Portfolio Management and Earnings Management: Evidence from Property and Casualty Insurers

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When underwriting losses occur, Property and Casualty (P&C) managers may exercise discretion on both sides of the balance sheet – rebalancing assets and/or adjusting loss reserves. We investigate whether asset (portfolio) management and loss reserve management are endogenous. P&Cs usually maintain a conservative investment posture. However, we find that when P&Cs have underwriting losses a positive association exists between portfolio management and earnings management. We provide evidence supporting the income smoothing and tax hypotheses for P&C's discretionary loss reserve errors - an area of much debate in the recent literature.

INTRODUCTION

This paper examines the joint determination of earnings management (i.e., discretionary loss reserve errors) and investment portfolio management. We examine loss reserves as they are typically the largest liability balances for Property and Casualty Insurers (P&Cs) and prior research has shown that managers have a wide range of discretion over these liabilities (Grace, 1990; Grace & Leverty, 2012; 2014). We are also interested in managers' efforts to rebalance their companies' investment portfolios, particularly when underwriting losses or gains occur. It seems, therefore, that managers of P&Cs have some discretion over both sides of the balance sheet and, as a result, we are interested in investigating whether asset management and loss reserve management are jointly determined.

Prior studies that examine the effects of operating losses on portfolio management primarily focus on the opportunistic behavior of managers rebalancing their investment portfolios (Hendershott & Koch, 1980; Heaton, 1986; Chen & PonArul, 1991; Cummins & Grace, 1994). Earnings management has also been the focus of many studies. The literature examines the effects of income taxes (e.g., Grace, 1990; Scholes, Wilson, & Wolfson, 1990; Petroni, 1992; Gaver & Paterson, 1999), income smoothing (e.g., Burgstahler & Dichev, 1997; Beatty, Ke, & Petroni, 2002; Beaver, McNichols, & Nelson, 2003), organizational structure (e.g., Mayers & Smith, 1981, 1986; Mayers, Shivdasani, & Smith, 1997,

Cummins, Weiss, & Zi, 1999; He & Sommer, 2010; Mayers & Smith, 2010), product and geographical diversification (e.g., Comment & Jarrell, 1995; Berger & Ofek, 1995; Berger, Cummins, Weiss, & Zi, 2000) on earnings management. However, without considering the two opportunistic behaviors of investment portfolio rebalancing and earnings management that mangers have jointly, the determination of what amounts to optimal investment portfolio management or optimal earnings management is far from apparent. Surprisingly, no empirical research has formally considered what factors jointly determine the relationship between these two measures of opportunistic behavior. By connecting the literature on investment portfolio management with that related to earnings management, this study attempts to fill the gap in existing research.

To conduct our investigation into the relationship between investment portfolio management and earnings management we use a sample of Property and Casualty insurance firms for several important reasons. First, using a homogenous group of firms allows us to reduce variation due to industry-specific factors. Second, the unique reporting requirements of P&Cs allow us to examine both investment portfolio management and earnings management directly. Access to details of changes in investment portfolios is limited in many industries; however, P&Cs are required to make this information publicly available. Finally, P&Cs are subject to regulatory requirements that may provide added incentive to engage in earnings management behaviors (Healy and Whalen, 1999), thus allowing a better opportunity to observe these behaviors. All in all, the P&C industry is an ideal environment in which to test our hypotheses.

This paper is based to a significant degree on the large volume of literature that concludes that P&Cs engage in earnings management by way of manipulating loss reserves (e.g., Petroni, 1992; Gaver & Paterson, 2001; Beaver, McNichols, & Nelson, 2003). More importantly, it examines the association between investment portfolio management and earnings management and how P&Cs approach these strategies when underwriting or investment losses and gains occur. Our study is conducted using a simultaneous equation method. We examine whether P&Cs rebalance their investment portfolios because they manage their loss reserves or whether they manipulate their loss reserves because they rebalance their investment portfolios. To address this endogeneity issue, we use the lagged values of our main independent variable for each regression. We estimate a simultaneous equation regression that includes the investment portfolio management and earnings management measures as the dependent variables and determinants of a P&C decision to rebalance its investment portfolio or a P&C decision to manage its discretionary loss reserve.

Overall, for P&Cs in our sample, we find that earnings management measured by discretionary loss reserve errors is associated with investment portfolio management when operating losses occur. Our main finding is that P&Cs that manage their discretionary loss reserve errors are more likely to rebalance their portfolios towards taxable securities when operating losses occur. This result is consistent with the view that P&Cs conduct investment portfolio management effectively when they are managing their loss reserves and have operating losses. Since we study the joint determination of earnings management and investment portfolio management, we are also able to provide new insight into another important area that is currently being debated in the literature. Specifically, we find evidence in support of prior research that suggests an income smoothing motivation for discretionary loss reserve errors (Grace, 1990; Beaver, McNichols, & Nelson, 2003) as well as a tax incentives (Grace, 1990; Penalva, 1998; Gaver & Paterson, 1999, 2000; Nelson, 2000; Beaver, McNichols, & Nelson, 2003; Grace & Leverty, 2012). Altogether, our findings that P&Cs that manage loss reserves are managing their investment portfolios effectively and positively suggest that managers are acting in the best interests of both shareholders and policyholders.

This analysis adds to the literature that examines the interplay between P&Cs rebalancing their investment portfolios and their choice to manipulate their loss reserves. By using a simultaneous equation method, we are able to address the potential endogeneity between whether P&Cs that manipulate loss reserves may have an incentive to rebalance their investment portfolios, or P&Cs that rebalance their portfolios may have an incentive to manipulate loss reserves. This paper also adds to the literature on the effect of using statutory financial statement information and understanding the joint relationship between the two largest balance sheet items of P&C insurers (investment portfolios and loss reserves) when

operating losses occur. In addition, this paper contributes to the large volume of literature on earnings management and assesses the effects of discretionary loss reserve errors on investment portfolio management.

This paper proceeds as follows. In the next section we discuss related literature and the conceptual basis of our research design. Next, is a description of the data and methodology used to empirically test our hypothesis followed by a section reporting our results. The final section is a conclusion.

LITERATURE REVIEW

Portfolio Management

Portfolio management goals vary by industry. While hedge funds managers may use risky strategies in hopes of obtaining high returns, P&Cs are typically more risk-averse. Due to strict regulatory requirements and an intensely competitive business environment, P&Cs' investment portfolio management strategies are extremely conservative - capital preservation is a common goal. Building on the Black (1980) and Tepper (1981) arbitrage hypothesis, Hendershott and Koch (1980) find that income taxes play a particularly important role in portfolio management decisions of financial institutions. Specifically, they argue that these firms use tax laws to shelter income and thereby maximize profit. Furthermore, the literature suggests that P&Cs with losses[1] should rebalance their tax-free investments towards taxable investments (e.g., Hendershott & Koch, 1980; Heaton, 1986; Chen & PonArul, 1991; Cummins & Grace, 1994). However, since managers have discretion over how to reallocate their investment portfolios, it is an empirical question as to whether P&Cs that manage their earnings (i.e., loss reserves) keep their conservative investment strategies intact when managing their portfolios.

Earnings Management

In this study, we use the Healy and Whalen (1999) definition of earnings management. Specifically, earnings management occurs when managers utilize discretion when creating financial reports with the purpose of misleading stakeholders or influencing processes that are reliant upon the financial reports. One benefit of using the P&C industry to conduct our study is that it provides an interesting way to measure earnings management – discretionary loss reserve errors. Studies have shown that loan loss provisions and operating gains and losses are used to manage earnings and income taxes and to reduce regulatory costs (e.g., Scholes, Wilson, & Wolfson, 1990; Warfield & Linsmeier, 1992; Beatty, Chamberlain, & Magliolo, 1995; Collins, Shackelford, & Wahlen, 1995; Ahmed, Takeda, & Thomas, 1999; Beatty, Ke, & Petroni, 2002; Cornett, McNutt, & Tehranian, 2009; Adams, Carow, & Perry, 2009; Song & Linsmeier, 2004).

Based upon prior studies on the subject (e.g., Petroni, 1992; Petroni & Beasley, 1996; Beavers & McNichols, 1998; Penalva, 1998; Gaver & Paterson, 1999, 2000, 2004, 2007; Petroni, Ryan, & Wahlen, 2000; Nelson, 2000; Beaver, McNichols, & Nelson, 2003; Grace & Leverty, 2010, 2012), we need information provided in Schedule P: Part2 & Part3 of the NAIC statements to calculate the discretionary loss reserve errors:

$$DLRE_{i,t} = (DRI_{i,t+j} - LRI_{i,t})/ASSETS_{i,t} \quad (1)$$

where, $LRI_{i,t}$ is the total losses reserve incurred for insurer *i* and reported in financial year *t*, and $DRI_{i,t+j}$ is the developed reserve of total losses incurred for insurer *i* reported in financial years *t* and *j* (e.g., *j=0,1,2,3,4*). Similar to Beaver, McNichols, and Nelson (2003), Gaver and Paterson (1999; 2004; 2007), and Grace and Leverty (2010; 2012), we scale $DLRE_{i,t+j}$ by total admitted assets in year t. As in Beaver, McNichols, and Nelson (2003), we calculate $DLRE_{i,t}$ for a five year loss reserve window period (e.g., *j=0,1,2,3,4*). $DLRE_{i,t}$ is the developed reserve of total losses incurred subtracted from total loss reserve incurred scaled by total admitted assets. If $DLRE_{i,t}$ is initially negative, then the P&C over-reserved the discretionary loss reserve errors, and vice versa.

Consider the illustration in Appendix A which shows select Schedule P data for Allstate Insurance Company in 2011. As disclosed in Schedule P – Part 2 for the year 2011, Allstate Insurance Company estimated that $13,214,861,000 of losses occurred in 2006. This estimate of 2006 losses was revised downward to $13,094,492,000 by 2011. Schedule P – Part 3, cash payments to policyholders for losses incurred in each accident year, shows that payments of $8,213,041,000 for 2006 losses were made by the end of 2006. By the end of 2011, additional payments of $4,673,254,000 ($12,886,295,000-$8,213,041,000) were made for the 2006 losses.

The loss reserve nets total estimated losses against cumulative cash payments for current and previous loss years. Thus, the loss reserves value reported in 2006 Allstate Insurance Company balance sheet is the sum of all loss estimates in column 5 (2006) of Schedule P – Part 2, less the sum of all cash payments in the corresponding column of Schedule P – Part 3. The amount is $13,147,165,000 ($76,555,796,000-$63,408,631,000). Even though cash payments ($63,408,631,000) are a matter of record, loss expenses are subject to managerial discretion. At the end of 2006, estimated losses for all years up to and including 2006 totaled $76,555,796,000. By the end of 2011, the estimate for the same loss period had been increased to $77,189,784,000. The difference between the revised estimate of cumulative losses ($77,189,784,000) and the cumulative cash payment ($63,408,631,000) is known as the "developed reserve." Thus, the 2011 developed reserve for 2006 (and earlier) losses is $13,781,153,000 ($77,189,784,000-$63,408,631,000).

Similar to Gaver and Paterson (2004), we use a 5-year development reserve period to determine the discretionary loss reserve error. For each P&C, we subtract the loss reserve incurred from the developed reserve. We then divide the results by the net admitted assets to control for variation in insurers size.[2] For Allstate, the 5-year developed reserve for 2006 is $13,781,153,000, and the 2006 loss reserve incurred is $13,147,165,000. This produces a positive loss reserve error in the amount of $633,988,000. Here, the P&C under-reserved by approximately $0.634 billion. In general, a positive number indicates under-reserving, while a negative number indicates over-reserving.

HYPOTHESIS DEVELOPMENT

Previous research in the banking industry has shown that loan loss provisions are used to manage earnings and income taxes and to reduce regulatory costs (e.g., Scholes, Wilson, & Wolfson, 1990; Warfield & Linsmeier, 1992; Beatty, Chamberlain, & Magliolo, 1995; Collins, Shackelford, & Wahlen, 1995; Ahmed, Takeda, & Thomas, 1999; Beatty, Ke, & Petroni, 2002; Song & Linsmeier, 2004). Managers of financial institutions also have discretion in the management of their investment portfolios. To the best of our knowledge, research has not been completed that evaluates a relationship between the discretionary actions on the left (investment portfolio) and right (loan loss provision) sides of the balance sheet. This study endeavors to address this gap in the literature using the P&C industry as it provides us with a unique homogenous setting. Thus, the hypothesis presented here is that P&Cs that manage their loss reserves are more likely to rebalance their investment portfolio. The following hypothesis, stated in alternative form, will be tested:

H1: P&Cs that engage in earnings management by managing their loss reserve will more likely rebalance their investment portfolio effectively.

The second hypothesis relates to P&Cs that manage their loss reserves and how they manage their investment portfolios. As indicated earlier, due to management's discretion over how they can manipulate their loss reserves and rebalance their investment portfolios can alter their optimal portfolio allocation. There is no existing research that addresses whether there is an association between P&Cs that manage their loss reserves with rebalancing of their investment portfolios. Therefore, the issue of whether P&Cs rebalance their investment portfolios when manipulating their loss reserves will be examined. The second hypothesis, stated in alternative form, is:

H2: P&Cs that rebalance their investment portfolio towards taxable securities will be less likely to engage in earnings management by managing their loss reserve.

METHODOLOGY AND DATA

Methodology

The hypotheses introduced in the previous section suggest that investment portfolio management and earnings management are jointly determined. This is consistent with what is observed in practice. Managers have discretion over both the content of their firm's investment portfolio as well as the amount of the loss reserve and they are not exogenously given but endogenously determined. Thus, estimating the equations of investment portfolio management and earnings management is not the proper way to test predictions. The parameter estimates will be biased as regressors are endogenously determined along the dependent variable. Hence, we adopt a simultaneous equation approach.

To investigate the endogenous relationship between a P&C's investment portfolio rebalancing choices or portfolio management and its earnings management (of loss reserves) we estimate a simultaneous equation model. In equation (2), the portfolio management variable is regressed on exogenous control variables and an independent variable (e.g., discretionary loss reserve errors). We estimate the following model:

$$\Delta y_{i,t} = \beta' Z_{i,t-1} + \Delta\theta' X_{i,t} + \Gamma_i + \Lambda_t + \varepsilon_{i,t} \quad (2)$$

where, i indexes the P&Cs and t indexes the financial year, $y_{i,t}$ is the measure of portfolio management or discretionary loss reserve errors, $Z_{i,t-1}$ is a vector of the independent variables of interest, $\Delta X_{i,t}$ is a vector of control variables, Γ_i is P&C fixed effect, Λ_t is year fixed effect. The standard errors are adjusted for P&C clustering. The variables used in equation (2) are consistent with those used in prior research. We include additional exogenous variables (in the vector X): *Regulatory Flexibility*, *Tax Shield, Growth*, *Net Assets, Reinsurance, Short-Tail, Liability, Auto, Worker's Compensation, HHState, HHLine, Mutual Insurer, Public Insurer, Group,* and *Risk Based Capital (RBC)*.

Our next model follows:

$$\Delta \dot{y}_{i,t} = \lambda' L_{i,t-1} + \Delta\delta' W_{i,t} + \phi_i + \psi_t + \mu_{i,t} \quad (3)$$

where, i indexes the P&Cs and t indexes the financial year as above, $\Delta \dot{y}_{i,t}$ is the measure of loss reserve errors, $L_{i,t-1}$ is a vector of the independent variables of interest, $W_{i,t}$ is a vector of control variables, ϕ_i is P&C fixed effect, ψ_t is year fixed effect. The standard errors are adjusted for P&Cs clustering. We include the variables *Smoothing, Tax Shield, Growth, Net Assets, Reinsurance, Short-Tail, Liability, Auto, Worker's Compensation, HHState, HHLine, Mutual Insurer, Public Insurer, and Group* (Grace, 1990; Petroni,1992; Beaver, McNichols, & Nelson, 2003; Gaver & Paterson, 2004).[3]

Data

We obtain data from the NAIC (National Association of Insurance Commissioners) annual statement database, which is prepared using SAP. The NAIC database contains information that allows for the construction of the variables that measures the main variables of interest as well as other control variables. Our sample covers all types of P&C insurers that report total admitted assets (i.e., taxable and non-taxable investments), direct premiums written, and losses incurred. We make use of data spanning a period from 1996 to 2012 to create a sample for a period from 1997 to 2007. When calculating loss reserve errors, our estimates rely on the five year developed loss reserve incurred. (See Appendix A.) We use data extending out to 2012 to calculate 2007 loss reserve errors. Similar to Brandt, Ma, and Pope (2013), we incorporate data as early as 1996 in creating our 1997 lagged smoothing variable (*Smoothing*). Our final sample consists of 2,430 unique P&Cs that provides 20,111 insurer-year observations.

Table 1 reports the summary statistics of the variables used in our simultaneous equations. The first dependent variable, *Portfolio Management,* is the change in the ratio of earned taxable investment income to total earned income from year t-1 to year t. On average, in our sample, 0.14 percent of P&Cs rebalance

away from taxable investments. The second dependent variable, *DLRE,* is the revised (future) estimate of the loss reserve reduced by the loss reserve (current) in year t minus t-1. To control for difference in P&Cs' size in Model (2) above, the discretionary loss reserve errors (*DLRE*) are scaled by total admitted assets (Petroni, 1992; Gaver & Paterson, 2001, 2004, 2007). Overall, the difference of the discretionary loss reserve errors accounts for an average of negative 0.44 percent of our sample, indicating that insurers under-reserve. Turning to the independent variables, *Underwriting Income* is a continuous variable that indicates whether the P&C had underwriting gains or losses from the prior year. *Underwriting Losses* is a lagged dichotomous variable with a value of one for an insurer that has underwriting losses. Forty-eight point eight percent of our sample includes firms that suffered underwriting losses.

TABLE 1
DESCRIPTIVE STATISTICS

				Percentiles					
Variables	Mean	Std.	Min	10th	25th	50th	75th	90th	Max
ΔPortfolio Management	-0.001	0.057	-0.238	-0.050	-0.009	0.000	0.008	0.043	0.230
ΔDLRE	-0.004	0.124	-0.990	-0.080	-0.023	0.000	0.017	0.064	0.998
Underwriting Income	-0.004	0.061	-0.231	-0.069	-0.027	0.000	0.022	0.061	0.182
Underwriting Losses	0.488	0.500	0.000	0.000	0.000	0.000	1.000	1.000	1.000
Smoothing	0.028	0.067	-0.099	-0.014	0.008	0.027	0.045	0.070	0.164
Tax Shield	0.028	0.067	-1.970	-0.022	0.008	0.028	0.050	0.078	1.636
Regulatory Flexibility	0.651	0.270	0.000	0.231	0.538	0.653	0.881	0.999	1.000
RBC	292	1062	0.062	0.944	5.597	26.289	114	507	8413
Growth	0.291	1.256	-0.955	-0.216	-0.038	0.067	0.221	0.592	9.987
Reinsurance	0.445	0.352	0.000	0.008	0.123	0.376	0.770	1.000	1.000
Short Tail	0.296	0.309	0.000	0.000	0.044	0.214	0.375	0.999	1.000
Liability	0.247	0.333	0.000	0.000	0.000	0.078	0.363	0.984	1.000
Auto	0.184	0.244	0.000	0.000	0.000	0.051	0.302	0.588	0.997
Workers Compensation	0.097	0.237	0.000	0.000	0.000	0.000	0.054	0.278	1.000
Herfindahl (State)	0.547	0.399	0.000	0.053	0.127	0.512	1.000	1.000	1.000
Herfindahl (Line)	0.431	0.347	0.000	0.000	0.146	0.354	0.698	1.000	1.000
Mutual Insurer	0.180	0.384	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Public Insurer	0.360	0.480	0.000	0.000	0.000	0.000	1.000	1.000	1.000
Group	0.738	0.440	0.000	0.000	0.000	1.000	1.000	1.000	1.000
Net Assets ($M)	452	1419	1.22	5.65	14.06	53.02	221	895	1060
Underwriting Income ($M)	.686	37	-207	-8.286	-1.052	0.000	1.426	10.829	190
Loss Reserves ($M)	6.08	117	-440	-22.02	-3.12	-.018	0.86	17.96	891

The table presents summary statistics for years 1997-2007, respectively. There are 20,111 insurer-year observations. ***Portfolio Management*** is the difference of earned taxable investment income deflated by the sum of earned taxable investment income plus earned tax-free investment in year t minus earned taxable investment income deflated by the sum of earned taxable investment income plus earned tax-free investment in year t-1. ***DLRE*** is the revised (future) estimate subtracted by the loss reserve (current) in year t minus t-1 scaled by total admitted assets. ***Underwriting Income*** is the lagged underwriting gains or losses scaled by net admitted assets. ***Underwriting Losses*** is a lagged dichotomous variable with a value of one for insurer that has underwriting losses. ***Smoothing*** is measured with the average return on assets over previous three years (Grace, 1990; Grace & Leverty, 2012). ***Tax Shield*** is the sum of net income and the estimated reserves (5 years prior to resolution) over net admitted assets (Grace, 1990; Grace & Leverty, 2012). ***Regulatory Flexibility*** is the percent of investment classes subject to the regulatory investment limitations per state, per year (Alford, Luchtenberg, & Reddic, 2016). ***RBC*** is risk-adjusted capital ratio is the total adjusted capital divided by the authorized control level. ***Growth*** is the one-year percent increase in net premium. ***Net Assets*** is defined as net admitted assets. ***Reinsurance*** is the proportion of gross premium written ceded to reinsurers. ***Short Tail*** is the proportion of net premium written in typical short-tail lines of business. ***Liability*** is the proportion of net premium written in liability lines of product liability, other liability, and medical malpractice. ***Auto*** is the proportion of net premium written in private and commercial auto liabilities. ***Workers Compensation*** is the proportion of net premium written in workers' compensation. ***Herfindahl (Line)*** is the insurers' business line

Herfindahl index. ***Herfindahl (State)*** is the geographical Herfindahl index. ***Mutual Insurer*** is a dichotomous variable with a value of one for insurer that has a mutual structure, zero otherwise. ***Public Insurer*** is a dichotomous variable with a value of one if the insurers' is publicly traded and listed on an exchange or OTC, it is zero otherwise. ***Group*** is a dichotomous variable with a value of one for insurer that belongs to a group of insurers, zero otherwise.

Since there are other important variables that affect P&Cs' management of both investment portfolios and loss reserves, we consider control variables that have been used in prior studies. As determinants of investment portfolio management, discretionary loss reserve errors, operating income, and other portfolio management components are included in a regression. Among several variables of investment portfolio management characteristics, we employ regulatory investment environment, tax shield, and RBC. *Regulatory Flexibility* is the percent of investment classes subject to the regulatory investment limitations per state, per year (Alford, Luchtenberg, & Reddic, 2016). The tax variable (*Tax Shield*) is similar to that used in other studies (e.g., Grace, 1990; Grace & Leverty, 2012). *Tax Shield* is the sum of net income and the estimated loss reserves (five years prior to resolution) over net admitted assets. Tax management strategies play an important role in P&Cs' investment portfolio and earnings management (Cummins & Grace, 1994; Leland, 1999). We also include RBC as one of the regressors for investment portfolio management. *RBC* (RBC ratio) is calculated as the Total Adjusted Capital divided by Authorized Control Level Risk-Based.[4] Within the RBC calculation, investment and other asset risks are included as these metrics are significant to regulators (NAIC, 2009). As an important determinant of discretionary loss reserve errors, we use investment portfolio management, operating income, and other earnings management components. The variables *Smoothing* and *Tax Shield* have been widely used as factors of discretionary loss reserve errors (Grace, 1990; Grace & Leverty, 2012). *Smoothing* is measured with the average return on assets over the previous three years.

RESULTS

Correlation among Portfolio Management, DLRE, and Control Variables

In Table 2, we report the correlation coefficients between investment portfolio management, discretionary loss reserve errors, and the related control variables. First, we examine the contemporaneous relation between *Portfolio Management* and the earnings management variable, *DLRE,* and find that the Spearman correlation is positive and significant. Furthermore, as predicted in H1, *Portfolio Management* and *lagDLRE* are positive and significantly correlated with each other. These results suggest that P&Cs that manage earnings in a prior year (e.g., through loss reserves) are more likely to rebalance their investment portfolios toward taxable securities. However, as observed for H2, *lagPortfolio Management* and *DLRE* are negative and significantly correlated with each other, suggesting that P&Cs that rebalanced their investment portfolios towards taxable securities in the prior year are more likely to under-reserve their loss reserves. These conflicting results warrant further investigation in a multivariate setting.

TABLE 2
CORRELATION MATRIX: PORTFOLIO MANAGEMENT, DLRE, UNDERWRITING LOSSES

(1) Portfolio Management		*0.016***	*-0.157****	*0.035****	*-0.087****	*0.071****	*-0.026****	*0.031****	*0.016***	*0.026****	*-0.032****	*0.000*	*0.022****	*-0.002*	*-0.007*	*-0.004*	*0.010*	*0.021****	*-0.011*	*0.011*	*0.010*	*-0.002*
(2) DLRE	-0.009		*-0.024****	*-0.252****	*0.032****	*-0.018****	*-0.102****	*0.045****	*0.037****	*0.039****	*-0.082****	*0.045****	*0.036****	*-0.015***	*-0.012**	*0.000*	*-0.023***	*-0.028****	*-0.098****	*0.017***	*0.003*	*0.005*
(3) LagPortfolio Management	-0.184***	-0.014**		*0.010*	*-0.115****	*0.110****	*0.046****	*0.015***	*0.023****	*-0.015****	*-0.001*	*-0.005*	*-0.012**	*-0.022****	*0.032****	*0.000*	*0.026****	*0.021****	*-0.004*	*0.016***	*-0.144****	*-0.187****
(4) LagDLRE	0.029***	-0.285***	-0.010		*-0.172****	*0.134****	*-0.064****	*0.038****	*-0.088****	*0.022****	*0.019****	*-0.002*	*-0.037****	*0.040****	*0.011*	*0.014***	*0.022****	*0.041****	*0.076****	*-0.069****	*0.102****	*0.133****
(5) LagUnderwriting Income	-0.064***	0.028***	-0.085***	-0.093***		*-0.866****	*-0.072****	*-0.064****	*-0.287****	*-0.017***	*0.103****	*-0.025****	*-0.005*	*-0.004*	*0.005*	*0.016***	*-0.038****	*-0.036****	*0.032****	*-0.035***	*0.068****	*-0.006*
(6) LagUnderwriting Losses	0.058***	-0.012*	0.093***	0.088***	-0.658***		*0.061****	*0.042****	*0.209****	*0.016***	*-0.072****	*0.028****	*0.005*	*0.014***	*-0.011*	*-0.008*	*0.035****	*0.031****	*-0.018****	*0.043****	*-0.054****	*-0.021****
(7) Smoothing	-0.010	-0.038***	0.034***	-0.060***	-0.098***	0.057***		*-0.085****	*0.231****	*-0.065****	*0.089****	*-0.029****	*-0.044****	*0.009*	*-0.000*	*-0.011*	*0.026****	*0.039****	*-0.015***	*-0.009*	*-0.001*	*-0.011**
(8) Regulatory Flexiblity	0.041***	0.040***	0.007	0.012*	-0.040***	0.054***	-0.095***		*-0.056****	*0.043****	*-0.041****	*0.021****	*0.023****	*0.008*	*-0.007*	*0.012**	*0.008*	*-0.005*	*-0.017***	*-0.018****	*0.016***	*0.014***
(9) Tax Shield	0.016**	0.049***	0.015**	-0.064***	-0.354***	0.194***	0.194***	-0.061***		*-0.097****	*0.023****	*0.011*	*-0.026****	*0.005*	*-0.008*	*0.002*	*0.023****	*0.022****	*-0.129****	*-0.001*	*-0.008*	*-0.006*
(10) Growth	0.015**	0.007	-0.018***	0.015**	0.036***	-0.034***	-0.029***	-0.010	-0.081***		*0.045****	*-0.290****	*-0.032****	*-0.005*	*-0.027****	*-0.017***	*-0.001*	*-0.034****	*0.072****	*0.028****	*-0.001*	*0.009*
(11) Net Assets	-0.036***	-0.047***	0.028***	0.033***	0.004	-0.010	0.021***	-0.027***	-0.024***	0.025***		*-0.082****	*-0.052****	*0.023****	*0.017***	*0.020****	*-0.059****	*0.005*	*0.405****	*-0.023****	*-0.014***	*-0.033****
(12) Reinsurance	-0.002	0.034***	-0.003	-0.024***	-0.026***	0.030***	-0.009	0.011	0.050***	-0.177***	-0.092***		*0.030****	*0.010*	*0.020****	*0.027****	*-0.023****	*-0.018***	*-0.067****	*0.002*	*-0.011*	*-0.002*
(13) Short Tail	0.010	0.003	-0.006	-0.008	0.003	-0.007	0.002	0.021***	-0.001	-0.042***	-0.019***	0.014**		*-0.258****	*-0.157****	*-0.181****	*0.002*	*-0.191****	*-0.019****	*-0.060****	*0.036****	*0.003****
(14) Liability	0.003	-0.005	-0.000	0.017**	-0.005	-0.008	-0.003	-0.019***	0.002	0.06	0.017**	-0.010	-0.366***		*-0.175****	*-0.031****	*-0.023****	*-0.043****	*0.015***	*0.029****	*0.016***	*0.021****
(15) Auto	-0.015**	-0.007	0.011	0.004	-0.005	0.010	-0.012*	-0.002	-0.000	-0.007	0.032***	0.023***	-0.236***	-0.177***		*-0.143****	*-0.009*	*0.119****	*0.022****	*-0.020****	*-0.008*	*-0.046****
(16) Worker's Compensation	0.006	0.007	-0.003	0.016**	0.012*	-0.001	0.000	0.022***	-0.003	0.002	0.019***	0.024***	-0.159***	-0.171***	-0.163***		*-0.004*	*0.024***	*0.006*	*0.010*	*0.000*	*-0.014***
(17) Herfindahl (State)	-0.003	-0.011	0.011	0.011	-0.019***	0.025***	0.007	0.019***	-0.021***	0.024***	0.057***	0.006	0.009	-0.011	-0.011	0.004		*0.058****	*-0.055****	*0.014***	*0.004*	*-0.004*
(18) Herfindahl (Line)	0.008	-0.005	0.014*	0.007	-0.025***	0.029***	0.009	0.008	0.010	-0.014**	0.072***	-0.025***	-0.067***	-0.015**	-0.015**	0.026***	0.266***		*0.009*	*-0.001*	*0.004*	*-0.023****
(19) RBC	-0.026**	-0.045***	0.036***	0.039***	0.007	0.015**	-0.023***	0.002	-0.085***	0.033***	0.448***	-0.090***	-0.006	0.001	0.023***	0.002	0.119***	0.141***		*-0.023****	*-0.012**	*-0.009*
(20) Mutual Insurer	0.008	0.013*	0.010	-0.037***	-0.035***	0.043***	0.001	-0.009	0.002	0.039***	-0.058***	0.006	-0.015**	0.009	-0.015**	-0.005	-0.011	-0.015**	-0.061***		*-0.334****	*-0.278****
(21) Public Insurer	0.002	-0.010	-0.101***	0.062***	0.077***	-0.054***	-0.018***	0.006	-0.016**	-0.005	0.015**	-0.005	-0.008	0.003	0.005	0.05	0.000	0.004	0.007	-0.334***		*0.384****
(22) Group	-0.002	-0.002	-0.098***	0.074***	-0.002	-0.021***	-0.016**	0.011	-0.011	0.005	-0.010	0.019***	0.013**	0.012*	-0.011	-0.009	0.003	-0.008	0.006	-0.278***	0.381***	

This table presents correlations for the years 2000-2007. Pearson correlations are in the lower triangle (unitalicized) and Spearman correlations are in the upper triangle (italicized). All variables are defined in Table 1. *, **, and *** indicate significance at the 0.10, 0.05, 0.01 percent levels, respectively.

Multivariate Results for Portfolio Management, DLRE, and Control Variables

To test Hypothesis 1a (H1), we examine P&Cs managing their discretionary loss reserve errors in the year prior to the rebalancing of their investment portfolios. Our main results are found in Models (1), (3), and (5) of Table 3. For Model (1), we observe that P&Cs that manage their loss reserves are more likely to rebalance their investment portfolios. We see in Models (3) and (5) that P&Cs rebalance toward taxable securities whether an underwriting loss or gain occurs in the prior year. These results suggest P&Cs will manage their investment portfolios when engaging in earnings management regardless of whether underwriting gains or losses occur. In contrast to our results for H1, our H2 results are less robust. In Model (2) we find a negative relationship between *lagPortfolioManagement* and *DLRE.* However, this result is marginally significant for firms with underwriting losses Model (4) and insignificant for firms with underwriting gains Model (6). Although less significant than our primary results, these results may reflect the complex endogenous relationship between earnings management and investment portfolio management.

We also find some interesting results in the estimation of coefficients for the control variables. We find that *Regulatory Flexibility* is positively related to *Portfolio Management* for all observations Model (1) and for firms reporting underwriting losses Model (3) and is significant at the 1 percent level. A similar result is found in firms with underwriting gains Model (6) but it is marginally significant. The use of loss reserves to smooth income has found mixed support in the literature. Beaver, McNichols, and Nelson (2003) find that P&Cs use loss reserves to smooth income, while Grace and Leverty (2012) find little support for income smoothing. We find a negative relationship between *Smoothing* and *DLRE* in Model (2), a result that supports the findings of Beaver, McNichols, and Nelson (2003). Since the negative relationship is present in observations with both underwriting losses Model (4) and underwriting gains Model (6) it seems that the smoothing is not dependent on underwriting losses. The effect of income taxes on discretionary loss reserve errors is another area that has received mixed support in the literature. We find that *TaxShield* is positively related to earnings management, which lends support to other studies that argue that a tax incentive for loss reserve management exists (Grace, 1990; Penalva, 1998; Gaver & Paterson, 1999, 2000; Nelson, 2000; Beaver, McNichols, & Nelson, 2003; Grace & Leverty, 2012).

TABLE 3
RESULTS OF ESTIMATION FOR THE SIMULTANEOUS EQUATIONS

	ΔPortfolio Management		ΔDLRE		ΔPortfolio Management Underwriting Losses		ΔDLRE Underwriting Losses		ΔPortfolio Management Underwriting Gains		ΔDLRE Underwriting Gains	
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Intercept	-.004	.001***	.008	.003**	.000	.001	.009	.006	-.003	.002*	.003	.004
LagPortfolio Management			-.006	.003**			-.010	.006*			-.002	.003
LagDLRE	.009	.003***			.007	.003**			.012	.004***		
LagUnderwriting Losses	.006	.001***	-.005	.002***								
ΔRegulatory Flexibility	.011	.001***			.014	.003***			.006	.003*		
ΔSmoothing			-.283	.053***			-.289	.075***			-.273	.073***
ΔTax Shield	.014	.010	.143	.023***	.025	.011**	.137	.031***	-.006	.016	.145	.037***
ΔGrowth	.001	.000**	.002	.001*	.001	.000**	.001	.001	.001	.001	.003	.002*
ΔNet Assets	-.006	.002**	-.017	.004***	-.006	.002**	-.071	.006***	-.005	.003*	-.009	.005*
ΔReinsurance	-.004	.005	.042	.013***	.002	.006	.029	.017*	-.013	.008	.061	.021***
ΔShort Tail	.028	.013**	-.004	.035	.046	.016***	-.003	.052	.002	.020	-.002	.041
ΔLiability	-.025	.014*	-.026	.039	.049	.019***	.023	.054	-.018	.022	-.106	.051**
ΔAuto	-.009	.016	-.032	.049	-.007	.020	-.072	.067	-.010	.028	.049	.063
ΔWorker's Compensation	.031	.024	.044	.074	.057	.030*	.093	.099	-.023	.041	-.053	.105
ΔHerfindahl (State)	-.004	.005	-.004	.009	-.004	.005	-.010	.013	-.005	.007	.003	.013
ΔHerfindahl (Line)	.008	.005	-.002	.013	.003	.007*	.019	.018	.003	.008	-.020	.018
Mutual Insurer	.001	.001	.003	.002	.003	.001**	.001	.003	-.002	.002	.004	.003
Public Insurer	.001	.001	-.002	.002	-.001	.001	-.002	.003	.003	.001*	-.002	.003
Group	-.000	.001	-.000	.002	.001	.001	-.001	.003	-.002	.001	.001	.003
ΔRBC	-.001	.000	-.002	.001**	-.001	.001	-.002	.001*	-.000	.001	-.002	.001
P&C Indicators?	Yes		Yes		Yes		Yes		Yes		Yes	
Year Indicators?	Yes		Yes		Yes		Yes		Yes		Yes	
Obs.	20111		20111		10014		10014		10097		10097	

All variables are defined in Table 1. P&C and Year indicators are included in the model but not reported to conserve space. *, **, and *** indicate significance at the 0.10, 0.05, 0.01 percent levels, respectively.

Our final analysis, reported in Table 4, shows the results of whether the relationship between investment portfolio management and earnings management changes with the nature of the earnings management. The literature suggests that there may be differences in the behavior of P&Cs when earnings management is motivated by income taxes. Many studies find that firms with higher effective tax rates have a greater incentive to over-reserve – report higher amounts in their loss reserves (Grace, 1990; Penalva, 1998; Gaver & Paterson, 1999, 2000; Nelson, 2000; Beaver, McNichols, & Nelson, 2003; Grace & Leverty, 2012). Accordingly, we report separate models for firm-year observations where discretionary loss reserve errors are positive, indicating that firms over-reserved (see Models (1) and (2)), as well as firm-year observations where discretionary loss reserve errors are negative, signifying that the firms under-reserved (see Models (3) and (4)). As presented in Table 3, we estimate the models using simultaneous equations. Consistent with our previous results, we find a positive relationship between *PortfolioManagement* and *lagDLRE.* However we find that this result is only marginally significant in Model (1), where firms over-reserve, but highly significant at the one percent level in Model (3) for firms

that under-reserve. These results may be driven by the desire to satisfy regulatory requirements. Once again, for models that have earnings management, or *DLRE,* as the dependent variable, we find a marginal or insignificant relationship between earnings management and lagged portfolio management.

The results for control variables reinforce our findings from Table 3. *Regulatory Flexibility* is positively related to *Portfolio Management* for firms that over-reserve and under-reserve in Models (1) and (3), respectively. Once again, *Smoothing* is negatively related to discretionary loss reserve errors, for both under-reserving firms Model (2) and over- reserving firms Model (4). The coefficient of *Tax Shield* is positive and significant in both Model (2) and Model (4). Earlier studies associate income tax-motivated earnings management with P&Cs that over-reserve (Grace, 1990; Penalva, 1998, Gaver & Paterson, 1999, 2000; Nelson, 2000; Beaver, McNichols, & Nelson, 2003; Grace & Leverty, 2012). However Grace and Leverty (2012) also find that the results are dependent on model specification. Taken together, these results suggest that income smoothing and income taxes are incentives for P&Cs to engage in earnings management by both over- and/or under- estimating loss reserves.

TABLE 4
RESULTS OF ESTIMATION FOR THE SIMULTANEOUS EQUATIONS

	ΔPortfolio Management Over-Reserve		ΔDLRE Over-Reserve		ΔPortfolio Management Under-Reserve		ΔDLRE Under-Reserve	
Variable	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Intercept	-.001	.001	.012	.004***	-.002	.002	-.018	.006***
LagPortfolio Management			-.001	.004			-.006	.004*
LagDLRE	.007	.004*			.012	.005***		
LagUnderwriting	-.060	.009***	.041	.021	-.057	.013***	.038	.037
ΔRegulatory Flexibility	.011	.003***			.009	.003***		
ΔSmoothing			-.202	.064***			-.472	.088***
ΔTax Shield	-.013	.012	.125	.030***	.019	.016	.129	.043***
ΔGrowth	.001	.001	.002	.001	.001	.001*	.002	.002
ΔNet Assets	-.007	.002***	.011	.004**	-.003	.003	-.054	.009***
ΔReinsurance	-.012	.007*	.049	.017***	.008	.007	.023	.020
ΔShort Tail	.047	.017***	.004	.039	.000	.020	-.008	.066
ΔLiability	.052	.019***	.028	.060	-.008	.021	-.058	.066
ΔAuto	-.020	.021	.096	.096	-.002	.024	-.089	.079
ΔWorker's Compensation	.036	.033	-.013	.010	.030	.034	.028	.113
ΔHerfindahl (State)	-.005	.005	-.013	.010	.001	.006	-.008	.020
ΔHerfindahl (Line)	.006	.007	.001	.015	.010	.008	-.001	.025
Mutual Insurer	.001	.001	.000	.002	-.000	.002	.006	.004
Public Insurer	.001	.001	-.000	.002	.001	.002	-.001	.004
Group	-.001	.001	-.001	.002	-.000	.002	.007	.004*
ΔRBC	-.001	.001	-.003	.001***	-.001	.001	-.003	.003
P&C Indicators?	Yes		Yes		Yes		Yes	
Year Indicators?	Yes		Yes		Yes		Yes	
Obs.	13280		13280		6831		6831	

All variables are defined in Table 1. P&C and Year indicators are included in the model but not reported to conserve space. *, **, and *** indicate significance at the 0.10, 0.05, 0.01 percent levels, respectively.

CONCLUSION

The objective of our study is to investigate the joint determination of investment portfolio management and earnings management. Previous research finds that both investment portfolio management and earnings management can be affected by opportunistic behaviors. However, the relationship between these two areas has been previously unexplored. To the best of our knowledge, ours is the first paper to examine these two important management activities together; thus, we fill an important gap in the literature.

Using a large sample of P&Cs, we measure investment portfolio management by observing tax-motivated portfolio rebalancing and measure earnings management by discretionary loss reserve errors. In recognition of the endogenous nature of investment portfolio management and earnings management decisions, we employ a simultaneous equation methodology. Our central finding is that there is a positive relationship between investment portfolio management and earnings management when P&Cs have underwriting losses. In other words, P&Cs with underwriting losses are able to effectively manage their loss reserves and conduct investment portfolio management effectively.

By modeling the endogeneity that exists between investment portfolio management and earnings management, we are able to provide a more complete understanding of the interplay between the two financial statement management techniques. In addition to being the first to study these discretionary management activities together, we contribute to the literature by finding support for both an income smoothing motivation (Grace, 1990; Beaver, McNichols, & Nelson, 2003) and a tax motivation (Grace, 1990; Penalva, 1998; Gaver & Paterson, 1999, 2000; Nelson, 2000; Beaver, McNichols, & Nelson, 2003; Grace & Leverty, 2012) for discretionary loss reserve management. Our findings provide strong evidence that investment portfolio management and earnings management are interrelated. Our results also suggest that P&Cs are acting in the best interests of both policyholders and shareholders when they manage their loss reserves.

ENDNOTES

1. P&Cs derive their income from two sources: underwriting and investing. Income from underwriting can be volatile and has historically generated negative income (Fairley, 1979). To truly see how the losses change the asset mix in the following year, only underwriting gains and losses are observed in this study.
2. Prior studies use multiple scaling proxies. For example, Grace (1990) uses net premium earned, Gaver and Paterson (2004; 2007) uses developed reserve, and Petroni (1992) and Beaver, McNichols, and Nelson (2003) use net admitted assets. Our results are qualitatively similar to prior studies.
3. Including all exogenous variables from the simultaneous model (2) and model (3) is a common econometric practice as long as they are all valid instruments.
4. There are five distinctive outcomes to the RBC calculation. For more information about the general overview of RBC see http://www.naic.org/cipr_topics/topic_risk_based_capital.htm or a critique see Feldblum (1996).
   a. "No Action" – If an insurer's RBC ratio is greater than 200 percent
   b. "Company Action Level" – If an insurers' RBC ratio is between 150 to 200 percent
   c. "Regulatory Action Level" – If an insurers' RBC ratio is between 100 to 150 percent
   d. "Authorized Control Level" – If an insurers' RBC ratio is between 70 to 100 percent
   e. "Mandatory Control Level" – If an insurers' RBC ratio is less than 70 percent

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APPENDIX A

Example of loss reserve data from the 2011 Statutory Annual Statement of the Allstate Insurance Company (NAIC 19232).

Annual Statement for the Year 2011 of the Allstate Insurance Company

NAIC Property and Casualty Annual Statement: Schedule P Part 2 - Summary

Incurred Net Losses and Defense and Cost Containment Expenses Reported at Year End ($000 Ommitted)

Yrs. In Which Losses Were Incurred	1	2	3	4	5	6	7	8	9	10
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1. Prior	7,013,450	7,639,414	8,013,552	8,256,293	8,324,393	8,485,609	8,595,706	8,874,086	9,175,476	9,345,538
2. 2002	13,641,857	13,499,599	13,329,105	13,276,962	13,262,002	13,269,069	13,273,030	13,278,325	13,269,506	13,279,980
3. 2003	XXX	12,523,155	13,080,280	12,894,498	12,828,066	12,817,908	12,802,360	12,805,400	12,783,451	12,802,442
4. 2004	XXX	XXX	13,199,732	12,776,860	12,528,060	12,742,160	12,473,568	12,497,020	12,489,335	12,483,509
5. 2005	XXX	XXX	XXX	16,993,357	16,398,414	16,098,860	16,206,303	16,215,839	16,190,270	16,183,823
6. 2006	XXX	XXX	XXX	XXX	13,214,861	13,274,092	13,215,321	13,184,977	13,104,097	13,094,492
7. 2007	XXX	XXX	XXX	XXX	XXX	14,033,899	14,064,175	13,908,744	13,823,226	13,818,519
8. 2008	XXX	XXX	XXX	XXX	XXX	XXX	15,691,173	15,488,971	15,482,323	15,474,599
9. 2009	XXX	XXX	XXX	XXX	XXX	XXX	XXX	14,949,344	14,901,125	14,742,864
10. 2010	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	15,178,721	14,915,338
11. 2011	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	16,235,011
					=76,555,796					=77,189,784

Annual Statement for the Year 2011 of the Allstate Insurance Company

NAIC Property and Casualty Annual Statement: Schedule P Part 3 - Summary

Cumulative Paid Net Losses and Defense and Cost Containment Expenses Reported at Year End ($000 Ommitted)

Yrs. In Which Losses Were Incurred	1	2	3	4	5	6	7	8	9	10
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1. Prior	0	2,534,012	4,017,056	4,992,700	5,513,803	5,909,752	6,270,233	6,507,475	6,739,713	7,013,311
2. 2002	8,306,746	11,027,292	11,989,661	12,550,771	12,870,662	13,039,270	13,130,080	13,183,306	13,212,506	13,237,973
3. 2003	XXX	8,040,984	10,652,731	11,564,391	12,107,845	12,426,230	12,591,247	12,671,526	12,713,270	12,735,678
4. 2004	XXX	XXX	7,722,449	10,308,811	11,206,575	11,769,628	12,103,298	12,280,723	12,365,565	12,401,684
5. 2005	XXX	XXX	XXX	9,736,934	13,496,705	14,673,681	15,396,315	15,756,314	15,290,421	15,981,987
6. 2006	XXX	XXX	XXX	XXX	8,213,041	10,879,160	11,830,267	12,406,558	12,726,320	12,886,295
7. 2007	XXX	XXX	XXX	XXX	XXX	8,706,215	11,569,308	12,484,334	13,078,161	13,388,679
8. 2008	XXX	XXX	XXX	XXX	XXX	XXX	9,953,455	13,132,825	14,099,086	14,681,995
9. 2009	XXX	XXX	XXX	XXX	XXX	XXX	XXX	9,418,510	12,358,723	13,257,958
10. 2010	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	9,451,032	12,254,494
11. 2011	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	10,603,166
					=63,408,631					

Loss Reserve Incurred

$LRI_{i,t}$

(76,555,796 – 63,408,631)

=$13,147,165

Developed Loss Reserves Incurred

$DLRI_{i,t+j}$

(77,189,784 – 63,408,631)

=$13,781,153

Discretionary Loss Reserve Error

$DLRE_{i,t}$ = (13,781,153 – 13,147,165)

= $633,988