATIO and stock price crash risk is larger for firms with lower institutional ownership.

I further split the subsample with a medium and high ratio of NAS fees based on the ratio of institutional ownership and obtain four further subsamples with medium-NASFEERATIO and low-institutional ownership, medium-NASFEERATIO and high-institutional ownership, high-NASFEERATIO and low institutional ownership, and high-NASFEERATIO and high institutional ownership sample. For the sample

with medium-NASFEERATIO and low-institutional ownership, the coefficient of *NASFEERATIO* is only significantly negative and for the sample with medium-NASFEERATIO and high-institutional ownership, the coefficient of *NASFEERATIO* is not significantly different from zero. The results indicate that the knowledge spillover effect mainly impacts firms with lower institutional ownership for the sample with a medium ratio of NAS fees. For the sample with high-NASFEERATIO and low-institutional ownership, the coefficient of NASFEERATIO is significantly positive, while for the sample with high-NASFEERATIO and high-institutional ownership, the coefficient of *NASFEERATIO* is not significantly different from zero. The results support that the institutional ownership acts as an external monitor and can mitigate the positive impact of NAS fees on stock crash risk due to the economic bond effect.

I also consider the cross-sectional effect of corporate governance. For firms with poor corporate governance, the economic bond effect will be enhanced. Due to the lack of effective monitoring, it is likely that the auditors will compromise with managers to obtain and maintain the non-audit service I expect the positive relation between *NASFEERATIO* and stock price crash risk is more significant for firms with weaker corporate governance. I construct a comprehensive proxy for corporate governance based on the board characteristics and CEO characteristics which will be described in detail in the empirical design section of the paper. Since most of the CEO characteristics data are from ISS director and ExecuComp, the sample mainly cover S&P 1500 firms, I utilize a smaller sample of 15,955 firm-year observations to test the effect of corporate governance. First, I split the sample into two subsamples based on the ratio of NAS fees to the total fees. Then, I further split the subsample into two samples based on the corporate governance measure. The results show that for firms

with high NAS fee ratio, the association between *NASFEERATIO* and stock price crash risk is positive, and the coefficient of *NASFEETIO* is only significantly positive for the subsample with weaker corporate governance. For the subsample of stronger corporate governance, the coefficient of *NASFEERATIO* is not significantly different from zero. The results suggest that the economic bond effect of NAS fee is mitigated by strong corporate governance environment.

In additional analyses, I compare the knowledge spillover effect for firms with lower number of clients and with larger number of clients. The auditors not only learn from the incumbent client but also obtain information from peer firms of the client within the same industry. Thus, I expect that the knowledge spillover effect is stronger for auditor with larger number of clients. Accordingly, I split the sample with medium NAS fee ratio into two subsamples based on the number of clients, and find that the negative association between NAS fee ratio mainly exists in the sample with larger number of clients.

The paper contributes to the literature on the economic consequences of non-audit services. Prior literature mainly examines the effect of NAS on audit quality using the measure of earnings management, the probability of issuing going concern opinion for distressed firms, or financial statement frauds. Some other literature investigates how investors or the bond market perceiving the impact of NAS on audit independence. However, few studies have looked into the direct impact of NAS on investors. This paper investigates how NAS is related to stock price crash risk and provides some evidence on how investors' interests be harmed or enhanced by the purchasing of NAS from their incumbent auditors. Stock price crash risk is an important risk to which investors pay attention because once the stock price crashes, investors bear a huge loss.

The paper also contributes to the literature on stock price crash risk. The auditor is an important external monitor for the quality of financial reports. One important theory proposed and tested by prior studies is the bad news hoarding theory (Jin and Myers 2006, Hutton et al. 2009, Kim et al. 2016, Kim et al, 2011, Kim and Zhang 2014). Auditor plays an important role in preventing managers from hiding bad news. However, few studies have examined how auditors affect future crash risk excluding Robin and Zhang (2015) and Callen and Fang (2017). The paper adds to the literature by examining how the joint provision of audit service and non-audit service is associated with future stock price crashes. The evidence shows that the medium level of NAS fee ratio is negatively related to stock price crash risk, while a high level of NAS fee ratio is negatively related to future stock crashes. The findings of the research help investors to understand how NAS affects investors' interests.

The paper also contributes to the research on differentiating effects of NAS. Prior literature usually uses pooled sample to investigate how NAS affects audit outcome or investors' perception of NAS provided by the incumbent investor. I partition the sample based on the ratio of NAS fees to total fees and find that the relation between NAS fees and stock price crash risk is nonlinear. The evidence also warns regulators and investors not only pay attention to whether the firm purchase NAS from the incumbent auditor, but also the level of NAS fees.

Chapter 2 Background and Literature review

2.1. Stock price crash risk

Large and sudden declines in firms' stock prices are of primary concern to investors and regulators. Recent literature in finance and accounting studies firms' downside tail risk, often referred to as stock price crash risk (Hutton et al. 2009; Jin and Myers, 2006). Bali, Cakici, and Whitelaw (2014, 208) state that "the tail risk of the individual stock will [also] matter for the tail risk of the under-diversified portfolio." There is a growing interest in finding firm-specific factors that are related to future stock price crashes of individual stocks. The existing research is built upon the theory of Jin and Myers (2006), who posit that stock price crashes are the consequences of managers' hoarding bad news and releasing it all at once. Hutton et al. (2009) provide support for this theory by demonstrating that firms with greater amounts of earnings management over the past three years tend to have higher stock price crash risk. Since then, researchers have shown that many factors are associated with stock price crash risk, including CFO equity incentives (Kim, Li, and Zhang 2011a), tax avoidance (Kim et al. 2011b), accounting conservatism (Kim and Zhang 2016), CEO overconfidence (Kim, Wang, and Zhang 2016), annual report readability (Kim, Wang, and Zhang 2018), and accounting comparability (Kim, Li, Lu, and Yu 2016).

To date, there is little evidence on how a firm's auditor affects stock price crash risk. Hao and Zhang (2015) find that firms with industry specialist auditors have lower crash risk. Callen and Fang (2017) find that longer auditor tenure is associated with lower crash risk. The paper adds to the literature on how audit characteristics affect

stock price crash risk by investigating how the joint provision of non-audit service and audit service is related to stock price crash risk.

2.2. Non-audit service

For decades, there has been an ongoing debate on whether the joint providing of audit service and non-audit service (NAS) will impair auditor's independence. The potential conflicts between NAS and auditor's independence have drawn the attention of regulators/legislators, audit practitioners as well as academic.

Regulators have considered the effect of NAS on auditor's independence for a long period. Early in the 1970s, the SEC issued Accounting Series Release (ASR) No. 250 to mandate the disclosure of NAS nature and NAS fees. However, the SEC rescinded the rule in 1982. In November 2000, the SEC issued a new rule S7-13-00, which mandates listed firms to disclose audit fees, financial information systems design and implementation fees, and all other fees paid to their auditor in the proxy statement. The purpose of the disclosure is to provide investors with knowledge of the facts and circumstances about the auditor and client contract and then help investors judge the auditor's independence in appearance. Later, the Enron scandal caught the attention of legislators and led to the pass of the Sarbanes-Oxley Act in 2002 which prohibits the audit firms from providing certain types of non-audit service to its clients. Furthermore, the PCAOB 2005 guidance restricts the scope of acceptable tax-planning services. In general, the regulators and even legislators consider aggressive non-audit services provided by the audit firm to its client arise the concern of auditor independence and restrict the scope of NAS and increase the disclosure of related information to warn the investors and to monitor audit firms and managers of listed firms.

Audit practitioners have also expressed their concern about the potential conflicts between NAS service and auditor independence. The accounting scandals involving a high proportion of non-audit service fees have enhanced the concern. According to the survey of Lindberg and Beck (2004), significantly more CPAs perceive the simultaneous provision of NAS and audit service by the audit firm as impairment of auditor's independence in appearance after the Enron Scandal. More recently, there is a severe debate on whether audit firms can provide NAS to their audit clients in the UK. On 8 November 2018, KPMG's Chairman, Bill Michael told KPMG's 625 UK partners that KPMG is to cease all but essential non-audit services for the 90 FTSE-350 companies in a briefing note (Sky News and Financial Times). The media consider the action of KPMG as an attempt to repair its reputation impaired by a series of high-profile accounting scandals, especially the collapse of the UK's second-largest construction company Carillion. As reported by the Financial Times, KPMG earned 198 million pounds of audit fees and 79 million pounds non-audit fees from FTSE 350 clients during 2017. The audit firms consider ceasing aggressive non-audit services due to the reputation cost, regulation risk or litigation risk.

A large body of academic research has investigated the economic consequences of the join provision of NAS. Prior literature proposes several channels through which NAS affect audit results. One is the knowledge spillover effect (Beck and Wu, 2006). Early studies propose that the joint provision of audit and non-audit service is able to create knowledge spillovers and improve audit production efficiency, which will ultimately increase audit quality and audit fees (Simunic 1984; Palmrose 1986; Beck et al. 1988a). The other is the economic bond effect. Since the audit firms earn luxury profits through providing non-audit service, the incumbent auditor has incentives to compromise with their clients' pressure to obtain or maintain the NAS contract

(Simunic 1984, Beck et al. 1988b, Beeler and Hunton 2001, Frankel et al. 2002). Thus, the NAS will harm the auditor independence and decrease the auditor quality, which leads to the increase of earnings management such as higher level of abnormal accruals, higher frequency of meeting or beating earnings, less issuance of going concern opinion, etc.

A large amount of empirical research investigates the economic consequence of non-audit service and is not capable of providing consistent evidence. Before the SEC mandating the disclosure of all fees received by the incumbent audit firm from the clients, early studies use survey and experimental methodology to investigate the impact of NAS on auditor independence in appearance. Early survey research asks financial statements users about their opinions or perceptions on whether NAS impact auditor independence (Schulte 1965; Hartley and Ross 1972; Titard 1971; Pany and Reckers 1984; Earnscliffe Research & Communications 1999) and finds that generally, the respondents consider the provision of NAS to audit clients impairing audit independence. Experimental research using within-subject design provides evidence that the level of NAS significantly impair financial statement users' perception of auditor independence and undermine the reliability of audited information (Lavin 1976; Shockley 1981; Pany and Reckers 1984), while the experimental research using between-subject design to control for the demand effect finds no significant evidence on the effect of NAS (McKinley, Pany, and Reckers 1985; Pany and Reckers 1987). These studies mainly investigate the impact of NAS on auditor independence in appearance, more recent literature uses archival data to examine the effect of NAS on auditor independence in fact. After the mandating disclosure of both audit fees and non-audit fees in the proxy statement, a large amount

of studies investigates how NAS affects auditor independence in fact and appearance using large sample data.

2.2.1. Market perception of disclosure of NAS fees

Several studies investigate how the providing of NAS affects perceived audit independence in the appearance of investors and the bond market. Francis and Ke (2006) examines the relationship between the level of NAS fees and earnings response coefficient to quarterly earnings surprise following the initial fee disclosure in 2001 and finds that after the disclosure of NAS fees, the earnings response coefficient is significantly lower for firms with higher level of NAS fees. The paper provides evidence that investors perceive accounting information for firms of a higher level of NAS fee as less informative and NAS reduces audit independence in appearance. However, Chaney et al. (2002) examines whether larger ratios of non-audit fees to total assets enhance the negative market reaction to Andersen shredded documents for Andersen's clients after the Enron scandal and finds no significant evidence. Brandon et al. (2006) investigates how NAS affects the perceived audit independence in the bond market and finds that firms with a larger amount of NAS paid to the incumbent auditor have a significantly lower bond rating.

2.2.2 The impact of NAS on audit independence and audit quality

Early studies use the fee data immediately after the mandatory disclosure of non-audit fee data in 2001 generally find no significant evidence that NAS impairs audit independence in fact, with a few studies providing some evidence. Frankel, Johnson, and Nelson (2002) is among the earliest studies which has investigated the effect of NAS on earnings management. The paper uses hand-collected fee data from 2074 proxy statements filed between February 5, 2001, and June 15, 2001 and investigates the association between NAS fee ratio and earnings management proxied by the

probability of issuing small positive earnings surprise and the magnitude of discretionary accruals. The results show that the NAS fee ratio is significantly and positively related to the level of earnings management, which suggests that NAS reduces audit quality and impairs audit independence fact. However, Ashbungh, LaFond, and Mayhew (2003) extends the study of Frankel et al. (2002) by altering the research design and finds that the results of FJN are not robust to different research designs. The paper finds little support for the conclusion that higher-level non-audit service fees are significantly positively related to the firm's earnings management level. Similarly, Chung and Kallapur (2003) fails to find a statistically significant association between the ratio of non-audit fees and abnormal accruals. DeFond, Raghunandan, and Subramanyam (2002) tests the association between NAS fees and the probability to issue going concern audit opinions and find no significant relation. However, Causholli, Chambers, and Payne (2014) changes the research design and uses the combination of fee-growth opportunities (low NAS fees in *current* year) and a client's willingness to purchase future NAS (high NAS fees in the *future*) to examine the effect of NAS on audit quality during 2000-2001 and finds that NAS significantly reduces audit quality.

More recent studies using post-SOX data have found that high non-audit service fees impair auditor independence in fact and thus high NAS fee is associated with lower audit quality. Blay and Geiger (2013) uses post-SOX data to examine whether future non-audit service revenue earned from the client is associated with the probability of issuing going-concern opinions for distressed firms. They find that auditors who receive higher future non-audit service revenue from their clients are less likely to issue going concern opinions. Markelevich and Rosner (2013) investigates the association between NAS fees and financial reporting fraud using data

from 2000 to 2005. They find that firms with higher NAS fees paid to the incumbent auditor are more likely to be sanctioned by the SEC for fraud as reported in Accounting and Auditing Enforcement Releases (AAERs). Several other papers classify NAS fees differently and investigate how different types of NAS impact audit quality. Robinson (2008) examines how auditor-provided tax service affects the probability of issuing going-concern opinions prior to the bankruptcy filings for firms going bankruptcy. The study finds a significant positive effect which suggests that auditors providing tax service are more capable of providing correct opinions before the bankruptcy of the firm.

Chapter 3 Hypothesis development

Equity-based incentive or career concerns have put on managers pressure to keep their companies' stock price stable or increasing. Managers are then expected to have the incentive to withhold bad news from investors for short-term interest. When the earnings are decreasing, managers are motivated to manage earnings through accrual management or real earnings management (Kothari, Shu and Wysocki, 2009). If the situation continues to be bad, and the withholding of bad news cannot be reversed by future good performance, the accumulated bad news has to be released all at once and thus leads to a sudden and large scale of stock price decrease. Auditor is an important independent monitor for the credibility of the financial reports (Defond and Zhang, 2014), and plays an important role in detecting and preventing managers from such opportunistic behavior. The effect of non-audit service on stock price crash risk depends on whether the joint provision of audit and non-audit service prevent or enhance the bad news behavior of managers. The impact thus depends on whether knowledge spillover effect or economic bond effect dominates, and I develop the *knowledge spillover hypothesis* and *economic bond hypothesis* as the following.

3.1. Knowledge spillover hypothesis

Non-audit service provided by auditors includes tax planning, management consultancy, etc. The additional provision of non-audit service to the clients increases the exposure of auditor to the client firm's other aspects such as operation activity, merge and acquisition activity beyond financial information (Beck et al. 1988a 1988b, Beck et al. 20006). By learning from the process of providing non-audit services, the auditors are more capable of detecting the bad news hoarding behavior and thus reduce future stock price crash risk. If the knowledge spillover effect dominates, I

expect that the association between non-audit service fees and future stock price crash risk is significantly negative. I develop the knowledge spillover effect as the following:

Knowledge Spillover Hypothesis*: The association between non-audit service fees and future stock price crash risk is significantly negative.*

3.2 Economic bond hypothesis

Non-audit service provides auditors another channel to increase revenue. It is suggested by anecdotal evidence and academic research that the costs of providing non-audit service are low but profits in return are high. As the non-audit service fees increase, the client becomes more important to the auditor and thus enhances the economic bond between the auditor and the client. When the economic bond is enhanced, the auditors are less able to resist the managers' pressure to keep silent on managers' bad news hoarding behavior and thus increase future stock price crash risk. When the economic bond effect dominates, I expect that the association between non-audit service fees and future stock crash risk is significantly positive and propose the following hypothesis:

Economic Bond Hypothesis*: The association between non-audit service fees and future stock price crash risk is significantly positive.*

Chapter 4 Research design and sample

4.1. Measurement of stock price crash risk

Following prior literature (e.g., Kim et al. 2011; Callen and Fang 2015; Kim et al. 2016), I assess stock price crash risk using three different measures. All three measures are based on firm-specific returns, which remove any market trends. Firm-specific returns are calculated as the natural log of one plus the residual from estimating the following market model separately for each firm-year:

$$r_{it} = \beta_0 + \beta_1 r_{mt-1} + \beta_2 r_{mt} + \beta_3 r_{mt+1} + \varepsilon_{it} \quad (1)$$

Where r_{it} is the raw stock return for firm i in week t, r_{mt} is the CRSP value-weighted stock return in week t. The natural log of one plus the residual from estimating Eq. (1) is the firm-specific weekly return, denoted R_{it}.

The first measure of crash risk is $CRASH$, which equals 1 if the firm experiences at least one firm-specific weekly return 3.09 standard deviations below the mean weekly firm-specific return during the year, and 0 otherwise.[1]

The second measure of crash risk is the negative coefficient of skewness of firm-specific weekly returns ($NCSKEW$), defined as the negative of the third moment of each firm's firm-specific weekly return, scaled by the cubed standard deviation. Thus, it is defined as follows:

[1] The choice of 3.09 standard deviations is chosen to generate frequencies of 0.1 percent in a normal distribution (Hutton et al. 2009; Callen and Fang 2015). While stock returns do not follow a normal distribution, the cutoff of 3.09 standard deviations is consistent with prior literature in this area (e.g., Callen and Fang 2015, 2017; Robin and Zhang 2015).

$$NCSKEW_{it} = -\frac{n(n-1)^{\frac{3}{2}}\sum R_{it}^{3}}{(n-1)(n-2)\left(\sum R_{it}^{2}\right)^{\frac{3}{2}}} \quad (2)$$

Where n is the number of observations of firm-specific weekly returns during the fiscal year T. A higher value of $NCSKEW$ means that a stock has a more left-skewed distribution, hence, it is more crash-prone.

The third measure of crash risk is the down-to-up volatility ratio. For firm i in year T, this is calculated as:

$$DUVOL_{it} = \log\left(\frac{(n_u - 1)\sum_{DOWN} R_{it}^{2}}{(n_d - 1)\sum_{UP} R_{it}^{2}}\right) \quad (3)$$

Where n_u and n_d are the numbers of up and down weeks during the fiscal year, respectively. Up weeks (down weeks) are those in which the firm-specific weekly return is above (below) the mean for the year. Essentially, $DUVOL$ is the log ratio of the standard deviation of the firm's stock returns during down weeks to the standard deviation of the firm's stock returns during up weeks. Therefore, higher values of $DUVOL$ represent greater stock price crash risk.

4.2. Research design

To investigate the relationship between non-audit service fees and future stock price crash risk under hypothesis 1a, 1b and 1c, I first partition the sample based on the ratio of non-audit service fees to total fees into three subsamples, and then estimate the following model for each subsample:

$$CRASHRISK_{it+1} = \alpha_0 + \alpha_1 NASFEERATIO_{it} + \sum_{k=2}^{K} \alpha_k CONTROL_{kt} + Industry_{jt} + Year_t + \varepsilon_{it} \quad (4)$$

Where $CRASHRISK$ is one of the three measures of stock price crash risk ($NCRASH$, $NCSKEW$, or $DUVOL$). The variable of interest in Eq. (3) is $NASFEERATIO$ which equals the non-audit service fees paid to the auditor divided by the total audit fees paid. I expect to observe a significantly negative coefficient on $NASFEERATIO$ for the sample with a medium level of NASFEERATIO, indicating that the knowledge spillover effect dominates economic bond effect for firms purchase medium level of non-audit service, and auditors providing non-audit service to their clients are able to prevent managers from withholding bad news, which ultimately reduces stock price crash risk. I expect a significantly positive coefficient on NASFEERATIO for the sample with a high level of NASFEERATIO, indicating that the economic bond effect dominates the knowledge spillover effect for firms who purchase a high level of non-audit services, and compromise with managers' opportunistically behavior which increase stock price crash risk.

The set of control variables follow the stock price crash literature and includes the natural logarithm of firm size ($Ln(SIZE)$), leverage (LEV), return on assets (ROA),

the market-to-book ratio (MB), the change in stock turnover ($DTURN$), the standard deviation of the firm'-specific stock return ($SIGMA$), and the firm's 12 month firm-specific stock return in year t (RET). I also include the sum of the absolute value of the prior 3 years' discretionary accruals ($OPAQUE$) following Hutton et al. (2009). The Khan and Watts (2009) firm-specific measure of conditional accounting conservatism (C_SCORE) is included to control for the fact that firms with more conservative accounting have lower future crash risk (Kim and Zhang 2016).

4.3. Data and sample

Table 1 outlines the sample selection process. I begin with the intersection of Compustat, CRSP, and Audit Analytics during the sample period 2000-2016, which yields 93186 observations. The calculation of stock price crash risk measures requires at least 26 weekly return for the firm-year, so I delete 34,210 observations with missing future stock crash measures. Then I delete 1,225 observations with missing audit fee data. After deleting firms with insufficient data necessary to estimate Eq. (4), the analysis is left with 41,802 firm-year observations for the test of the main hypothesis. I winsorize each independent variable at the 1st and 99th percentile to reduce the influence of outliers.

For the sample used to do the cross-sectional analysis regarding corporate governance, I calculate the corporate governance index using the data from ISS Director and ExecuComp. Since these two databases mainly cover S&P 1500 firms, I only have 15955 observations to commit the analysis.

< Insert Table 1 here >

Table 2 provides the summary description for the full sample and three subsamples with low, medium and high NAS fee ratio.

Panel A of Table 2 presents descriptive statistics for all variables used in the main analysis. Approximately 23.4 percent of observations in the sample experience a stock price crash, which is comparable to recent research in this area (Kim et al. 2016; Li and Zhan 2018). The mean (median) ratio of non-audit services fees to total fees is 0.213 (0.165). The median ROA for the sample is 3.3 percent, and the mean (median) ratio of market to book value is 2.811 (1.943). The mean (median) of total assets for the full sample is 4823 (629) million dollars.

To be simplified and convenient for comparison of the characteristics of three subsamples, Panel B of Table 2 reports the mean and median value of all the variables used in the main analysis for the three subsamples, i.e. the sample of low, medium, and high NAS fee ratio. I also provide the detail description of the three subsamples in the Appendix. The mean (median) value is 3.5 (3.1) percent for the sample with low NAS fee ratio, 16.7 (16.7) percent for the sample with medium NAS fee ratio, and 43.6 (39.6) for the sample with high NAS fee ratio. The size for the sample with low NAS fee ratio is smallest, with a median of 501 million compared to 780 for the sample with medium NAS fee ratio and 642 for the sample with high NAS fee ratio. The crash risk of the sample with low NAS fee ratio is slightly higher than the sample with medium and high NAS fee ratio. At the same time, the firms with a medium and high NAS fee ratio are more profitable than firms with low NAS fee ratio. The mean (median) of ROA for the three samples are -0.003 (0.029), 0.014 (0.032) and 0.017 (0.037) for the three subsamples respectively.

< Insert Table 2 here >

Table 3 provides the correlation matrix for the full sample and three subsamples with low, medium and high NAS fee ratio and the Pearson's correlation coefficients are presented in the lower-triangular cells and Spearman's rank correlation coefficients are presented in the upper triangular cells for all panels. Panel A of Table 3 reports the correlation matrix for the full sample. The correlation between NASFEERAIO of year t and CRASH of t+1 is not significantly different from zero, while the correlation between NASFEERAIO of year t and the other two measures of stock price crash risk NCSKEW and DUVOL of year t+1 is significantly positive. Consistent with prior literature, SIZE is significantly positively related to future crash risk, the association between current profitability ROA and future stock price crash risk is also significantly positive with the correlation coefficient 0.053, 0.071, and 0.072 for the measure of future CRASH, NCSKEW and DUVOL respectively. The measure of financial statement opaqueness proxied by three year's sums of abnormal accruals (Hutton et al. 2009) is also positively related to future CRASH. The measure of accounting conservatism CSCORE is significantly negatively correlated to future CRASH, NCSKEW, and DUVOL, which is also consistent with prior studies on the relationship between accounting conservatism and stock price crash risk (Kim and Zhang 2016).

Panel B of Table 3 provides the correlation matrix for the sample with low NAS fee ratio and the Pearson's correlation coefficients of NASFEERATIO and future CRASH and NCSKEW is not significantly different from zero, while that of NASFEERATIO and DUVOL is significantly positive. Panel C of Table 3 describes the correlation matrix for the sample with medium NAS fee ratio. The Pearson's correlation coefficients and Spearman's correlation coefficients for the relation between NASFEERATIO and all three future stock price crash risk measures are

significantly negative, which is consistent with hypothesis 1b. Panel D of Table 3 describes the correlation matrix for the sample with medium NAS fee ratio. The Pearson's correlation coefficients and Spearman's correlation coefficients for the relation between NASFEERATIO and all three future stock price crash risk measures are significantly positive, which is consistent with hypothesis 1c.

< *Insert Table 3 here* >

Chapter 5 Empirical analysis

5.1 Impact of NAS fee ratio on stock price crash risk

To test the *knowledge spillover hypothesis* and *economic bond hypothesis*, I partition the full sample into three subsamples with low, medium, and high ratio of NAS fees to total fees using the cuts of 33.33 and 66.67 percentile of NAS fee ratio. The reason is that for different levels of NAS fee ratio, the dominated effect may be different. When the ratio of NAS fee is low, there is no significant association between NAS and stock price risk. When the ratio of NAS fee is at a medium level, the knowledge spillover effect increases, and the economic bond effect also increases. If the knowledge spillover effect dominates the economic bond effect, I expect that the ratio of NAS fee can reduce stock crash risk. However, as the ratio of NAS fee continues to increase, the economic bond effect will be enhanced, and the auditor's independence will be impaired. I estimate model (4) for the subsamples with low, medium and high NAS fee ratio. Table 4 reports the regression results for each subsample using three measures of stock price crash risk. Columns (1), (2) and (3) show the results for the sample with low NAS fee ratio. the coefficients of NASFEERATIO is slightly significant and positive at the 10% level when using future CRASH as the dependent variable, while the coefficients of NASFEERATIO are positive but not significant when using future NCSKEW and DUVOL as the dependent variable. The results indicate that for firms with low NAS fee ratio, NASFEERATIO is not significantly associated with future stock price risk. The possible reason is that the ratio of NAS fees for these firms is small with the mean of NAS fee ratio as 3.5 percent. The economic bond effect and knowledge spillover effect are both weak, thus NAS provided by the incumbent auditor cannot generate knowledge spillover effects which would help auditors to be better capable of

detecting the bad news hoarding behavior nor would NAS fees received by the incumbent auditor from their clients form significant economic bond effects which lead auditors to compromise with their clients' opportunistic behavior and thus increase future stock price crash.

Columns 4, 5 and 6 present the estimated results for the sample with a medium level of NAS fee ratio. The dependent variable is CRASH at year t+1 for Column 4, NCSKEW at year t+1 for Column 5, and DUVOL at year t+1 for Column 6. The coefficients of NASFEERATIO for all three models using three measures of future stock price crash risk are significantly negative. The coefficient of NASFEERATIO is -0.885 for Column 4, -0.327 for Column 5, and -1.444 for Column 6. The results indicate that for firms with medium level of NAS fee ratio, the association between NAS fee ratio and stock price crash risk is significantly negative and suggest that as the NAS fee ratio increases from a relatively low level to a medium level, the non-audit service provided by the incumbent investors generates spillover effects and as the incumbent auditors learn more about the firm, they are more capable of detecting and preventing the bad news hoarding behavior of managers and thus reduce stock price crash risk. Although the economic bond effect also increases as the NAS fees increase, for non-audit service provided at a medium level, the knowledge spillover effect outweighs economic bond effect, which is beneficial to investors. The results provide evidence consistent with the *knowledge spillover hypothesis*.

Columns 7, 8 and 9 show the results for the sample with a high NAS fee ratio. The coefficients for NASFEERATIO for all three measures of stock price risk are significantly positive, with the coefficient as 0.525 for future CRASH, 0.219 for future NCSKEW and 0.093 for future DUVOL, and all the coefficients are significant at 1 percent level. The significant positive association between NAS fee ratio and future

stock price crash risk suggests that as the ratio of NAS fees continues to increase to a high level, the incumbent auditor's revenue comes more from providing non-audit service on providing non-audit service and are less reluctant to lose the client. Thus, the auditors are less likely to resist the pressure from the managers and less capable of preventing managers from opportunistic behavior to withhold bad news. The economic bond effect exceeds the benefits from knowledge spillover effects, and the ratio of NAS fee to total fees is significantly and positively related to future stock price crash risk. The findings provide supports for the *economic bond hypothesis*.

The findings of Table 4 show that the association between NAS fee ratio and stock price crash risk is nonlinear. When the NAS fee ratio is low, the impact of NAS fee on stock price crash risk is weak, as the ratio of NAS fees increases but not to a very high level, NAS provided by the auditors reduces stock price crash risk due to the knowledge spillover effect. However, as the ratio of NAS fees increases to a sufficiently high level, the economic bond effect between auditors and managers dominates the knowledge spillover effect and is significantly positively associated with future stock price risk. The results suggest that investors should pay attention to the level of NAS fee ratio. When the ratio of NAS fees is at an appropriate level, the providing of NAS is beneficial to investors by reducing future stock crashes. However, when the ratio of NAS fees is extremely high, the providing of NAS will harm investors by increasing stock price crash risk.

< *Insert Table 4 here* >

5.2. The role of institutional ownership in the economic bond effect

The predicted relation between NAS and stock price risk is based on whether the NAS mitigate or exacerbate the agency conflicts between shareholders and managers. On the other hand, institutional owners can affect audit quality through increase auditors' litigation risk. Schmidt (2012) finds that investors' attorneys will sue the firm and auditors when stock prices drop significantly and cite the joint provision of non-audit service as evidence of impairment of independence of the auditor. It is not sure whether institutional investors will increase auditors' litigation risk. Barabanov et al. (2008) finds that institutional investors have more sources of information and they trade before the litigation events, thus it is possible that institutional investors will involve less in the litigation issue of the firm. For firms with efficient external governance, the economic bond effect of NAS shall be mitigated. Institutional investors are one of the most important external monitors of managers. Institutional owners can affect audit quality through influence auditor hiring decisions. Both Mayhew and Pike (2004) and Raghunandan and Rama (2012) finds that shareholder voting on auditor selection can increase audit fees and increase audit quality. Velury, Reisch, and O'Reilly (2003) finds that firms with higher institutional ownership are more prone to select more experienced auditors. Thus, it is possible that institutional investors increase audit quality through auditor selection decision. For firms with high institutional ownership, the economic bond effect shall be mitigated, and the association between NAS fee ratio and stock price crash risk should be less significant compared to firms with low institutional ownership.

To test how institutional ownership affect the economic bond effect of NAS fee ratio on future stock price crash risk, I further participate the subsample with high NAS fee ratio into two subsamples based on the median value of ratio of institutional

ownership and then estimate model (4) for the subsample with low institutional ownership and high institutional ownership. I expect that the coefficient of NASFEERATIO to be more significantly positive for the sample with low institutional ownership compared to the sample with high institutional ownership compared to the sample with low institutional ownership. Table 5 shows the results of the regression analysis based on model (4). Columns 1, 2 and 3 report the results for the subsample of low institutional ownership and the coefficients of NASFEERATIO for all three measures of stock price crash risk are significantly positive at 1% level, with 0.614 for the measure of future CRASH, 0.202 for future NCSKEW and 0.087 for future DUVOL. Columns 4, 5, and 6 show the results for the subsample of high institutional ownership and the coefficients of NASFEERATIO for all three measures of stock price crash risk are not significantly different from zero. The results are consistent with prior literature which argues that institutional investors act as an active external monitor and can resolve the conflicts between investors and managers, and thus constrain the opportunistic behavior of the managers. In this way, institutional investors can also constrain the managers' behavior of putting pressure on auditor to compromise with their bad news hoarding behavior. The results suggest that high institutional ownership can alleviate the economic bond effect of the firms purchasing high level of non-audit service from their auditor and thus mitigate the positive association between NAS fee and stock price crash risk. The results further provide evidence that the positive association between NAS fee and stock price crash risk is driven by the economic bond effect and effective external monitoring can help constrain the economic bond effect.

< Insert Table 5 here >

5.3. The role of corporate governance in economic bond effect

Corporate governance attributes play an important role in constraining the opportunistic behavior of managers and thus good corporate governance is capable of reducing the economic bond effect of high NAS fees mitigating the positive association between NAS fee ratio and stock price crash risk.

To test the effect of corporate governance on the economic bond effect of NAS fee ratio on stock price crash risk, I first construct a comprehensive index for corporate governance. The index is based on 9 indexes for CEO characteristics, board director characteristics, and ownership structure. The indexes for CEO characteristics include: *DUALITY* which equals to 1 if the CEO of the firm also serves as the chairman of the board and 0 other wise, CEO Tenure which is the number of years the CEO serves on the position, *CEO_COMMITEE* which is the number of director committees[2] the CEO serves within the firm. When CEO serves as the chairman of the board, the *CEO tenure* is longer and CEO sits on more boards within the company, it is more difficult for the board directors to monitor the CEO's behavior, and the corporate governance index is lower. The indexes for board director characteristics include the number of directors serving on the board (*BOARDSIZE*), the number of boards outside the company the firm's directors are serving (*OUTBOARD*), the percentage of directors who are hired during the year after the appointment of CEO (*DIR_AFTER_CEO*) and the percentage of independent directors (*INDEP*). The larger the *BOARDSIZE*, higher the *INDEP*, smaller the *OUTBOARD*, and smaller the *DIR_AFTRE_CEO* indicate higher quality of corporate governance. For ownership structure, I include the

[2] The committees included in the ISS Director database are nominating committee, compensation committee, audit committee, and corporate governance committee.

ownership of block holders (BLOCKOWN) – investors holding 5% or more shares of the firm and percentage of shares held by institutional investors (INSTOWN). Higher BLOCKOWN and INSTOWN indicate higher quality of corporate governance. For each index, I attribute 0 to firm-year observations with lower quality of corporate governance (i.e lower or higher than median of the index). For example, smaller DIR_AFTER_CEO indicates a higher quality of corporate governance, then I create a dummy variable equals 0 if the DIR_AFTER_CEO is larger than the mean of the sample and 1 otherwise. While high INDEP indicates a higher quality of corporate governance, I create the index for INDEP which equals 0 if INDEP is smaller than the median of the sample and 1 otherwise. Then I simply add the value of all the index and obtain the Corporate Governance Index.

Since the sample for the test is different and the sample is smaller, I partition the sample into two low NASFEERATIO sample and high NASFEERATIO sample based on NAS fee ratio. I first estimate model (4) for each subsample. Panel A of Table 6 presents the results for the regression analysis. The coefficients of *NASFEERATIO* for the sample with low NAS fee ratio are all negative but not significant, while the coefficients of *NASFEERATIO* for the sample with high NAS fee ratio are all significantly positive. The results are consistent with hypothesis 1c that the economic bond effect dominates knowledge spillover effect and the increase of NAS fee ratio increases stock price crash risk. I furthered split the sample of high NAS fee ratio into two subsamples based on the Corporate Governance Index and estimate model 4 for each subsample. Panel B of Table 6 shows the results for the regression analysis. Columns 1, 2, and 3 report the regression analysis for the sample with low Corporate Governance Index and Columns 4, 5, and 6 present the results for the sample with high Corporate Governance Index. The coefficients of

NASFEERATIO are all significantly positive at 1% level for the sample with low Corporate Governance Index, while the coefficients are generally insignificantly different from 0 for the sample with high Corporate Governance Index, except that the coefficient of *NASFEERATIO* is slightly significant when using future CRASH as the measure for future stock price crash risk. The results provide evidence that high quality of corporate governance can mitigate the economic bond effect of NAS fee ratio and alleviate the positive association between NAS fee ratio and stock price crash risk.

< *Insert Table 6 here* >

5.4. The role of institutional investor in the knowledge spillover effect

I also analyze whether the ratio of institutional investors affects the knowledge spillover effect. Institutional investors are expected to be more knowledgeable through investing in different firms within one industry. Thus, the auditors' effect can be substituted by the institutional investors' impact. I expect that, for firms with medium level of NAS fee ratio, the knowledge spillover effect to be more significant for firms with lower institutional ownership. I partition the sample with medium level of NAS fee ratio into two subsamples based on institutional ownership and estimate the model (4) for each subsample. Table 7 reports the results of the analysis. The coefficients of NASFEERATIO are significantly negative at 5% level when using future CRASH as the dependent variable and at 1% level when using future NCSKEW and DUVOL as the dependent variable for the sample with lower institutional ownership, while not significantly different from zero for the sample with higher institutional ownership. The results suggest that the effect of institutional ownership substitutes the knowledge spillover effect of NAS, and mitigates the significant negative association between NAS fees and future stock crash risk.

< Insert Table 7 here >

5.5. The role of industry experience in knowledge spillover effect

Auditors can learn more about a company if they provide service to more companies within the industry and thus the knowledge spillover effect should be enhanced. I partition the sample with a medium level of NAS fee ratio into two subsamples based on the median value of the number of clients the auditors have served within the same industry and then estimate model (4) for each subsample. Table 8 provides the results for the analysis. Columns 1, 2, 3 reports the result for the sample with low number of clients and columns 4, 5 and 6 presents the results for the

sample with high number of clients. The coefficients of NASFEERATIO are only significantly negative for the sample with high number of clients, but not significant for the sample with low number of clients. The findings suggest that for auditors who providing service to more firms, the knowledge spillover effect is enhanced as they can better use the knowledge obtained from providing non-audit services.

< *Insert Table 8 here* >

5.6. Channel analysis

To investigate the channel through which providing non-audit service, I investigate how non-audit service fees are related to accounting conservatism and absolute discretionary accruals. Table 9 Panel A presents the results of the analysis on the association between non-audit service fee ratio (NASFEERATIO) and accounting conservatism (C-score). The results show that the coefficient is significantly negative for the sample with high NASFEERATIO and not significantly different from zero for the sample with low and medium NASFEERATIO. The findings suggest that providing high level of non-audit service increases future stock price crash risk through decrease accounting conservatism, which is a form of bad news hoarding behavior. Table 9 Panel B reports the results on the relationship between non-audit service fees and absolute discretionary accruals. The coefficient of NASFEERATIO is significantly positive for the sample with high non-audit service fee ratio, which indicates that the increase of non-audit service fee ratio is associated with higher future stock price crash risk for firms of high non-audit service fee ratio. However, I don't find any significant evidence that non-audit service fee ratio is related to accounting conservatism and earnings management. It remains a question on the channel through which knowledge spillover effect of non-audit service affects stock price crash risk, and I will leave it to future research.

< *Insert Table 9 here* >

Chapter 6 Additional analysis and robustness tests

6.1. Effect different types of non-audit service

After the year 2002, more firms provide specific types of non-audit service in the proxy statement. To understand how different types of non-audit service is associated with future stock price crash risk, I keep the sample during 2003 to 2016 and classify non-audit service fees into three types including tax-related service, audit-related service, and non-specific service. After 2003, the information system service has been forbidden by the SEC. I calculate the ratio of tax service fees to total fees, audit-related service fees to total fees and non-specific service fees to total fees. Table 10 reports the results for the association between different types of non-audit service fee ratio and future stock price crash risk. Panel A of Table 10 shows the regression analysis using *TAXFEERATIO* as the independent variable and the coefficients of *TAXFEERATIO* are generally insignificant different from zero for low, medium and high *NASFEERATIO* except that the coefficient is slightly significantly negative at 10 percent for medium *NASFEERATIO* sample. Panel B of Table 10 reports the results for the analysis of audit-related fees ratio and stock price crash risk. All the coefficients of *AUD_REL_FEERATIO* are not significantly different from zero for the sample with low and medium *NASFEERATIO*. However, the coefficients are all significantly positive at less than 1 percent level for the sample with high NASFEERATO. Panel C of Table 10 shows the results of the regression analysis using the non-specific service fee ratio as the independent variable. The coefficients of *NONSPECFEERATIO* are insignificantly different from zero for the sample with low and high NASFEERATIO. However, the coefficients are significantly negative for the sample with medium NASFEERATIO when using future *NCSKEW* and *DUVOL* as measures of stock price crash risk. The results indicate that the audit-

related service drives the domination of the economic bond effect for firms with high non-audit service ratio and the non-specific service drives the domination of knowledge spillover effect for firms with medium non-audit service ratio. However, I find no significant effect of tax service fees on stock price crash risk.

< Insert Table 10 here >

6.2. Robustness Test

6.2.1 Control for auditor characteristics

To check whether the results still hold after controlling for other auditor characteristics, I add *BIG4*, *SPECIALIST* and *AUDITTENURE* in model 4 and re-estimate the model for the three subsamples with low, medium and high NASFEERATIO. Robin and Zhang (2015) finds that industry specialist is negatively associated with stock price crash risk and Callen and Fang (2017) finds that auditor tenure is also negatively associated with one-year-ahead stock crashes. I measure specialist based on the ratio of sales the office level auditor's clients within one industry-year to the sales of all the firms for that industry-year. Here, one industry is defined as with the same two-digit sic code. Audit tenure is defined as the year the auditors providing audit service for their clients. Table 11 reports the results after adding auditor characteristics as control variables. The results are generally consistent with the main analysis before adding *BIG4*, *SPECIALIST* and *AUDITTENURE*.

< Insert Table 11 here >

6.2.2 Alternative measure of NAS fee and alternative sample period.

Causholli, Chambers, and Payne (2014) uses the future NAS fee instead of the current NAS fee to test the impact of the provision of non-audit service on audit quality. The paper argues that future NAS fee is also an important consideration for the auditors and auditor may care more about future NAS fee rather than current NAS fee. I use the NAS fee ratio of year t+1 as the independent variable. I partition the sample into three subsamples based on the ratio of future stock price crash risk and then estimate model (4) for each subsample to see the association between future NAS fee ratio and future stock price crash risk.

Table 12 reports the results of the analysis, Colum (1), (2) and (3) shows the results for the subsample with low future *NASFEERATIO*, and the coefficients of future *NASFEERATIO* is in general not significant and of different direction, except that the coefficient is marginally significantly negative when using *DUVOL* as the measure for future stock price crash risk. Colum (4), (5) and (6) presents the results for the sample with medium future *NASFEERATIO*, and the coefficients of future *NASFEERATIO* are all negative, with the significance at 5 percent level when using *CRASH* as the measure for future stock price crash risk and at 10 percent level when using *NCSKEW* and *DUVOL* as the measures for future stock price crash risk. Colum (7), (8), and (9) reports the results for the subsample with high future *NASFEERATIO*, and all the coefficients of future *NASFEERATIO* are positive, with significant at 1 percent level when using *CRASH* as dependent variable and 10 percent level when using *NCSKEW* as the dependent variable. The results are generally consistent with that of the main analysis.

< Insert Table 12 here >

Since the SOX act forbid auditors from providing certain types of non-audit service to their client firms, I also provide analysis for the period between 2003 and 2016. Table 13 shows the results and the results suggest the conclusion still holds for the period after SOX. The coefficients of NASFEERATIO are significantly negative for the sample with a medium level of NAS fee ratio, and significantly positive for the sample with a high level of NAS fee ratio.

< Insert Table 13 here >

6.2.3 Propensity score matching

Unobserved or uncontrolled different firm characters between firms with high-level of NAS fee ratio and firms with low and medium level of NAS fee ratio may drive the different association between non-audit service fee ratio and stock price crash risk. To solve this endogeneity problem, I commit the propensity score match method and match the sample with low and medium level of NAS fee ratio to firms with high-level of NAS fee ratio based on all the control variables, industry with same two digit sic code and fiscal year. I use the nearest nationhood and with replacement match. The matched observation is 4,989 for sample with low level of NAS fee ratio and 6,020 for sample with medium level of NAS fee ratio, and 13,912 for sample with high level of NAS fee ratio. Then I estimate model (4) for the three matched subsamples. Table 14 reports the results for the analysis. The coefficients of NAS Fee ratio are not significantly different from zero for the sample with low NAS fee ratio, significantly positive for the sample with medium NAS fee ratio, and significantly positive for the sample with high NAS fee ratio. The results are consistent with the main analysis and suggest that the knowledge spillover effect dominates for firms with medium NAS fee ratio and leads to the negative association between non-audit service fee and stock price crash risk. The economic bond effect dominates for firms with high NAS fee ratio and leads to the positive association between non-audit service fee and stock price crash risk. Although propensity score matching cannot solve all the endogeneity problem, it solves the problem of omitted variable problem to some extent and indicates that the results still hold.

< Insert Table 14 here >

6.2.4 Firm fixed effects

To further resolve endogenous problem, I also run the firm fixed effects model. Since using firm fixed effect model will reduce the variance of the sample to a large extent, I use dummy variables instead of subsample analysis. I construct NASL, which equals 1 if the firm-year belongs to the lowest level of NAS fee ratio and 0 otherwise, NASM, which equals 1 if the firm-year belongs to the medium level of NAS fee ratio and 0 otherwise, and NASH, which equals 1 if the firm-year belongs to the highest level of NAS fee ratio and 0 otherwise. Then I interact NASFEERATIO with NASL, NASM, and NASH. I also add the interaction of all the control variables with NASL, NASM, and NASH. Table 15 presents the results. The coefficients of NASFEERATIO*NASH are significantly positive for all three models, which suggests that high level of NAS fee ratio is related to higher future stock price crash risk. Since the main endogenous concern is that firm with higher crash risk are more prone to purchase non-audit service, the results suggest that after running firm-fixed effect model, the conclusion still holds, which can attenuate the endogenous concern to some extent.

< Insert Table 15 here >

6.2.5 Big 4 Auditing Firms

The effect of NAS fee ratio on stock price crash risk may also be driven by the reputation cost or size effect. To further control for the alternative effect, I keep firms with only Big 4 audit firms and table 16 presents the results. The results are robust when constrain the sample to Big 4 auditors.

< Insert Table 16 here >

Chapter 7 Conclusion

The paper examines whether non-audit service provided by the incumbent auditors would impact future stock price crash risk. Different from prior literature, I hypotheses that the association between non-audit service fee ratio and future stock price crash risk is nonlinear due to the different results of trading off between economic bond effect and knowledge spillover effect for firms with different level of non-audit service ratio. Using three measures for stock price crash risk according to prior literature and the ratio of non-audit service fees to total fees received by the auditors from their clients, I partition the samples into three subsamples with low, medium and high NAS fee ratio and regress the NAS fee ratio on the measures for stock price crash risk. I find that for the firms with low NAS fee ratio, there is no significant effect of NAS fee on stock price risk, which suggests that the non-audit service fee is extremely low, the effect can be ignored. While for firms with medium NAS fee ratio, NAS fee ratio is significantly negative related to future stock price crashes. This result provides evidence that as the ratio of NAS fees increases from a low level to a medium level, the knowledge spillover effect predominates the economic bond effect and auditors are more capable of detecting and preventing the bad news hoarding behavior and thus reduce stock price crash risk. As the ratio of NAS fees ratio continues to increase, the economic bond effect is enhanced. Thus, for the sample of high NAS fee ratio, the association between NAS fee ratio and stock price crash risk is significantly positive, which suggests that the economic bond effect dominates the knowledge spillover effects when the proportion of the incumbent auditor's revenue which comes from providing non-audit service from their client increase to a high level.

To further understand the tradeoffs between economic bond effect and knowledge spillover effect, I examine how institutional ownership, corporate governance, and industry experience impact the association between NAS fee and stock price crash risk. I find that for sample of high NAS fee ratio, higher institutional ownership and higher quality of corporate governance can mitigate the positive effect of NAS fee ratio on stock price crash risk, which provides evidence that the economic bond effect is mitigated by a higher level of external or internal monitoring. For the sample of medium NAS fee ratio, the negative association between NAS fee ratio and stock price crash risk is only significant for the sample with low institutional ownership and firms with auditors providing service to a larger number of clients. The results suggest that higher institutional ownership mitigates the knowledge spillover effect while larger number of clients enhance the knowledge spillover effect of providing non-audit service.

I also investigate the effect of different types of non-audit service on stock price crash risk. The results shows that tax-related service generally has no effect on stock price crash risk; non-specific audit service (service other than tax related service and audit related service) drives the negative association between non-audit service and stock price risk for firms with medium level of NAS fee ratio; and audit-related service drives the positive relationship for the sample with high NAS fee ratio.

My study contributes to the literature on non-audit service by examining the nonlinear economic consequence of non-audit service. Prior literature examines the impact of non-audit service mainly using the pooled sample and does not consider the non-linear effect of non-audit service. The findings of the paper provide insights into how non-audit service provided by incumbent auditor impact investors' interest by looking at the association between NAS fee and stock price crash risk. My study

provides new evidence on the debating of the impact of non-audit service among regulators, practitioners and academics. The results suggest that regulators and investors should pay attention to the level of NAS fee ratio due to the nonlinear consequences of non-audit service. My study also contributes to the literature on stock price crash risk by examining the role of auditors in impacting stock price crash risk. Auditors are important monitors for the credibility of financial reports, as the stock price crash risk is proved by prior literature to be one of the results of bad news hoarding behavior of managers, it is important to investigate how the auditors play a role in resolving the agency conflict between investors and managers.

Reference

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List of Tables

Table 1 Sample Construction

Full sample:	
Intersection of Compustat, CRSP, and Audit Analytics (2000-2016)	93186
Less: Observations with missing future crash risk	(34310)
Less: observations with missing fee data	(1225)
Less: observations with missing control variables	(15849)
Final Sample:	41802
Sample restricted to firms with executive and board characteristics (2000-2016):	
Less: observations with missing corporate governance measure (ISS Director and ExecuComp)	(25847)
Final Sample:	15955

Table 2 Summary Statistics

Panel A: summary statistics for the full sample

Variable	N	MEAN	MEDIAN	STD.	Q1	Q3
$CRASH_{t+1}$	41802	0.234	0.000	0.423	0.000	0.000
$NCSKEW_{t+1}$	41802	-0.019	-0.063	0.873	-0.485	0.386
$DUVOL_{t+1}$	41802	-0.025	-0.039	0.379	-0.274	0.207
$NASFEERATIO_t$	41802	0.213	0.165	0.191	0.062	0.312
$SIZE_t$	41802	4823	629	26179	154	2473
LEV_t	41802	0.150	0.099	0.162	0.001	0.256
MB_t	41802	0.009	0.033	0.153	-0.003	0.078
ROA_t	41802	2.811	1.943	2.694	1.231	3.314
$DTURN_t$	41802	0.001	0.000	0.089	-0.026	0.028
$NCSKEW_t$	41802	-0.037	-0.073	0.797	-0.489	0.362
$SIGMA_t$	41802	0.053	0.046	0.029	0.032	0.067
RET_t	41802	-0.181	-0.104	0.218	-0.219	-0.049
$OPAQUE_t$	41802	0.489	0.232	0.826	0.110	0.494
$CSCORE_t$	41802	0.141	0.136	0.117	0.070	0.207

Panel B: mean and median value for the three subsamples based on NASFEERATIO

Variable	Mean	Median	Mean	Median	Mean	Median
	Low NASFEERATIO		Medium NASFEERATIO		High NASFEERATIO	
$CRASH_{t+1}$	0.242	0.000	0.227	0.000	0.233	0.000
$NCSKEW_{t+1}$	-0.014	-0.064	-0.033	-0.076	-0.008	-0.047
$DUVOL_{t+1}$	-0.025	-0.040	-0.031	-0.046	-0.021	-0.029
$NASFEERATIO_t$	0.035	0.031	0.167	0.165	0.436	0.396
$SIZE_t$	3012	501	6121	780	5341	642
LEV_t	0.140	0.075	0.148	0.099	0.163	0.122
ROA_t	-0.003	0.029	0.014	0.032	0.017	0.037
MB_t	2.855	1.955	2.754	1.881	2.825	1.996
$DTURN_t$	0.001	0.000	0.002	0.001	0.001	0.001
$NCSKEW_t$	-0.028	-0.072	-0.061	-0.087	-0.022	-0.057
$SIGMA_t$	0.052	0.046	0.050	0.042	0.058	0.050
RET_t	-0.171	-0.105	-0.160	-0.088	-0.213	-0.122
$OPAQUE_t$	0.530	0.257	0.470	0.211	0.468	0.232
$CSCORE_t$	0.149	0.142	0.141	0.136	0.135	0.131

Table 3 Correlation Matrix

Panel A Correlation Matrix for full sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
$CRASH_{t+1}$ (1)		0.63§	0.58§	**-0.010**	0.01‡	0.000	0.05§	0.08§	0.03§	0.03§	0.000	0.000	0.04§	-0.04§
$NCSKEW_{t+1}$ (2)	0.62§		0.98§	**0.01§**	0.10§	0.03§	0.10§	0.10§	0.05§	0.06§	-0.05§	0.06§	0.000	-0.12§
$DUVOL_{t+1}$ (3)	0.59§	0.95§		**0.01§**	0.10§	0.03§	0.10§	0.10§	0.05§	0.06§	-0.06§	0.06§	-0.010	-0.12§
$NASFEERATIO_t$(4)	**0.000**	**0.02§**	**0.02§**		0.07§	0.08§	0.06§	0.01§	0.01§	0.01§	0.06§	-0.06§	-0.04§	-0.07§
$SIZE_t$ (5)	0.01‡	0.08§	0.10§	0.05§		0.43§	0.18§	0.000	0.06§	0.11§	-0.56§	0.56§	-0.33§	-0.51§
LEV_t (6)	0.000	0.02§	0.03§	0.07§	0.34§		-0.02§	-0.01‡	0.06§	0.04§	-0.18§	0.18§	-0.11§	-0.07§
ROA_t (7)	0.02§	0.05§	0.07§	0.04§	0.28§	0.04§		0.31§	0.10§	0.03§	-0.32§	0.32§	-0.02§	-0.35§
MB_t (8)	0.05§	0.07§	0.07§	0.01§	-0.07§	0.07§	-0.09§		0.10§	-0.05§	-0.07§	0.07§	0.19§	-0.36§
$DTURN_t$ (9)	0.03§	0.04§	0.04§	0.01‡	0.04§	0.05§	0.05§	0.07§		0.02§	0.09§	-0.09§	-0.03§	-0.07§
$NCSKEW_t$ (10)	0.04§	0.06§	0.06§	0.02§	0.11§	0.04§	0.03§	-0.05§	0.02§		-0.03§	0.04§	-0.01§	-0.08§
$SIGMA_t$ (11)	-0.02§	-0.05§	-0.07§	0.13§	-0.51§	-0.11§	-0.41§	0.04§	0.12§	-0.02§		-1.00§	0.33§	0.28§
RET_t (12)	0.03§	0.06§	0.08§	-0.12§	0.44§	0.10§	0.41§	-0.05§	-0.13§	0.06§	-0.96§		-0.33§	-0.28§
$OPAQUE_t$ (13)	0.02§	0.010	0.000	-0.03§	-0.13§	0.02§	-0.09§	0.10§	-0.02§	0.000	0.13§	-0.11§		0.05§
$CSCORE_t$ (14)	-0.04§	-0.11§	-0.11§	-0.07§	-0.49§	-0.02§	-0.21§	-0.25§	-0.04§	-0.06§	0.26§	-0.23§	0.02§	

Lower-triangular cells report Pearson's correlation coefficients, upper-triangular cells are Spearman's rank correlation

§ p<0.01, ‡ p<0.05, † p<0.1

Panel B Correlation Matrix for sample with low level of NAS fee ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
$CRASH_{t+1}$ (1)		0.63§	0.59§	**0.02**†	0.000	-0.02‡	0.05§	0.07§	0.04§	0.03§	0.000	0.000	0.04§	-0.03§
$NCSKEW_{t+1}$ (2)	0.63§		0.98§	**0.02§**	0.08§	0.010	0.09§	0.07§	0.04§	0.05§	-0.07§	0.07§	0.000	-0.09§
$DUVOL_{t+1}$ (3)	0.60§	0.95§		**0.02§**	0.08§	0.02†	0.09§	0.07§	0.04§	0.05§	-0.07§	0.07§	0.000	-0.09§
$NASFEERATIO_t$(4)	**0.010**	**0.010**	**0.02**‡		0.24§	0.10§	0.06§	0.03§	0.03§	0.02§	-0.16§	0.16§	-0.09§	-0.15§
$SIZE_t$ (5)	0.000	0.06§	0.08§	0.22§		0.45§	0.22§	-0.07§	0.06§	0.09§	-0.56§	0.56§	-0.32§	-0.47§
LEV_t (6)	-0.010	0.010	0.02†	0.07§	0.37§		-0.02§	-0.02‡	0.06§	0.03§	-0.19§	0.19§	-0.09§	-0.06§
ROA_t (7)	0.02‡	0.03§	0.06§	0.05§	0.31§	0.03§		0.22§	0.09§	0.010	-0.35§	0.35§	-0.06§	-0.31§
MB_t (8)	0.05§	0.05§	0.05§	0.010	-0.13§	0.07§	-0.18§		0.10§	-0.09§	-0.04§	0.04§	0.19§	-0.30§
$DTURN_t$ (9)	0.03§	0.04§	0.04§	0.02‡	0.04§	0.06§	0.03§	0.06§		0.02‡	0.10§	-0.09§	-0.010	-0.07§
$NCSKEW_t$ (10)	0.03§	0.04§	0.04§	0.010	0.09§	0.03§	0.01†	-0.06§	0.02‡		-0.03§	0.04§	-0.010	-0.05§
$SIGMA_t$ (11)	-0.02‡	-0.06§	-0.08§	-0.12§	-0.51§	-0.11§	-0.42§	0.06§	0.14§	-0.03§		-1.00§	0.31§	0.28§
RET_t (12)	0.03§	0.06§	0.08§	0.10§	0.43§	0.09§	0.40§	-0.07§	-0.15§	0.07§	-0.96§		-0.31§	-0.28§
$OPAQUE_t$ (13)	0.02‡	0.000	0.000	-0.05§	-0.10§	0.03§	-0.08§	0.11§	0.000	0.000	0.12§	-0.10§		0.07§
$CSCORE_t$ (14)	-0.03§	-0.08§	-0.09§	-0.13§	-0.47§	-0.02‡	-0.19§	-0.22§	-0.04§	-0.04§	0.28§	-0.25§	0.03§	

Lower-triangular cells report Pearson's correlation coefficients, upper-triangular cells are Spearman's rank correlation

§ $p<0.01$, ‡ $p<0.05$, † $p<0.1$

Panel C: Correlation Matrix for sample with medium level of NAS fee ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
$CRASH_{t+1}$ (1)		0.62§	0.57§	**-0.02**‡	0.000	-0.010	0.05§	0.09§	0.03§	0.03§	0.01†	-0.01†	0.06§	-0.04§
$NCSKEW_{t+1}$ (2)	0.62§		0.98§	**-0.02**§	0.09§	0.03§	0.11§	0.10§	0.04§	0.06§	-0.06§	0.06§	0.010	-0.12§
$DUVOL_{t+1}$ (3)	0.58§	0.95§		**-0.02**‡	0.09§	0.03§	0.11§	0.10§	0.04§	0.06§	-0.06§	0.06§	0.010	-0.12§
$NASFEERATIO_t$(4)	**-0.02**‡	**-0.02**‡	**-0.02**§		-0.02‡	-0.010	0.01†	0.02†	0.000	-0.02†	0.02‡	-0.02‡	0.010	-0.010
$SIZE_t$ (5)	0.000	0.08§	0.09§	-0.02‡		0.43§	0.17§	-0.02‡	0.04§	0.13§	-0.58§	0.59§	-0.35§	-0.51§
LEV_t (6)	0.000	0.02‡	0.03§	-0.010	0.34§		0.000	0.02†	0.06§	0.06§	-0.21§	0.21§	-0.09§	-0.11§
ROA_t (7)	0.010	0.05§	0.07§	0.000	0.28§	0.04§		0.34§	0.06§	0.02§	-0.31§	0.31§	0.03§	-0.37§
MB_t (8)	0.06§	0.08§	0.08§	0.02‡	-0.08§	0.09§	-0.08§		0.07§	-0.05§	-0.06§	0.06§	0.23§	-0.36§
$DTURN_t$ (9)	0.03§	0.04§	0.04§	0.000	0.02§	0.05§	0.010	0.06§		0.010	0.12§	-0.12§	-0.02‡	-0.05§
$NCSKEW_t$ (10)	0.04§	0.06§	0.06§	-0.02‡	0.12§	0.06§	0.03§	-0.06§	0.010		-0.06§	0.07§	-0.02§	-0.08§
$SIGMA_t$ (11)	0.000	-0.05§	-0.07§	0.02§	-0.54§	-0.12§	-0.41§	0.04§	0.15§	-0.06§		-1.00§	0.34§	0.30§
RET_t (12)	0.010	0.06§	0.07§	-0.02§	0.46§	0.10§	0.41§	-0.05§	-0.15§	0.09§	-0.96§		-0.34§	-0.30§
$OPAQUE_t$ (13)	0.03§	0.02‡	0.02†	0.000	-0.14§	0.03§	-0.07§	0.12§	-0.02§	-0.010	0.14§	-0.11§		0.03§
$CSCORE_t$ (14)	-0.03§	-0.11§	-0.11§	-0.010	-0.48§	-0.06§	-0.21§	-0.24§	-0.02‡	-0.06§	0.29§	-0.25§	0.010	

Lower-triangular cells report Pearson's correlation coefficients, upper-triangular cells are Spearman's rank correlation

§ $p<0.01$, ‡ $p<0.05$, † $p<0.1$

Panel D: Correlation Matrix for sample with high level of NAS fee ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
$CRASH_{t+1}$ (1)		0.63§	0.57§	**0.02§**	0.04§	0.02†	0.06§	0.08§	0.03§	0.03§	-0.02‡	0.02‡	0.02§	-0.06§
$NCSKEW_{t+1}$ (2)	0.62§		0.98§	**0.06§**	0.13§	0.04§	0.11§	0.13§	0.06§	0.07§	-0.05§	0.05§	-0.02‡	-0.15§
$DUVOL_{t+1}$ (3)	0.59§	0.96§		**0.06§**	0.13§	0.04§	0.11§	0.13§	0.06§	0.07§	-0.06§	0.06§	-0.03§	-0.15§
$NASFEERATIO_t$(4)	**0.03§**	**0.07§**	**0.07§**		0.02‡	0.05§	0.02‡	0.05§	0.03§	0.06§	0.20§	-0.20§	0.02‡	-0.10§
$SIZE_t$ (5)	0.04§	0.11§	0.13§	0.03§		0.39§	0.14§	0.09§	0.08§	0.13§	-0.53§	0.53§	-0.32§	-0.56§
LEV_t (6)	0.02‡	0.03§	0.03§	0.06§	0.32§		-0.05§	-0.03§	0.06§	0.03§	-0.18§	0.18§	-0.14§	-0.02‡
ROA_t (7)	0.04§	0.07§	0.08§	0.00	0.24§	0.03§		0.36§	0.14§	0.05§	-0.31§	0.31§	-0.02§	-0.35§
MB_t (8)	0.05§	0.08§	0.09§	0.05§	0.00	0.04§	-0.01		0.13§	-0.01	-0.10§	0.10§	0.14§	-0.42§
$DTURN_t$ (9)	0.03§	0.05§	0.05§	0.03§	0.04§	0.04§	0.09§	0.08§		0.04§	0.06§	-0.06§	-0.06§	-0.09§
$NCSKEW_t$ (10)	0.04§	0.07§	0.07§	0.07§	0.12§	0.02§	0.05§	-0.03§	0.03§		-0.01	0.02‡	-0.01	-0.11§
$SIGMA_t$ (11)	-0.03§	-0.06§	-0.07§	0.19§	-0.49§	-0.13§	-0.41§	0.02‡	0.09§	0.01		-1.00§	0.33§	0.28§
RET_t (12)	0.03§	0.07§	0.08§	-0.15§	0.43§	0.12§	0.43§	-0.04§	-0.10§	0.03§	-0.96§		-0.33§	-0.28§
$OPAQUE_t$ (13)	0.02‡	-0.01	-0.01	-0.01†	-0.13§	0.00	-0.11§	0.08§	-0.03§	0.00	0.15§	-0.13§		0.07§
$CSCORE_t$ (14)	-0.06§	-0.13§	-0.14§	-0.09§	-0.51§	0.04§	-0.21§	-0.29§	-0.04§	-0.09§	0.24§	-0.21§	0.03§	

Lower-triangular cells report Pearson's correlation coefficients, upper-triangular cells are Spearman's rank correlation

§ p<0.01, ‡ p<0.05, † p<0.1

Table 4 Effect of Non-audit Service Fee on stock price crash risk

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**1.220***	**0.036**	**0.044**	**-0.885***	**-0.327****	**-0.144****	**0.525*****	**0.219*****	**0.093*****
	[1.71]	**[0.14]**	**[0.41]**	**[-1.86]**	**[-1.99]**	**[-2.03]**	**[3.23]**	**[3.88]**	**[3.82]**
$SIZE_t$	0.008	0.021***	0.009***	0.046**	0.029***	0.014***	0.019	0.023***	0.012***
	[0.34]	[2.65]	[2.71]	[2.39]	[4.12]	[4.72]	[0.97]	[3.42]	[4.04]
LEV_t	0.020	-0.062	-0.038	-0.094	-0.111	-0.057**	0.218	-0.006	-0.012
	[0.12]	[-0.92]	[-1.36]	[-0.54]	[-1.64]	[-1.98]	[1.34]	[-0.10]	[-0.47]
ROA_t	0.352**	0.083	0.074***	0.161	0.145**	0.105***	0.362**	0.154**	0.093***
	[2.15]	[1.22]	[2.76]	[1.00]	[2.19]	[3.85]	[2.12]	[2.46]	[3.58]
MB_t	0.012	0.010***	0.005***	0.029***	0.019***	0.009***	0.012	0.015***	0.008***
	[1.34]	[2.72]	[3.34]	[3.45]	[5.41]	[6.30]	[1.36]	[4.42]	[5.32]
$DTURN_t$	0.832***	0.343***	0.143***	0.686***	0.309***	0.138***	0.614**	0.420***	0.185***
	[3.40]	[3.58]	[3.61]	[2.64]	[3.09]	[3.32]	[2.55]	[5.00]	[5.02]
$NCSKEW_t$	0.050**	0.028***	0.012***	0.088***	0.046***	0.020***	0.055**	0.040***	0.016***
	[1.97]	[2.62]	[2.67]	[3.29]	[4.36]	[4.55]	[2.06]	[3.88]	[3.67]
$SIGMA_t$	11.129***	4.246***	1.616***	10.302***	4.292***	1.538***	10.301***	5.109***	2.347***
	[3.46]	[3.48]	[3.25]	[3.24]	[3.90]	[3.27]	[3.46]	[4.84]	[5.17]
RET_t	1.599***	0.631***	0.257***	1.296***	0.577***	0.214***	1.421***	0.744***	0.350***
	[3.85]	[4.03]	[4.14]	[3.16]	[4.18]	[3.68]	[3.91]	[6.02]	[6.55]
$OPAQUE_t$	0.014	-0.004	-0.003	0.060**	0.017	0.006	0.027	-0.002	-0.002
	[0.55]	[-0.45]	[-0.72]	[2.28]	[1.50]	[1.17]	[1.00]	[-0.17]	[-0.43]
$CSCORE_t$	-0.933***	-0.541***	-0.224***	-0.105	-0.371***	-0.129***	-0.826**	-0.734***	-0.315***
	[-2.83]	[-4.33]	[-4.26]	[-0.34]	[-3.20]	[-2.68]	[-2.21]	[-5.55]	[-5.32]

Table 4 Effect of Non-audit Service Fee on stock price crash risk (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
Constant	-1.530	-0.193	-0.038	-1.921***	-0.284*	-0.138	-2.698***	-0.700***	-0.331***
	[-1.47]	[-0.71]	[-0.37]	[-2.94]	[-1.79]	[-1.61]	[-4.45]	[-6.44]	[-5.64]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,949	13,949	13,949	13,931	13,931	13,931	13,922	13,922	13,922
Pseudo R^2	0.022	0.025	0.031	0.022	0.031	0.037	0.022	0.046	0.055

Note: Table 4 reports results of the regression of NASFEERATIO on future stock price crash risk for the three subsamples with low, medium and high NAS fee ratio. The dependent variable are three measures for future stock price crash risk. Colum (1), (2) and (3) reports the results for the subsample with low NAS fee ratio. Colum (4), (5) and (6) reports the results for the subsample with medium NAS fee ratio, and Colum (7), (8) and (9) reports the results for the sample with high NAS fee ratio. See appendix 1 for variable definitions. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 5 The role of institutional ownership in economic bond effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Low INSTOWN			High INSTOWN		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**0.614*** **	**0.202*** **	**0.087*** **	**0.226**	**0.102**	**0.036**
	[2.73]	**[2.74]**	**[2.68]**	**[0.96]**	**[1.13]**	**[0.96]**
$SIZE_t$	0.076***	0.041***	0.021***	-0.067**	-0.023**	-0.008*
	[2.62]	[4.43]	[5.08]	[-2.29]	[-2.26]	[-1.76]
LEV_t	0.065	0.035	0.012	0.409*	0.023	-0.006
	[0.26]	[0.42]	[0.32]	[1.82]	[0.28]	[-0.16]
ROA_t	0.364*	0.126*	0.085***	0.236	0.140	0.074
	[1.66]	[1.78]	[2.83]	[0.83]	[1.11]	[1.46]
MB_t	0.031**	0.023***	0.011***	-0.006	0.005	0.004*
	[2.27]	[4.76]	[5.26]	[-0.51]	[1.02]	[1.82]
$DTURN_t$	1.121***	0.426***	0.199***	0.078	0.298**	0.127**
	[3.02]	[3.49]	[3.74]	[0.24]	[2.57]	[2.46]
$NCSKEW_t$	0.034	0.030**	0.014**	0.035	0.024	0.007
	[0.86]	[2.10]	[2.24]	[0.96]	[1.61]	[1.07]
$SIGMA_t$	5.997	4.882***	2.038***	7.621*	1.593	1.099
	[1.37]	[3.46]	[3.31]	[1.80]	[0.94]	[1.52]
RET_t	1.023**	0.688***	0.303***	0.853	0.285	0.188**
	[2.01]	[4.33]	[4.37]	[1.53]	[1.31]	[2.04]
$OPAQUE_t$	0.025	-0.004	-0.002	0.041	0.005	-0.000
	[0.59]	[-0.25]	[-0.25]	[1.16]	[0.38]	[-0.06]
$CSCORE_t$	-0.617	-0.924***	-0.376***	-0.826	-0.447**	-0.219**
	[-1.09]	[-4.99]	[-4.61]	[-1.55]	[-2.15]	[-2.31]

Table 5 The role of institutional ownership in economic bond effect (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
	Low INSTOWN			High INSTOWN		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
Constant	**-3.062*** **	**-0.855*** **	**-0.400*** **	**0.378**	**0.980*** **	**0.386*** **
	[-5.16]	**[-6.56]**	**[-6.28]**	**[0.67]**	**[3.26]**	**[3.27]**
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	6,945	6,945	6,945	6,977	6,977	6,977
Pseudo R^2	0.031	0.063	0.074	0.031	0.024	0.028

Note: Table 5 reports the results for the cross-sectional analysis of institutional ownership for the economic bond effect. The analysis is based on the sample with high NAS fee ratio in table 4 and for two subsamples with low and high institutional ownership. Colum (1), (2) and (3) reports the results for the subsample with low institutional ownership, and Colum (4), (5) and (6) reports the results for the subsample with high institutional ownership. See appendix 1 for variable definition. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 6 The role of corporate governance in economic bond effect

Panel A: Effects of NAS fee ratio on stock price crash risk

	(1)	(2)	(3)	(4)	(5)	(6)
	Low NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	NCSKEW $_{t+1}$	DUVOL $_{t+1}$	$CRASH_{t+1}$	NCSKEW $_{t+1}$	DUVOL $_{t+1}$
$NASFEERATIO_t$	**-0.312**	**-0.146**	**-0.042**	**0.712*** **	**0.199*** **	**0.071** **
	[-0.60]	**[-0.80]**	**[-0.53]**	**[3.52]**	**[2.66]**	**[2.18]**
$SIZE_t$	-0.035	0.003	0.002	-0.053*	-0.016	-0.005
	[-1.05]	[0.30]	[0.31]	[-1.80]	[-1.60]	[-1.03]
LEV_t	0.028	-0.053	-0.051	0.304	0.071	0.005
	[0.12]	[-0.56]	[-1.24]	[1.27]	[0.80]	[0.14]
ROA_t	0.443	0.314**	0.182***	0.293	0.398***	0.191***
	[1.08]	[2.05]	[2.60]	[0.87]	[3.44]	[3.80]
MB_t	0.004	0.007	0.003	-0.004	0.001	0.002
	[0.27]	[1.32]	[1.42]	[-0.31]	[0.19]	[1.09]
$DTURN_t$	0.842**	0.245*	0.070	0.187	0.177	0.074
	[2.28]	[1.86]	[1.19]	[0.52]	[1.49]	[1.40]
$NCSKEW_t$	0.067**	0.028**	0.010*	0.004	0.017	0.006
	[2.07]	[2.07]	[1.73]	[0.12]	[1.18]	[1.04]
$SIGMA_t$	11.380*	5.296***	2.428***	8.962*	2.337	1.054
	[1.93]	[2.73]	[2.88]	[1.90]	[1.42]	[1.47]
RET_t	2.244**	0.908***	0.404***	1.393**	0.448**	0.207**
	[2.22]	[2.87]	[2.94]	[2.06]	[2.09]	[2.12]
$OPAQUE_t$	0.015	-0.004	-0.001	0.084**	0.004	-0.003
	[0.47]	[-0.32]	[-0.23]	[2.36]	[0.33]	[-0.47]
$CSCORE_t$	-0.445	-0.230	-0.115	-0.167	-0.247	-0.106
	[-0.86]	[-1.20]	[-1.36]	[-0.30]	[-1.20]	[-1.15]
Constant	-0.756	0.148	0.047	-0.795	0.124	0.082
	[-1.01]	[0.44]	[0.32]	[-1.30]	[0.98]	[1.49]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	7,984	7,984	7,984	7,971	7,971	7,971
Pseudo R^2	0.0291	0.015	0.020	0.0291	0.020	0.024

Panel B: the role of corporate governance in the economic bond effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Low Corporate Governance Index			High Corporate Governance Index		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**0.873*** **	**0.275*** **	**0.113*** **	**0.605***	**0.173**	**0.039**
	[3.28]	**[2.94]**	**[2.73]**	**[1.90]**	**[1.51]**	**[0.79]**
$SIZE_t$	-0.069*	-0.023*	-0.008	-0.031	-0.005	0.000
	[-1.87]	[-1.95]	[-1.55]	[-0.62]	[-0.25]	[0.04]
LEV_t	0.368	-0.001	-0.037	0.233	0.058	0.017
	[1.12]	[-0.01]	[-0.72]	[0.67]	[0.42]	[0.29]
MB_t	0.392	0.360**	0.158**	0.204	0.414**	0.217***
	[0.83]	[2.42]	[2.35]	[0.43]	[2.19]	[2.66]
ROA_t	-0.007	-0.002	0.001	0.000	0.006	0.005
	[-0.39]	[-0.28]	[0.39]	[0.01]	[0.85]	[1.49]
$DTURN_t$	0.516	0.337**	0.130*	-0.165	-0.048	-0.002
	[1.02]	[2.16]	[1.87]	[-0.32]	[-0.26]	[-0.03]
$NCSKEW_t$	-0.013	0.019	0.008	0.008	0.002	0.000
	[-0.27]	[1.13]	[1.06]	[0.14]	[0.10]	[0.05]
$SIGMA_t$	9.435	2.384	1.025	7.676	1.765	0.870
	[1.55]	[1.17]	[1.12]	[0.99]	[0.64]	[0.75]
RET_t	1.247	0.423	0.203	1.523	0.459	0.201
	[1.40]	[1.60]	[1.64]	[1.38]	[1.30]	[1.32]
$OPAQUE_t$	0.086**	0.008	-0.002	0.076	0.006	0.000
	[2.05]	[0.56]	[-0.31]	[1.33]	[0.27]	[0.01]
$CSCORE_t$	-0.362	-0.380	-0.158	-0.110	0.059	0.003
	[-0.48]	[-1.54]	[-1.40]	[-0.13]	[0.17]	[0.02]
Constant	-0.908	0.113	0.088	-0.321	0.493	0.209
	[-1.36]	[0.78]	[1.38]	[-0.34]	[1.44]	[1.37]
N	4,745	4,747	4,747	3,226	3,231	3,231
Pseudo R^2	0.0380	0.027	0.029	0.0380	0.016	0.020

Note: Table 6 reports the results for the cross-sectional analysis of corporate governance for the economic bond effect. Panel A reports the analysis of the association between NAS fee ratio and future stock price crash risk based on the small sample which are covered by the ISS director database and EXECUCOMP. The sample is partitioned into two subsamples with low and high NAS fee ratio. In Panel A, Colum (1), (2) and (3) reports the results for the subsample with low NAS fee ratio p, and Colum (4), (5) and (6) reports the results for the subsample with high NAS fee ratio. Panel B reports the results based on the sample with high NAS fee ratio in panel A of table 6. The sample is partitioned into two subsamples with low and high corporate governance index. In Panel B, Colum (1), (2) and (3) reports the results for the subsample with low corporate governance index, and Colum (4), (5) and (6) reports the results for the subsample with high corporate governance index. See appendix 1 for variable definition. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 7 The role of institutional ownership in knowledge spillover effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Low INSTOWN			High INSTOWN		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**-1.549****	**-0.708*****	**-0.314*****	**-0.031**	**0.108**	**0.048**
	[-2.19]	**[-3.09]**	**[-3.16]**	**[-0.05]**	**[0.45]**	**[0.47]**
$SIZE_t$	0.046	0.037***	0.019***	0.030	-0.005	-0.002
	[1.62]	[3.89]	[4.50]	[1.00]	[-0.45]	[-0.33]
LEV_t	-0.353	-0.246***	-0.121***	0.191	0.053	0.022
	[-1.35]	[-2.82]	[-3.19]	[0.81]	[0.53]	[0.53]
ROA_t	0.147	0.151**	0.093***	0.207	0.087	0.103*
	[0.71]	[1.99]	[2.94]	[0.75]	[0.65]	[1.92]
MB_t	0.044***	0.020***	0.009***	0.020*	0.017***	0.008***
	[3.61]	[3.95]	[4.57]	[1.71]	[3.54]	[4.01]
$DTURN_t$	1.175***	0.540***	0.259***	0.179	0.027	-0.010
	[3.23]	[4.08]	[4.58]	[0.47]	[0.17]	[-0.17]
$NCSKEW_t$	0.121***	0.047***	0.019***	0.027	0.026*	0.013**
	[2.97]	[3.15]	[3.11]	[0.77]	[1.67]	[1.98]
$SIGMA_t$	1.417	1.741	0.586	17.121***	4.711**	1.477*
	[0.33]	[1.24]	[0.99]	[3.30]	[2.45]	[1.79]
RET_t	0.483	0.324*	0.127*	1.636**	0.439	0.098
	[0.92]	[1.90]	[1.80]	[2.12]	[1.55]	[0.81]
$OPAQUE_t$	0.093**	0.036**	0.012*	0.040	0.002	0.001
	[2.26]	[2.10]	[1.72]	[1.13]	[0.13]	[0.16]
$CSCORE_t$	0.375	-0.426***	-0.149**	-0.251	-0.184	-0.081
	[0.83]	[-2.63]	[-2.25]	[-0.54]	[-1.03]	[-1.06]
Constant	-1.814**	-0.071	-0.057	-2.199**	-0.250	-0.094
	[-2.26]	[-0.37]	[-0.60]	[-2.45]	[-0.95]	[-0.66]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	6,962	6,962	6,962	6,969	6,969	6,969
Pseudo R^2	0.0305	0.040	0.046	0.0305	0.016	0.020

Note: Table 7 reports the results for the cross-sectional analysis of institutional ownership for the knowledge spillover effect. The analysis is based on the sample with medium NAS fee ratio in table 4 and further be partitioned into two subsamples with low and high institutional ownership. Colum (1), (2) and (3) reports the results for the subsample with low institutional ownership, and Colum (4), (5) and (6) reports the results for the subsample with high institutional ownership. See appendix 1 for variable definition. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 8 The role of industry experience in knowledge spillover effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Low No. of Clients			High No. of Clients		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**-0.309**	**-0.081**	**-0.044**	**-1.333****	**-0.560****	**-0.234****
	[-0.45]	**[-0.35]**	**[-0.44]**	**[-1.99]**	**[-2.36]**	**[-2.28]**
$SIZE_t$	0.013	0.017*	0.010**	0.074**	0.036***	0.015***
	[0.47]	[1.70]	[2.42]	[2.55]	[3.30]	[3.30]
LEV_t	0.082	0.007	-0.014	-0.139	-0.182*	-0.079*
	[0.32]	[0.08]	[-0.35]	[-0.56]	[-1.83]	[-1.87]
MB_t	0.400	0.291***	0.163***	-0.042	0.057	0.073*
	[1.63]	[3.25]	[4.24]	[-0.19]	[0.61]	[1.92]
ROA_t	0.012	0.013***	0.007***	0.039***	0.022***	0.010***
	[0.96]	[2.70]	[3.55]	[3.48]	[4.50]	[4.98]
$DTURN_t$	0.515	0.301**	0.147**	0.865**	0.330**	0.138**
	[1.37]	[2.27]	[2.56]	[2.37]	[2.22]	[2.30]
$NCSKEW_t$	0.155***	0.062***	0.026***	0.021	0.024	0.012*
	[4.14]	[4.21]	[4.14]	[0.53]	[1.57]	[1.86]
$SIGMA_t$	7.306	4.025***	1.436**	13.364***	4.631***	1.582**
	[1.63]	[2.61]	[2.16]	[2.89]	[2.88]	[2.34]
RET_t	0.798	0.525***	0.189**	1.720***	0.615***	0.220***
	[1.38]	[2.70]	[2.28]	[2.90]	[3.10]	[2.67]
$OPAQUE_t$	0.093**	0.032**	0.013**	0.034	0.005	-0.000
	[2.55]	[2.00]	[2.01]	[0.80]	[0.33]	[-0.00]
$CSCORE_t$	-0.116	-0.582***	-0.208***	-0.186	-0.186	-0.060
	[-0.25]	[-3.52]	[-3.06]	[-0.43]	[-1.09]	[-0.84]
Constant	-1.375**	-0.027	-0.006	-2.039***	-0.870***	-0.438***
	[-2.08]	[-0.16]	[-0.07]	[-4.43]	[-2.84]	[-2.72]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	6,870	6,870	6,870	7,015	7,047	7,047
Pseudo R^2	0.0253	0.036	0.042	0.0253	0.027	0.032

Note: Table 7 reports the results for the cross-sectional analysis of institutional ownership for the knowledge spillover effect. The analysis is based on the sample with medium NAS fee ratio in table 4 and further be partitioned into two subsamples with low and high industry experience. Colum (1), (2) and (3) reports the results for the subsample with low industry experience, and Colum (4), (5) and (6) reports the results for the subsample with high industry experience. See appendix 1 for variable definition. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 9 Channel analysis

Panel A: Effect of non-audit service fees on accounting conservatism

	(1) Low NASFEERATIO	(4) Medium NASFEERATIO	(7) High NASFEERATIO
$NASFEERATIO_t$	-0.035	-0.025	-0.009**
	[-1.39]	[-1.64]	[-2.03]
$SIZE_t$	-0.044***	-0.042***	-0.038***
	[-61.27]	[-64.31]	[-63.45]
LEV_t	0.140***	0.147***	0.151***
	[15.66]	[16.08]	[20.79]
$LOSS_t$	0.016***	0.024***	0.019***
	[6.98]	[9.88]	[9.93]
AGE_t	0.016**	0.014**	0.002
	[2.28]	[2.01]	[0.32]
OCF_t	-0.032***	0.001	0.01
	[-2.82]	[0.06]	[0.92]
$CASH_t$	-0.077***	-0.078***	-0.067***
	[-14.93]	[-13.33]	[-14.41]
$NEWFINANCE_t$	-0.004**	-0.003**	-0.001
	[-2.44]	[-1.97]	[-0.80]
$LITIGATION_t$	-0.009**	-0.011***	-0.009***
	[-2.39]	[-3.42]	[-3.45]
$SALEGROWTH_t$	-0.039***	-0.030***	-0.021***
	[-10.24]	[-8.13]	[-6.79]
$R\&D_t$	-0.014***	-0.015***	-0.018***
	[-5.16]	[-6.09]	[-7.85]
$PROFIT_t$	-0.006	-0.037**	-0.062***
	[-0.52]	[-2.45]	[-5.94]
Constant	0.388***	0.358***	0.323***
	[11.30]	[18.79]	[11.45]
Industry F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Observations	13949	13931	13922
Pseudo R^2	0.651	0.684	0.678

Panel B: effect of non-audit service fees on absolute discretionary accruals

	(1) Low NASFEERATIO	(4) Medium NASFEERATIO	(7) High NASFEERATIO
$NASFEERATIO_t$	0.062	0.031	0.067***
	[0.71]	[0.63]	[3.29]
$SIZE_t$	-0.011***	-0.014***	-0.013***
	[-4.28]	[-6.82]	[-6.36]
LEV_t	0.004	0.002	0.045*
	[0.14]	[0.07]	[1.89]
$LOSS_t$	0.014*	0.005	-0.010
	[1.70]	[0.62]	[-1.35]
AGE_t	-0.170***	-0.079***	-0.118***
	[-4.72]	[-2.88]	[-4.17]
OCF_t	0.099***	0.175***	0.106***
	[3.79]	[4.78]	[3.31]
$CASH_t$	-0.091***	-0.049***	-0.040**
	[-4.78]	[-2.88]	[-2.56]
$NEWFINANCE_t$	0.016***	0.024***	0.022***
	[3.06]	[4.61]	[4.23]
$LITIGATION_t$	0.039***	0.034***	0.054***
	[3.13]	[2.86]	[4.67]
$SALEGROWTH_t$	0.014**	0.059***	0.002
	[2.16]	[2.78]	[0.11]
$R\&D_t$	0.010	0.019**	-0.013
	[0.90]	[2.04]	[-1.26]
ROA_t	-0.018	-0.137***	-0.115**
	[-0.48]	[-2.99]	[-2.54]
Constant	0.205	0.229***	0.145***
	[1.59]	[5.54]	[3.95]
Industry F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Observations	13,949	13,931	13,922
Pseudo R^2	0.120	0.140	0.133

Table 10 Different types of non-audit service

Panel A: Effect of tax related service

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$TAXFEERATIO_t$	**1.098**	**-0.035**	**-0.013**	**-0.773***	**0.081**	**0.029**	**-0.202**	**-0.090**	**-0.040**
	[1.14]	**[-0.09]**	**[-0.08]**	**[-1.89]**	**[0.53]**	**[0.44]**	**[-1.07]**	**[-1.31]**	**[-1.36]**
$SIZE_t$	0.014	0.025***	0.011***	0.040*	0.022***	0.011***	0.019	0.017**	0.009***
	[0.57]	[2.73]	[2.86]	[1.83]	[2.75]	[3.20]	[0.92]	[2.37]	[2.71]
LEV_t	-0.065	-0.078	-0.040	-0.051	-0.057	-0.041	0.309*	-0.051	-0.029
	[-0.35]	[-1.06]	[-1.29]	[-0.27]	[-0.75]	[-1.27]	[1.74]	[-0.74]	[-0.99]
ROA_t	0.331*	0.076	0.068**	0.062	0.064	0.078**	0.577***	0.149*	0.094***
	[1.84]	[1.04]	[2.36]	[0.32]	[0.77]	[2.36]	[2.84]	[1.85]	[2.90]
MB_t	0.014	0.010**	0.005***	0.031***	0.018***	0.009***	0.004	0.012***	0.006***
	[1.37]	[2.42]	[2.80]	[3.39]	[4.44]	[5.41]	[0.40]	[3.23]	[3.94]
$DTURN_t$	0.787***	0.327***	0.146***	0.734***	0.380***	0.158***	0.048	0.239**	0.088*
	[2.96]	[3.11]	[3.35]	[2.66]	[3.35]	[3.37]	[0.18]	[2.29]	[1.94]
$NCSKEW_t$	0.056**	0.030***	0.012**	0.080***	0.030***	0.013***	0.057*	0.043***	0.018***
	[2.01]	[2.59]	[2.51]	[2.76]	[2.60]	[2.65]	[1.96]	[3.71]	[3.67]
$SIGMA_t$	9.970***	4.477***	1.888***	8.853**	2.807**	0.970*	14.697***	4.637***	1.971***
	[2.68]	[3.17]	[3.32]	[2.48]	[2.10]	[1.75]	[4.06]	[3.59]	[3.59]
RET_t	1.471***	0.683***	0.305***	0.963**	0.381**	0.139*	2.030***	0.781***	0.338***
	[2.97]	[3.60]	[4.14]	[2.04]	[2.11]	[1.89]	[4.00]	[4.60]	[4.73]
$OPAQUE_t$	0.022	-0.004	-0.003	0.053*	0.015	0.004	0.022	-0.000	-0.002
	[0.84]	[-0.43]	[-0.59]	[1.94]	[1.32]	[0.71]	[0.69]	[-0.03]	[-0.42]
$CSCORE_t$	-0.958***	-0.548***	-0.228***	-0.203	-0.377***	-0.132**	-0.315	-0.434***	-0.172***
	[-2.68]	[-3.96]	[-3.94]	[-0.59]	[-2.95]	[-2.50]	[-0.90]	[-3.38]	[-3.08]

Constant	-1.742***	-0.422***	-0.229***	-1.850**	-0.295*	-0.158*	-2.260***	-0.330***	-0.164**
	[-6.02]	[-4.09]	[-5.25]	[-2.36]	[-1.68]	[-1.72]	[-4.16]	[-2.75]	[-2.25]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,444	11,444	11,444	11,449	11,449	11,449	11,450	11,450	11,450
Pseudo R^2	0.0264	0.026	0.031	0.0264	0.023	0.028	0.0264	0.027	0.032

Panel B: Effect of audit related fees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$AUD\_REL\_FEERATIO_t$	**0.696**	**0.280**	**0.158**	**0.551**	**0.033**	**-0.012**	**0.489*** **	**0.219*** **	**0.101*** **
	[0.95]	**[1.11]**	**[1.42]**	**[1.32]**	**[0.21]**	**[-0.17]**	**[2.65]**	**[3.07]**	**[3.31]**
$SIZE_t$	0.015	0.024***	0.011***	0.040*	0.021***	0.011***	0.016	0.016**	0.008**
	[0.60]	[2.66]	[2.78]	[1.80]	[2.68]	[3.18]	[0.78]	[2.17]	[2.50]
LEV_t	-0.070	-0.078	-0.040	-0.046	-0.057	-0.041	0.285	-0.061	-0.034
	[-0.38]	[-1.07]	[-1.30]	[-0.24]	[-0.75]	[-1.27]	[1.60]	[-0.88]	[-1.14]
ROA_t	0.326*	0.077	0.069**	0.056	0.067	0.079**	0.598***	0.159**	0.099***
	[1.82]	[1.05]	[2.38]	[0.29]	[0.81]	[2.38]	[2.97]	[2.00]	[3.07]
MB_t	0.014	0.010**	0.005***	0.031***	0.018***	0.009***	0.004	0.012***	0.006***
	[1.40]	[2.41]	[2.80]	[3.37]	[4.46]	[5.42]	[0.36]	[3.19]	[3.90]
$DTURN_t$	0.785***	0.326***	0.146***	0.737***	0.380***	0.157***	0.041	0.236**	0.087*
	[2.95]	[3.10]	[3.33]	[2.67]	[3.35]	[3.37]	[0.15]	[2.27]	[1.91]
$NCSKEW_t$	0.056**	0.030***	0.012**	0.079***	0.030***	0.013***	0.057*	0.043***	0.018***
	[2.03]	[2.59]	[2.52]	[2.72]	[2.62]	[2.66]	[1.94]	[3.71]	[3.67]

Table 10 Different type of non-audit service (continued)

Panel B: Effect of audit related fees (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$SIGMA_t$	**9.950*** **	**4.486*** **	**1.893*** **	**8.863** **	**2.793** **	**0.968***	**14.623*** **	**4.590*** **	**1.949*** **
	[2.68]	**[3.18]**	**[3.33]**	**[2.48]**	**[2.09]**	**[1.75]**	**[4.05]**	**[3.56]**	**[3.56]**
RET_t	1.466***	0.684***	0.305***	0.958**	0.380**	0.139*	2.020***	0.776***	0.336***
	[2.97]	[3.60]	[4.14]	[2.03]	[2.10]	[1.89]	[3.99]	[4.58]	[4.71]
$OPAQUE_t$	0.022	-0.004	-0.002	0.052*	0.016	0.004	0.019	-0.001	-0.003
	[0.84]	[-0.42]	[-0.58]	[1.92]	[1.33]	[0.71]	[0.62]	[-0.13]	[-0.53]
$CSCORE_t$	-0.955***	-0.547***	-0.228***	-0.207	-0.376***	-0.132**	-0.296	-0.425***	-0.167***
	[-2.67]	[-3.95]	[-3.93]	[-0.61]	[-2.94]	[-2.50]	[-0.84]	[-3.30]	[-3.00]
Constant	-1.783***	-0.435***	-0.236***	-1.947**	-0.286	-0.155*	-2.320***	-0.355***	-0.176**
	[-6.13]	[-4.17]	[-5.37]	[-2.48]	[-1.64]	[-1.68]	[-4.29]	[-3.03]	[-2.44]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,444	11,444	11,444	11,449	11,449	11,449	11,450	11,450	11,450
Pseudo R-squared	0.0268	0.026	0.031	0.0268	0.023	0.028	0.0268	0.028	0.033

Table 10 Different type of non-audit service (continued)

Panel C: Effect of non-specific non-audit service fees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NONSPE\_FEERATIO_t$	**0.287**	**0.407**	**0.103**	**-1.107**	**-0.626****	**-0.269****	**-0.140**	**0.078**	**0.012**
	[0.20]	**[1.07]**	**[0.56]**	**[-1.40]**	**[-2.38]**	**[-2.37]**	**[-0.49]**	**[0.80]**	**[0.27]**
$SIZE_t$	0.016	0.024***	0.011***	0.040*	0.020**	0.010***	0.019	0.018**	0.009***
	[0.65]	[2.72]	[2.86]	[1.83]	[2.57]	[3.03]	[0.89]	[2.41]	[2.72]
LEV_t	-0.068	-0.078	-0.040	-0.038	-0.052	-0.038	0.313*	-0.050	-0.029
	[-0.37]	[-1.06]	[-1.29]	[-0.20]	[-0.68]	[-1.19]	[1.76]	[-0.72]	[-0.97]
ROA_t	0.323*	0.076	0.068**	0.048	0.070	0.081**	0.558***	0.138*	0.089***
	[1.80]	[1.03]	[2.36]	[0.25]	[0.85]	[2.45]	[2.76]	[1.73]	[2.78]
MB_t	0.014	0.010**	0.005***	0.031***	0.018***	0.009***	0.004	0.012***	0.006***
	[1.41]	[2.42]	[2.80]	[3.31]	[4.40]	[5.37]	[0.39]	[3.22]	[3.92]
$DTURN_t$	0.788***	0.327***	0.146***	0.738***	0.379***	0.157***	0.059	0.244**	0.091**
	[2.96]	[3.11]	[3.35]	[2.67]	[3.34]	[3.36]	[0.22]	[2.34]	[1.99]
$NCSKEW_t$	0.056**	0.030***	0.012**	0.078***	0.030***	0.013***	0.056*	0.042***	0.018***
	[2.02]	[2.59]	[2.51]	[2.70]	[2.61]	[2.65]	[1.94]	[3.69]	[3.65]
$SIGMA_t$	9.931***	4.475***	1.888***	8.790**	2.716**	0.931*	14.754***	4.662***	1.982***
	[2.68]	[3.17]	[3.32]	[2.46]	[2.04]	[1.68]	[4.08]	[3.61]	[3.61]
RET_t	1.465***	0.684***	0.305***	0.942**	0.367**	0.133*	2.031***	0.783***	0.339***
	[2.97]	[3.60]	[4.14]	[2.00]	[2.04]	[1.82]	[4.00]	[4.61]	[4.74]
$OPAQUE_t$	0.022	-0.004	-0.003	0.052*	0.015	0.004	0.021	-0.000	-0.002
	[0.83]	[-0.43]	[-0.59]	[1.91]	[1.32]	[0.71]	[0.68]	[-0.02]	[-0.43]
$CSCORE_t$	-0.959***	-0.548***	-0.228***	-0.223	-0.379***	-0.133**	-0.309	-0.436***	-0.171***
	[-2.68]	[-3.96]	[-3.94]	[-0.65]	[-2.97]	[-2.52]	[-0.88]	[-3.38]	[-3.08]

Table 10 Different type of non-audit service

Panel C: non-specific non-audit service fees (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
Constant	-1.750***	-0.424***	-0.230***	-1.906**	-0.266	-0.146	-2.302***	-0.356***	-0.175**
	[-6.05]	[-4.11]	[-5.26]	[-2.44]	[-1.54]	[-1.61]	[-4.25]	[-3.01]	[-2.41]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,444	11,444	11,444	11,449	11,449	11,449	11,450	11,450	11,450
Pseudo R^2	0.0263	0.026	0.031	0.0263	0.023	0.028	0.0263	0.027	0.032

Note: Table 9 reports the results for the analysis of different type of non-audit service based on the three subsample of table 4. Panel A of table 9 shows the results for Tax-related service, panel B of table 9 presents the results for audit-related service, and panel C of table 9 reports the results for the analysis of other unspecific non-audit service. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 11 Control for auditor characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**1.178**	**0.100**	**0.066**	**-0.881***	**-0.323***	**-0.143****	**0.560*****	**0.219*****	**0.092*****
	[1.63]	**[0.39]**	**[0.60]**	**[-1.84]**	**[-1.94]**	**[-2.00]**	**[3.41]**	**[3.79]**	**[3.72]**
$SIZE_t$	-0.006	0.020**	0.009**	0.041*	0.025***	0.012***	0.019	0.024***	0.013***
	[-0.24]	[2.35]	[2.44]	[1.93]	[3.22]	[3.77]	[0.90]	[3.40]	[4.10]
LEV_t	0.039	-0.069	-0.042	-0.107	-0.119*	-0.061**	0.154	-0.018	-0.014
	[0.23]	[-1.02]	[-1.47]	[-0.61]	[-1.73]	[-2.08]	[0.94]	[-0.31]	[-0.54]
ROA_t	0.408**	0.110	0.086***	0.201	0.159**	0.110***	0.443**	0.167**	0.099***
	[2.42]	[1.55]	[3.10]	[1.22]	[2.36]	[3.96]	[2.55]	[2.55]	[3.68]
MB_t	0.013	0.010***	0.005***	0.028***	0.019***	0.009***	0.012	0.016***	0.008***
	[1.40]	[2.67]	[3.23]	[3.30]	[5.35]	[6.12]	[1.30]	[4.35]	[5.24]
$DTURN_t$	0.800***	0.345***	0.140***	0.696***	0.317***	0.144***	0.657***	0.420***	0.186***
	[3.21]	[3.49]	[3.45]	[2.61]	[3.07]	[3.36]	[2.63]	[4.86]	[4.93]
$NCSKEW_t$	0.050*	0.026**	0.011**	0.084***	0.044***	0.019***	0.052*	0.040***	0.016***
	[1.92]	[2.43]	[2.43]	[3.07]	[4.07]	[4.21]	[1.95]	[3.88]	[3.64]
$SIGMA_t$	10.783***	4.420***	1.680***	10.396***	4.050***	1.439***	9.292***	4.919***	2.238***
	[3.30]	[3.57]	[3.33]	[3.19]	[3.57]	[2.98]	[3.07]	[4.58]	[4.84]
RET_t	1.557***	0.649***	0.264***	1.323***	0.557***	0.205***	1.315***	0.727***	0.339***
	[3.69]	[4.05]	[4.18]	[3.16]	[3.92]	[3.45]	[3.56]	[5.78]	[6.22]
$OPAQUE_t$	0.005	-0.009	-0.005	0.066**	0.021*	0.008	0.032	-0.002	-0.002
	[0.19]	[-0.95]	[-1.19]	[2.48]	[1.77]	[1.57]	[1.15]	[-0.20]	[-0.48]

Table 11 Control for auditor Characteristics (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$CSCORE_t$	-0.843**	-0.519***	-0.214***	-0.171	-0.369***	-0.127***	-0.604	-0.686***	-0.300***
	[-2.53]	[-4.12]	[-4.02]	[-0.54]	[-3.14]	[-2.63]	[-1.58]	[-5.04]	[-4.93]
$BIG4_t$	0.117**	0.029	0.009	0.064	0.049**	0.021**	0.150**	0.006	0.000
	[1.99]	[1.42]	[1.05]	[0.98]	[2.18]	[2.18]	[2.03]	[0.23]	[0.01]
$SPECIALIST_t$	-0.004	0.007	0.004	-0.021	0.006	0.004	0.003	0.006	-0.000
	[-0.08]	[0.43]	[0.51]	[-0.44]	[0.35]	[0.56]	[0.05]	[0.35]	[-0.01]
$AUDITTENURET_t$	-0.044	-0.036***	-0.014***	-0.053	-0.038***	-0.017***	-0.069**	-0.020*	-0.010**
	[-1.34]	[-3.01]	[-2.78]	[-1.61]	[-3.19]	[-3.39]	[-2.18]	[-1.86]	[-2.01]
Constant	-1.266	-0.049	-0.019	-1.804***	-0.208	-0.104	-2.818***	-0.666***	-0.321***
	[-1.23]	[-0.16]	[-0.15]	[-2.75]	[-1.33]	[-1.24]	[-3.64]	[-5.59]	[-4.88]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,595	13,595	13,595	13,660	13,660	13,660	13,558	13,558	13,558
Pseudo R^2	0.0231	0.025	0.031	0.0231	0.032	0.037	0.0231	0.046	0.055

Note: Table 10 reports the robustness test controlling for auditor characteristics. The dependent variable are three measures for future stock price crash risk. Colum (1), (2) and (3) reports the results for the subsample with low NAS fee ratio. Colum (4), (5) and (6) reports the results for the subsample with medium NAS fee ratio, and Colum (7), (8) and (9) reports the results for the sample with high NAS fee ratio. See appendix 1 for variable definitions. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 12 Future NAS Fee ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low future NASFEERATIO			Medium future NASFEERATIO			High future NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_{t+1}$	**-0.644**	**0.155**	**-0.308***	**-1.130****	**-0.308***	**-0.137***	**0.456*****	**0.101***	**0.039**
	[-0.82]	**[0.55]**	**[-1.70]**	**[-2.20]**	**[-1.70]**	**[-1.75]**	**[2.68]**	**[1.72]**	**[1.53]**
$SIZE_t$	-0.002	0.021**	0.033***	0.062***	0.033***	0.016***	0.030	0.027***	0.014***
	[-0.09]	[2.56]	[4.79]	[3.13]	[4.79]	[5.33]	[1.52]	[4.14]	[4.73]
LEV_t	0.140	-0.047	-0.055	-0.127	-0.055	-0.035	0.127	-0.075	-0.045*
	[0.83]	[-0.69]	[-0.84]	[-0.74]	[-0.84]	[-1.25]	[0.76]	[-1.25]	[-1.73]
ROA_t	0.247	0.078	0.105	0.364**	0.105	0.082***	0.287*	0.222***	0.127***
	[1.57]	[1.17]	[1.49]	[2.07]	[1.49]	[2.97]	[1.65]	[3.47]	[4.65]
MB_t	0.021**	0.016***	0.013***	0.017*	0.013***	0.006***	0.018*	0.015***	0.009***
	[2.29]	[4.50]	[3.34]	[1.94]	[3.34]	[4.04]	[1.96]	[4.70]	[6.03]
$DTURN_t$	0.727***	0.379***	0.368***	0.950***	0.368***	0.153***	0.550**	0.360***	0.156***
	[3.01]	[4.00]	[3.82]	[3.61]	[3.82]	[3.82]	[2.30]	[4.04]	[4.11]
$NCSKEW_t$	0.079***	0.036***	0.046***	0.078***	0.046***	0.018***	0.049*	0.033***	0.014***
	[3.13]	[3.33]	[4.41]	[2.88]	[4.41]	[4.20]	[1.81]	[3.14]	[3.28]
$SIGMA_t$	7.907**	3.996***	4.199***	12.157***	4.199***	1.627***	10.862***	4.750***	2.084***
	[2.47]	[3.25]	[3.86]	[3.87]	[3.86]	[3.53]	[3.63]	[4.45]	[4.51]
RET_t	1.137***	0.606***	0.607***	1.655***	0.607***	0.242***	1.484***	0.683***	0.311***
	[2.76]	[3.80]	[4.47]	[4.10]	[4.47]	[4.31]	[4.09]	[5.49]	[5.72]
$OPAQUE_t$	-0.004	-0.006	0.006	0.048*	0.006	0.000	0.071**	0.021*	0.008*
	[-0.15]	[-0.63]	[0.61]	[1.92]	[0.61]	[0.05]	[2.52]	[1.89]	[1.69]

Table 12 Future NAS Fee ratio (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low future NASFEERATIO			Medium future NASFEERATIO			High future NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$CSCORE_t$	-1.004***	-0.631***	-0.332***	0.035	-0.332***	-0.125**	-0.832**	-0.645***	-0.263***
	[-2.90]	[-4.84]	[-2.85]	[0.11]	[-2.85]	[-2.57]	[-2.36]	[-5.21]	[-4.81]
Constant	-1.868**	-0.409	-0.380**	-1.860***	-0.380**	-0.176**	-2.713***	-0.555***	-0.256***
	[-2.18]	[-1.60]	[-2.47]	[-3.04]	[-2.47]	[-2.09]	[-5.03]	[-4.35]	[-4.23]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,864	13,864	13,852	13,852	13,852	13,852	13,851	13,851	13,851
Pseudo R^2	0.0234	0.029	0.030	0.0234	0.030	0.036	0.0234	0.041	0.048

Note: Table 12 reports the robustness test using future NAS fee ratio as independent variable. The dependent variable are three measures for future stock price crash risk. Colum (1), (2) and (3) reports the results for the subsample with low future NAS fee ratio. Colum (4), (5) and (6) reports the results for the subsample with medium future NAS fee ratio, and Colum (7), (8) and (9) reports the results for the sample with high future NAS fee ratio. See appendix 1 for variable definitions. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 13 Alternative sample period (2003 – 2016)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**1.327**	**0.292**	**0.105**	**-1.551****	**-0.441****	**-0.209****	**0.179**	**0.172****	**0.064****
	[1.36]	**[0.86]**	**[0.71]**	**[-2.48]**	**[-1.99]**	**[-2.21]**	**[0.89]**	**[2.27]**	**[2.01]**
$SIZE_t$	0.010	0.023**	0.010***	0.042*	0.022***	0.011***	0.019	0.017**	0.009***
	[0.41]	[2.56]	[2.72]	[1.93]	[2.73]	[3.19]	[0.92]	[2.38]	[2.72]
LEV_t	-0.064	-0.076	-0.039	-0.048	-0.059	-0.041	0.305*	-0.057	-0.031
	[-0.35]	[-1.05]	[-1.28]	[-0.25]	[-0.77]	[-1.28]	[1.72]	[-0.82]	[-1.06]
ROA_t	0.329*	0.077	0.069**	0.057	0.071	0.081**	0.551***	0.135*	0.088***
	[1.83]	[1.05]	[2.37]	[0.29]	[0.86]	[2.46]	[2.73]	[1.69]	[2.73]
MB_t	0.013	0.010**	0.005***	0.031***	0.018***	0.009***	0.004	0.012***	0.006***
	[1.34]	[2.38]	[2.77]	[3.31]	[4.43]	[5.40]	[0.39]	[3.21]	[3.91]
$DTURN_t$	0.787***	0.327***	0.146***	0.732***	0.378***	0.156***	0.064	0.249**	0.092**
	[2.95]	[3.11]	[3.35]	[2.65]	[3.33]	[3.35]	[0.23]	[2.39]	[2.02]
$NCSKEW_t$	0.055**	0.030***	0.012**	0.079***	0.030***	0.013***	0.056*	0.042***	0.018***
	[1.99]	[2.58]	[2.50]	[2.71]	[2.61]	[2.66]	[1.92]	[3.66]	[3.62]
$SIGMA_t$	10.118***	4.499***	1.896***	8.787**	2.782**	0.959*	14.732***	4.655***	1.980***
	[2.72]	[3.18]	[3.33]	[2.46]	[2.08]	[1.73]	[4.07]	[3.61]	[3.61]
RET_t	1.485***	0.686***	0.306***	0.951**	0.379**	0.138*	2.028***	0.781***	0.338***
	[3.00]	[3.61]	[4.15]	[2.01]	[2.10]	[1.88]	[4.00]	[4.60]	[4.73]
$OPAQUE_t$	0.023	-0.004	-0.002	0.054**	0.016	0.004	0.021	-0.001	-0.002
	[0.87]	[-0.41]	[-0.58]	[1.97]	[1.36]	[0.75]	[0.68]	[-0.07]	[-0.46]

Table 13 Alternative sample period (2003 – 2016) (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$CSCORE_t$	-0.969***	-0.550***	-0.229***	-0.214	-0.377***	-0.132**	-0.306	-0.429***	-0.169***
	[-2.72]	[-3.97]	[-3.94]	[-0.63]	[-2.95]	[-2.50]	[-0.87]	[-3.33]	[-3.04]
Constant	-0.165	-0.431***	-0.232***	-1.704**	-0.218	-0.123	-2.375***	-0.414***	-0.198***
	[-0.29]	[-4.14]	[-5.28]	[-2.17]	[-1.24]	[-1.33]	[-4.36]	[-3.40]	[-2.69]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,444	11,444	11,444	11,449	11,449	11,449	11,450	11,450	11,450
Pseudo R^2	0.0263	0.026	0.031	0.0263	0.023	0.028	0.0263	0.028	0.032

Note: Table 12 reports the robustness test for the period during 2003 to 2016. The dependent variable are three measures for future stock price crash risk. Colum (1), (2) and (3) reports the results for the subsample with low NAS fee ratio. Colum (4), (5) and (6) reports the results for the subsample with medium NAS fee ratio, and Colum (7), (8) and (9) reports the results for the sample with high NAS fee ratio. See appendix 1 for variable definitions. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 14 Propensity Score Matching

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**1.379**	**-0.137**	**-0.033**	**-1.751****	**-0.594****	**-0.227****	**0.527*****	**0.219*****	**0.092*****
	[1.22]	**[-0.33]**	**[-0.19]**	**[-2.45]**	**[-2.31]**	**[-2.05]**	**[3.25]**	**[3.88]**	**[3.82]**
$SIZE_t$	0.027	0.025**	0.010*	0.061**	0.045***	0.020***	0.020	0.023***	0.012***
	[0.74]	[2.02]	[1.84]	[2.05]	[4.20]	[4.31]	[0.99]	[3.43]	[4.06]
LEV_t	-0.035	-0.061	-0.031	-0.031	-0.249***	-0.115***	0.211	-0.006	-0.012
	[-0.13]	[-0.57]	[-0.70]	[-0.12]	[-2.62]	[-2.80]	[1.30]	[-0.11]	[-0.49]
ROA_t	0.395	0.144	0.085*	0.152	0.028	0.063	0.362**	0.154**	0.093***
	[1.41]	[1.24]	[1.86]	[0.62]	[0.26]	[1.48]	[2.12]	[2.46]	[3.57]
MB_t	0.007	0.010	0.005**	0.031**	0.021***	0.010***	0.013	0.015***	0.008***
	[0.48]	[1.63]	[2.16]	[2.42]	[3.98]	[4.31]	[1.37]	[4.43]	[5.34]
$DTURN_t$	0.745*	0.168	0.080	0.560	0.214	0.125*	0.606**	0.419***	0.185***
	[1.71]	[0.96]	[1.13]	[1.40]	[1.39]	[1.94]	[2.52]	[4.99]	[5.01]
$NCSKEW_t$	0.069	0.017	0.005	0.159***	0.068***	0.029***	0.056**	0.040***	0.016***
	[1.57]	[0.96]	[0.69]	[3.98]	[4.07]	[4.23]	[2.12]	[3.94]	[3.75]
$SIGMA_t$	4.509	4.664**	1.751**	10.909**	4.814***	1.896***	10.211***	5.073***	2.328***
	[0.89]	[2.54]	[2.28]	[2.31]	[2.94]	[2.77]	[3.43]	[4.80]	[5.12]
RET_t	0.657	0.645***	0.236**	1.365**	0.633***	0.250***	1.408***	0.740***	0.348***
	[1.04]	[2.84]	[2.52]	[2.25]	[3.04]	[2.94]	[3.88]	[5.98]	[6.50]
$OPAQUE_t$	-0.055	-0.027	-0.013*	0.062	0.026*	0.010	0.027	-0.002	-0.002
	[-1.15]	[-1.64]	[-1.89]	[1.44]	[1.66]	[1.42]	[1.01]	[-0.17]	[-0.43]
$CSCORE_t$	-0.791	-0.453**	-0.199**	-0.048	-0.274	-0.112	-0.814**	-0.731***	-0.312***
	[-1.29]	[-2.15]	[-2.22]	[-0.09]	[-1.46]	[-1.47]	[-2.17]	[-5.52]	[-5.28]

Table 14 Propensity Score Matching (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
Constant	-1.138	-0.158	-0.027	-1.529**	-0.239	-0.099	-2.698***	-0.699***	-0.331***
	[-1.04]	[-0.64]	[-0.39]	[-2.47]	[-1.36]	[-1.10]	[-4.46]	[-6.44]	[-5.63]
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,989	4,989	4,989	6,020	6,020	6,020	13,912	13,912	13,912
Pseudo R^2	0.0221	0.021	0.027	0.0221	0.038	0.042	0.0221	0.047	0.055

Note: Table 13 reports the robustness test using Propensity Score Matching method. The dependent variable are three measures for future stock price crash risk. Colum (1), (2) and (3) reports the results for the subsample with low future NAS fee ratio. Colum (4), (5) and (6) reports the results for the subsample with medium future NAS fee ratio, and Colum (7), (8) and (9) reports the results for the sample with high future NAS fee ratio. See appendix 1 for variable definitions. *, ** and *** indicate statistical significance at the 1%, 5% and 10% level.

Table 15 Firm-fixed Effects Model

	(1)	(4)	(7)
	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
VARIABLES	NASFEE Low	NASFEE Low	NASFEE Low
$NASFEERATIO*NASL_t$	1.538*	0.085	0.091
	[1.84]	[0.29]	[0.72]
$NASFEERATIO*NASM_t$	-0.547	-0.076	-0.042
	[-1.12]	[-0.46]	[-0.58]
$NASFEERATIO*NASH_t$	0.406**	0.217***	0.095***
	[2.27]	[3.52]	[3.54]
$SIZE_t$	0.395***	0.211***	0.098***
	[10.14]	[16.23]	[17.33]
LEV_t	-0.260	-0.255***	-0.132***
	[-1.21]	[-3.39]	[-4.05]
MB_t	0.507**	0.337***	0.180***
	[2.39]	[4.60]	[5.66]
ROA_t	0.069***	0.041***	0.019***
	[6.57]	[10.74]	[11.65]
$DTURN_t$	1.068***	0.359***	0.154***
	[3.94]	[3.80]	[3.74]
$NCSKEW_t$	-0.108***	-0.078***	-0.033***
	[-3.88]	[-7.78]	[-7.53]
$SIGMA_t$	-1.392	1.370	0.495
	[-0.45]	[1.33]	[1.10]
RET_t	0.633	0.351**	0.135**
	[1.47]	[2.53]	[2.24]
$OPAQUE_t$	0.034	0.016	0.007
	[1.08]	[1.42]	[1.48]
$CSCORE_t$	-0.364	-0.486***	-0.207***
	[-1.26]	[-4.89]	[-4.78]
$Control*NASL_t$	Yes	Yes	Yes
$Control*NASL_t$	Yes	Yes	Yes
$Control*NASH_t$	Yes	Yes	Yes
Constant	-2.172***	-1.359***	-0.644***
	[-4.88]	[-15.00]	[-16.33]
Firm F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Observations	35,829	41,802	41,802
Pseudo R^2	0.0231	-0.115	-0.108

Table 16 Big 4 Auditor

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
$NASFEERATIO_t$	**0.646**	**-0.213**	**-0.062**	**-0.928***	**-0.320***	**-0.148***	**0.570*****	**0.222*****	**0.089*****
	[0.77]	**[-0.70]**	**[-0.48]**	**[-1.72]**	**[-1.71]**	**[-1.83]**	**[3.23]**	**[3.61]**	**[3.37]**
$SIZE_t$	-0.028	0.012	0.006	0.054**	0.021**	0.010***	0.002	0.016**	0.010***
	[-1.00]	[1.19]	[1.52]	[2.29]	[2.36]	[2.63]	[0.10]	[2.04]	[2.77]
LEV_t	-0.055	-0.119	-0.068**	-0.117	-0.088	-0.045	0.127	0.024	-0.001
	[-0.28]	[-1.49]	[-2.06]	[-0.60]	[-1.13]	[-1.33]	[0.72]	[0.38]	[-0.03]
ROA_t	0.419**	0.008	0.039	0.089	0.096	0.086**	0.330*	0.190***	0.111***
	[2.15]	[0.09]	[1.18]	[0.44]	[1.15]	[2.54]	[1.71]	[2.89]	[3.92]
MB_t	0.008	0.010**	0.005***	0.027***	0.018***	0.008***	0.012	0.014***	0.007***
	[0.76]	[2.27]	[3.04]	[3.00]	[4.75]	[5.37]	[1.25]	[3.73]	[4.51]
$DTURN_t$	0.919***	0.286**	0.119**	0.743**	0.346***	0.143***	0.529**	0.465***	0.210***
	[3.16]	[2.50]	[2.52]	[2.50]	[2.98]	[3.01]	[2.06]	[5.36]	[5.40]
$NCSKEW_t$	0.054*	0.026**	0.011**	0.090***	0.044***	0.019***	0.054*	0.033***	0.012**
	[1.87]	[2.09]	[2.12]	[2.96]	[3.59]	[3.78]	[1.88]	[2.95]	[2.50]
$SIGMA_t$	8.829**	3.647**	1.574**	9.673***	4.410***	1.653***	9.978***	5.118***	2.492***
	[2.36]	[2.39]	[2.57]	[2.60]	[3.25]	[2.88]	[3.08]	[4.37]	[4.96]
RET_t	1.299***	0.475**	0.228***	1.186**	0.615***	0.243***	1.480***	0.736***	0.361***
	[2.73]	[2.39]	[2.93]	[2.44]	[3.65]	[3.44]	[3.72]	[5.42]	[6.11]
$OPAQUE_t$	0.018	-0.002	-0.001	0.059**	0.011	0.005	0.016	-0.014	-0.008
	[0.62]	[-0.17]	[-0.12]	[1.96]	[0.87]	[0.84]	[0.55]	[-1.25]	[-1.63]
$CSCORE_t$	-1.052***	-0.588***	-0.231***	-0.052	-0.319**	-0.117*	-0.847*	-0.853***	-0.379***
	[-2.62]	[-3.65]	[-3.54]	[-0.14]	[-2.25]	[-1.94]	[-1.92]	[-5.26]	[-5.22]
Constant	-0.876	-0.292	-0.082	-1.616**	-0.197	-0.094	-2.274***	-0.647***	-0.304***
	[-0.88]	[-0.86]	[-0.63]	[-2.52]	[-1.00]	[-0.89]	[-4.53]	[-5.41]	[-5.10]

Table 16 Big 4 Auditor (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low NASFEERATIO			Medium NASFEERATIO			High NASFEERATIO		
VARIABLES	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$	$CRASH_{t+1}$	$NCSKEW_{t+1}$	$DUVOL_{t+1}$
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10,132	10,132	10,132	10,528	10,528	10,528	11,587	11,587	11,587
Pseudo R^2	0.0221	0.019	0.027	0.0221	0.021	0.026	0.0221	0.042	0.051

Appendix

A1. Literature Review in Detail

Literature on crash risk

Jin and Myers (2006) proposes the theory that firms with financial report opaqueness are more likely due to managers withhold of band news. When the bad news accumulates, cannot be hidden from the investors and comes out all at once, the sudden disclosure of a huge amount of bad news leads to sudden and large drop in stock price, which is referred to as stock crashes. Since then, there is a growing literature in investigating factors that can help predict or are associated with future stock price crash risk based on bad news hoarding theory.

Kim, Li and Zhang (2011a) examines the association between CEO's equity incentive versus CFO's equity incentive and future stock price crash risk. The authors argue that the increase use of option- or equity-based compensation incentives managers to commit short-termism behavior which increases concurrent stock price but decreases long-term firm value, including the behavior of concealing bad news, which may ultimately lead to stock crashes. The paper finds that the strength of CFO's equity-based incentives is significantly positively related to future stock price crashes, while the authors fail to find supports for significant relation between CEO's equity-based incentives and future stock price crash risk. The results indicate that CFO incentives play a more important role in manipulation of information to withhold bad news. Kim et al. (2011b) investigates how tax avoidance is related to future stock price crash risk. The authors argue that although tax avoidance is perceived as value-maximizing activity for such activity increases shareholder's wealth through reducing money paid to the state, complex tax avoidance activity can also provide masks for

managers to engage in activities that hide bad news and mislead investors. The reason is that managers can justify the opaqueness and complexity of tax avoidance transaction by arguing that it's the needs to avoid being detected by the regulators. Thus, it is hard to detect the bad news hoarding behavior and leads to future stock price crashes. The paper finds that for firms with larger level of tax avoidance, firm-specific future stock price crash risk is higher, and the positive association is mitigated when external monitor is tighter, such as higher institutional ownership.

Kim and Zhang (2016) investigates the association between financial report conditional conservatism and future stock price crash risk. The paper reasons that the requirement of conservatism accelerates the recognition of unverifiable bad news while delays the recognition of unverifiable good news, which offsets the tendency of managers to withhold bad news and thus decreases future stock crashes. The authors find support for this argument and provides robust and consistent evidence that accounting conservatism is significantly and negatively related to future stock price crash risk. The negative association is more pronounced for firms with intensive research and development (R&D), higher industry concentration and lower analyst coverage, which proxy for higher information asymmetry.

Kim et al. (2016) examines the relation between accounting comparability and ex ante crash risk. The paper argues that the increased comparability within peer firms will enable investors to obtain bad news about the focal firm from the disclosure from other peer firms and thus decrease the benefits managers can get and increase related costs. Thus, both incentive and ability for managers to withhold bad news are reduced by the increased costs and decreased benefits and investors perceive the firms with higher accounting comparability as having lower crash risk. The paper finds significantly negative association between comparability and ex ante crash risk and

the association is more significant for firms with lower-quality information, weaker external monitoring, and operated in less competitive industry. The findings suggest that higher requirement of accounting comparability is beneficial to investors through constraining managers' incentive to withhold bad news.

Prior studies also test how financial report opacity is associated with crash risk. Hutton et al. (2009) investigates how financial report opaqueness is associated with future stock price crash risk and find that opaque firms are more likely to experience stock price crashes in the future. Kim and Zhang (2014) explores how financial report opaque is related to ex ante crash risk and finds that firms with higher abnormal accruals, presence of financial statement restatements and material internal control weakness are more likely to be perceived as having higher future stock price risk.

Although auditors are important external governance for the credibility financial reporting quality and serves as independent monitor for managers' behavior, few studies have investigated how auditor characteristics are associated with future stock price risk. Robin and Zhang (2015) investigates whether industry-specialist auditors reduce the client firm's future stock price crashes. The author expect industry-specialist auditors are more capable of uncovering bad news and have more incentive to uncovering bad news due to high reputation cost. The paper finds significantly negative association between industry-specialist auditor and future stock price risk and that the channel is through reducing financial report opaqueness, increasing accounting conservatism, and decrease the effect of tax avoidance on crash risk. Callen and Fang (2017) investigates how auditor tenure is associated with future stock price risk. The paper proposes "monitoring-by-learning" perspective and independence dampening perspective which suggest no direction for the effect of

auditor tenure on crash risk. The paper finds consistent significantly negative association between auditor tenure and future stock price crash risk.

More recent paper examines the effect of analyst coverage and real earnings manipulation on stock price crash risk. In the prior literature, although no study directly investigates how analyst coverage affect future stock price risk, the empirical analysis of prior literature shows that the coefficients of analyst coverage is significantly positive. Kim et al. (forthcoming) investigates the causal effect of analyst coverage on ex ante crash risk utilizing the mergers and closures of brokers and finds that the exogenous decrease in analyst coverage is followed by significant increase in the crash risk perceived by the investors. The results indicate that investors perceive analysts as important monitors of managers' opportunistic behavior.

Khurana, Pereira and Zhang (2018) proposes that real earnings smoothing impact both the flow of firm-specific information to the market and the managers' real decision making. Managers' real earnings smoothing overstates income following negative earnings surprise and enable managers to keep unprofitable projects, and thus increase future stock price crash risk. A counter argument is that real earnings smoothing is used to convey private information and thus lower stock price crash risk instead of increasing stock price crash risk. The paper finds a significantly positive association between real earnings smoothing and stock price crash risk and supports that managers use real earnings smoothing to overstate income and keep unprofitable projects.

Chang, Chen and Zolotoy (2017) examines how stock liquidity affect stock price crash risk and argues that stock liquidity enables investors to trade at low cost in a

short time and thus exert effective monitoring on managers which will reduce the probability of bad news hoarding and thus reduce stock price crash risk.

The literature on stock price crash risk are generally based on the bad news hoarding theory developed by Jin and Myers (2006), however little literature explore other theories or mechanism that predict stock price crash risk. For example, in the paper Chen, Hong, and Stein (2001), the authors propose several theories to explain stock price crashes such as "volatility feedback" and disagreement among investors.

Non-audit service (NAS)

Early empirical evidence of the association between NAS and audit quality in U.S.

Early empirical study general finds inconsistent evidence on whether the joint provision of non-audit service and audit service impairs auditor independence and decrease audit quality. Frankel, Johnson and Nelson (2002) argues that the provision of non-audit services may dampen the independence through enhancing the economic bond between auditors and the client and thus decrease audit quality. On the other hand, the provision of non-audit services increases the reputation investment of the auditor and increase audit quality. The paper empirically tests whether non-audit service fee is related to earnings management and how the market reacts to the disclosure of NAS fees. The results show significantly positive association between NAS fees and the likelihood of reporting a small positive earnings surprise, absolute discretionary accruals and investors react negatively to the disclosure of NAS fees.

However, Defond, Raghunandan, and Subramanyam (2002) investigates the same research question by examining how NAS fees are related to the probability to

issue going concern opinion using the sample 1158 distressed firms' NAS fee information disclosed in the proxy statement and find no significant association between NAS fees and the likelihood of issue going concern opinion. The authors explain the findings as result of reputation and litigation costs. Ashbungh, LaFond, and Mayhew (2003) reinvestigate the research question of Francis et al. (2002) by using discretionary accruals adjusted for firm performance and change the measure of nonaudit fees ratio to total audit and non-audit fees and the paper fails to find any significant association between non-audit service and earnings management. The paper concludes that the findings of Francis et al. (2002) are sensitive to different research design.

In addition to the research on the impact of NAS on audit quality, Abbott, Parker, and Peters (2003) investigates how audit committee characteristics are associated with NAS fee ratio. The authors argue that if more independent audit committee perceive non-audit service as impairment of the independence of auditors, they will constrain the level of non-audit service. The paper collects non-audit service fee data from the proxy statement filed during Feb 2001 to June 2001 for 538 companies and regress the proxy for audit committee effectiveness which equals 1 if the audit committee are composed of all independent audit committee directors and attend at least four meetings during the year. The paper finds that audit committee effectiveness is significantly negatively associated with NAS fee ratio, which suggests that effective audit committee control the level of NAS fee ratio.

Evidence outside U.S.

Ruddock, Taylor, and Taylor (2006) investigate the association between non-audit service fee and accounting conservatism using Australia sample during 19933

to 2000. The author finds that non-audit service fees are significantly positively associated with accounting conservatism and the paper finds no evidence that higher NAS fees is associated with reduced accounting conservatism. Ferguson, Seow, and Young (2004) investigate whether NAS service purchased is related to the probability that public criticizes, or the regulator investigates, the accounting practices of the client firms, the likelihood of financial restatement, and the mean of absolute discretionary accrual. The paper uses the data from UK during 1996 to 1998 and finds significantly positive association between the provision of NAS and the three measures of earnings management. The results suggest that the provision of non-audit service from auditor compromises auditor's independence.

In summary, early studies using sample before 2003 either using US data or other country's data generally provide inconsistent evidence on whether the joint provision of audit and non-audit service impair the audit independence and thus reduce audit quality. Some study shows that non-audit service increase earnings management level of the client, and some studies find no significant association between non-audit service fee and earnings quality.

Recent evidence on the impact of NAS on audit quality

Since the SOX future restrict the type of non-audit service the client firm can purchase from their auditor, and regulators, practitioner and investors' perception of the impact of NAS have changed due to several accounting scandals, research using post-SOX data provide different results. Later research generally finds that NAS do harm auditor's independence and reduce audit quality. Blay and Geiger (2013) utilize the data during 2004 to 2006 for firms that received a going-concern opinion and firms with both negative income and cash flows (distressed firms) but not receiving going

concern opinion to investigate the association between future non-audit service fees and the likelihood of issuing going-concern opinion. The paper demonstrates a robust significant negative association between future NAS fees and the likelihood association between going-concern opinions. Causholli, Chambers, and Payne (2014)

A2. Variable Description

Variable		Definition
Dependent Variables		
$CRASH$	=	1 if the firm experiences one or more crash weeks during the fiscal year, 0 otherwise. Crash weeks are defined as those in which the firm experiences a firm-specific stock return 3.09 standard deviations below the mean firm-specific weekly return over the fiscal year.
$NCSKEW$	=	The negative skewness of firm-specific weekly returns over the fiscal year.
$DUVOL$	=	The log of the ratio of the standard deviation of firm-specific weekly returns for down weeks to the standard deviation of firm-specific weekly returns for up weeks. Down weeks (up weeks) are defined as those weeks in which the firm-specific return is below (above) the mean firm-specific weekly return over the fiscal year.
Variables of Interest		
$NASFEERATIO$	=	The ratio of non-audit service fees paid to the auditor to the total audit fees paid to the auditor.
Control Variables		
$SIZE$	=	The natural log of total assets (at).
LEV	=	Leverage, calculated as debt-to-assets ($dltt/at$).
ROA	=	Return on assets, calculated as net income before extraordinary items income (ib) divided by lagged assets.
MB	=	The market-to-book ratio ($prcc\_f \times csho/ceq$).
$DTURN$	=	The average monthly share turnover over the current fiscal year minus the average monthly share turnover over the prior fiscal year, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.
$SIGMA$	=	The standard deviation of firm-specific weekly returns during the fiscal year.
RET	=	The mean firm-specific weekly return during the fiscal year, multiplied by 100.
$OPAQUE$	=	The sum of the absolute value of the firm's discretionary accruals over the past three years.

C_SCORE	=	The Khan and Watts (2009) measure of accounting conservatism.
$BIG4$	=	1 if the client has a Big 4 auditor, 0 otherwise.
$SPEC$	=	Auditor industry specialization, defined as 1 if the firm's auditor has at least a 30 percent market share of the firm's industry in the metropolitan statistical area (MSA) of the firm's headquarters, 0 otherwise. Industries are defined using 2-digit SIC codes.
$TENURE$	=	The length, in years, of the auditor-client relationship.
Cross-sectional Variables		
$INSTOWN$	=	The percentage of the firm's shares held by institutional investors.
Corporate Governance Index	=	A comprehensive index based on DUALITY, CEOCOMMITEE, CEO Tenure, BOARDSIZE, OUTBOARD, DIR_AFTER_CEO, INDEP, BLOCKOWN and INSTOWN
DUALITY	=	1 if CEO also serves as chairman of the director board
CEOCOMMITEE	=	The number of director committees the CEO sits in
CEO Tenure	=	The number of years CEO employed on the position
BOARDSIZE	=	Number of directors on the board
OUTBOARD	=	The number of boards outside the company the firm's directors are serving
DIR_AFTER_CEO	=	the percentage of directors who are hired during the year after the appointment of CEO
INDEP	=	the percentage of independent directors
BLOCKOWN	=	The ownership of block holders (investors holding 5% or more shares of the firm

A3. Relation between non-audit service fee and future stock price crash risk

Figure 1 graphs the association between non-audit service fee and future stock price crash risk. I first partitioned the sample into 10 group based on the 10 percentiles of NAS fee ratio and then calculate the mean of future CRASH, NCSKEW and DUVOL for each group. Figure 1a plots the mean of future CRASH for each group, figure 1b plots the mean of future NCSKEW for each group, and figure 1c plots the mean of future DUVOL for each group. Figure 1a suggests that at the first three percentile of NAS fee ratio, future stock price crashes increase with NAS fee ratio. for the firms between the third and seventh percentile of NAS fee ratio, future stock price crashes decrease with the increase of NAS fee ratio, and for the firms with above the seventh percentile of NAS fee ratio, future stock price crashes increase with NAS fee ratio. Figure 1b and 1c show similar trends of future NCSKEW and DUVOL except that for the first three percentile of NAS fee ratio, there is no clear trends for future NCSKEW and DUVOL.

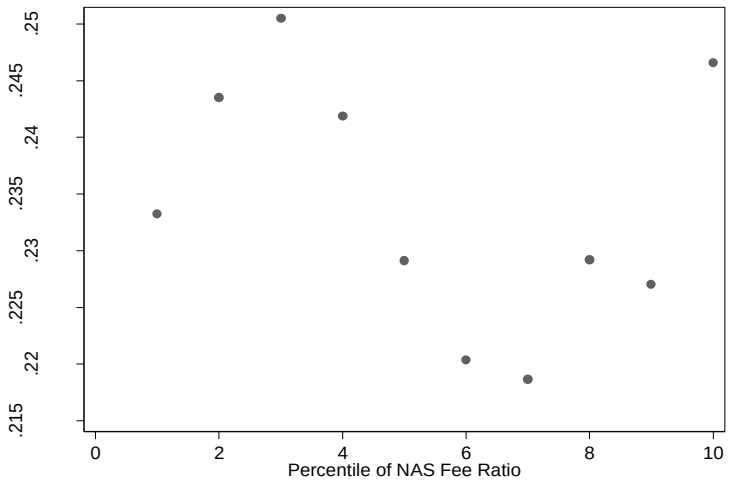

Figure 1a: Mean of CRASH at year t+1 for each percentile of NAS Fee ratio

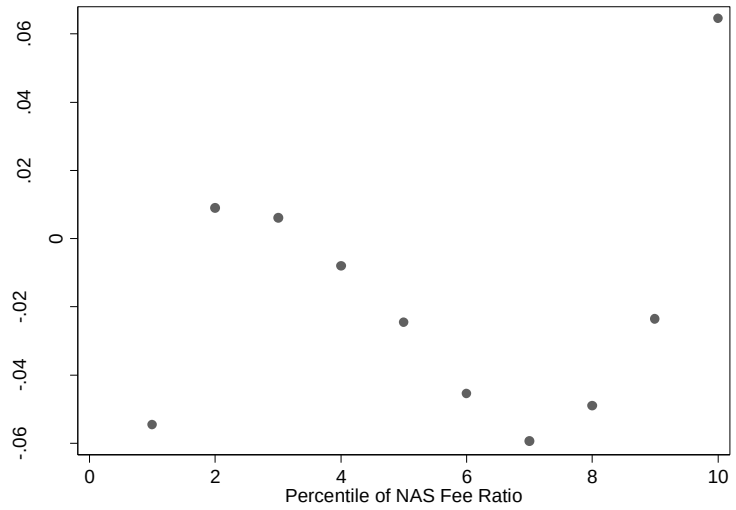

Figure 1b: Mean of NCSKEW at year t+1 for each percentile of NAS Fee ratio

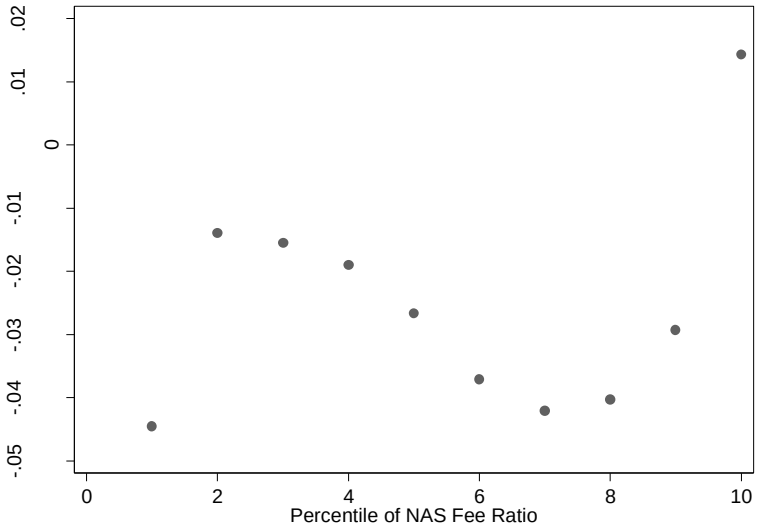

Figure 1c: Mean of DUVOL at year t+1 for each percentile of NAS Fee ratio