

Yuan, Hongqi; Gao, Chong; Shi, Haina

## Article

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China Journal of Accounting Studies (CJAS)

## Provided in Cooperation with:

Accounting Society of China (ASC), Beijing

*Suggested Citation:* Yuan, Hongqi; Gao, Chong; Shi, Haina (2020) : Failure in performance commitment and goodwill impairment: Evidence from M&As, China Journal of Accounting Studies (CJAS), ISSN 2169-7221, Taylor & Francis, Abingdon, Vol. 8, Iss. 2, pp. 183-213, <https://doi.org/10.1080/21697213.2020.1822028>

This Version is available at:

<https://hdl.handle.net/10419/338424>

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**To cite this article:** Hongqi Yuan, Chong Gao & Haina Shi (2020) Failure in performance commitment and goodwill impairment: evidence from M&As, China Journal of Accounting Studies, 8:2, 183-213, DOI: [10.1080/21697213.2020.1822028](https://doi.org/10.1080/21697213.2020.1822028)

**To link to this article:** <https://doi.org/10.1080/21697213.2020.1822028>



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ARTICLE



## Failure in performance commitment and goodwill impairment: evidence from M&As

Hongqi Yuan, Chong Gao and Haina Shi

School of Management, Fudan University, Shanghai, China

### ABSTRACT

We examine whether and how the failure in performance commitment by an acquiree affects the acquirers' recognition of goodwill impairment. Based on a sample of A-share-listed firms during 2008–2016, we document the following evidence. First, both the likelihood and amounts of goodwill impairment increase significantly if an acquiree fails to meet the performance commitment. The results are robust to alternative measures of failed commitment and alternative sampling. Second, the relation is more pronounced (i) in the bear markets than in the bull markets, and (ii) for voluntary adoption of commitment terms than for mandatory ones. Third, the likelihood of goodwill impairment in the post-commitment period increases if an acquiree successfully met the commitment, especially if the acquiree met the commitment through earnings management. Last but not least, timely recognition of goodwill impairment for failed commitments leads to a reduction of future stock price crash risk.

### KEYWORDS

M&A; performance commitment; goodwill impairment; earnings management; stock price crash risk

## 1. Introduction

The past decade has witnessed an explosion of merge and acquisition (M&As) transactions, resulting in rapid growth of goodwill on the financial statements of listed firms. As of the end of 2017, the total book value of goodwill of A-share-listed firms reached RMB1,303.804 billion. Among them, about 25% firms recognised goodwill impairment, totalled RMB36.6 billion (Data source: WIND). Goodwill impairment adversely affects firm performance. More importantly, it leads to volatility and uncertainty in performance,<sup>1</sup> which imposes substantial risks on investors. Thus it is important for the listed firms, investors as well as regulators to better understand the determinants of goodwill impairment.<sup>2</sup>

**CONTACT** Hongqi Yuan  [yuanhq@fdsm.fudan.edu.cn](mailto:yuanhq@fdsm.fudan.edu.cn)  Shanghai, China

Paper accepted by Kangtao Ye.

This article has been republished with minor changes. These changes do not impact the academic content of the article.

<sup>1</sup>An unexpected recognition of goodwill impairment can have a great impact on profits. For example, the Bus Online (Stock code: 002188.SZ) released an announcement on 31 January 2018 regarding the amendment of its annual earnings forecast due to a material goodwill impairment. According to the announcement, the original earnings forecast for 2017 was revised from an expected profit of RMB 0.164 to 0.21 billion to an expected loss of RMB1.5 to 1.8 billion.

<sup>2</sup>Both the International Financial Reporting Standards (IFRS) and the China Accounting Standards (CAS) require the test for impairment for goodwill. However, both the International Accounting Standards Board and the Ministry of Finance of China have expressed their concerns about the accounting treatment of goodwill. China Securities Regulatory Commission (CSRC) issued 'The 8<sup>th</sup> Risk Warning from the Accounting Regulations: Regarding Goodwill Impairment' on

The accounting standards require that goodwill impairment should be allocated proportionately to underlying asset groups. However, the decision-making process of recognising goodwill impairment is largely subjective and unverifiable (Beatty & Weber, 2006; Ramanna & Watts, 2012). In practice, the identification of asset groups largely depends on management's professional judgement and a firm can choose to allocate goodwill to asset groups with high values so as to avoid the write-off of goodwill. The professional judgement in this process can result in bias in estimation and/or earnings manipulation. Existing literature documents that determinants of goodwill impairment include earnings management incentives (AbuGhazaleh et al., 2011; Cheng et al., 2017; Lu et al., 2010; Lu & Qu, 2016), and the high premium paid for an acquiree in the M&A (Gu & Lev, 2011; Hayn & Hughes, 2006). However, it remains unclear whether other contract terms adopted for an M&A transaction affect goodwill impairment.

The use of performance commitment terms in M&As is widespread in China. CSRC issued 'Measures on Material Asset Restructuring' in 2008 (hereafter 'the Measures'), which mandated that an acquiree should make performance commitments to the acquirer if the transaction price is determined by discounted future earnings in case of material M&As. The use of performance commitment terms is voluntary for immaterial M&As.<sup>3</sup> Under the performance commitment arrangement, an acquiree should specify performance targets for a certain period of time (i.e., the commitment period). While the majority of the transactions adopt earnings as the performance targets, some specify performance targets in terms of sales or other financial figures.<sup>4</sup> The commitment terms are expected to effectively bond the acquiree because the shareholders of the acquiree need to compensate with cash or stocks if it later misses the commitments.

We examine whether and how failure to meet the performance commitment affects goodwill impairment. Based on a sample of A-share-listed firms that involve M&As and have non-zero beginning balances in goodwill during 2008 we document the following evidence. First, both the likelihood and amounts of goodwill impairment increase significantly if an acquiree fails to meet the performance commitment. The results are robust to alternative measures of failed commitment, alternative sampling, and controls for time to expiry date of the commitment. Second, the relation is more pronounced (i) in the bear markets than in the bull markets, and (ii) for voluntary adoption of commitment terms than for mandatory ones. Third, the likelihood of goodwill impairment in the post-commitment period increases if an acquiree successfully met the commitment, especially if the acquiree met the commitment through earnings management. Last but not least, timely recognition of goodwill impairment for failed commitments leads to a reduction of

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16 November 2018. The risk warning explained questions that were frequently asked. It also interpreted regulatory concerns on goodwill impairment from the following Three aspects: (i) accounting treatment and information disclosure of goodwill impairment, (ii) audit issues related to goodwill impairment, and (iii) assessment on issues related to goodwill impairment.

<sup>3</sup>According to the Measures, an M&A is defined as a material one if the size of the acquiree is larger than 50% of that of the listed firm at consolidated level. Size is considered from three aspects: total assets, sales revenue, or net assets (under the criteria of net assets, an absolute amount of RMB50 million is also considered). A revision of the Measures in 2014 no longer mandated the use of performance commitment in material asset restructuring. As a result, the adoption of performance commitment in M&As is now voluntary for all the M&As.

<sup>4</sup>In our study, we analyse both the performance commitments in general and the earnings commitments in particular. To differentiate, we specify them as performance commitments and earnings commitments respectively throughout the study.

future stock price crash risk. Our results indicate that acquiree's failure on performance commitment is associated with important economic and informational consequences.

We contribute to the literature and provide practical implications in the following ways. First, we add to the literature on determinants of goodwill impairment. Previous studies find that recognition of goodwill impairment is driven by earnings management incentives (Filip et al., 2015; Lu & Qu, 2016; Ramanna & Watts, 2012) and M&A premiums (Gu & Lev, 2011). The literature on M&A premiums suggests that high transaction prices translated into large amounts of goodwill, which in turn increases the probability of subsequent goodwill impairment. Thus, the relation between M&A premiums and goodwill impairment can be mechanical. However, it remains unclear for outsiders about when the goodwill resulted from the M&A premiums should be properly impaired (Hayn & Hughes, 2006). Our study contributes to this line of literature by directly linking the transaction terms in M&As to subsequent goodwill impairment. To be specific, the prescribed performance commitment terms enable us to observe the decision-making process on goodwill impairment. Outside investors are thus able to judge whether and when goodwill should be impaired. We document that the failure to meet the performance commitment by an acquiree significantly affects goodwill impairment. In this sense, our findings also enhance the understanding of the economic and informational consequences of the contract terms in M&As. Existing literature has found that the commitment terms influence acquirees' behaviours in that acquirees tend to manipulate earnings to meet the commitments (Wang & Fan, 2017; Zhai et al., 2019). Our study extends this line of literature on how acquiree's on the commitments subsequently influences acquirer's earnings. Therefore, the findings in our study have great implications to investors as well as regulators to better understand firm's decision-making process regarding goodwill impairment.

Second, we provide multiple perspectives to explain firm's decision to write-off goodwill. We find that both the macro market level and the micro firm level factors (i.e., the level of realisation and time to expiry date of the commitment) affect goodwill impairment. We also provide evidence of goodwill impairment in the post-performance commitment period. The multiple perspectives provide insights to investors and regulators to evaluate the firms' decisions as well as risks associated with goodwill impairment.

Third, we contribute to the literature on the informational consequences of goodwill impairment. We document a reduction in future stock price crash risk for firms that timely recognise goodwill impairment if an acquiree fails to meet the performance commitment. In this sense, we support for the informativeness of goodwill impairment. To be specific, our evidence suggests that the disclosure of acquiree's realisation of the performance commitment in M&As can enhance the reliability in the accounting treatment of goodwill impairment. Thus we provide insights to the current controversy on the accounting for goodwill.

The rest of the paper is organised as follows. [Section 2](#) conducts literature review and develops hypotheses. The sample selection and research design are discussed in [section 3](#). [Section 4](#) analyzes the empirical results. An additional test is performed in [section 5](#) and [section 6](#) concludes.

## 2. Literature review and hypotheses development

### 2.1. Determinants of goodwill impairment

Existing studies have documented various determinants of goodwill impairment. One line of literature investigates the relation between M&A premiums and goodwill impairment. The basic idea is that an abnormally high M&A premium leads to overvalued goodwill, which in turn is more likely to be impaired (Gu & Lev, 2011; Li et al., 2011). Hayn and Hughes (2006) provide supporting evidence that goodwill impairment is significantly related to M&A characteristics such as M&A premium, proportion of goodwill in the acquisition price, and an indicator of stock acquisition. Interestingly, they do not find evidence that disclosures on acquiree's financial performance adequately predict future goodwill write-offs. However, given the sample period of the afore-mentioned studies, subsequent studies concern that the conclusion is biased due to the aggressive M&A investments during the high-tech bubble in the late 1990s (Boennen & Glaum, 2014).

The other stream of literature examines whether goodwill impairment is related to earnings management incentives. Theoretically, the valuation of goodwill (thus the recognition of goodwill impairment) can reflect management's expectation of an acquiree's future performance. In this case, the valuation of goodwill plays an informational role (the informational hypothesis). However, on the other hand, the accounting treatment for goodwill requires substantial professional judgement, thus providing room to opportunistically manipulate earnings (the opportunistic hypothesis, Ramanna & Watts, 2012). The majority of literature tends to support the opportunistic hypothesis. For example, Beatty and Weber (2006) investigate the goodwill impairment decisions of U.S. firms when switching from goodwill amortisation to impairment.<sup>5</sup> They find that earnings management incentives such as debt contracting, bonus plans, CEO tenure, and the stock exchange's delisting requirement influence firms' decisions to delay or accelerate recognition of goodwill impairment.

Firms may manage earnings upward by recognising less goodwill impairment in the current period. Filip et al. (2015) find that firms tend to delay the recognition of goodwill impairment by upward management of cash flows. Lu et al. (2010) examine how the A-share firms manage earning via goodwill impairment. They document factors such as impairment of other assets, size of goodwill, debt to asset ratio, and return on equity significantly affect goodwill impairment. Alternatively, firms may accelerate the recognition of goodwill impairment to conduct 'big bath' earnings management. Cheng et al. (2017) indicate that firms accelerate recognition of various assets impairment for 'big bath' earnings management. Based on a U.K. sample, AbuGhazaleh et al. (2011) find a significant relation between goodwill impairment and opportunistic reporting incentives such as CEO turnover, income smoothing and 'big bath' reporting behaviours. Lu and Qu (2016) examine the Chinese listed firms and find that the recognition of goodwill impairment is related to the incentives of 'big bath' earnings management and income smoothing.

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<sup>5</sup>During the transitional period, firms can choose one of the alternative ways to record the impairments: to accelerate goodwill impairment recognition so as to record the impairment charges below-the-line, or to delay goodwill impairment recognition but to record the future charges above-the-line. Thus the transitional period leaves managers a lot of room to discretionally choose the accounting treatment regarding goodwill.

Given that the decision of goodwill impairment is largely unobservable, existing literature typically employs the book to market ratio (BTM) as the indicator to recognise goodwill impairment, i.e.,  $BTM > 1$  suggests that the market expects a write-off of goodwill (Ramanna & Watts, 2012). While the BTM approach can effectively alleviate Type I error, it may result in Type II error because firms with  $BTM < 1$  may also satisfy conditions to impair goodwill. To mitigate the potential measurement error, subsequent studies employ a matching approach, i.e., firms with goodwill impairment are matched with those without impairment based on industry, year and lagged MTB. However, under either approach, goodwill impairment should be allocated to asset groups, which can be determined at manager's discretion. Another concern over the use of MTB is that it is a measure for the firm as a whole. That is, it cannot be decomposed to individual asset groups. In comparison, the performance commitment is made by each acquiree where goodwill can be clearly allocated to. The goodwill related to a particular acquiree should be impaired if the acquiree misses the commitment, and vice versa. We thus conjecture that failure to meet the commitment by an acquiree is a more direct indicator of goodwill impairment, compared with BTM ratio.

## 2.2. Performance commitment and goodwill impairment

The use of performance commitment terms in M&As is widespread in China. CSRC's 2008 Measures mandated that an acquiree should make performance commitments to the acquirer if the transaction price is determined by discounted future earnings for material M&As. The use of performance commitment terms is voluntary for immaterial M&As. In practice, performance can be defined in various ways such as earnings or sales. Although the 2014 revised Measures no longer mandated the use of performance commitment terms for material M&As, the majority of material M&As still adopt performance commitment terms to properly bond the acquirees. Existing literature show that the use of performance commitment terms is associated with favourable informational consequences in terms of higher abnormal returns and lower stock price crash risks (Song et al., 2019).

We are interested in whether and how failure to meet the performance commitment has any impact on the recognition of goodwill impairment during the commitment period. The answer to this question helps us better understand why the use of performance commitment terms is associated with capital market reaction. It is *ex ante* unclear whether failed commitment leads to goodwill impairment. On the one hand, external monitoring mechanisms can prompt firms with failed commitments to timely write-off goodwill. We identify several types of external monitoring mechanisms that can play a role. First, if a listed firm involves in M&As with performance commitment terms, it must disclose the committed performance figures and the realisation of them during the commitment period. The disclosure is subject to a special audit with an audit opinion. The disclosure undoubtedly enhances transparency on the M&A transaction. Investors thus can better understand whether an acquiree has met the commitments. Second, an independent financial advisor is usually involved in an M&A transaction. The financial advisor is required to continuously supervise and review the underlying transaction and to express an opinion regarding the standardised operation and the realisation of

performance commitments.<sup>6</sup> Third, the regulators have adopted strict measures regarding the disclosure of information as well as the acquiree's fulfilment of the commitment.<sup>7</sup> Special attention has been paid to whether an acquiree has met the commitment. Fourth, the accounting standards require that tests for goodwill impairment should be based on the asset groups defined by a firm. While an acquiree with performance commitments typically keeps independent operations,<sup>8</sup> it is justifiable to treat an acquiree as an identifiable asset group. The above-mentioned external monitoring mechanisms thus are likely to significantly affect the accounting treatment and disclosure of the performance commitments in the M&As. Following this line of argument, an acquiree's performance on the commitment terms may significantly affect the recognition of goodwill impairment.

On the other hand, one may expect insignificant influence of the performance commitment on goodwill impairment given that managers can exercise discretions in determining the fair value of the goodwill. As a result, they may choose not to write-off goodwill even when an acquiree fails the commitment. An acquiree's financial performance can affect the consolidated income statement by (i) its own financial performance and (ii) potential goodwill charges. Thus in case of acquiree's poor performance, a recognition of goodwill impairment further worsens the consolidated income statement. While the deteriorated performance can result in adverse consequences such as receiving special treatment or delisting, listed firms usually have strong incentives to avoid goodwill impairment. In practice, acquirers typically justify the reasons of not recognising goodwill impairment from the following two aspects. First, a failure to meet the commitment in a particular year can be attributed to a temporary decline in performance, which does not affect the long-term prospects of an acquiree. Thus it is justifiable not to write-off the book value of the acquiree. Second, identifying the asset group is largely a professional judgement. The firm can thus choose either to treat a particular acquiree as an individual asset group or to combine the acquiree with other assets into one asset group. In the latter case, failure to meet the commitment does not necessarily lead to deteriorated performance of the asset group as a whole. Thus, the manager can justify that the book value of the asset group is not impaired.

Given the above competing arguments, it remains an empirical question of whether a failure in the performance commitment triggers goodwill impairment during the commitment period. We expect that the impact of the monitoring mechanisms may dominate due to the strict measures on performance commitments. Thus auditors, financial advisors as well as the regulatory bodies, to protect their reputations, are motivated to urge the listed firms to properly write-off goodwill in case of failed commitments. We thus hypothesise that:

*H1: Acquiree's failure to meet the performance commitment is significantly related to goodwill impairment during the commitment period.*

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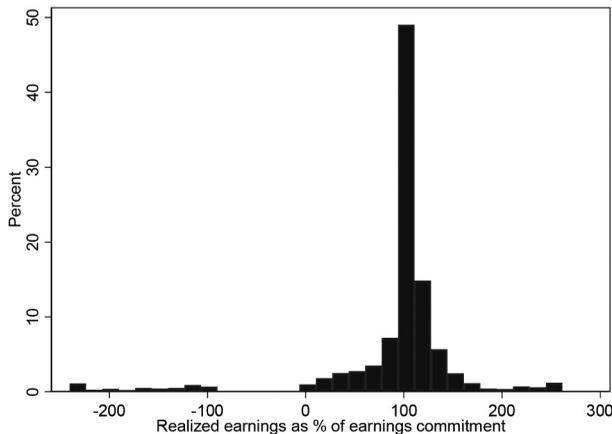
<sup>6</sup>See Article 38 of the Measures for details.

<sup>7</sup>See No. 4 Regulatory Guidelines for Listed Firms: The commitment and fulfilment by the ultimate controller, shareholders, related parties, and acquirer.

<sup>8</sup>A common practice is that the management team or ultimate controller of an acquiree maintains significant control of the acquiree's business operations. Another reason for the independent operation is to clearly define the responsibility of the performance commitment made by the acquiree.

In most cases, acquirees make performance commitments for three or 4 years. Next, we move on to examine whether meeting or missing performance commitments during the commitment period has any impact on goodwill impairment in the post-commitment period. We focus on earnings commitments, rather than performance commitments in general, because we intend to investigate acquiree's earnings management behaviour during the commitment period. To effectively bond the shareholders and/or management of an acquiree, the performance commitment arrangement typically requires them to compensate with cash or stocks if it fails the commitments during the commitment period. The original shareholders and/or management of the acquiree thus have strong incentives to manipulate earnings to meet the commitments. In practice, an acquiree may conduct either real activity earnings management such as deferring or cutting certain expenses (e.g., advertising or R&D expenses), or accrual earnings management such as advance revenue recognition. An acquiree can also manipulate earnings via related party transactions. We observe a cluster of firms that 'just meet' the earnings commitment. [Figure 1](#) exhibits the distribution of the realisation of earnings commitment, i.e., realised earnings compared with committed earnings. We find that 43% of our sample firms 'just meet' the commitment with reported earnings exceeding the commitment by less than 10%. In sharp comparison, only less than 7% of the sample firms just miss the performance commitment with reported earnings being lower than the commitment by less than 10%. The asymmetric distribution between the meeting and missing commitment firms is in line with our argument that an acquiree is likely to manipulate earnings to meet the commitments (Burgstahler & Dichev, 1997; Hayn, 1995; Hou et al., 2015).<sup>9</sup>

When the commitment period ends, the acquiree no longer faces the pressure to meet any particular earnings threshold. Its performance thus is likely to decline in the post-



**Figure 1.** Distribution of degree of meeting performance commitment.

<sup>9</sup>We do not provide further evidence on the acquirees' earnings management behaviour due to the following two reasons. First, although the listed firm as the acquirer is required to disclose whether an acquiree meets the performance commitment, most acquirees do not disclose the full sets of financial statements. The data limitation restricts our ability to directly examine the acquiree's earnings management behaviour. Second, while we can rely on the consolidated financial statements to indirectly investigate acquirees' earnings management behaviour, the power of test will be very low if the acquiree accounts for only a small proportion in the group. Meanwhile, we are not able to separate the earnings management incentives of a particular acquiree from that of the listed firm.

commitment period. The decline in performance can be more pronounced if the acquiree manipulates earnings during the commitment period due to the reversal of accruals. Given that the acquiree's deteriorated performance is likely to trigger goodwill impairment, we hypothesise that:

*H2: Firms with acquirees that met earnings commitments are more likely to impair goodwill in the post-commitment period. The relation is driven by acquirees that met the commitments by earnings management.*

### 3. Sample and research design

#### 3.1. Model specification

We employ the following model to examine the relation between failed commitment and goodwill impairment:

$$GWI = \beta_0 + \beta_1 FailPC + \beta_2 Earnings\ Management + \beta_3 MA\ Characteristics + \beta_4 Managerial\ Incentives + \beta_5 Controls + Industry\ \&\ Year\ Fixed\ effects + \varepsilon$$

whereas the dependent variable *GWI* is measured by three variables: (i) a dummy variable, *D\_GWI*, which equals one if the firm recognises goodwill impairment in a particular year, and zero otherwise; (ii) *GWI%* which is calculated as the provision for goodwill impairment in a particular year divided by beginning balance of goodwill; and (iii) *GWI\_A* which is calculated as the provision for goodwill impairment in a particular year divided by beginning balance of total assets. Accordingly, a Probit model is employed when the dependent variable is *D\_GWI* while an OLS is employed when the dependent variables are *GWI%* and *GWI\_A*.

Our variable of interest is *FailPC* which captures an acquiree's failure to meet the performance commitment in a particular year during the commitment period. It is a dummy variable that equals one if the firm has any acquiree that fails to meet the performance commitment in a particular year, and zero otherwise. A significantly positive coefficient of *FailPC* is in line with the argument that failed commitment leads to goodwill impairment during the commitment period.

Existing literature has documented various determinants of goodwill impairment. Following this line of literature, we include controls for earnings management incentives, M&A characteristics, managerial incentives, as well as firm-level control variables. Two variables are used to capture firm's earnings management incentives: (i) *EM\_SEO* which equals one if the firm refinance with seasoned equity offering subsequent to the M&A, and zero otherwise; and (ii) *EM\_Loss* which captures firm's earnings management incentives to avoid losses. It equals one if the firm made a loss in the previous year, or makes a small profit with ROE between [0, 0.01] in the current year, and zero otherwise. We employ four variables to measure the M&A characteristics: (i) number of M&As the firm takes in a given year (*Intensity*). Intensive M&As lead to large amounts of goodwill as well as growth in goodwill, which in turn results in future goodwill impairment (Gu & Lev, 2011); (ii) a dummy variable that equals one if an independent financial advisor is hired for the M&A, and zero otherwise (Zhang & Chen, 2019); (iii) the book to market ratio (*BTM*);

and (iv) the book value of goodwill plus goodwill impairment in the current year scaled by beginning balances of total assets (*GW*) because large amounts of goodwill increases the likelihood of goodwill impairment (Gu & Lev, 2011; Hayn & Hughes, 2006). In terms of managerial incentives, the following four variables are employed: (i) leverage ratio (*LEV*) because managers tend to avoid goodwill impairment to meet the requirements of debt contracts (Beatty & Weber, 2006; Ramanna & Watts, 2012); (ii) management shareholding (*MShare*) because managers' equity incentives discourage them to write-off goodwill (Lu & Qu, 2016); (iii) CEO tenure (*Tenure*) because CEOs with longer tenure are more likely to participate in M&As at a price premium. To protect their reputation, CEOs with longer tenure tend to avoid goodwill impairment (Beatty & Weber, 2006; Francis et al., 1996; Ramanna & Watts, 2012); and (iv) turnover in top management team (*Turnover*) because the new CEO or chairman tends to aggressively write-off goodwill created by their predecessors (Beatty & Weber, 2006; Francis et al., 1996). Following Lu et al. (2010) and Lu and Qu (2016), we also control for firm level characteristics by firm size (*Size*), growth in sales revenue (*Growth*), profitability (*ROA*), audit quality (*Big4*), institutional shareholding (*INST*), analyst coverage (*ANA*), and largest shareholding (*TopShare*). Finally, the industry and year fixed effects are included in the model.

While H1 focuses on the ongoing performance commitments, H2 examines the relation between earnings commitment and goodwill impairment in the post-commitment period. We employ the following Equation (2) to empirically investigate H2:

$$GW_i = \beta_0 + \beta_1 Post + \beta_2 MeetEC + \beta_3 Post * MeetEC + \beta_4 Earnings\ Management + \beta_5 MA\ Characteristics + \beta_6 Managerial\ Incentives + \beta_7 Controls + Industry\ \&\ Year\ Fixed\ effects + \varepsilon$$

We add two variables, *Post* and *MeetEC*, as well as the interaction term in the model. Specifically, *Post* is a dummy variable that equals one for years in the post-commitment period and zero for years during the commitment period. The variable *MeetEC* is also a dummy variable. It equals one if an acquiree successfully meets all the earnings commitments during the commitment period and zero if it fails one or more commitment. The interaction term thus captures whether the acquiree's meeting of earnings commitment during the commitment period leads to goodwill impairment in the post-commitment period. A positive coefficient of the interaction term supports our H2. Appendix A provides detailed definitions for all the variables.

### 3.2. Sample selection

Our sample covers all the A-share-listed firms that have M&As with performance commitment terms during 2008–2016. We start from the performance commitment dataset from the WIND database. The database provides details on the performance commitment terms in an M&A. We then hand-collect the information on (i) whether an acquiree meets or misses the performance commitment, and (ii) the level of realising the performance commitment by an acquiree, in a particular year during the commitment period. Data on goodwill impairment comes from the WIND database and all other data is obtained from the CSMAR database. To reduce the potential impact of extreme values on our results, all the continuous variables are winsorised by 1%.

Following the approach of Ramanna and Watts (2012), we restrict our sample to firms with non-zero beginning balances in the goodwill account. We further exclude special-

treated firms, firms in the financial industry, and observations with missing values. The filtering process leaves us with a total of 1,381 (676) firm-year observations (unique firms). Panel A of Table 1 describes the yearly distribution of our sample. As shown, the number of firms involving M&As increases gradually by year. Among our sample, 457 (292) observations (unique firms) fail to meet the performance commitment during the commitment period, accounting for 33.09% (43.20%) of the sample. Note that some firms may involve multiple M&As with performance commitments in a given year. To rule out the potential confounding effects by different performance commitment terms, we construct another sample which include the firm-years with single performance commitment in a given year only (the restricted sample). There are 860 (511) firm-year observations (unique firms) in the restricted sample, among which 277 (162) firm-years (unique firms) fail to meet the commitments.

Panel B of Table 1 compares the write-offs of goodwill in the sub-samples of firm-years that meet and miss the commitments during the commitment period. On average, 22.30% of our sample recognise goodwill impairment. For the sub-sample of firm-years with acquirees successfully meeting the commitments, only 15.26% recognise goodwill impairment while 84.74% do not recognise. In comparison, for the sub-sample of firm-years with acquirees failure to meet the commitments, 36.54% (63.46%) recognise (do not recognise) goodwill impairment in the year. A  $\chi^2$  value of 79.93 suggests significant differences in goodwill impairment for the sub-sample meeting and that missing the performance commitment.

**Table 1.** Sample distribution.

Panel A Sample distribution by year				
Year	Full sample		Restricted sample	
	# of firms with performance commitment	# of firms failure to meet commitment	# of firms with performance commitment	# of firms failure to meet commitment
2008	1	0	1	0
2009	2	0	2	0
2010	8	2	8	2
2011	27	5	23	5
2012	58	25	45	18
2013	115	39	84	27
2014	211	65	145	37
2015	389	123	226	50
2016	570	198	326	88
Firm-year observations	1,381	457	860	227
Unique firms	676	292	511	162

Panel B Realisation of performance commitment and goodwill impairment			
	$D\_GWI = 0$	$D\_GWI = 1$	Total
<i>FailPC</i> = 0	783 (84.74%)	141 (15.26%)	924 (100%)
<i>FailPC</i> = 1	290 (63.46%)	167 (36.54%)	457 (100%)
Total	1,073 (77.7%)	308 (22.30%)	1,381 (100%)

Panel C Frequency of goodwill impairment		
Frequency of goodwill impairment	# of unique firms	%
1	156	69.33%
2	57	25.33%
$\geq 3$	12	5.33%
Total	225	100%

The 308 firm-year observations that recognise goodwill impairment in Panel B correspond to 225 unique firms. Panel C describes the frequency of write-offs during the sample period. As shown, the majority of firms (69.33%) recognise goodwill impairment once for the ongoing commitments during the sample period. Only 5.33% of the firms recognise impairment for more than three times.

## 4. Empirical results

### 4.1. Descriptive statistics

Table 2 reports the descriptive statistics. On average, 22.3% of our sample recognises goodwill impairment. The amounts of goodwill impairment accounts for 5.5% and 0.2% of the book values of goodwill and total assets, respectively. The maximum value of *GW%* is 1, suggesting that some sample firms write-off all the goodwill. Meanwhile, 33.1% of the sample fails to meet the performance commitment during the commitment period. In terms of control variables, we observe that while a firm conducts an average of 4.5 M&As in a particular year, 61.9% of the M&As are involved by financial advisors. The book value of goodwill is 20% of total assets, which is relatively high because we include firms with non-zero balances in goodwill only. 27.1% of the sample firms have earnings management incentives related to SEO while 64.7% of the sample firms have incentives to avoid losses. Only 1.7% of our sample are audited by Big 4 auditors. The sample firms are covered by nine analysts on average. In general, all the variables are within a normal range.

### 4.2. Regression results: H1

H1 investigates whether an acquiree's failure to meet the performance commitment during the commitment period results in write-off of goodwill. Equation (1) is employed to empirically test the hypothesis. The results are reported in Table 3. Columns (1) – (3)

**Table 2.** Descriptive statistics (full sample, N = 1,381).

	Mean	Std. Dev.	Min.	Median	Max.
<i>D_GWI</i>	0.223	0.416	0.000	0.000	1.000
<i>GW%</i>	0.055	0.187	0.000	0.000	1.000
<i>GW_A</i>	0.002	0.010	0.000	0.000	0.079
<i>FailPC</i>	0.331	0.471	0.000	0.000	1.000
<i>EM_SEO</i>	0.271	0.445	0.000	0.000	1.000
<i>EM_Loss</i>	0.647	0.478	0.000	1.000	1.000
<i>Intensity</i>	4.534	4.668	0.000	3.000	25.000
<i>Advisor</i>	0.619	0.486	0.000	1.000	1.000
<i>BTM</i>	0.283	0.160	0.056	0.247	0.893
<i>GW</i>	0.200	0.271	0.000	0.105	1.551
<i>LEV</i>	0.401	0.183	0.073	0.390	0.826
<i>MShare</i>	0.204	0.203	0.000	0.142	0.673
<i>Tenure</i>	4.046	3.042	0.083	3.333	12.500
<i>Turnover</i>	0.256	0.437	0.000	0.000	1.000
<i>Size</i>	22.133	0.906	20.352	22.032	25.053
<i>Growth</i>	0.416	0.708	-0.522	0.251	4.728
<i>ROA</i>	0.048	0.037	-0.058	0.045	0.161
<i>Big4</i>	0.017	0.131	0.000	0.000	1.000
<i>INST</i>	6.137	5.684	0.000	4.830	35.100
<i>ANA</i>	9.259	8.022	0.000	7.000	36.000
<i>TopShare</i>	0.304	0.134	0.073	0.274	0.705

**Table 3.** Regression results: H1.

	(1)	(2)	(3)
	<i>D_GWI</i>	<i>GWl%</i>	<i>GWl_A</i>
<i>FailPC</i>	0.690*** (7.899)	0.043*** (3.339)	0.004*** (5.644)
<i>EM_SEO</i>	0.045 (0.483)	-0.018 (-1.475)	-0.001* (-1.709)
<i>EM_Loss</i>	-0.234** (-2.308)	-0.059*** (-3.249)	-0.004*** (-2.761)
<i>Intensity</i>	0.007 (0.758)	0.001 (0.613)	0.000 (0.767)
<i>Advisor</i>	-0.033 (-0.330)	-0.002 (-0.117)	0.000 (0.412)
<i>BTM</i>	0.183 (0.421)	0.046 (0.818)	0.001 (0.500)
<i>GW</i>	0.123 (0.715)	-0.018 (-0.776)	0.002* (1.735)
<i>LEV</i>	-0.322 (-0.875)	-0.043 (-0.829)	-0.001 (-0.383)
<i>MShare</i>	-0.098 (-0.417)	-0.023 (-0.800)	-0.000 (-0.321)
<i>Tenure</i>	-0.001 (-0.039)	-0.000 (-0.017)	0.000 (0.653)
<i>Turnover</i>	-0.011 (-0.111)	0.006 (0.428)	-0.000 (-0.098)
<i>Size</i>	0.066 (0.789)	-0.009 (-0.896)	-0.001** (-2.323)
<i>Growth</i>	-0.081 (-1.166)	-0.010 (-1.432)	-0.001** (-2.210)
<i>ROA</i>	-2.139 (-1.264)	-0.701** (-2.167)	-0.023 (-0.929)
<i>Big4</i>	-0.684* (-1.655)	-0.066*** (-3.767)	-0.001* (-1.896)
<i>INST</i>	-0.009 (-1.068)	-0.000 (-0.422)	0.000 (0.780)
<i>ANA</i>	-0.011 (-1.535)	-0.000 (-0.308)	-0.000 (-1.283)
<i>TopShare</i>	-0.838** (-2.332)	-0.014 (-0.356)	-0.001 (-0.345)
Constant	-1.781 (-1.069)	0.313 (1.606)	0.029*** (3.112)
Industry & Year	Yes	Yes	Yes
N	1,369	1,381	1,381
Pseudo R <sup>2</sup> / R <sup>2</sup>	9.48%	6.28%	9.87%

This table reports the results for Equation (1) on the full sample. All the variables are defined in Appendix A. Z-statistics in column (1) and t-statistics in columns (2) and (3) are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

report the empirical results when the dependent variables are *D\_GWI*, *GWl%*, and *GWl\_A*, respectively. As shown, the coefficient of *FailPC* is significantly positive at less than 1% level in all the three columns.<sup>10</sup> The significantly positive coefficient supports the argument that failure to meet the performance commitment leads to goodwill impairment in terms of higher likelihood of recognising impairment (column 1) and larger amounts of

<sup>10</sup>We use Probit model to estimate Equation (1) when the dependent variable is *D\_GWI*. To ensure the robustness of our results, we re-estimate Equation (1) using Logit and Tobit models respectively. Our results are unaffected by the alternative models. The sample size in column (1) is slightly smaller than that in columns (2) and (3) because some industries do not have variance in *D\_GWI*. As a result, these observations are omitted when industry and year fixed effects are controlled. Our results are also robust to the use of the restricted sample as described in Table 1.

impairment (columns 2 and 3). In other words, an acquirer's realisation of the commitment signals that it operates as efficiently as expected. Investors thus can reliably judge whether it is appropriate to write-off goodwill for the acquiree. Our results are economically significant as well. Taken column (1) as an example, the coefficient of *FailPC* is 0.690, indicating that the likelihood of write-off goodwill increases by 69% if an acquiree fails to meet the commitment, compared with the case if it meets the commitment. Columns (2) and (3) exhibit the economic significance in terms of amounts: failure to meet the commitment translates into a goodwill impairment charge of 4.3% of book value of goodwill (column 2) and 0.4% of total assets (column 3).

We observe the following regarding the control variables. First, the coefficient of *EM\_SEO* is significantly negative in column (3) and that of *EM\_Loss* is significantly negative in all the three columns, supporting our conjecture that firms with upward earnings management incentives are less likely to write-off goodwill. Second, the M&A characteristics are in general not significantly related to goodwill impairment. While existing literature documents significantly positive relation between *GW* and goodwill impairment (Gu & Lev, 2011), we only find weak evidence on this relation, i.e., the coefficient of *GW* is positive in column (3) at 10% level and insignificant in columns (1) and (2). Third, firms audited by Big 4 auditors and those with high top shareholdings are less likely to recognise goodwill impairment, probably because these firms are more likely to involve high-quality M&As. Fourth, larger firms, more profitable firms and firms with higher growth potential are associated with lower amounts of goodwill impairment. Last but not least, while existing studies use BTM ratio as the indicator of goodwill impairment, the coefficient of *BTM* is not significant in our study. The insignificant coefficient lends further support to our conjecture that BTM ratio may not be as direct as the transaction-level indicators for goodwill impairment.

### 4.3. Robustness checks for H1

In this section, we employ alternative measures and alternative sampling to check the robustness of our results. In the main analysis in Table 3, we use a dummy variable, *FailPC*, to indicate an acquiree's failure to meet the performance commitment in a particular year during the commitment period. We use two alternative variables to capture the extent of meeting or missing the performance commitment. The first alternative measure is *FailPC\_N*. It measures the number of acquirees that fail to meet the performance commitment in a particular year.<sup>11</sup> The second alternative measure is *MeetEC%*, which captures the level of realising an earnings commitment. It is calculated as the realised earnings divided by committed earnings. Thus, a less than 100% value means missing the earnings commitment. Equation (1) is then re-estimated using the two alternative measures. As discussed in section 3.2, some firms may have multiple performance commitments in a particular year. The existence of multiple commitments may confound the measurement of *MeetEC%* because a firm can have some acquirees meeting while others missing the commitment. To mitigate such confounding effect, we employ the restricted sample

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<sup>11</sup>Besides *FailPC\_N*, we also use the percentage of failed performance commitments out of total number of performance commitments in a particular year as an alternative measure. The results remain unchanged.

**Table 4.** Robustness check: use alternative measures of *FailPC*.

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>D_GWI</i>	<i>GWI%</i>	<i>GWI_A</i>	<i>D_GWI</i>	<i>GWI%</i>	<i>GWI_A</i>
<i>FailPC_N</i>	0.454*** (7.344)	0.027*** (3.142)	0.003*** (4.657)			
<i>MeetEC%</i>				-0.448*** (-5.835)	-0.047*** (-3.521)	-0.005*** (-4.208)
<i>EM_SEO</i>	0.039 (0.419)	-0.018 (-1.498)	-0.001* (-1.729)	0.022 (0.171)	-0.020 (-1.198)	-0.002* (-1.918)
<i>EM_Loss</i>	-0.236** (-2.328)	-0.059*** (-3.274)	-0.004*** (-2.783)	-0.341*** (-2.714)	-0.072*** (-3.216)	-0.005*** (-3.172)
<i>Intensity</i>	0.006 (0.656)	0.001 (0.588)	0.000 (0.706)	0.003 (0.198)	0.001 (0.663)	0.000 (0.554)
<i>Advisor</i>	-0.059 (-0.587)	-0.003 (-0.225)	0.000 (0.240)	0.002 (0.013)	-0.002 (-0.130)	0.001 (0.932)
<i>BTM</i>	0.197 (0.450)	0.048 (0.862)	0.001 (0.604)	0.556 (1.033)	0.090 (1.132)	0.001 (0.452)
<i>GW</i>	0.137 (0.801)	-0.018 (-0.749)	0.003* (1.803)	0.298 (1.175)	0.035 (0.904)	0.005* (1.858)
<i>LEV</i>	-0.350 (-0.936)	-0.045 (-0.864)	-0.001 (-0.464)	-0.247 (-0.554)	-0.041 (-0.624)	-0.001 (-0.338)
<i>MShare</i>	-0.042 (-0.176)	-0.019 (-0.694)	-0.000 (-0.098)	-0.077 (-0.246)	-0.011 (-0.315)	0.001 (0.311)
<i>Tenure</i>	-0.000 (-0.014)	-0.000 (-0.018)	0.000 (0.639)	-0.002 (-0.120)	0.001 (0.306)	0.000 (0.739)
<i>Turnover</i>	0.010 (0.100)	0.007 (0.497)	0.000 (0.091)	-0.001 (-0.006)	0.014 (0.681)	0.000 (0.177)
<i>Size</i>	0.062 (0.747)	-0.009 (-0.927)	-0.001** (-2.352)	0.089 (0.844)	-0.015 (-1.194)	-0.001** (-2.130)
<i>Growth</i>	-0.091 (-1.352)	-0.010 (-1.493)	-0.001** (-2.362)	-0.098 (-1.033)	-0.013 (-1.607)	-0.001* (-1.755)
<i>ROA</i>	-2.214 (-1.318)	-0.707** (-2.196)	-0.023 (-0.955)	-2.231 (-1.065)	-0.905** (-2.253)	-0.037 (-1.256)
<i>Big4</i>	-0.687* (-1.670)	-0.066*** (-3.818)	-0.001* (-1.714)	-1.028** (-1.969)	-0.071*** (-3.004)	-0.001 (-0.770)
<i>INST</i>	-0.008 (-1.010)	-0.000 (-0.366)	0.000 (0.893)	-0.030*** (-3.011)	-0.001 (-0.973)	-0.000 (-0.459)
<i>ANA</i>	-0.012* (-1.699)	-0.000 (-0.356)	-0.000 (-1.376)	-0.008 (-0.776)	0.001 (0.590)	-0.000 (-0.213)
<i>TopShare</i>	-0.835** (-2.324)	-0.014 (-0.343)	-0.001 (-0.316)	-0.677 (-1.578)	0.057 (1.020)	0.002 (0.563)
Constant	-1.702 (-1.015)	0.320 (1.641)	0.029*** (3.112)	-1.654 (-0.797)	0.455* (1.939)	0.034*** (2.885)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
N	1,369	1,381	1,381	789	813	813
<i>Pseudo R</i> <sup>2</sup> / <i>R</i> <sup>2</sup>	9.49%	6.20%	9.80%	10.97%	10.10%	16.61%

This table reports the results for Equation (1). Columns (1) – (3) use the full sample and columns (4) – (6) use the restricted sample and include firms with earnings commitment only. All the variables are defined in Appendix A. Z-statistics in columns (1) & (4) and t-statistics in columns (2), (3), (5) and (6) are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

which includes only firm-years with single commitment in a particular year when the independent variable is *MeetEC%*.<sup>12</sup>

The results for using the alternative measures are reported in Table 4. As shown, the coefficient of *FailPC\_N* remains significantly positive in columns (1) – (3), confirming our conclusion that the firm is more likely to write-off goodwill and to recognise impairment in larger amounts when more acquirers fail the commitments. Columns (4) – (6) present

<sup>12</sup>The full sample is also used as a robustness check. In this case, the average *MeetPC%* is calculated to translate the transaction level to firm level data. The results remain unchanged.

the results of Equation (1) when *MeetEC%* is used. We find that the coefficient of *MeetEC%* is significantly negative in all the three columns, suggesting that high degree of realising the earnings commitment decreases both the likelihood and the amounts of goodwill impairment. Thus, our results in Table 3 are robust to alternative measures of *FailPC*.

Next, our main test conducts the analysis on firm-year observations. One may argue that the transaction-level analysis can more precisely capture an acquiree's behaviour than the firm-level analysis. Following this line of argument, our first alternative sample employs transaction-year observations. In this sample, *FailPC* is defined at the transaction level, i.e., it equals one if the performance commitment of a particular transaction is failed in a given year, and zero otherwise. As described in section 3.2, our sample selection process starts from firms with performance commitment terms. Our second alternative sample adds back the firms that do not adopt performance commitment terms in M&As. That is, this expanded sample includes all the firms with non-zero balances in goodwill account, regardless of the adoption of performance commitment terms. We include a new variable, *PC*, in Equation (1) to capture the existence of performance commitment terms. Specifically, *PC* is a dummy variable that equals one if a firm has any acquiree that adopts performance commitment terms in a given year and zero otherwise. For acquirees that do not adopt performance commitment terms, *FailPC* is set to be zero.

Table 5 reports the results using the two alternative samples. Columns (1) – (3) conduct the transaction-year analysis. The coefficient of *FailPC* remains significantly positive in all the columns. Columns (4) – (6) employ the expanded sample. Again, the coefficient of *FailPC* is significantly positive in all the columns. Moreover, we find that the coefficient of *PC* is significantly positive as well, suggesting that the adoption of commitment terms in M&As increases the likelihood and the amounts of goodwill impairment.

In short, the results in Tables 4 and 5 confirm that our main findings are robust to (i) alternative measures of failure to meet the performance commitment, and (ii) alternative samplings.

#### 4.4. Additional analyses on H1

In this section, we conduct further analysis to investigate how acquiree's incentives may impact the write-off of goodwill. Figure 1 exhibits the distribution of the realisation of earnings commitment (*MeetEC%*). We observe an obvious cluster of observations that 'just meet' the commitment. The phenomenon of 'just meeting' a certain performance threshold is well documented in the literature (Burgstahler & Dichev, 1997; Hayn, 1995; Hou et al., 2015). We thus are motivated to investigate how an acquiree's earnings management behaviour may influence the goodwill impairment. It is *ex ante* unclear whether commitments realised by earnings management are more likely to result in goodwill impairment. One the one hand, the acquirer may be able to see through and conclude that an acquiree would not be able to realise the commitment without earnings management. We expect that the acquirer has the ability to see through because of the following two reasons. First, the acquirer is likely to have sufficient understanding of the acquiree's operation either because they are in the same industry or through due diligence during the M&A process. Second, the acquirer usually has various information channels to obtain sufficient financial information of the acquiree and to monitor the acquiree. In practice, the auditor of the listed firm usually also audits the acquiree's financial statements. If the acquirer can effectively understand the acquiree's accounting

**Table 5.** Robustness check: use of alternative samples.

	Section A: Transaction-year sample			Section B: Inclusion of firms without performance commitment terms		
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>D_GWI</i>	<i>GWI%</i>	<i>GWI_A</i>	<i>D_GWI</i>	<i>GWI%</i>	<i>GWI_A</i>
<i>PC</i>				0.579*** (6.967)	0.029** (2.377)	0.002*** (7.097)
<i>FailPC</i>	0.646*** (7.466)	0.049*** (4.008)	0.004*** (5.435)	0.687*** (7.896)	0.041*** (3.305)	0.002*** (7.632)
<i>EM_SEO</i>	0.037 (0.359)	-0.009 (-0.822)	-0.001 (-1.293)	-0.057 (-1.097)	-0.018*** (-3.297)	-0.000** (-2.061)
<i>EM_Loss</i>	-0.149 (-1.293)	-0.050*** (-2.743)	-0.003* (-1.828)	-0.170*** (-3.821)	-0.037*** (-5.434)	-0.001*** (-5.814)
<i>Intensity</i>	0.019* (1.705)	0.005 (1.355)	0.000 (1.145)	0.008 (1.299)	0.000 (0.585)	0.000 (0.499)
<i>Advisor</i>	0.001 (0.012)	0.014 (1.325)	0.000 (0.400)	-0.036 (-0.364)	0.002 (0.183)	-0.000 (-0.477)
<i>BTM</i>	0.112 (0.227)	0.054 (0.997)	0.002 (0.890)	0.135 (1.053)	0.011 (0.806)	-0.000 (-0.619)
<i>GW</i>	-0.087 (-0.412)	-0.059* (-1.910)	0.001 (1.238)	0.793*** (3.805)	-0.045 (-1.579)	0.003*** (4.380)
<i>LEV</i>	-0.302 (-0.756)	-0.042 (-0.856)	0.000 (0.008)	-0.085 (-0.523)	-0.038* (-1.698)	-0.000 (-1.491)
<i>MShare</i>	0.127 (0.452)	-0.036 (-1.241)	-0.001 (-0.386)	-0.038 (-0.283)	-0.026* (-1.762)	-0.000 (-0.287)
<i>Tenure</i>	-0.004 (-0.238)	-0.003 (-1.011)	0.000 (0.359)	-0.004 (-0.490)	-0.000 (-0.047)	-0.000 (-0.549)
<i>Turnover</i>	0.049 (0.447)	-0.009 (-0.533)	0.000 (0.166)	-0.054 (-1.239)	0.001 (0.133)	-0.000 (-1.000)
<i>Size</i>	0.057 (0.588)	-0.008 (-0.876)	-0.001** (-2.196)	-0.001 (-0.036)	-0.014*** (-3.650)	-0.000*** (-3.419)
<i>Growth</i>	-0.031 (-0.395)	0.005 (0.363)	-0.001** (-2.098)	-0.114** (-2.145)	-0.005 (-0.755)	-0.000*** (-2.768)
<i>ROA</i>	-3.193* (-1.663)	-0.525* (-1.669)	-0.009 (-0.325)	-2.936*** (-5.266)	-0.722*** (-7.048)	-0.006*** (-3.760)
<i>Big4</i>	-0.687 (-1.503)	-0.066*** (-3.122)	-0.002** (-2.293)	-0.129 (-1.304)	-0.006 (-0.775)	0.000* (1.651)
<i>INST</i>	0.001 (0.088)	-0.001 (-0.833)	0.000 (1.236)	-0.005* (-1.771)	-0.000 (-1.217)	-0.000 (-1.510)
<i>ANA</i>	-0.006 (-0.706)	0.000 (0.289)	-0.000 (-1.365)	-0.009*** (-2.836)	-0.000 (-0.599)	-0.000 (-1.322)
<i>TopShare</i>	-1.129*** (-2.737)	-0.035 (-0.968)	-0.003 (-1.447)	-0.292* (-1.682)	0.012 (0.656)	-0.000* (-1.723)
Constant	-1.387 (-0.701)	0.324* (1.684)	0.031*** (3.364)	-1.405* (-1.914)	0.401*** (5.115)	0.003*** (2.764)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
N	2,297	2,309	2,309	7,333	7,343	7,343
<i>Pseudo R</i> <sup>2</sup> / <i>R</i> <sup>2</sup>	9.91%	8.44%	9.80%	6.76%	4.86%	9.67%

This table reports the results for Equation (1) on the transaction-year sample (Section A) and an expanded sample which includes firms without performance commitment terms (Section B). All the variables are defined in Appendix A. Z-statistics in columns (1) & (4) and t-statistics in columns (2), (3), (5) and (6) are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

quality, it tends to properly write-off goodwill of the acquirees which realise the commitment through earnings management.

On the other hand, the acquirer may choose not to write-off goodwill of the acquirees which 'just meet' the commitment for the following two reasons. First, write-off of goodwill sends a signal to the market that an acquiree's performance is not as good as expected. Compared with the case of missing the commitment, outside investors may concern the quality of an M&A decision to a larger extent if goodwill is impaired in case of

meeting the earnings commitment. To justify the appropriateness of an M&A decision so as to protect their reputation, managers tend not to write-off goodwill. Second, the market is likely to negatively react to firms whose acquirees miss the earnings commitment. A recognition of goodwill impairment further deteriorates the performance of consolidated financial statements. To alleviate the potential adverse impact on stock prices, the acquirer is likely to allow the acquiree to manipulate earnings to meet the commitment. That is, the acquirer tends not to write-off goodwill of acquirees that meet the commitment through earnings management.

To capture how acquiree's earnings management behaviour affects goodwill impairment, we define two dummy variables,  $D\_MeetEC1$  and  $D\_MeetEC2$  and re-estimate Equation (1) by substituting  $FailPC$  with the two variables. Note that we mainly concern the realisation of earnings commitments, rather than other types of performance commitments in this test. Thus we include firms with earnings commitments only.  $D\_MeetEC1$  captures the 'just meet' case and equals one if an acquiree realises the earnings commitment by less than 10% (i.e., the realised earnings divided by committed earnings lies between 100% and 110%), and zero otherwise. It thus indicates that the commitment is realised by earnings management. In comparison,  $D\_MeetEC2$  equals one if an acquiree realises the earnings commitment by more than 10%, (i.e., the realised earnings divided by committed earnings is larger than 110%), and zero otherwise. We employ the restricted sample which includes only firm-years with single commitment in a given year to mitigate any noises caused by multiple commitments. The results are reported in Section A of Table 6. The coefficients of both  $D\_MeetEC1$  and  $D\_MeetEC2$  are significantly negative in all the columns (1) – (3) except for that of  $D\_MeetEC2$  in column (2), suggesting that the likelihood and the amounts to write-off goodwill decrease significantly as long as an acquiree meets the earnings commitment. Although not reported in the table, the two coefficients do not differ significantly. That is, to account for goodwill impairment, firms do not differentiate whether or not the commitment is realised through earnings management.

Next, to deepen our understanding on the commitment terms, we analyse another factor, i.e., time to the expiry date of the commitment. Specifically, we investigate whether and how time left to the expiry date of the commitment affects goodwill impairment. The commitment period typically covers three to four years. At the beginning of the period, it is reasonable to justify that better future performance is expected, so the firm does not write-off goodwill for failed performance commitments. In other words, when it approaches to the end of the commitment period, we expect increases in the likelihood and amounts of goodwill recognition. To empirically investigate this issue, we re-estimate Equation (1) by including a new variable,  $Time$ . It is defined as the number of years since the beginning of the commitment period. For example,  $Time$  takes a value of one if it is the first year of the commitment period. A larger value of  $Time$  thus indicates closer to the end of the commitment period. We again employ the restricted sample to avoid noises caused by other commitments in the same year.

The results are reported in Section B of Table 6. While the coefficient of  $FailPC$  remains significantly positive throughout columns (4) – (6), the coefficient of  $Time$  is significantly positive in column (6) and is insignificant in columns (4) and (5). Thus, we find some evidence that the amounts of goodwill impairment increase when it is close to the end of commitment period.

**Table 6.** Regression results of H1: further analyses.

	Section A: Acquiree's earnings management incentives			Section B: Impact of time to expiry date of commitment		
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>D_GWI</i>	<i>GWl%</i>	<i>GWl_A</i>	<i>D_GWI</i>	<i>GWl%</i>	<i>GWl_A</i>
<i>D_MeetEC1</i>	-0.648*** (-4.678)	-0.045** (-2.211)	-0.006*** (-4.080)			
<i>D_MeetEC2</i>	-0.645*** (-4.491)	-0.035 (-1.529)	-0.005*** (-3.560)			
<i>FailPC</i>				0.709*** (5.754)	0.059*** (2.824)	0.006*** (4.510)
<i>Time</i>				0.079 (1.092)	-0.010 (-1.016)	0.001* (1.741)
<i>EM_SEO</i>	0.012 (0.094)	-0.018 (-1.036)	-0.001 (-1.580)	0.036 (0.301)	-0.022 (-1.385)	-0.001 (-1.448)
<i>EM_Loss</i>	-0.123 (-0.185)	0.180 (1.019)	-0.001 (-0.514)	-0.029 (-0.045)	0.171 (0.958)	-0.000 (-0.438)
<i>Intensity</i>	0.003 (0.238)	0.002 (0.983)	0.000 (0.765)	0.005 (0.399)	0.001 (0.654)	0.000 (0.763)
<i>Advisor</i>	0.044 (0.338)	-0.006 (-0.322)	0.001 (0.911)	0.067 (0.536)	-0.003 (-0.174)	0.001 (1.012)
<i>BTM</i>	0.294 (0.548)	0.048 (0.606)	-0.002 (-0.633)	-0.014 (-0.028)	0.039 (0.530)	-0.002 (-0.824)
<i>GW</i>	0.318 (1.206)	0.030 (0.785)	0.005* (1.787)	0.264 (1.024)	0.026 (0.686)	0.005* (1.856)
<i>LEV</i>	-0.037 (-0.081)	-0.008 (-0.123)	0.002 (0.407)	-0.218 (-0.490)	-0.001 (-0.015)	0.001 (0.350)
<i>MShare</i>	-0.223 (-0.748)	-0.028 (-0.777)	-0.001 (-0.403)	-0.065 (-0.224)	-0.018 (-0.490)	-0.000 (-0.089)
<i>Tenure</i>	0.001 (0.059)	0.000 (0.019)	0.000 (0.792)	0.003 (0.148)	0.001 (0.249)	0.000 (0.619)
<i>Size</i>	0.055 (0.520)	-0.018 (-1.353)	-0.002** (-2.475)	0.127 (1.230)	-0.009 (-0.736)	-0.001** (-2.374)
<i>Growth</i>	-0.105 (-1.131)	-0.014* (-1.675)	-0.001* (-1.744)	-0.091 (-0.946)	-0.016* (-1.872)	-0.001 (-1.337)
<i>ROA</i>	-0.788 (-0.392)	-0.608* (-1.676)	-0.014 (-0.535)	-0.588 (-0.293)	-0.429 (-1.206)	-0.011 (-0.469)
<i>Big4</i>	-0.859* (-1.645)	-0.055** (-2.468)	-0.000 (-0.004)	-1.065** (-1.986)	-0.072*** (-3.010)	-0.001 (-0.602)
<i>INST</i>	-0.027*** (-2.718)	-0.001 (-0.921)	-0.000 (-0.231)	-0.025** (-2.506)	-0.001 (-0.795)	-0.000 (-0.062)
<i>ANA</i>	-0.005 (-0.562)	0.001 (0.884)	0.000 (0.112)	-0.009 (-1.007)	0.001 (0.449)	-0.000 (-0.009)
<i>TopShare</i>	-0.588 (-1.353)	0.073 (1.244)	0.003 (0.655)	-0.528 (-1.244)	0.047 (0.841)	0.003 (0.883)
Constant	-1.347 (-0.651)	0.461* (1.903)	0.037*** (2.959)	-3.647* (-1.791)	0.228 (0.981)	0.025** (2.369)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
N	789	813	813	835	860	860
Pseudo R <sup>2</sup> / R <sup>2</sup>	9.44%	7.10%	9.90%	9.55%	7.10%	11.26%

This table reports the results for Equation (1) on the restricted sample. Section A include firms with earnings commitment only. All the variables are defined in Appendix A. Z-statistics in columns (1) & (4) and t-statistics in columns (2), (3), (5) and (6) are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

#### 4.5. Cross-sectional tests for H1

Up to now, we provide evidence that failed performance commitments significantly affect goodwill impairment. One may expect that the commitment–impairment relation varies cross-sectionally, we conduct two sub-sample tests in this section.

First, the market condition is likely to play a role in the commitment–impairment relation. We expect that the relation is more pronounced in the bear market than in the bull market. From the acquiree’s perspective, a failure in meeting the commitment in the bull market is expected to be a temporary decline in performance. If the managers believe that the acquiree’s performance can be recovered in the near future given the market condition, it is justifiable not to write-off goodwill. In comparison, a failure in the commitment in the bear market may indicate worsening performance for a certain period of time. Thus firms are more likely to write-off goodwill in the bear market than in the bull market. From the acquirer’s perspective, firms enjoy higher valuation in the bull markets than in the bear markets. Given that the recognition of goodwill impairment adversely affects net income, the adverse impact on market valuation is multiplied by PE ratio. Thus, the adverse impact on market valuation is less severe in the bear markets than in the bull markets due to the relatively low PE ratios in the bear markets. Taken together, we expect that firms are more likely to write-off goodwill for failed commitments in the bear markets than in the bull markets.

We partition the sample into two sub-samples of firm-years in the bull and the bear markets, respectively. We employ a measure that is widely used to define the bull (bear) markets in the Chinese capital market (Xiao, 2013): a bull market is when the Composite Index of Shanghai Stock Exchange increases by more than 20% during the past 1 year, and a bear market otherwise. Equation (1) is then re-estimated on each sub-sample and the results are presented in Section A of Table 7. The coefficient of *FailPC* remains significantly positive at 1% level in each sub-sample, lending further evidence to our H1 that failed commitment is an important factor of goodwill impairment regardless of market condition. A test of difference in the coefficient of *FailPC* between the two sub-samples shows a *p*-value of 0.1034, providing some weak evidence that the commitment–impairment relation is more pronounced in the bear markets.<sup>13</sup>

Second, information asymmetry between the acquirer and the acquiree may play a role. During our sample period, the adoption of commitment terms is mandatory for material M&As and voluntary for immaterial ones (as discussed in section 1). That is, for immaterial M&As, the adoption of commitment terms is a self-selection decision. An acquirer with effective monitoring mechanisms is more likely to bond the acquiree with commitment terms in case of high level of information asymmetry. Such acquirer tends to write-off goodwill on a timely basis in case of failed commitment to improve information transparency. At the same time, the impact of goodwill impairment on the consolidated financial statements is relatively mild for immaterial M&As. We thus expect that the commitment–impairment relation is more pronounced for voluntary commitment terms.

We partition the sample based on whether the M&A is a material or immaterial one. By doing so, we effectively identify the two sub-samples of mandatory and voluntary adoption of performance commitment terms. Equation (1) is then re-estimated on each sub-sample. Section B of Table 7 reports the results for the sub-sample test. As shown, the coefficient of *FailPC* remains significantly positive in each sub-sample. That is, the likelihood of goodwill impairment increases regardless of whether the adoption of the

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<sup>13</sup>The coefficient of *FailPC* does not significantly differ between the two sub-samples when the dependent variable is *GWI %* or *GWI\_A*. That is, the cross-sectional differences affect the likelihood but not the amounts of goodwill impairment.

**Table 7.** Regression results of H1: sub-sample test (Dependent variable =  $D\_GW$ ).

	Section A: Sample partition by market condition		Section B: Sample partition by voluntary adoption of performance commitment terms	
	(1)	(2)	(3)	(4)
	Bull market	Bear market	Material M&As (Mandatory adoption)	Immaterial M&As (Voluntary adoption)
<i>FailPC</i>	0.529** (2.258)	0.724*** (7.522)	0.458*** (3.995)	1.127*** (7.077)
<i>EM_SEO</i>	-0.120 (-0.512)	0.043 (0.431)	-0.011 (-0.088)	0.101 (0.700)
<i>EM_Loss</i>	-0.764*** (-2.970)	-0.133 (-1.222)	-0.271** (-2.074)	-0.155 (-0.870)
<i>Intensity</i>	0.008 (0.354)	0.012 (1.281)	0.009 (0.765)	0.011 (0.670)
<i>Advisor</i>	0.461* (1.932)	-0.055 (-0.526)	-0.285* (-1.850)	0.167 (0.928)
<i>BTM</i>	1.743* (1.718)	-0.481 (-1.307)	0.153 (0.283)	-0.143 (-0.188)
<i>GW</i>	0.346 (0.642)	0.150 (0.814)	0.100 (0.520)	1.054* (1.702)
<i>LEV</i>	0.030 (0.029)	-0.476 (-1.396)	0.098 (0.214)	-0.816 (-1.227)
<i>MShare</i>	-0.114 (-0.187)	-0.056 (-0.236)	-0.234 (-0.770)	0.036 (0.092)
<i>Tenure</i>	0.040 (0.952)	0.002 (0.104)	0.016 (0.813)	-0.020 (-0.733)
<i>Turnover</i>	0.048 (0.134)	-0.034 (-0.349)	0.053 (0.436)	-0.023 (-0.137)
<i>Size</i>	0.006 (0.027)	0.156** (2.034)	0.023 (0.232)	0.103 (0.696)
<i>Growth</i>	-0.540*** (-2.596)	-0.043 (-0.605)	-0.081 (-1.052)	-0.089 (-0.516)
<i>ROA</i>	-0.745 (-0.170)	-2.250 (-1.356)	-4.614** (-2.167)	-0.024 (-0.008)
<i>Big4</i>		-0.553 (-1.303)	-0.859 (-1.511)	-0.163 (-0.250)
<i>INST</i>	-0.008 (-0.425)	-0.012 (-1.322)	-0.014 (-1.250)	-0.012 (-0.911)
<i>ANA</i>	-0.049*** (-2.601)	-0.012 (-1.640)	-0.005 (-0.525)	-0.012 (-0.967)
<i>TopShare</i>	-1.103 (-1.410)	-0.735** (-1.969)	-0.234 (-0.525)	-1.481** (-2.400)
Constant	-0.876 (-0.200)	-3.583** (-2.313)	-0.856 (-0.410)	-2.359 (-0.830)
Industry & Year	Yes	Yes	Yes	Yes
<i>Diff. in FailPC</i>	$p\text{-value} = 0.10^*$		$p\text{-value} < 0.01^{***}$	
N	211	1,168	794	556
Pseudo R <sup>2</sup>	19.56%	7.83%	8.61%	19.80%

This table reports the results for Equation (1) on the sub-samples. Section A partitions the sample based on market condition and Section B partitions the sample based on whether the adoption of commitment terms is mandatory or voluntary. All the variables are defined in Appendix A. Z-statistics are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

commitment terms is mandatory or voluntary. More interestingly, the coefficient of *FailPC* significantly differs between the two sub-samples at 1% level, supporting our argument that failed commitment is more likely to result in goodwill impairment for voluntary commitment terms than for mandatory ones.

#### 4.6. Regression results: H2

H1 investigates whether an acquiree's failure to meet the performance commitment leads to recognition of goodwill impairment in that year. Next, we move on to examine H2 on whether failure to meet commitment during the commitment period affects the goodwill impairment in the post-commitment period. Note that H2 focuses on the earnings commitment because we are interested in examining acquiree's earnings management behaviour during the commitment period. Equation (2) is employed which expands Equation (1) by the variables *MeetEC*, *Post*, and the interaction term. The restricted sample is employed to clearly link an earnings commitment to post-commitment period impairment. We modify the restricted sample in the following ways. First, we included only earnings commitments and delete other types of performance commitments. Second, we delete any earnings commitment which expires after year 2016 (the end of our sample period). Third, two years, 2017 and 2018, are added to the sample for the purpose of testing the post-commitment period.

The results are reported in column (1) of Table 8. The coefficient of *MeetEC* is significantly negative, further confirming that meeting earnings commitment during the commitment period reduces the likelihood of goodwill impairment. Our variable of interest is the interaction term, *MeetEC\*POST*, which captures the impact on post-commitment period goodwill impairment. Consistent with H2, we find that the coefficient is significantly positive (0.618 with a *t*-value of 2.335), showing that a firm is more likely to recognise goodwill impairment in the post-commitment period if an acquiree meets all the earnings commitments during the commitment period.<sup>14</sup>

Next, we investigate whether the commitment–impairment relation in the post-commitment period varies for commitments realised with and without earnings management. To do so, we partition the sample into two sub-samples. The earnings management sub-sample includes transactions that 'just meet' the earnings commitment in any year during the commitment period, i.e., *D\_MeetEC1* equals one in any year during the commitment period. The non-earnings management sub-sample thus includes transactions that miss or beat the earnings commitment throughout the commitment period, i.e., *D\_MeetEC1* equals zero in all years during the commitment period. Equation (2) is then estimated on the two sub-samples and the results are presented in columns (2) and (3), respectively.<sup>15</sup> The coefficient of *MeetEC\*POST* is significantly positive in column (2), suggesting that the firm is more likely to write-off goodwill in the post-commitment period if the commitment was realised by earnings management. In comparison, the coefficient of *MeetEC\*POST* is insignificantly different from zero in column (3). The insignificant coefficient is consistent with our expectation that firms do not write-off goodwill in the post-commitment period if the acquiree's reported financial performance is of high quality without earning management.

In short, the results in Table 8 show that firms are likely to write-off goodwill in the post-commitment period for acquirees that successfully met the earnings commitment. The recognition of goodwill impairment is mainly driven by acquirees that met the

<sup>14</sup>Results in Table 8 hold only when the dependent variable is *D\_GWI*. The coefficient of *MeetEC\*Post* is not significant when the other two dependent variables (*GW1%* and *GW1\_A*) are used, suggesting that the post-commitment effect holds for the likelihood, but not the amounts of goodwill impairment.

<sup>15</sup>We lose eight observations in the sub-sample tests because some industry-years do not have variance in *D\_GWI*.

**Table 8.** Regression results: H2 (Dependent variable =  $D\_GW$ ).

	(1)	(2)	(3)
	Firms with performance commitment	Sub-sample of $D\_MeetEC1 = 1$ in any year during the commitment period	Sub-sample of $D\_MeetEC1 = 0$ in all years during the commitment period
<i>Post</i>	-0.226 (-1.171)	-0.296 (-0.949)	-0.069 (-0.244)
<i>MeetEC</i>	-0.916*** (-3.835)	-0.665* (-1.945)	-1.136*** (-2.630)
<i>MeetEC * Post</i>	0.618** (2.335)	0.715* (1.912)	0.557 (1.233)
<i>EM_SEO</i>	-0.039 (-0.217)	0.052 (0.237)	-0.022 (-0.071)
<i>EM_Loss</i>	-0.232* (-1.884)	-0.329* (-1.846)	-0.100 (-0.527)
<i>Intensity</i>	-0.002 (-0.113)	-0.011 (-0.648)	0.008 (0.309)
<i>Advisor</i>	0.447* (1.931)	0.239 (0.768)	0.492 (1.071)
<i>BTM</i>	0.239 (0.682)	0.541 (0.957)	0.249 (0.525)
<i>GW</i>	0.994 (1.565)	2.023** (2.089)	-0.199 (-0.236)
<i>LEV</i>	-0.838 (-1.611)	0.080 (0.099)	-1.751** (-2.436)
<i>MShare</i>	0.463 (1.236)	-0.001 (-0.002)	0.903* (1.732)
<i>Tenure</i>	-0.006 (-0.282)	-0.027 (-0.822)	-0.012 (-0.396)
<i>Turnover</i>	0.093 (0.734)	0.010 (0.049)	0.191 (0.990)
<i>Size</i>	0.050 (0.438)	0.063 (0.399)	-0.039 (-0.253)
<i>Growth</i>	-0.076 (-0.453)	-0.278 (-1.185)	0.253 (1.043)
<i>ROA</i>	-3.669*** (-2.706)	-6.465*** (-3.386)	-3.181 (-1.406)
<i>Big4</i>	-0.492** (-2.127)		-0.174 (-0.587)
<i>INST</i>	-0.015 (-1.040)	-0.001 (-0.067)	-0.040 (-1.556)
<i>ANA</i>	-0.010 (-1.253)	-0.001 (-0.088)	-0.012 (-0.910)
<i>TopShare</i>	-0.183 (-0.314)	-0.746 (-0.756)	0.268 (0.328)
Constant	0.324 (0.145)	-0.668 (-0.220)	2.428 (0.803)
Industry & Year	Yes	Yes	Yes
N	742	383	351
Pseudo R <sup>2</sup>	18.97%	23.96%	22.72%

Column (1) reports the results for Equation (2) on the modified restricted sample. Columns (2) & (3) partition the sample based on whether the commitment is realised with or without earnings management. All the variables are defined in [Appendix A](#). Z-statistics are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

commitment by earnings management during the commitment period. The findings remind investors of the potentially adverse impact on performance caused by goodwill impairment even in the post-commitment period.

## 5. Additional test: informativeness of recognising goodwill impairment

Up to now, we have provided evidence on an important determinant of recognition of goodwill impairment: an acquiree's failure to meet performance commitments. As a result of recognising impairment for the failed commitments, firm's performance can be volatile. A growing debate arises on whether goodwill should be amortised or tested for impairment. In this section, we examine a potential informational consequence of goodwill impairment, i.e., stock price crash risk. Specifically, we examine whether and how the recognition of goodwill impairment affects future stock price crash risk. Evidence to this question can provide some insights to the debates on the accounting treatment of goodwill impairment.

Proponents of the amortisation approach argue that amortisation restricts managers' opportunistic behaviour and results in more verifiable earnings information. However, opponents conjecture that the amortisation approach sacrifices value relevance because the subsequent measurement of goodwill does not reflect the real value of the acquiree. In comparison, the test for impairment approach promotes value relevance because the book value of goodwill reflects manager's best estimates of an acquiree's future performance. However, due to the professional judgement and assumptions involved in the test, managers may opportunistically accelerate or delay the recognition of impairment. This approach is thus often criticised for the lack of reliability. Consistent with IFRS, China currently adopts the test for impairment approach. But most members of the CAS Advisory Committee tend to support the amortisation approach.<sup>16</sup> A direct comparison between the two approaches is virtually impossible due to data limitation. The performance commitment terms provide us a unique setting to examine the informativeness of goodwill impairment. As discussed above, the test for impairment approach involves managers' professional judgement and assumptions, which is unobservable for outside investors. However, the existence of performance commitments facilitates us to clearly observe whether an acquiree meets or misses the commitment. The recognition of goodwill impairment thus becomes verifiable and reliable. We are thus motivated to examine whether the enhanced reliability in goodwill impairment translates into favourable informational consequences such as reduced stock price crash risk.

The agency theory argues that managers have incentives to withhold bad news while timely disclose good news. When the bad news is accumulated to a certain extent that managers cannot withhold anymore, the stock price crashes (Hutton et al., 2009; Kim et al., 2011a; Ye et al., 2015). In the performance commitment setting, investors are able to get information on the performance of an acquiree on a timely basis so as to mitigate information asymmetry in an M&A transaction. In case of failed performance commitments, firms are likely to timely disclose the bad news by timely recognising goodwill impairment. Thus, we expect a negative relation between timely recognition of goodwill impairment for failed commitments and future stock price crash risk.

To empirically investigate the impact on crash risk, we estimate an OLS regression based on the restricted sample. Specifically, the indicator variable,  $D\_GWI$ , and a set of control variables are regressed on stock price crash risk. We employ two variables,  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$ , to measure future crash risk. Appendix B describes the

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<sup>16</sup>Securities Times reported on 7 January 2019 that 'the Ministry of Finance: Most members of the CAS Advisory Committee tend to support the amortisation, instead of test for impairment of goodwill'. Details of the report can be found at: <http://kuaixun.stcn.com/2019/0107/14781864.shtml>.

calculation of the two variables. Following literature on crash risk (Chen et al., 2001; Chu & Fang, 2016; Kim et al., 2011a, 2011b), we include three market-level controls: stock return ( $RET$ ), share turnover ( $DTURN$ ), return volatility ( $Sigma$ ), as well as five firm-level controls: book to market ratio ( $BTM$ ), firm size ( $Size$ ), leverage ratio ( $LEV$ ), profitability ( $ROA$ ), and information opaqueness ( $DA$ ). We also control for the crash risk of year  $t$ , and the industry and year fixed effects.

Panel A of Table 9 reports the descriptive statistics for the crash risk test. The mean values of  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$  are  $-0.180$  and  $-0.192$ , respectively. This is in general consistent with existing literature (Chu & Fang, 2016). Panel B of Table 9 present the empirical results for the crash risk whereas Sections A and B use  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$  as the dependent variable, respectively. We first examine the relation between goodwill impairment and future crash risk on the restricted sample. Then the restricted sample is partitioned into sub-samples of missing and meeting performance commitments. As shown, the coefficient of  $D\_GWI$  is negative but insignificantly different from zero in the restricted sample (columns (1) and (4)), suggesting that recognition of goodwill impairment *per se* does not reduce crash risk. More interestingly, the coefficient of  $D\_GWI$  is significantly negative in the sub-sample of firms where the acquirees failed the performance commitment (columns (2) and (5)). It is insignificant again in the sub-sample where the acquirees met the performance commitment (columns (3) and (6)). Moreover, the coefficient of  $D\_GWI$  differs significantly between the two sub-samples in Section A at 5% level. Taken together, the results in Panel B of Table 9 suggest that in case of failed performance commitments, the timely recognition of goodwill impairment has favourable informational consequences in terms of reduction in future stock price crash risk. The evidence adds support for the regulation on the mandatory disclosure of the acquiree's realisation of performance commitments. Such information is value relevant for investors as it helps to verify the appropriateness and timeliness of goodwill impairment. The book value of goodwill thus fairly reflects an acquiree's value, which reduces future crash risk.

Panel C of Table 9 further investigates how an acquiree's earnings management behaviour affects the relation between goodwill impairment and crash risk. In this test, we include firms with earnings commitment only and exclude other types of commitments. We first estimate the relation based on a sample with acquirees meeting earnings commitments (columns (1) and (4)). Then the sample is partitioned into sub-samples that met the commitments with earnings management ( $D\_MeetEC1 = 1$  in columns (2) and (5)) and those without earnings management ( $D\_MeetEC2 = 1$  in columns (3) and (6)). While the coefficient of  $D\_GWI$  is insignificant in the non-earnings management sub-sample, it is significantly negative in the sub-sample that acquirees manipulate earnings to meet commitment. In addition, the coefficient of  $D\_GWI$  differs significantly between the two sub-samples at 5% in both Sections A and B. The results in Panel C reveal that the timely write-off of goodwill in firms with acquirees that 'just meet' the earnings commitments effectively signals to the market that the acquirees' performance is not as good as expected. By doing so, the firm releases the bad news on a timely basis, resulting in a reduction in future stock price crash risk.

**Table 9.** Additional test: impact on stock price crash risk.

Panel A Descriptive statistics (N = 800)						
	Mean	Std. Dev.	Min.	Median	Max.	
<i>NCSKEW</i> <sub><i>t</i>+1</sub>	-0.180	0.897	-2.347	-0.170	2.118	
<i>NCSKEW</i>	-0.277	0.910	-2.215	-0.348	2.241	
<i>DUVOL</i> <sub><i>t</i>+1</sub>	-0.192	0.769	-2.117	-0.160	1.709	
<i>DUVOL</i>	-0.318	0.778	-2.138	-0.286	1.541	
<i>D_GWI</i>	0.209	0.407	0.000	0.000	1.000	
<i>RET</i>	0.287	0.647	-0.535	0.121	2.699	
<i>DTURN</i>	-0.516	4.368	-13.400	-0.327	10.475	
<i>Sigma</i>	0.070	0.032	0.033	0.058	0.162	
<i>BTM</i>	0.302	0.174	0.061	0.258	1.002	
<i>Size</i>	22.132	0.971	20.457	22.009	25.464	
<i>LEV</i>	0.413	0.188	0.070	0.402	0.829	
<i>ROA</i>	0.047	0.039	-0.063	0.043	0.164	
<i>DA</i>	0.061	0.069	0.001	0.039	0.424	

Panel B Regression results: Impact of goodwill impairment on future stock price crash risk						
	Section A: DV = <i>NCSKEW</i> <sub><i>t</i>+1</sub>			Section B: DV = <i>DUVOL</i> <sub><i>t</i>+1</sub>		
	(1)	(2)	(3)	(4)	(5)	(6)
	Restricted sample	<i>FailPC</i> = 1	<i>FailPC</i> = 0	Restricted sample	<i>FailPC</i> = 1	<i>FailPC</i> = 0
<i>D_GWI</i>	-0.098 (-1.486)	-0.297** (-2.529)	-0.047 (-0.547)	-0.072 (-1.262)	-0.190* (-1.838)	-0.035 (-0.461)
<i>RET</i>	0.167** (2.429)	0.262 (1.490)	0.137* (1.946)	0.142** (2.500)	0.144 (0.932)	0.138** (2.373)
<i>DTURN</i>	-0.012* (-1.809)	-0.015 (-0.823)	-0.013* (-1.656)	-0.007 (-1.231)	-0.009 (-0.647)	-0.007 (-1.032)
<i>Sigma</i>	-0.375 (-0.201)	-3.939 (-0.765)	0.615 (0.310)	0.080 (0.052)	-3.917 (-0.928)	1.344 (0.824)
<i>BTM</i>	0.161 (0.714)	0.246 (0.548)	0.144 (0.557)	0.253 (1.224)	0.163 (0.385)	0.310 (1.324)
<i>Size</i>	0.007 (0.178)	-0.032 (-0.323)	0.021 (0.447)	-0.017 (-0.449)	-0.065 (-0.760)	-0.007 (-0.157)
<i>LEV</i>	0.081 (0.376)	-0.451 (-0.980)	0.321 (1.341)	0.133 (0.718)	-0.070 (-0.177)	0.288 (1.353)
<i>ROA</i>	-1.300 (-1.578)	-2.692 (-1.630)	-0.551 (-0.589)	-0.996 (-1.418)	-1.869 (-1.223)	-0.388 (-0.485)
<i>DA</i>	-0.101 (-0.243)	2.157** (2.228)	-0.452 (-0.929)	-0.079 (-0.236)	1.011 (1.142)	-0.228 (-0.588)
<i>Crashrisk</i>	0.047 (1.296)	0.073 (0.873)	0.050 (1.184)	0.045 (1.134)	-0.050 (-0.517)	0.077* (1.737)
Constant	0.025 (0.029)	1.619 (0.796)	-0.723 (-0.705)	0.316 (0.411)	2.159 (1.225)	-0.353 (-0.378)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
<i>Diff. in D_GWI</i>		<i>p</i> -value = 0.049**			<i>p</i> -value = 0.151	
<i>N</i>	800	208	592	800	208	592
<i>R</i> <sup>2</sup>	35.56%	37.16%	38.56%	37.79%	37.12%	41.06%

Panel C Regression results: Relation between goodwill impairment and future stock price crash risk, role of acquirer's earnings management						
	Section A: DV = <i>NCSKEW</i> <sub><i>t</i>+1</sub>			Section B: DV = <i>DUVOL</i> <sub><i>t</i>+1</sub>		
	(1)	(2)	(3)	(4)	(5)	(6)
	Firms meet earnings commitment	<i>D_MeetEC1</i> = 1	<i>D_MeetEC2</i> = 1	Firms meet earnings commitment	<i>D_MeetEC1</i> = 1	<i>D_MeetEC2</i> = 1
<i>D_GWI</i>	-0.131 (-1.395)	-0.347*** (-2.816)	0.135 (1.015)	-0.126 (-1.613)	-0.334*** (-3.276)	0.121 (1.130)
<i>RET</i>	0.135* (1.823)	0.177 (1.371)	0.054 (0.563)	0.115* (1.923)	0.177* (1.804)	0.011 (0.128)
<i>DTURN</i>	-0.015* (-1.798)	-0.023** (-2.175)	-0.005 (-0.358)	-0.005 (-0.783)	-0.009 (-1.065)	0.005 (-0.375)
<i>Sigma</i>	0.902	-1.436	5.298	1.635	-1.458	6.959**

(Continued)

Table 9. (Continued).

	(0.433)	(-0.568)	(1.478)	(0.954)	(-0.734)	(2.354)
<i>BTM</i>	0.248	0.258	0.023	0.397*	0.495	0.108
	(0.952)	(0.676)	(0.061)	(1.844)	(1.544)	(0.357)
<i>Size</i>	0.005	-0.034	0.087	-0.023	-0.085	0.071
	(0.102)	(-0.483)	(1.219)	(-0.557)	(-1.483)	(1.156)
<i>LEV</i>	0.396	0.557*	0.164	0.344*	0.492*	0.105
	(1.623)	(1.714)	(0.431)	(1.652)	(1.888)	(0.323)
<i>ROA</i>	-0.531	-3.753***	1.788	-0.602	-3.211***	1.296
	(-0.535)	(-2.919)	(1.087)	(-0.742)	(-3.134)	(0.983)
<i>DA</i>	-0.429	-0.656	-0.545	-0.085	-0.287	-0.111
	(-0.868)	(-0.952)	(-0.808)	(-0.222)	(-0.582)	(-0.205)
<i>Crashrisk</i>	0.057	0.134**	0.000	0.082*	0.168***	0.002
	(1.291)	(2.335)	(0.005)	(1.816)	(2.788)	(0.036)
Constant	-0.410	0.356	-0.045	0.004	1.385	-0.230
	(-0.382)	(0.234)	(-0.032)	(0.004)	(1.120)	(-0.190)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
<i>Diff. in D_GWI</i>		<i>p</i> -value = 0.047**			<i>p</i> -value = 0.019**	
<i>N</i>	530	290	240	530	290	240
<i>R</i> <sup>2</sup>	37.87%	43.89%	45.69%	39.88%	46.52%	47.96%

This table reports the results for future stock price crash risk based on the restricted sample. Panel A reports the descriptive statistics. Panel B reports the regression results. Panel C includes firms with earnings commitments only and reports the regression results on the sample that meets the earnings commitments. Sections A and B use  $NCSKEW_{t+1}$  and  $DUVOL_{t+1}$  as the dependent variable, respectively. In Panel B, the sample is partitioned based on whether an acquiree meets or misses the performance commitment. In Panel C, the sample is partitioned based on whether an earnings commitment is met through earnings management. All the variables are defined in [Appendices A and B](#). *T*-statistics are clustered at firm level and are reported in parentheses. \*, \*\*, and \*\*\* represents statistical significance at 10%, 5%, and 1% level, respectively.

## 6. Conclusions and implications

This study investigates an important determinant of goodwill impairment, i.e., acquiree's failure to meet the performance commitment. Based on a sample of firms with non-zero beginning balances in goodwill, we document the following. First, an acquiree's failure to meet the commitment increases both the likelihood and amounts of goodwill impairment. The results are robust to alternative measures of failed commitment, alternative sampling, and controls for time to expiry date of the commitment. Second, the commitment-impairment relation is more pronounced in the bear markets and in the case of voluntary adoption of the commitment terms. Third, the likelihood of goodwill impairment in the post-commitment period increases if an acquiree successfully met the commitments, especially if the acquiree met the commitments through earnings management. Last but not least, we find that timely recognition of goodwill impairment for failed commitments leads to favourable informational consequences in terms of reduction of future stock price crash risk.

The evidence in our study has important implications to investors, regulators as well as the listed firms. The realisation of an acquiree's commitment facilitates outside investors to observe whether the firm timely recognises goodwill in appropriate amounts. Investors and regulators thus can judge the earnings management behaviour of the underlying firm, which improves decision-making efficiency by the investors. Finally, our evidence encourages the listed firms to timely write-off goodwill in case of failed commitment so as to avoid future stock price crash risk.

## Acknowledgements

We appreciate the insightful comments and suggestions of two anonymous referees and participants at China Journal of Accounting Studies Conference. All remaining errors and omissions are our own.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This study is funded by the National Natural Science Foundation of China [No. 71772044].

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**Appendix A. Variable definition**

Variable	Definition
Variables on goodwill impairment	
<i>D_GWI</i>	A dummy variable that equals one if the firm recognises goodwill impairment in a particular year, and zero otherwise
<i>GW%</i>	The provision for goodwill impairment in a particular year divided by beginning balance of goodwill
<i>GW_A</i>	The provision for goodwill impairment in a particular year divided by beginning balance of total assets
Variables on realisation of performance commitment	
<i>FailPC</i>	A dummy variable that equals one if the firm has any acquiree that fails to meet the performance commitment in a given year, and zero otherwise.
<i>FailPC_N</i>	Number of acquirees that fail to meet the performance commitment. It equals zero if all the acquirees meet the performance commitment
<i>MeetEC%</i>	The level of realising an earnings commitment, calculated as the realised earnings divided by committed earnings
<i>PC</i>	A dummy variable that equals one if a firm has any acquiree that adopts performance commitment in a given year and zero if none acquiree adopts performance commitment terms
<i>D_MeetEC1</i>	A dummy variable that equals one if the acquiree realises the earnings commitment by less than 10%, and zero otherwise.
<i>D_MeetEC2</i>	A dummy variable that equals one if the acquiree realises the earnings commitment by more than 10%, and zero otherwise
<i>Time</i>	The number of years since the beginning of the commitment period
<i>MeetEC</i>	A dummy variable that equals one if an acquiree successfully meets all the earnings commitments during the commitment period, zero if one or more earnings commitments are missed
<i>Post</i>	A dummy variable that equals one for years in the post-commitment period and zero for years during the commitment period
Control variables: Earnings management incentives	
<i>EM_SEO</i>	A dummy variable equals one if the firm refinance with seasoned equity offering subsequent to the M&A, and zero otherwise
<i>EM_Loss</i>	A dummy variable that equals one if the firm made a loss in year $t-1$ , or makes a small profit with ROE between $[0, 0.01]$ in year $t$ , and zero otherwise
Control variables: M&A characteristics	
<i>Intensity</i>	Number of M&As the firm takes in year $t$
<i>Advisor</i>	A dummy variable that equals one if an independent financial advisor is hired for the M&A, and zero otherwise
<i>BTM</i>	Book to market ratio, calculated as the net book value divided by market value
<i>GW</i>	Book value of goodwill plus goodwill impairment in the current year, deflated by beginning total assets
Control variables: Managerial incentives	
<i>LEV</i>	Leverage, calculated as total liabilities divided by total assets
<i>MShare</i>	Percentage of total management shareholding
<i>Tenure</i>	Number of years for CEO tenure

*(Continued)*

(Continued).

Variable	Definition
<i>Turnover</i>	A dummy variable that equals one if there was a turnover in CEO or chairman in year $t-1$
Control variables: Firm level controls	
<i>Size</i>	Natural logarithm of total assets
<i>Growth</i>	Growth in sales revenue, calculated as the growth in sales revenue divided by beginning balance of sales revenue
<i>ROA</i>	Return on assets, calculated as net income plus goodwill impairment divided by total assets
<i>Big4</i>	A dummy variable that equals one if the firm is audited by one of the Big 4 auditors, and zero otherwise
<i>INST</i>	Percentage of shares held by institutional investors
<i>ANA</i>	Number of analysts following the firm in year $t$
<i>TopShare</i>	Percentage of shares held by the largest shareholder
Variables in additional test	
<i>NCSKEW<sub>t+1</sub></i>	Measure of crash risk, the negative skewness of the adjusted firm-specific weekly returns, see <a href="#">Appendix B</a> for detailed calculation
<i>DUVOL<sub>t+1</sub></i>	Measure of crash risk, calculated as the differences of
<i>RET</i>	Yearly return in year $t$
<i>DTURN</i>	De-trended share turnover, calculated as the difference of the average monthly share turnover in year $t$ and the average monthly share turnover in year $t-1$
<i>Sigma</i>	The standard deviation of the market-adjusted firm-specific weekly returns
<i>DA</i>	Absolute value of discretionary accruals, discretionary accruals are calculated by the modified Jones model

## Appendix B. Calculation of stock price crash risk

Step 1: the following expanded market model (Equation (1)) is estimated

$$R_{is} = \beta_i + \beta_{1i}R_{ms-2} + \beta_{2i}R_{ms-1} + \beta_{3i}R_{ms} + \beta_{4i}R_{ms+1} + \beta_{5i}R_{ms+2}$$

where  $R_{is}$  is the return on stock  $i$  in week  $s$ , and  $R_{ms}$  is the tradable shares value-weighted market index in week  $s$ . Equation (1) is estimated over May to next April. The market adjusted firm-specific weekly return  $W_{is}$  is calculated as the natural log of one plus the residual from Equation (1):  $W_{is} = \ln(1 + \varepsilon_{is})$ .

Step 2: the negative conditional return skewness ( $NSCKEW_{it}$ ), and the down-to-up volatility measure of crash likelihood ( $DUVOL_{it}$ ) are calculated as:

$$NSCKEW_{it} = -\frac{n(n-1)^{3/2} \sum W^3 is}{(n-1)(n-2)(\sum W^2 is)^{3/2}}$$

$$DUVOL_{it} = \ln\left[\frac{(n_u - 1) \sum \text{Down } W^2 is}{(n_d - 1) \sum \text{Up } W^2 is}\right]$$

where  $n$  is the number of trading weeks for firm  $i$ ,  $n_u$  is the number of weeks with  $W_{is}$  being higher than annual return ('up' weeks),  $n_d$  is the number of weeks with  $W_{is}$  being lower than annual return ('down' weeks). Larger values of  $NSCKEW$  and  $DUVOL$  mean higher stock price crash risks.