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Earnings Management and Subsequent Risk Assessments: Evidence from the Property-Casualty Insurance Industry

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Abstract

This paper investigates circumstances under which earnings management influences subsequent risk assessments. We predict and find a positive association. That is, earnings management is positively related to an increase in perceived risk in a subsequent period, although our findings are nuanced. Specifically, we examine the association between earnings management and a decline in and Best's Capital Adequacy Relativity (BCAR) and the regulatory-based Risk-Based Capital (RBC) in subsequent periods. In a sample of property and casualty insurance companies during the period of 2008-2012, we estimate the level of earnings management for each firm in that sample year and use it to predict declines in assessed risk in the following period. We find that subsequent BCAR ratings are statistically sensitive to earnings management, while the more mechanical RBC appears not to be statistically associated. However, in a subsample of firms nearing financial distress, we find that both BCAR and RBC are subsequently statistically associated with earnings management. Although perhaps not intended to be a standalone predictor of insolvency, both measures appear to provide important information to both regulators, investors, customers and other stakeholders. We note limitations, including a relatively brief sample, and mention that the RBC formula has since been revised.

Keywords: Earnings Management, Risk Assessments, Property & Casualty Insurers, Best's Capital Adequacy Relativity (BCAR) ratings, Risk-Based Capital (RBC) ratings

JEL codes: D7, G2, H3, M4

1. Introduction

In this study, we demonstrate that Best's Capital Adequacy Ratio (BCAR) better captures hidden risk in property and casualty insurers' business than the Risk-Based Capital measure (RBC) except

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in cases where firms are nearing financial distress, when both measures appear to be useful. State insurance regulators use BCAR and RBC to monitor the financial health of the insurers that operate in their state. Regulators play an important role in protecting the insurance investments made by state residents. The BCAR and RBC measures are used by insurance regulators to monitor property and casualty (P&C) insurer risk. It is therefore important that regulators understand the relative strengths and weaknesses of these two measures so that they can more efficiently identify and address cases of high insolvency risk among P&C firms.

Research has shown that executives use the claim loss reserve to manage earnings upwards. For example, Eckles and Halek (2010) find that executives who receive bonuses that are likely not capped tend to under-reserve, presumably in an effort to increase their bonus. Eckles, Halek, He, Sommer and Zhang (2011) find that insurers with weaker corporate boards are more likely to manipulate reserves opportunistically. Moreover, Browne, Ma, and Wang (2009) find that stock-based compensation is associated with under-reserving.

Managers of P&C firms have incentives to bias earnings upwards via the claim loss reserve in times of increased insolvency risk. Research has shown that managers sometimes succumb to incentives and may inject bias in reported earnings (Grace, 1990; Perry and Williams, 1994; Rangan, 1998; Healy and Wahlen, 1999; Leuz, Nanda, and Wysocki, 2003). This is especially true in cases where there is a performance threshold that, if crossed, will lead to significant negative consequences for the manager or the firm. For example, Gaver and Paterson (2004) and Beaver, McNichols and Nelson (2003) find that insurers may mask solvency problems by manipulating the claims loss reserve.[2] Other examples of threshold-induced earnings management include cases where the firm is in danger of violating debt covenants (Franz, HassabElnaby, and Lobo, 2014), or having its credit rating downgraded (Liu, Subramanyam, Zhang, and Shi, 2018). In the P&C insurance industry, state regulators play a role similar to that of debt covenants – they are authorized to take regulatory action and/or control of an insurer when insolvency risk gets too high. These interventions are likely to have a significant negative impact on the careers of the executives of a firm. Executives at P&C firms therefore have incentive to use the claim loss reserve to manage earnings up.

Managers at P&C firms have the ability to manage earnings via the claim loss reserve – the reported liability for unpaid claims and unpaid loss adjustment expenses. Eventual claim payouts are highly uncertain, and estimation of the reserve is complex and involves substantial judgement. The uncertainty of eventual payouts makes it difficult for boards, regulators, etc. to catch managers who use the reserve to boost earnings. Moreover, the claim loss reserve is by far the largest liability for most P&C insurers. The addition of a relatively small amount of bias in the change to the reserve for a period can result in a relatively large change in earnings. The combined size and uncertainty associated with the claim loss reserve make it an alluringly low-cost channel for executives who wish to bias earnings to do so.

We use the reserve estimation error measure developed in Petroni (1992) using calendar reserve error as defined by Barth and Eckles (2018) as our primary proxy for earnings management. In their annual statutory statements, insurance firms report actual expenditures for prior periods' claims. Eventually, when claims are settled for a given period, the initial estimate for claims costs

[2] However, Grace and Leverty (2012) demonstrate that these results may be dependent on the definition of the reserve error.

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and actual payouts can be compared to arrive at an estimate for the amount of error contained in the initial claims estimate. Following Petroni (1992), we measure the claims paid with the initial estimate five years prior. We select this time period as a matter of sample constraint, though we recognize that some lines of business require more than five years to fully resolve (Kazenski et al., 1992).[3] The Petroni (1992) measure is the difference between the originally reported claim loss reserve for year t (which was reported in year t) and the revised estimate of the original reserve which is disclosed in the statutory statements for year t+5. Petroni (1992) uses this measure to test her hypothesis that managers of financially weak insurers bias downward their claim loss reserve estimates relative to financially strong insurers. Her results are consistent with this hypothesis. Additionally, she finds that insurers which are close to receiving regulatory attention understate reserves to an even larger degree.

We test the effectiveness of BCAR and RBC in capturing the P&C firm risk hidden by earnings management by regressing BCAR and RBC on the Petroni measure. We find a statistically significant and positive relation between the Petroni measure and contemporary and future BCAR. We find no significant relation between the Petroni measure and RBC. However, among firms nearing distress, we find evidence that both BCAR and RBC are significantly associated with the Petroni measure. Taken together, these results suggest that generally the BCAR measure better incorporates the P&C firm risk that drives managers to bias earnings than the RBC measure, though RBC does seem to respond to earnings management among firms nearing distress.

The remainder of the paper is organized as follows. Section 2 provides background and hypothesis development. Section 3 contains our sample and methodology. Section 4 contains our results and section 5 concludes.

2. Background and Hypothesis Development

2.1 Estimating earnings management

The claim loss reserve is the liability that represents any unpaid claims and unpaid loss adjustment expenses due to events that have already occurred. The reserve consists of the aggregation of the loss estimates for each of the individual cases handled by the P&C firm as well as bulk reserves set aside as part of Incurred But Not Reported (IBNR) claims. Eventual payouts for unsettled claims are somewhat uncertain initially, and these loss estimates therefore require material managerial judgement. Over time, the uncertainty associated with the unsettled claims from events occurring in year t is resolved as these claims are settled in later periods. Property and casualty insurers are required to update and report estimates of what eventual claim losses due to events from year t will be in each of the following five years (through year t+5). The t+5 estimate is a suitable proxy for the actual ex post realized claim loss for year t since most claims for year t have been realized by year t+5. The reserve estimation error is developed in Petroni (1992) and is the difference between the initially reported claim loss reserve (as it was reported in year t) and the realized eventual claim losses (from year t+5).[4]

[3] In untabulated results, we utilize a 2007-2010 sample and compare estimates in year *t* with results in year *t + 7* with qualitatively similar inferences.

[4] We follow the directive from Barth and Eckles (2018) to separate accident years in our estimation error calculations.

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The reserve estimation error is a unique proxy for earnings management because differences between an initial estimate and actual costs can eventually be observed with accuracy. Please note, however, that the claims reserve estimate is an aggregate number, which may be influenced by a number of important factors such as changes in the legal environment, unanticipated claims inflation, and emerging exposures such as asbestos and mold.

The Petroni measure stands in contrast to other methods to estimating earnings management. Most proxies for earnings management are based on an estimate of what earnings or an earnings component would be in the absence of earnings management (see the review by Dechow, Ge, and Schrand, 2010 for a summary of earnings management proxies). Petroni's reserve estimation error measure is, in theory, a much more accurate measure of earnings management. It does not compare the manager's estimate of eventual claim losses to a researcher's estimate of losses. Rather, it compares the manager's estimate of claim losses to actual claim losses for the period. Taken together, we assert that Petroni's measure is a viable, if imperfect, proxy for earnings management.[5]

2.2 Risk-Based Capital (RBC) and Best's Capital Adequacy Ratio (BCAR)

The heavily regulated insurance industry has a number of methods to assess firm risk in order to prevent insolvency. For example, regulators have traditionally used a set of thirteen ratios provided by the Insurance Regulatory Information System (IRIS ratios) to assess risk. However, in the mid-1980s, an increase in insurer insolvencies led to some concern about extant regulations. In response, "(t)he National Association of Insurance Commissioners (NAIC) responded by adopting a 'solvency policing' agenda in 1989" (Cummins, Grace, and Phillips, 1999). The risk-based capital (RBC) system was created as part of that agenda, and it went into effect in 1994.

According to the National Association of Insurance Commissioners, "Risk-Based Capital (RBC) is a method of measuring the minimum amount of capital appropriate for a reporting entity to support it overall business operations in consideration of its size and risk profile," (NAIC, 2019). The RBC ratio is calculated to include at least four types of risk—

Asset Risk—Affiliates: The risk of default for affiliated investments like subsidiaries.

Asset Risk—Other: This category incorporates credit risk, interest rate risk and fluctuations in investment fair values.

Underwriting Risk: the risk associated with errors in estimation of costs and losses associated with coverage that is already written, being currently offered or offered prospectively.

Business Risk: litigation risk, possible expenses related to certain types of insurance coverage and excessive growth.

Firms that fall below an RBC ratio of 200% incur specific penalties. For example, to satisfy regulators, these firms may be required to create a report, add capital, purchase reinsurance, accept restrictions on premiums written, or face a merger with a healthier insurer.

[5] Our argument is not that earnings management is solely a measure to mask insolvency risk. We are agnostic as to the purpose of the earnings management. Rather, our concern is whether readily consumable values such as BCAR and RBC are sensitive to this potential manipulation by managers.

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The NAIC has subsequently stated that RBC is not intended to be used as a standalone proxy for insolvency risk. The NAIC concludes that, "the RBC system operates as a tripwire system that gives regulators clear legal authority to intervene" while "there is still time…to minimize the overall costs of insolvency," (NAIC, 2019). Research suggests that the NAIC's invitation for regulators to consider other inputs may be warranted: Cummins and Phillips (2009) find that RBC is not an effective predictor of insolvency. In contrast, Grace, Harrington, and Klein (1998) report that RBC ratios have successfully predicted insolvency, although relatively few firms have fallen far enough for regulators to intervene prior to subsequent insolvency. Other predictors of insolvency have been examined and, in some cases, compared with RBC, including Solvency II the Swiss Solvency Test (Holzmüller, 2008). Taken together, prior research suggests that regardless of regulators' initial intent, RBC is probably not an effective standalone insolvency predictor. One potential alternative to the RBC ratio, is Best's Capital Adequacy Ratio (BCAR), developed by AM Best. Similar to RBC, the BCAR ratio is designed to be a summary measure. A firm's BCAR has been shown to be a better predictor of financial insolvency than regulatory measures such as RBC (Pottier and Sommer, 2002). "The BCAR considers quantitative risk-factors similar to those reflected in the NAIC's RBC system as well as a component for interest rate risk, a risk dimension that is not included in RBC. The BCAR also goes beyond RBC in considering qualitative criteria, such as reinsurance quality and exposure to catastrophic risk." (Cummins and Doherty, 2002).[6]

2.3 Hypotheses

Prior research has documented that earnings management precedes performance and return declines (Louis, 2004). Consistent with this notion, Petroni, Ryan, and Wahlen (2000) find that among property-casualty insurers, firms with relatively high discretionary accrual loss revisions (their proxy for earnings management) report significantly lower profitability, on average, in the following three years. In addition, they find that firms' earnings management is positively related to return volatility and beta.

Even in the absence of a real change in performance, we anticipate that perceived performance in times of earnings management and perceived risk in later periods are positively related. In support of this assertion, Ames, Hines, and Sankara (2018) find that the addition of a board risk committee, (i.e. a perceived improvement in corporate governance), is positively associated with insurer financial strength ratings even though performance does not immediately improve. Given that after earnings management, actual subsequent performance is likely to decline, we expect that perceived risk will increase.

H1a: Earnings management precedes an increase in assessed risk.

Prior research has also documented that firms that are distressed are more likely to manage earnings. The direction of earnings management for these firms depends on the incentives they face. For example, Jaggi and Lee (2002) find that financially distressed firms manage earnings

[6] In 2018, AM Best updated their BCAR methodology. The new methodology can be summarized as BCAR = (adjusted surplus – net required capital)/adjusted surplus with acceptable values being above zero. Because our proxy for earnings management requires five years of lag time, we use the prior methodology, which can be summarized as BCAR = adjusted surplus/net required capital, with acceptable values above 100.

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upwards if they are able to obtain debt covenant violation waivers and manage earnings downwards if they do not obtain waivers or need to restructure debt.

The same is true for regulatory intervention. For example, Jones (1991) finds that firms manage earnings down when they have an incentive to do so during import relief investigations by the International Trade Commission. Within the property-casualty insurance industry, Petroni (1992) finds that firms "close to receiving regulatory attention" are significantly more likely to manage earnings than are other insurers in the industry. Gaver and Paterson (2004) find that two-thirds of firms near IRIS ratio cutoffs manage their earnings (via the loss reserve accrual), presumably to avoid the regulatory intervention that comes from several IRIS ratio violations. However, not all findings in the literature on the property-casualty insurance industry lead to this conclusion. Beaver, McNichols, and Nelson (2003) find that, although property-casualty insurers near financial distress are more likely to manage earnings, those already financially distressed are no more likely to manage earnings than healthy financial insurers. Regardless of the likelihood of earnings management among financially distressed firms, Gallemore (2018) finds that one form of earnings management (delayed loan loss recognition) among banks during the financial crisis is negatively associated with regulatory intervention. This suggests that regulators, and perhaps by extension risk assessment metrics, may not be appropriately sensitive to earnings management. For example, Barth and Eckles (2015) find that the growth component of RBC is not associated with subsequent reserve errors. However, risk measures, and RBC in particular, are potentially most useful in capturing risk for precisely this group of firms. Taken together, we expect the following:

H1b: Earnings management precedes an increase in assessed risk for financially distressed firms.

3. Sample and methodology

3.1 Sample

We use AM Best BCAR data and financial information for property-casualty (P&C) insurers from the AM Best database. We obtain RBC ratios from the SNL database and our supplemental earnings management estimates from SNL Financial (part of S&P Global Market Intelligence). The sample selection process is reported in Table 1. There were 29,790 P&C insurer year observations from 2008 to 2012 with earnings management data (as proxied by the EM variable defined in table 2). In order to be included in this study, we also require BCAR, and RBC values for each insurer. We exclude 17,046 observations due to missing RBC data, and 350 observations as a result of missing AM Best financial information required for our regression models. We further eliminate 4,636 observations by requiring five years of data for the Petroni measure and and another 6,117 observations due to missing data in the SNL database. The final sample for our initial regressions includes 1,641 firm years. We eliminate another 3 observations in order to test the association in the subsequent period. Finally, in our tests of distressed firms, we eliminate all but the firms in the lowest quintile of BCAR and RBC scores respectively. We use this subsample to measure the association in the most distressed firms in our sample.

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Table 1: Sample Selection Summary

	Total Obs
AM Best dataset (2008 - 2012)	29,790
Less:	
Missing RBC data	-17,046
Other missing AM Best data	-350
Loss of Data due to 5 years of data requirement	-4,636
Loss of Data due to missing SNL data	-6,117
Observations used in regressions	1,641
Further loss of Data due to t+1 regression	-3
Observations used in changes model	1,638
Table 7 only (riskiest 20% of firms)	
Remaining observations with BCAR below 185[7]	168
Remaining observations with RBC below 441	332

Table 2: Variable Definitions

Variable	*Description*
BCAR	BCAR is the Capital adequacy ratio from the AM Best Database.
RBC	RBC is the risk-based capital from the SNL database scaled by admitted assets.
EM	EM (or EMt) is our calculation of a firm's claims loss estimation error in year t. Using a process similar to Petroni (1992), we deduct claims expense five years after the incident year from the claims' loss estimated in the incident year. This difference is scaled by NPW. Thus, positive values indicate conservative reporting; negative values indicate aggressive reporting.
LNTA	Natural log of total admitted assets.
Growth	Equal to the percentage change in NPW from the prior year.
Reinsurance	The ratio of reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed.
Longtail	Equal to 1 – percent of losses incurred in short-tail lines of insurance (the following lines of business are considered 'short tail': Fidelity and Surety, Auto Physical Damage, Special Property, Financial and Mortgage Guaranty, Warrant & Other Including Credit, Accident and Health).
Big4Auditor	Indicator variable equal to 1 if insurer uses a big four auditing firm and 0 otherwise.
Personal-LOB	Net premiums written by personal line of business as a percent of total net premiums written.
Group	Indicator variable equal to 1 if the insurer is part of a publicly traded group.
Northeast	Direct premium written for the Northeast geographic area as a percentage of total direct premiums written.
MidAtlantic	Direct premium written for the MidAtlantic geographic area as a percentage of total direct premiums written.
Southeast	Direct premium written for the Southeast geographic area as a percentage of total direct premiums written.
Midwest	Direct premium written for the Midwest geographic area as a percentage of total direct premiums written.
Southwest	Direct premium written for the Southwest geographic area as a percentage of total direct premiums written.
West	Direct premium written for the West geographic area as a percentage of total direct premiums written.

[7] Observations with BCAR equal to zero are excluded in this model.

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Table 3 – Descriptive Statistics - High Earnings Management compared to Low EM (2008 to 2012) - variables winsorized at 1% levels

Variable	Mean - Higher EM	Mean- Lower EM	Pooled Diff		Median Higher EM	Median Lower EM
n = 707 (934) for High (Low) EM observations. n = 704 (934) for High (Low) t+1 EM observations.						
Assets	125,714	167,586	(41,873)		24,952	28,500
NPW	30,432	39,602	(9,171)	**	8,417	7,851
RBC	0.11	0.10	0.00		0.03	0.03
BCAR	172	196	(24)	**	116	153
RBC t+1	0.11	0.11	(0.00)		0.03	0.03
EM	(0.038)	0.042	(0.080)	***	(0.004)	0.029
Lnta	10.353	10.458	(0.104)		10.125	10.258
Growth	25.518	9.603	15.915	***	5.000	2.000
Reinsurance	0.287	0.238	0.049	***	0.215	0.173
Longtail	0.736	0.818	(0.082)	***	0.890	0.968
Big4Auditor	0.116	0.130	(0.014)		-	-
Personal-LOB	26.839	24.840	2.000		-	-
Group	0.078	0.034	0.044	***	-	-
Northeast	1.569	2.909	(1.340)	**	-	-
MidAtlantic	21.672	22.411	(0.739)		-	-
Southeast	24.317	21.990	2.326		-	-
Midwest	22.184	26.058	(3.874)	**	-	-
Southwest	14.089	11.613	2.476	*	-	-
West	13.092	12.410	0.682		-	-
Public	0.045	0.014	0.031	***	-	-
Mutual	0.257	0.396	(0.139)	***	-	-

Table 3 provides descriptive statistics for our sample, partitioned into two groups on the basis of their level of earnings management. EM, our proxy for earnings management, is negative (-0.038) for the high half of the sample, whereas it is positive (0.042) for the low half of the sample. In considering the interpretation of this variable, EM can be interpreted as a measure of

conservatism—positive values reflect conservative initial reporting, whereas negative values reflect aggressive reporting (or earnings management). This preliminary method of observation suggests that firms reporting higher levels of earnings management are smaller as measured by net premium written (30,432 vs 39,602). The differences is not statistically significant when measured by assets (125,714 vs 167,586). Furthermore, firms reporting in the Higher EM group reported significantly lower BCAR scores (172 vs 196), but similar scaled RBC scores (0.11 vs 0.10). Firms in the Higher EM group also reported significantly superior growth (25.518 vs 9.603). Regression analysis is necessary to draw more specific inferences.

Table 4: BCAR, RBC and EM Correlation Matrix- Levels Model - Accident Years 2008 to 2012

Pearson \ Spearman Correlation Coefficients N = 1641 for most variables

Prob > |r| under H0: Rho=0

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. BCAR $_{t+1}$	1.000	-0.080	0.020	0.357	-0.067	0.011	-0.239	0.097	0.169	0.050
		0.001	0.426	<.0001	0.007	0.665	<.0001	<.0001	<.0001	0.043
2. RBC $_{t+1}$	-0.007	1.000	0.097	-0.857	-0.044	-0.043	-0.067	-0.245	-0.048	-0.171
	0.781		<.0001	<.0001	0.073	0.085	0.007	<.0001	0.054	<.0001
3. EM	0.041	0.033	1.000	-0.014	-0.112	-0.069	0.153	0.010	-0.112	-0.056
	0.099	0.183		0.559	<.0001	0.005	<.0001	0.698	<.0001	0.022
4. Lnta	0.232	-0.195	-0.025	1.000	-0.006	-0.056	0.029	0.331	0.074	0.199
	<.0001	<.0001	0.320		0.815	0.023	0.244	<.0001	0.003	<.0001
5. Growth	-0.036	-0.013	-0.034	-0.069	1.000	-0.017	-0.035	0.026	0.053	0.027
	0.144	0.588	0.166	0.005		0.491	0.152	0.300	0.033	0.272
6. Reinsurance	-0.050	0.054	-0.089	-0.120	0.036	1.000	-0.011	0.008	0.086	0.060
	0.044	0.030	0.000	<.0001	0.143		0.660	0.736	0.001	0.015
7. Longtail	-0.137	-0.064	-0.007	0.144	-0.047	0.036	1.000	-0.137	-0.473	-0.128
	<.0001	0.009	0.782	<.0001	0.057	0.141		<.0001	<.0001	<.0001
8. Big4Auditor	0.067	0.030	0.032	0.384	0.051	0.018	-0.136	1.000	-0.058	0.316
	0.007	0.230	0.200	<.0001	0.039	0.461	<.0001		0.019	<.0001
9. Personal-LOB	0.044	0.034	-0.006	0.004	-0.001	0.033	-0.064	-0.054	1.000	-0.043
	0.074	0.168	0.817	0.885	0.969	0.179	0.009	0.030		0.084
10. Group	0.013	-0.036	-0.003	0.193	0.053	0.067	-0.121	0.316	-0.051	1.000
	0.606	0.140	0.892	<.0001	0.031	0.007	<.0001	<.0001	0.039	

Table 4 reports bivariate correlations with Pearson correlation coefficients above the diagonal and Spearman correlation coefficients reported below the diagonal. In general, associations were consistent with ex ante expectations. However, a few correlations deserve mention. RBC and BCAR are inconsistently correlated (-0.080; -0.007). While RBC is significantly correlated with EM, our proxy for earnings management, in the Pearson specification, but not the Spearman (0.097; 0.033). In contrast, BCAR is significantly associated with EM at the 10% level in the Spearman specification, but not the Pearson (0.041; 0.020). Again, regression analysis appears to be appropriate in order to draw more specific inferences.

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3.2 Methodology

3.2.1 Base Model

We use regression models[8] to evaluate the riskiness of P&C insurers. We use two firm risk measures, Best's Capital Adequacy Ratio (BCAR) and Risk-Based Capital (RBC) as dependent variables for these models. We reference Ho, Lai, & Lee (2013) and Berry-Stölzle and Irlbeck (2018) in the development of our model of the determinants of insurers' risk. We further consult AM Best, which provides insight in their methodology used to assess insurers' financial health (AM Best, 2012). We expect insurers with worse financial health are more likely to be at risk. Based on the above-mentioned models used in prior research, our main firm risk levels models used to test our hypotheses follow:

$$Risk_t = \alpha + \beta 1EM_t + \beta 2Lnta + \beta 3Growth + \beta 4Reinsurance + \beta 5Longtail + \beta 6Big4Auditor + \beta 7Personal\text{-}LOB + \beta 8Group + \beta 9NorthEast + \beta 10MidAtlantic + \beta 11SouthEast + \beta 12MidWest + \beta 13SouthWest + \beta 14West + \varepsilon t \quad (1)$$

$$Risk_{t+1} = \alpha + \beta 1EM_t + \beta 2Lnta + \beta 3Growth + \beta 4Reinsurance + \beta 5Longtail + \beta 6Big4Auditor + \beta 7Personal\text{-}LOB + \beta 8Group + \beta 9NorthEast + \beta 10MidAtlantic + \beta 11SouthEast + \beta 12MidWest + \beta 13SouthWest + \beta 14West + \varepsilon t \quad (2)$$

where: Risk is the firm risk measure. We use 2 proxies for the firm risk measure as follows:

BCAR is the Capital adequacy ratio from the AM Best Database

RBC is the risk-based capital from the SNL database scaled by admitted assets.

The remainder of our variables are defined in Table 2.

3.2.2 Dependent variables

We use the AM Best Capital Adequacy Ratio (BCAR) as our first firm risk measure. The BCAR considers the capital needed to address various risks including investment risk (incorporating fixed income and equity risk), interest-rate risk, credit risk, reserve risk and premium risk (AM Best, 2012). A lower level of BCAR indicates more risk and is associated with lower levels of financial health. For example, a BCAR score of over 100 signifies a securely rated company whereas a ratio exceeding 200 indicates strong balance sheet strength (AM Best, 2012). BCAR is computed by AM Best as follows:

$$BCAR = \text{Adjusted Surplus}^{9} / \text{Net Required Capital (NRC)} \quad (3)$$

We also use the NAIC's Risk-Based Capital scaled by admitted assets as the competing measure of firm risk. The RBC measure considers investment risk (incorporating fixed income and equity risk), credit risk, reserve risk, off balance sheet risk and premium risk. Similar to the BCAR measure, lower levels of RBC signify greater firm risk. We use the RBC ratio reported in the SNL

[8] As our sample is panel data, we use year dummies and cluster standard errors by firm to adjust for fixed effects in the samples (by addressing cross-sectional and time-series dependent standard errors)

[9] Adjustments to surplus include unearned premium reserve, loss reserve equity, fixed income equity, surplus notes, off-balance sheet losses, future dividends and potential losses

database, which is based on the Authorized Control Level standard and scale that value by admitted assets. It is computed as follows:

RBC = (Adjusted Capital / Authorized Control Level Risk Based Capital)/Admitted Assets. (4)

In Table 5 we use the contemporary BCAR and RBC scores (period t) as our dependent variables to provide evidence of the association between earnings management and firm-risk scores. In Tables 6 and 7 we use BCAR and RBC in the following financial year (period t+1) as our dependent variables to investigate whether a different level of firm risk is assessed as a response to earnings management.

3.2.3 Explanatory variables

Our primary explanatory variable is EM, which is our proxy for earnings management as developed by Petroni (1992) and was previously defined. Based on our construction of the variable, positive values for EM indicate conservative estimates for the claim loss reserve. Negative values for EM indicate aggressive reporting of the claim loss reserve and are indicative of income-increasing earnings management. We anticipate that aggressive reporting (negative values of EM) will be associated with lower (worse) risk scores; the reverse follows—we predict that conservative reporting is associated with higher (better) risk scores. Thus, we expect EM to be positively associated with BCAR and RBC.

3.2.4 Control variables

We include a number of control variables based on the prior literature on P&C risk (Ho, Lai, and Lee, 2013; Berry-Stölzle and Irlbeck, 2018). We first add the natural log of total assets (Lnta) as our proxy for size. In addition, we include a proxy to control for growth (Growth), as well as for reinsurance (Reinsurance). We further control for the percentage of business in long-tailed lines (Longtail), for audit quality (Big4Auditor), the percentage of premiums written attributable to a personal line of business (Personal-LOB), whether the insurer is part of a publicly-traded group (Group) and for regional differences in premium written as a percentage of insurer total.

4. Results

In Table 5, we observe the results of the clustered regression of the associated risk measure (BCAR or RBC) in period t on EM in period t. In this specification, the association between EM and BCAR is significant (p-value < .01) and positive. This indicates that firms reporting deficient claim loss reserves for the period (relative to eventual realized payouts) simultaneously experience lower BCAR ratings, ceteris paribus. This is consistent with expectations and is intuitive, given our expectation that BCAR is a relatively comprehensive measure of insolvency risk. Conversely, the RBC measure does not show a statistically significant association between earnings management via deficient reserves and risk assessment (p-value >.10).

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Table 5: Earnings Management and Future Risk Scores (using Peterson Clustered Regression)

$$Risk = \alpha + \beta 1EMt + \beta 2Lnta + \beta 3Growth + \beta 4Reinsurance + \beta 5Longtail + \beta 6Big4Auditor + \beta 7Personal\text{-}LOB + \beta 8Group + \beta 9NorthEast + \beta 10MidAtlantic + \beta 11SouthEast + \beta 12MidWest + \beta 13SouthWest + \beta 14West + \varepsilon t$$

Dependent Variable		Model 1 BCAR		Model 1 RBC	
Variable	Pred	Coef. est.	Pr > |t|	Coef. est.	Pr > |t|
Emt	H1 +	96.48	0.0007	0.08	0.1287
Lnta		40.83	<.0001	-0.09	<.0001
Growth		-0.07	0.1204	0.00	0.3982
Reinsurance		14.78	0.5362	0.11	0.2126
Longtail		-129.96	<.0001	0.03	0.4727
Big4Auditor		-55.60	0.0092	0.29	0.0176
Personal-LOB		0.28	0.0526	0.00	0.1305
Group		-2.71	0.9134	-0.10	0.0418
Northeast		0.32	0.5270	0.00	0.2660
MidAtlantic		-0.40	0.2521	0.00	0.0053
Southeast		-1.08	0.0010	0.00	0.0156
Midwest		-0.35	0.3017	0.00	0.0135
Southwest		-1.02	0.0025	0.00	0.0404
West		-0.25	0.4946	0.00	0.0154
CONSTANT		-83.66	0.0918	0.77	<.0001
n of clusters			1,641		1,641
Adjusted R2		10.81%		10.78%	

See Table 2 for variable definitions.

In Table 6, we test H1a. In this specification, we use the risk assessment in year t+1 and test for an association with EM in the previous period in order to eliminate the possibility of reverse causality. Consistent with expectations, we find that the association between perceived risk as estimated by BCAR and earnings management is positive and significant (p-value < .01). We also find evidence of a significant relation between the RBC measure and earnings management, though at the 10 percent level (p-value <.1). Overall, the results in Table 6 suggest that the BCAR measure incorporates latent insolvency risk embedded in managed earnings. RBC appears to as well, though the effect size may not be as pronounced.

We test H1b in Table 7. Here, we restrict our sample to firms in the riskiest 20% of insurers with a BCAR or RBC ratio respectively.[10] In this specification, BCAR continues to be significantly associated with EM (p-value<.01). However, in contrast to our prior results, RBC becomes significant at the .05 level (p-value < .05). We conjecture that this change in inferences may be due to the way in which these measures are designed. As previously discussed, RBC is calculated

[10] In untabulated results, we test a subsample of the riskiest 5% of firms with qualitatively similar inferences.

mechanically and is designed to allow regulators to intervene during financial distress with enough time to avoid catastrophe. BCAR is intended to be more holistic and incorporate qualitative factors as well. Based on our data, both measures appear to be sensitive to earnings management when firms are near financial distress.

Table 6: Earnings Management and Future Firm Risk Scores (using Peterson Clustered Regression)

$$Risk_{t+1} = \alpha + \beta 1 EMt + \beta 2 Lnta + \beta 3 Growth + \beta 4 Reinsurance + \beta 5 Longtail + \beta 6 Big4Auditor + \beta 7 Personal\text{-}LOB + \beta 8 Group + \beta 9 NorthEast + \beta 10 MidAtlantic + \beta 11 SouthEast + \beta 12 MidWest + \beta 13 SouthWest + \beta 14 West + \varepsilon t$$

		Model 2		Model 2	
Dependent Variable		BCAR t+1		RBC t+1	
Variable	Pred	Coef. est.	Pr > |t|	Coef. est.	Pr > |t|
Emt	H1 +	110.99	0.0009	0.14	0.0962
Lnta		42.25	<.0001	-0.09	<.0001
Growth		-0.04	0.5268	0.00	0.2826
Reinsurance		10.52	0.6571	0.05	0.5792
Longtail		-139.38	<.0001	-0.04	0.6856
Big4Auditor		-49.52	0.0213	0.26	0.0266
Personal-LOB		0.26	0.0750	0.00	0.2801
Group		-39.22	0.0919	-0.09	0.0560
Northeast		0.34	0.5097	0.00	0.2323
MidAtlantic		-0.31	0.3763	0.00	0.0268
Southeast		-1.10	0.0011	0.00	0.0182
Midwest		-0.42	0.2131	0.00	0.0278
Southwest		-0.97	0.0047	0.00	0.0638
West		-0.27	0.4704	0.00	0.0096
CONSTANT		-87.53	0.0875	0.90	<.0001
n of clusters			1,638		1,638
Adjusted R2		11.13%		6.22%	

See Table 2 for variable definitions.

5. Conclusion

We test the impact of earnings management on subsequent risk assessments. In our sample of property and casualty insurers from 2008-2012, we use the measure developed by Petroni (1992), and carefully disambiguated by Barth & Eckles (2018) to proxy for managed earnings. We find that earnings management results in contemporaneous and subsequent declines in the BCAR measure for insolvency risk, but find that this association is not contemporaneously statically significant in the less holistic RBC measure. However, among firms nearing financial distress, both BCAR and RBC appear to be sensitive to earnings management. This suggests that although RBC is not intended to be a standalone predictor of insolvency, it appears to be at least somewhat effective in signaling regulators.

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Table 7: (Using new Controls): Earnings management and future firm risk scores - approaching distress (riskiest 20%) Exclude BCAR=0 in BCAR model

$$Risk_{t+1} = \alpha + \beta 1EMt + \beta 2Lnta + \beta 3Growth + \beta 4Reinsurance + \beta 5Longtail + \beta 6Big4Auditor + \beta 7Personal\text{-}LOB + \beta 8Group + \beta 9NorthEast + \beta 10MidAtlantic + \beta 11SouthEast + \beta 12MidWest + \beta 13SouthWest + \beta 14West + \varepsilon t$$

		Model 2		Model 2	
Dependent Variable		BCAR t+1 <185		RBC t+1 441	
Variable	Pred	Coef. est.	Pr > |t|	Coef. est.	Pr > |t|
Emt	H1 +	295.60	<.0001	0.02	0.0200
Lnta		3.83	0.4524	-0.02	<.0001
Growth		0.00	0.9319	0.00	0.3280
Reinsurance		2.32	0.8814	-0.02	0.0069
Longtail		2.53	0.8564	-0.01	0.5132
Big4Auditor		6.57	0.6191	0.03	<.0001
Personal-LOB		-0.15	0.0737	0.00	0.3259
Group		15.95	0.1597	-0.01	0.2638
Northeast		0.56	0.0520	0.00	0.0190
MidAtlantic		-0.07	0.8128	0.00	0.0044
Southeast		-0.03	0.8967	0.00	0.0198
Midwest		0.03	0.8906	0.00	0.0155
Southwest		0.24	0.3075	0.00	0.2645
West		0.31	0.2409	0.00	0.1667
CONSTANT		115.71	0.0131	0.23	<.0001
n of clusters			168		332
Adjusted R2		33.48%		50.26%	

See Table 2 for variable definitions.

As with all studies, ours has limitations. Among these, due to the nature of our measure of earnings management and availability of data, we are constrained to only a five-year window which includes the 2008 financial crisis. Furthermore, our sample likely suffers from survivorship bias. That is, firms that became insolvent or were assumed within our period were disqualified from our sample due to the inability to measure earnings management.

We contribute to the literature by helping consumers of summary risk measures better appreciate the relative strengths of two broadly available metrics. Users of BCAR may wish to consider its sensitivity to earnings management among a variety of firms, both financially secure firms and firms nearing insolvency and RBC's relative success among distressed firms. Future researchers may compare the sensitivity of the new BCAR measure against the BCAR utilized herein.

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