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A QUANTITATIVE STUDY OF THE EFFECT OF THE INSURANCE UNDERWRITING CYCLE ON UNITED STATES INSURANCE COMPANY IMPAIRMENT

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Abstract:-

The underwriting cycle in the property and casualty insurance industry is a well-known phenomenon; this research paper attempts to quantify the correlation of softening or hardening markets in the United States and insurance companies' subsequent impairments. Through statistical analysis, the research consists of a multi-decade, multivariate regression analysis investigating the historical levels of insurance company impairment (dependent variable) during a number of insurance cycle soft markets (independent variable). It was found that following soft markets there were significant relationships to the annual number of property and casualty insurance carrier impairments for the entire universe of companies during a recent period.

INTRODUCTION

The impairment or failure of insurance companies undermines the risk mitigation confidence needed to assume risk for economic growth, stability, future planning, and, if the company becomes insolvent, costs on average three to five times higher than insolvencies of other types of financial institutions (Global Facility for Disaster Reduction and Recovery, 2014; Grace, Klein & Phillips, 2003; Leadbetter & Dibra, 2008). The insurance underwriting cycle (particularly due to periods of "soft" markets, i.e. underpricing) frequently cited as one of the primary causes for insurance company impairment (Bruneau & Sghaier, 2015; Cheng & Weiss, 2012; Deleris & Paté-Cornell, 2012; Feldblum, 2007; Jiang & Nieh, 2012; Li & Nielson, 2015; Malinovskii, 2014).

Cheng and Weiss (2012), Li and Neilson (2015), and Ruml and Tippins (2016), among others, attempted to determine predictors for future insolvency of insurance companies in the United States, one of the most prominent of which was the financially corrosive effects of the property and casualty (P&C) insurance company's underwriting cycle. This paper conducts a multi-decade, systematic investigation to determine if there are quantified correlations between insurance company underwriting cycle and insurance company impairment in the United States. Inadequate pricing/deficient loss reserves are internationally found in scholarly literature to be the largest cause of insolvency (A.M. Best, 2004; Chen & Wong, 2004; Leadbetter & Dibra, 2008; McDonnell, 2002), because inadequate pricing of P&C insurance (Aon Benfield, 2013; Deleris, 2006; Leadbetter & Dibra, 2008; Nissim, 2010).

The key points and purpose of this study were to attempt to fill a gap of knowledge to determine if there exists a clear connection between the insurance company underwriting cycle and subsequent insurance/reinsurance company impairment, as postulated in a number of studies (Bruneau & Sghaier, 2015; Cheng & Weiss, 2012; Deleris & Paté-Cornell, 2012; Feldblum, 2007; Jiang & Nieh, 2012; Li & Nielson, 2015; Malinovskii, 2014). If impairments in the wake of soft markets/underpricing are highly correlated, this implies soft markets caused by insurance underwriters in not using adequate pricing for premium calculations (Aon Benfield, 2013; Leadbetter & Dibra, 2008; Nissim, 2010). This would mean that deficient loss reserves and inadequate pricing would be caused by soft markets are a large part of the primary internal cause of insurance company failure.

Literature Review

Although there are no specific insurance company theoretical models regarding firm survival (Leadbetter & Dibra, 2008), literature on this subject is extensive and consists of two basic theoretical frameworks. The two frameworks used in considering company survival and exit are the Dynamic Equilibrium Model (Jovanovic, 1982; Hopenhayn, 1992) and the Firm Survival Model (Carroll, Bigelow, Seidel & Tsai, 1996; Dunne, Roberts & Samuelson, 1988; Klepper & Simons, 2000; Mitchell, 1991), which are in many ways complementary to one another. The Dynamic Equilibrium could be described as exogenous and the Firm Survival Model could be described as endogenous for forensic/diagnostic purposes (Bruneau & Sghaier, 2015), and thus can be used to predict future company impairment (for, respectively, environmental [Dynamic Equilibrium] and firm attributes [Firm Survival]). Current research exists that attempts to deduce any connection between soft markets (which can derive from environmental factors [such as competitors underpricing new or existing business, such as Malinovskii, 2013, Stephon & Mann (2015) point out that, "the insurance cycle is driven to a large extent by macroeconomic factors"], or firm attributes [such as inexperience due to being new to writing/pricing homeowners insurance in hurricane-prone Florida, such as Born & Klimaszewski-Blettner, 2013]) and subsequent insurance/reinsurance company impairment. This paper is focused on Dynamic Equilibrium related material, specifically industry-wide soft underwriting cycles, relating to insurance company impairment.

Insurance company insolvency and impairment has a number of exogenous and endogenous factors that have been statistically examined to determine their relationship to the overall rate of insurer insolvencies among individual P&C insurance companies (Browne & Hoyt, 1995; Bruneau & Sghaier, 2015; Chen & Wong, 2004; Cheng & Weiss, 2012; Dang, 2014; Le Courtois and Randrianarivony, 2013; Leadbetter & Dibra, 2008; Li & Nielson, 2015; McDonnell, 2002; Rauch and Wende, 2015; Ruml & Tippins, 2016; Sharma, 2002). These studies contained a large number of different causes for insurance company insolvency/impairment that have been calculated, with inadequate pricing/deficient loss reserves are found, generally, to be the largest cause of insolvency, but usually without multi-decade analysis. For P&C insurance company impairments in the United States of America specifically, there have been a number of studies taking a multiple year approach (A.M. Best, 2012, 2013; Cheng & Weiss, 2012; Cummins & Weiss, 2014; Deleris, 2006; Deleris and Paté-Cornell, 2012; Modu, 2005; The Financial Soundness/Risk Management Committee of the American Academy of Actuaries, 2010; PatéCornell & Deleris, 2009; Thomann, 2013), often with findings that soft markets are correlated with increases in the numbers of insurance company impairments or insolvencies.

Cummins and Weiss (2014) using data from the rating firm A.M. Best Company showed the primary triggering events for insolvencies in the United States during the period 1969-2011, by cause by percentage, reproduced in Table 1. Soft markets are one of the causes of underpricing, or understating loss reserves (Cheng & Weiss, 2012; Li& Nielson, 2015; Malinovskii, 2013; Ruml & Tippins, 2016). Inadequate pricing/deficient loss reserves can be found on the Property-Casualty column, where, at 41.9%, they are shown as the most frequent cause of insolvency for P&C insurance companies in the United States during the period. Bruneau and Sghaier (2015) used a high (i.e. over 100%) combined ratio as an indicator for a soft market. Malinovskii (2013), working from a reflexivity perspective, ties together underwriting cycles' soft periods with inadequate pricing/deficient loss reserves.

Insurer Insolvencies: Primary Triggering Events		
Life Insurers (1969-2011) and Property-Casualty Insurers (1969-2011)		
	Life-Health	Property-Casualty
Inadequate pricing/Deficient loss reserves	29.1%	41.9%
Affiliate problems	18.1%	8.3%
Invest problems (overstated assets)	15.0%	7.0%
Rapid growth	14.1%	13.1%
Alleged fraud	8.8%	7.5%
Miscellaneous	8.1%	8.3%
Catastrophe Losses	N/A	7.1%
Significant business change	4.5%	3.6%
Reinsurance failure	2.1%	3.2%
Average number of failures per year	16.9	25.8
Note: Data are only on companies where the cause of impairment was identified		

Table 1

The next logical step in attempting to obtain a better understanding of a soft market's effects upon insurance company impairment/insolvency in the United States, would be to attempt to determine correlations between soft markets and impairments over a period of time. There are clear indications in the literature that additional research needs to be conducted in order to bridge the existing gap in knowledge in this particular area.

Research Method

In an effort to fill a gap of knowledge regarding current research with multi-decade analysis of P&C underwriting cycles and subsequent insurance/reinsurance company impairment, as postulated in a number of studies, the current research study was proposed to determine if there is any quantitative basis to the industry belief that soft markets lead to insurance carrier impairment or insolvency.

Using a data base of the 5,097 U.S.-domiciled insurance companies that had a Best's FSR between January 1, 1978 and December 31, 2012, coefficients were calculated using the best-fit line method, and multiple regression analyses were run by year, in an effort to determine the correlation between the position of the year in the underwriting cycle (specifically, the position of the year in the underwriting cycle; "soft" years in the underwriting cycle are often held in the literature to lead to future insurance carrier impairment [Cheng & Weiss, 2012; Paté-Cornell & Deleris, 2009])., and insurance company impairments during the same calendar year of the event and the subsequent two years. Both real and actual (i.e. inflated) amounts were calculated for the data. The F statistic and the P-value were also made for the independent variable. If impairments in or shortly after soft markets are highly correlated, this implies underpricing by insurance underwriters creates an environment in which there are a higher percentage of insurance company impairments (Aon Benfield, 2013; Bruneau & Sghaier, 2015; Cheng & Weiss, 2012; Deleris, 2006; Deleris & Paté-Cornell, 2012; Feldblum, 2007; Jiang & Nieh, 2012; Li & Nielson, 2015; Malinovskii, 2014).

Underwriting Cycle. The position for the insurance underwriting cycle during the majority of the calendar year in the United States stock market (the independent variable). Data came from Weisbart (2013) (as used by the NAIC), and was checked against similar underwriting cycle data from ISO (Insurance Services Office, 2015). This data is ordinal in nature and is in this study represented annually in a simple form as one of three numeric, pricing-related codes based on what part of the insurance underwriting cycle each given calendar year was historically: 1 for a soft market year, 2 for an average market year, and 3 for a hard market year. The underwriting cycle is tracked by the NAIC and reported by the Insurance Information Institute (III), as well as in various scholarly studies (Dang, 2014; Paté-Cornell & Deleris, 2009; Ren, Sun, Sun & Yu, 2011; Ruml 2016; Shuford, 2014; Wang, Major, Pan & Leong, 2011; Weisbart 2013).

The archival data (i.e. pre-existing "data that were collected or created for some other purpose" [Price, 2012]) used in this research is regularly collected and analyzed for purposes of solvency projections (A.M. Best data), loss/pricing reporting to regulators (Aon Benfield Impact Forecasting, Munich Reinsurance Company, and Swiss Re data), actuarial underwriting and claims analysis (Aon Benfield Impact Forecasting, Insurance Information Institute, Munich Reinsurance Company and Swiss Re data). Widely used in the insurance industry and by government regulators, these sources of information are extensively used, and their validity and reliability is generally considered high within the insurance industry. However, further discussion of these areas of validity and reliability as they relate to this present study is continued below in the section on limitations.

Findings

Research Question

The study's research question explores the relationships between the dependent variable, future, near-term (< 36 months) insurance company impairment (the annual number of P&C insurance company impairments in the United States), and an independent variable: the insurance underwriting cycle in the United States.

Q1: What is the relationship between the position of a year in the historic underwriting cycle in the United States and subsequent insurance company impairments?

Hypothesis

$H1_0$. Insurance company impairments are statistically equivalent (i.e. no significant variance) in the year of, or in the two calendar years subsequent to, a year of an insurance market soft market (see definition below in Definition of Key Terms under "Underwriting Cycle") (or occurring in the year or two previous for the subsequent calendar year).

$H1_a$. Insurance company impairments are statistically different (i.e. show significant variance) in the year of, or in the two calendar years subsequent to, a year of an insurance market soft market (or occurring in the year or two previous for the subsequent calendar year).

Results

Using a data set for the dependent variable (property and casualty insurance company impairment by year for the United States) (collected from A.M. Best, 2014a and A.M. Best, 2015), and a data set for the independent variable (yearly positions in the underwriting cycle) (derived from and defined for The National Association of Insurance Commissioners in Weisbart, 2013, and supplemented by /compared to Insurance Services Office, 2015), correlations were run. These data can, respectively, be found in Appendix A: Property and Casualty Insurance Company Impairment by Year for the United States 1978-2012, and in Appendix B: Annual Underwriting Cycle Position United States 1978-2012.

Descriptive data analysis.

Measure of central tendency: annual.

The relationship between the position of a year in the historic underwriting cycle in the United States and subsequent insurance company impairments. Next, the relationship between the property and casualty insurance company impairment by year for the United States and yearly positions in the insurance industry property and casualty underwriting cycle was considered. Again, using the best-fit line method to calculate the regression coefficients, one finds that: b_0 (the y-intercept) equals 17.00817439 and b_1 (cycle position) equals 6.604904632 (positive, thus implying that the harder the market that year, the more impairments that year). In this regression, b_1 indicates that each increase of one annual underwriting cycle position (from 1 indicating a soft year to 3 indicating a hard year, visualized in Figure 2), is estimated to increase the number of impairments by 6.61. Table 3 shows the regression statistics and analysis of variance for annual impairments and annual position in the underwriting cycle.

Figure 1 Visualization of Insurance Underwriting Cycle through Time. An average year of property and casualty insurance market pricing in the United States is indicated by a 2, a year considered a soft market pricing year is indicated by a 1, and a year considered a hard market pricing year is indicated by a 3 (years are given numbers on the basis of what the majority of months of that year were considered, price-wise). Adapted from "P/C underwriting cycles" by S. N. Weisbart, 2013, and "Percent change from prior year, net premiums written, p/c insurance, 1975-2014" by Insurance Services Office, 2015.

Table 2 Annual Impairments to Annual Underwriting Cycle Position, Property and Casualty Insurance Companies in the United States, 1978-2012

Regression Statistics	
Multiple R	0.32396899
R Square	0.104955906
Adjusted R Square	0.077833358
Standard Error	15.37596433
Observations	35

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	914.8736473	914.8736473	3.869691935	0.057619486
Residual	33	7801.86921	236.4202791		
Total	34	8716.742857			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	17.00817439	6.667052516	2.551078508	0.015560247	3.443954054	30.57239472
Cycle Position	6.604904632	3.357595352	1.967153257	0.057619486	-0.226174475	13.43598374

Measure of central tendency: rolling three years.

Since this study proposes to research diachronic change to impairments in the aftermath of soft insurance markets, regression analyses were also conducted for rolling, three calendar year periods (i.e. in the year of, and the two calendar years subsequent to, rolling forward) so that the possible latent aftereffects of a soft market would appear in the combined next three years of impairments. In this section, findings from this procedure are outlined. Mechanically, this was done by making a sum total of each (current) calendar year plus the subsequent two calendar years of United States property and casualty insurance company impairments, and comparison was made to the (current calendar year) annual United States property and casualty insured losses from the current calendar year position in the United States property and casualty insurance underwriting cycle. Because the dataset of impaired property and casualty insurance companies in the United States obtained by the researcher ended in 2013, the calculation of the rolling, three calendar year periods (i.e. in the year of, and the two calendar years subsequent to, rolling forward) could only be conducted from 1978 to 2011 (i.e. since the 2012 year would have required the number of impairments in 2012, 2013, and 2014, the 2012 year is not considered in the following analysis of rolling, three calendar year periods because no data was available for the 2014 to preforms this calculation) (A.M. Best, 2014a and A.M. Best, 2015).

The relationship between the position of a year in the historic underwriting cycle in the United States and subsequent insurance company impairments. The relationship between the rolling, three calendar year periods of numbers of United States property and casualty insurance company impairments, and yearly positions in the insurance industry property and casualty underwriting cycle, were next considered. Again, using the best-fit line method to calculate the regression coefficients, one finds that: b_0 (the y-intercept) equals 73.91853933 and b_1 (cycle position) equals 7.851123596 (positive, thus implying that the harder the market that year, the more impairments that year). In this regression, b_1 indicates that each increase of one annual underwriting cycle position (from 1 indicating a soft year to 3 indicating a hard year, visualized in

Figure 2, above), is estimated to increase the number of impairments by 7.85. Table 6 shows the regression statistics and analysis of variance for rolling, three-year impairments, and annual position in the underwriting cycle.

Table 3 Rolling Three-Year Impairments to Annual Underwriting Cycle Position, Property and Casualty Insurance Companies in the United States, 1978-2011

Regression Statistics	
Multiple R	0.149095137
R Square	0.02222936
Adjusted R Square	-0.008325973
Standard Error	42.1223295
Observations	34

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1290.817085	1290.817085	0.727511634	0.400030336
Residual	32	56777.30056	1774.290643		
Total	33	58068.11765			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	73.91853933	18.27362816	4.045093765	0.000308501	36.69637682	111.1407018
Cycle Position	7.851123596	9.204746718	0.852942926	0.400030336	-10.89833191	26.6005791

Measure of dispersion.
Annual. Calculating for the coefficient of determination (r^2) for annual number of United States property and casualty insurance company impairments to the independent variable, the results were as follows (using Microsoft Office Excel 2013 Data Analysis tool): The r^2 for annual number of United States property and casualty insurance company impairments to the annual position in the United States property and casualty insurance underwriting cycle equals 0.104955906 (Table 3). In other words, 10.5% of the variation in annual property and casualty insurance company impairments in this (total) population of companies can be explained by variation in annual United States property and casualty insured losses from annual position in the United States property and casualty insurance underwriting cycle.
Rolling, three-year. Calculating for the coefficient of determination (r^2) for rolling, threeyear number of United States property and casualty insurance company impairments to the independent variable, the results were as follows (using Microsoft Office Excel 2013 Data Analysis tool): The r^2 for rolling, three-year number of United States property and casualty insurance company impairments to the annual position in the United States property and casualty insurance underwriting cycle equals 0.02222936 (Table 3).

Interpretation of descriptive data analysis. Whether considered annually or in rolling, three-year periods, the relationship between United States property and casualty insurance company impairment and the independent variable (annual position in the United States property and casualty insurance underwriting cycle), there does not appear to be a clear best-fit line. The variable's r^2 is below 0.11, which implies that under 11% of the variation in either annual or rolling, three-year number of property and casualty insurance company impairments in this (total) population of companies can be explained by variation in the independent variable.

Counterintuitively, the number of annual or rolling, three-year number of impairments increases as markets harden, on average.

Whether considered annually or in rolling, three-year periods, the relationship between United States P&C insurance company impairment and annual position in the United States property and casualty insurance underwriting cycle, there does not appears to be a clear best-fit line. For the variable, the r^2 is at or well below of 0.05, which implies that under 5% of the variation in either annual or rolling, three-year number of P&C insurance company impairments in this (total) population of companies can be explained by variation in the independent variable. Counterintuitively, the number of annual or rolling, three-year number of impairments increases as markets harden, and slightly decrease in the aftermath of catastrophes, on average.

Statistical test to answer the hypothesis: multiple regression analysis. Using annual numbers, and then rolling, three-year numbers for the dependent variable, with the independent variable, statistical analysis was performed to determine if the null hypotheses are rejected, i.e. was there a significant relationship in existence between company impairments and the independent variable at the 0.05 level of significance? Multiple regression tests were conducted for analysis, as well as the analysis of the variables for the F statistic and P-value to determine if the null hypotheses should be rejected.
Annual impairments. For annual impairments to annual underwriting cycle position (Table 2), the t-statistic returned is 1.967153257 which is less than 2.032 (critical value at 34 degrees of freedom), and the P-value returned is 0.057619486, slightly above the value of 0.05 necessary to reject the null hypothesis at a 0.05 level of significance, thus the null hypotheses at 5% level of significance is not rejected. However, at a 0.10 level of significance, the null hypothesis would have been rejected. Thus, findings from this data found no evidence of a significant linear relationship between annual number of impairments and the independent variable at a 5% level of significance, but did find evidence of a linear relationship at a 10% level of significance. The test statistic F from the analysis of variance of the independent variable, with the dependent variable on a same-year basis (Table 2), it returned a value of 0.060430013. Underwriting cycle position loss is somewhat below 1.0, indicating that the means differ less than one would expect if all the population means were equal.

Rolling, three-year impairments. For rolling, three-year impairments to annual underwriting cycle position (Table 3), the t-statistic returned is 0.852942926 which is less than 2.0345 (critical value at 33 degrees of freedom), and the P-value returned is 0.400030336, which is more than 0.05 (95% confidence), indicating one cannot reject the null hypothesis. Insured loss makes no significant contribution to the regression model. Based on these findings, there is no evidence here of a significant linear relationship between rolling, three-year impairments and annual underwriting cycle position.

Finally, looking at the test statistic F from the analysis of variance of the independent variable, with the dependent variable on a rolling, three-year basis (Table 3), it returned a value of 0.727511634. Thus, annual underwriting cycle position is somewhat below 1.0, indicating that the means differ less than one would expect if all the population means were equal.

Evaluation of Findings
In considering the test statistic F and the P-value for the analysis of variance of the relationship between the number of impairments, with F not too distant from 1.0 (indicating sample means differ close to expected if the null hypotheses were not rejected), and P-values from the perspective of 0.05 necessary to reject the null hypothesis at a 0.05 level of significance, the null hypotheses cannot be rejected on an annual basis (although it is close, and would be rejected at a

0.10 level of significance), they should definitely be rejected on a rolling, three-year basis. This makes logical sense in one considers the effect of underpricing in a competitive environment for insurance companies as a result of a soft market.

Thus, the alternative hypotheses, that the number of impaired companies increases after soft market period during an underwriting cycle (i.e. that the number of impaired companies increases during and after a soft market) should be considered.

In the light of the conceptual framework of attempting to map out triggers that lead to future impairments (i.e. causes), in order to develop some degree of predictive analytics that could be utilized to enable more accurate early warning of financial problems of insurance carriers, this research serves to highlight three-year rolling impairments to annual underwriting cycle position as a clear leading indicator of an increased number of United States insurance company impairments. The presence of soft markets as one of the external causes in the body of research at the time of McDonnell (2002) and Sharma (2002) studies, appears to be in correlation with insurance company impairment, as postulated in some of the scholarly literature (Bruneau & Sghaier, 2015; Cheng & Weiss, 2012; Deleris & Paté-Cornell, 2012; Feldblum, 2007; Jiang & Nieh, 2012; Li & Nielson, 2015; Malinovskii, 2014; Ruml & Tippins, 2016) is indeed in evidence.

Thus, the findings of this present study are original and revelatory in nature, because they both fill a gap in knowledge, as well as proving intimations found in earlier literature. It is the most recent study to quantify soft market impacts of number of impairments over a historically recent, multi-decade period, and to collate and make available data which could be built upon for future research into various other forms of causation that could be leading indicators of future impairments.

The results of the current study were consistent in relation to the literature reviewed. However, as mentioned in Ruml and Tippins (2016) the literature in the area of insurance company failure/impairment is rather sparse, and has had no quantitative study of this thoroughness conducted that this researcher could find in his review of literature going back to the late 1970s. The current study extended the literature to examine this proposed relationship between financial impairment and the United States' P&C insurance industry t over the previous three decades. The findings would lead one to conclude that metrics for early warnings of future insurance company impairment may be productively found in the underwriting cycle in order to develop possible metrics for early warnings of future insurance company impairment.

Implications, Recommendations, and Conclusions

Although the insurance underwriting cycle is often cited as one of the causes of insurance company insolvency or impairment, little current research existed that clearly demonstrated a frequently-claimed connection between position in the underwriting cycle and subsequent insurance/reinsurance company impairment (Bruneau & Sghaier, 2015; Cheng & Weiss, 2012; Deleris & Paté-Cornell, 2012; Feldblum, 2007; Jiang & Nieh, 2012; Li & Nielson, 2015; Malinovskii, 2014; Ruml & Tippins, 2016). This study's research has specifically shown the correlation between catastrophes and insurance company underwriting cycle in the United States.

Implications

Relationship between the USA's P&C insurance industry underwriting cycle loss events and annual P&C insurance company impairment in the United States. While the coefficient of determination (r^2) for annual number of United States property and casualty insurance company impairments to the independent variable is low, the f test and p-values (particularly the rolling, 3-year), indicate that the null hypothesis should be rejected. The outcomes of this study in answer to the research question demonstrated a no significant (at a 0.05 level of significance) correlation between the position in the insurance underwriting cycle and annual P&C insurance company impairment in the United States on an annual basis, but did show significant correlation on a rolling, three-year basis, as well as an annual significance basis at a 0.10 level of significance. Regression analysis returned that a hardening cycle position increase of one unit related to a 6.604904632 increase in the number of annual impairments for that year, and a 7.851123596 increase in the number of impairments over the following three years on a rolling basis; in each case the regressions were bad, with the P-values (respectively) 0.057619486 and 26.6005791. Figures 3 and 4 provide graphical representation of the scatter plots for (respectively) the annual and the rolling three-year annual underwriting cycle position to number of impairments. After thorough statistical analysis, the null hypothesis was not rejected.

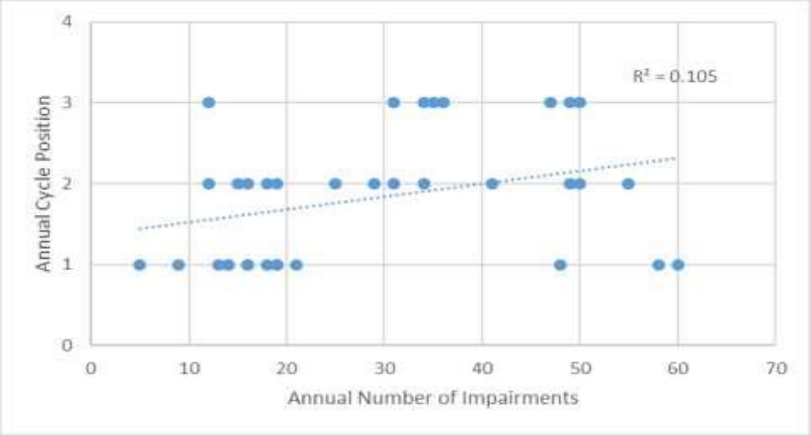

Figure 3 Visualization of Annual Impairments to Annual Underwriting Cycle position, P&C Insurance Companies in the United States, 1978-2012. Output generated by researcher from Microsoft Office Excel 2013.

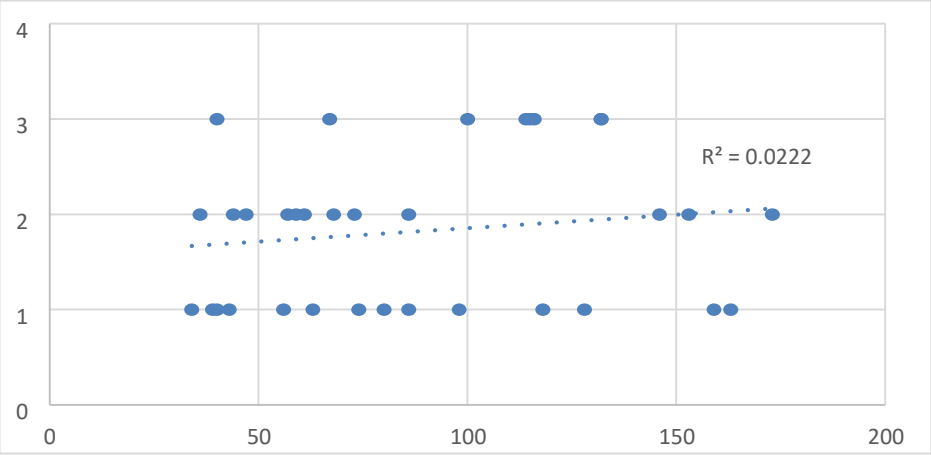

Figure 4 Visualization of Three-Year Rolling Impairments to Three-Year Underwriting Cycle position, P&C Insurance Companies in the United States, 1978-2012. Output generated by researcher from Microsoft Office Excel 2013.

The finding of no significant relationship between years after the low point in the insurance underwriting cycle is mitigated by the finding at a 0.10 level of significance that there is correlation and particularly for the subsequent number of insurance company impairments on a rolling basis (for that year or the two subsequent years) being significant at a 0.05 level of significance was consistent with the intimations that impairments after the bottom of a soft market may be related in the only three quantitative studies in the recently published literature (Born & KlimaszewskiBlettner, 2013; Cheng & Weiss, 2012; Deleris & Paté-Cornell, 2012). The finding that there was a significant statistical relationship between the insurance underwriting cycle and P&C insurance company number of annual impairments in the United States was a significant finding because it supports prior intimations, and is the first recent, large-scale quantitative study in this area, which has not previously been numerically explored by researchers.

Recommendations

Based on the results of the current study, recommendations could be made for the continuing research into other areas of possible early-warning metrics, as well as more in-depth research into the insurance company impairment. One approach to this may be starting with the financials of an impaired company, and working backward through time to see the effects of a soft insurance market on their balance sheets that may have tipped them into financial difficulty, and then using evidence of this to construct the profile of the sort of company more likely to be driven to financial difficulty by a soft market. Another consideration is to use, rather than annual numbers of impairments, the impairment rate for any given year: this may reveal more accurately correlations between future impairment probabilities and any independent variables being tested.

Conclusions

The purpose of the study was to determine whether or not the position in the insurance underwriting cycle should be considered as a factor that may lead to future United States P&C insurance carrier impairment. A quantitative, correlational study was undertaken to determine whether there was a relationship between the annual numbers of P&C insurance carrier impairments. It was found, for the 1978-2012 period studied (of all P&C insurance companies in the United States rated by the A.M. Best ratings agency), that in the year following a soft market there were not (at a 0.05 level) significantly related to the annual number of P&C insurance carrier impairments, for the entire universe of companies during this recent, multi-decade period, however there was significance on a rolling 3 year basis, and that there

was also a significant relationship even on an annual basis on at 0.10 level of significance. Based on these results, it is suggested that further study is needed using other possible independent variables to determine significant leading indicators of future P&C insurance carrier impairments. In addition, consideration should be given to revising the dependent variable to be a ratio, rather than an annual number, and to pursue alternative of investigating impacts of the insurance cycle in a more granular way.

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Appendix A: P&C Insurance Company Impairment by Year for the United States1978-2012

Year	Impairments
78	12
79	19
80	9
81	16
82	14
83	13
84	36
85	49
86	31
87	34
88	50
89	48
90	55
91	60
92	58
93	41
94	29
95	16
96	12
97	31
98	18
99	19
00	49
01	50
02	47
03	35
04	18
05	14
06	15
07	5
08	16
09	19
10	21
11	34
12	25

Appendix B: United States P & C Insurance Company Underwriting Cycle1978-2012

Year	Cycle Position
78	3
79	2
80	1
81	1
82	1
83	1
84	3
85	3
86	3
87	3
88	2
89	1
90	2
91	1
92	1
93	2
94	2
95	2
96	2
97	2
98	1
99	1

00	2
01	3
02	3
03	3
04	2
05	1
06	2
07	1
08	1
09	1
10	1
11	2
12	2