Based on Dr. Appel's analysis, this 9% underwriting profit provision would generate a statutory return on net worth of 6.8%. That return is significantly below Dr. Vander Weide's lower bound of 9.0%.

It is the statutory return that should be considered when determining the underwriting profit in North Carolina because it does not take into account investment income on surplus. Clearly, the Subcommittee is being very conservative with its selection. Even if the 9% underwriting profit were to consider investment income on surplus in addition to investment income from insurance operations, the estimated return on net worth would be 10.4%. That return is within Dr. Vander Weide's range but near the low end of that range, and thus the selected underwriting profit provision remains a conservative selection that is not excessive.

Furthermore, the Bureau has capped the filed rate changes below the indicated rates to no more than 30% in any territory. Assuming all other assumptions in the Filing are realized, that would result in even lower profit margins being realized.

Q: Did the Subcommittee consider a contingency provision?

A: Yes, the Subcommittee selected a 1% contingency provision. This is consistent with past filings and is a common industrywide practice across the country. The contingency provision reflects the total systematic bias from multiple sources that causes the indicated rate level without this adjustment to be inadequate. These biases can cause actual losses to be higher than reflected in the rates as well as cause actual premiums to be lower. Both impacts bias the indicated rate towards being inadequate.

Sources of this systematic bias in property insurance include, but are not limited to, judicial decisions that extend policy coverage beyond what was anticipated in the rates, legislative changes, regulatory delay in achieving the indicated rate change or regulatory reduction of the rate change.

Courts rarely restrict coverage to less than intended in the policy forms and frequently expand coverage beyond what was intended. In addition, major unexpected losses can and do come from large and infrequent events of a type and magnitude that are not reflected in the experience period.

One historical example for Homeowners insurance is the sudden surge of mold claims around the early 2000's that far exceeded the amounts seen in experience periods. In addition to unforeseen claims, rate filings are generally not approved prior to their intended effective date or for more than requested while some much needed rate filings are denied altogether.

Because of these factors, estimated premium that does not reflect a provision for these contingencies will fall short of adequate premium very frequently. When

these premiums are inadequate and underwriting losses are observed, an insurer must borrow from surplus to properly indemnify its policyholders or claimants. According to the Actuarial Standard of Practice #30, "the actuary should include a contingency provision if the assumptions used in the ratemaking process produce cost estimates that are not expected to equal average actual costs, and if this difference cannot be eliminated by changes in other components of the ratemaking process." The Subcommittee believes that a contingency provision is appropriate and necessary, and has selected a 1% factor in this Filing, the same as with all recent property insurance filings. The Subcommittee also believes this is a conservative estimate given the multitude of factors impacting this provision.

Q: Are the data in the Filing reliable and accurate for ratemaking purposes?

A. Yes. The data underlying the Filing are reliable, accurate and appropriate for ratemaking. There are three levels of quality checks performed by individual companies, statistical agents and ISO. Individual insurance companies employ extensive procedures to assure the quality and reliability of ratemaking data used in the Filing. When individual companies submit their data to their statistical agents, the statistical agents review the data for possible errors and compliance with approved statistical plans. If an error is suspected, the statistical agents ask the company to review the data and to correct the data if necessary.

When ISO aggregates premium, loss and expense data from the statistical agents, it reviews the accuracy of the data and similarly requests that the data be reviewed and corrected if errors are suspected.

These data include data for business written at or below the Bureau manual rates, business written under consent to rate procedures and therefore above the Bureau manual rate and business written in residual markets (the Beach Plan and FAIR Plan). When the Bureau assembles expense data and furnishes it to ISO, they also perform checks to determine the data's accuracy. Sometimes it is not feasible for a company to correct its data, and in these cases that company's data is excluded from the filing and that fact is noted in the filing.

An additional check is that the Bureau requested that the statistical agents produce exhibits for the 10 largest writers displaying exposure distributions for key factors (such as territory, amount of insurance and protection class) for the experience years in the filing. Each company was asked to review and evaluate the accuracy of its data as reported to its statistical agent. Companies have confirmed that they have performed these reviews and that to the best of their knowledge their data are correct in all material respects.

Q: You referred earlier to the difference between the "indicated" rate level and the "filed" rate level. Can you please explain the nature and the effect of capping in this filing?

The indicated rate level is the actuarially sound rate level. It is the rate level necessary to ensure that rates cover prospective losses and expenses and provide a fair and reasonable profit. The indicated rate level is the one that complies with the statutory standard that the rates be neither excessive, inadequate nor unfairly discriminatory

In the case of the homeowners forms, the indicated overall rate level change is 26.1%. That rate level change is the statewide composite of indications that vary by territory throughout the state. In general, western territories have lower indicated rate level changes while the eastern beach territories have higher indicated rate level changes.

The "filed" rates represent the rate changes proposed by the Bureau. The filed rates reflect a procedure known as "capping." The Bureau's Governing Committee reviewed the actuarially sound rate level indications determined by the Rating Subcommittee and elected to minimize the impact on policyholders by capping the indications. The caps vary by policy forms and territory groups.

For the owners forms, territories are placed into three groups based on each territory's rate level indication. For those territories with indications less than 30%, indications are capped at 20%. For those territories with indications from 30% to 40%, indications are capped at 25%. For those territories with indications greater than 40%, indications are capped at 30%.

For the tenants and condominium owners, there are also three groupings. For territories with indications less than 15%, indications are capped at 5%. For territories with indications from 15% to 20%, indications are capped at 10%. For territories with indications greater than 20%, indications are capped at 15%.

These caps result in a reduction of the overall rate level indications from 26.1% to 17.4%. Capping is a common and justifiable practice in the industry that limits premium disruption to policyholders, and the modest extent of capping in this filing still allows for significant and meaningful movement towards the full actuarial indicated rate level.

Q. From the standpoint of individual companies, how does homeowners ratemaking in North Carolina differ from other states?

A. In almost every other state, each company files its own homeowners rates independently. However, in North Carolina, the Bureau has the responsibility to file rates on behalf of the entire industry. The filing process in North Carolina establishes a system of "Bureau rates" (often called "manual" rates) for use on all homeowners policies written in the state.

In essence, the Bureau makes rates for a hypothetical one company that is composed of the aggregate policyholder attributes and loss experience of all the homeowners policies written in the state. Those policies include attributes such as the dollar amount of insurance written on each home, the geographic location of the home, the protection class of the area in which the house is located, the type of construction, the deductible amount, etc.

Once the Bureau rate has been set through the filing and approval process, Bureau companies must charge that rate unless they file their own deviations with the Department or engage in the consent to rate process. If the proposed premium exceeds the Bureau rate, the company must receive individual approval from the customer through the consent to rate process.

Q. You stated earlier that premiums are established at a level equal to expected losses plus expected expenses and a margin for a fair and reasonable profit. Does this mean that homeowners ratemaking is a simple matter of adding up past losses, past expenses and past profit and then putting them into a simple equation to equal premium?

A. That is not at all the case, for numerous reasons. The first reason is that ratemaking is prospective in nature. The ratemaking process requires the determination of the expected future losses and the expected future expenses of the composite company that will be incurred in the projection period. While it is important to consider past losses and expenses in determining expected future losses and expenses, the process is much more complex than that. There may be many reasons why past losses and expenses are not a perfectly accurate reflection of future loss and expense levels. Loss and expense cost trends can be driven by a wide range of factors such as inflation, cost of building materials, frequency of weather events, etc. Therefore, trends need to be projected into the future to determine accurate projected losses and expenses.

Further, it is particularly difficult to estimate prospective losses for property lines of business such as homeowners insurance because loss amounts in those lines are so volatile. The average frequency of claims in homeowners is lower than other lines of business, thereby providing fewer claims in the historical data to inform future loss levels. Another difficulty is that homeowners policies cover so many different situations and events. For instance, homeowners policies must pay for losses to buildings and contents for fires, as well as losses for numerous types of weather events, thefts and lawsuits. Even putting aside the potential impact of hurricanes, property lines are highly dependent upon weather events such as tornado outbreaks, winter storms, hail storms, freezing temperatures, etc.

Such volatility is greatly compounded in hurricane prone states such as North Carolina. In North Carolina and other hurricane prone states, a significant percentage of the prospective long-term average annual losses in certain

territories of the state are caused by intense hurricanes which are relatively infrequent but are devastating when they do occur. It would be actuarially unsound to rely on a few years of actual hurricane losses to estimate prospective hurricane losses because of the volatility of these losses driven by low frequency and high severity.

The volatility of property insurance in a hurricane prone state can be explained in part by a statistical concept of "independence" that is useful to consider in distinguishing between different lines of property casualty insurance. If one home is damaged by a hurricane, it is very likely that many other homes in the same geographic region will be damaged at the same time. The risk of damage for each individual home is not independent of the risk of damage to the other homes because a single event can cause widespread damage. As a contrast, in auto liability insurance, when there is one auto collision there generally is not a greater likelihood of there being numerous other auto collisions in the same geographic region at the same time. While the amount paid under bodily injury or property damage coverage because of that single auto collision may far exceed the premium collected for the individual policy involved, that fact is not replicated to numerous other policies because auto collisions are generally random and independent events. However, when intense hurricanes occur, there are likely to be payments far greater than the total premium collected on a large number of policies due to the geographic concentration of the event.

Q. Does the Filing in any manner require policyholders in North Carolina to pay the losses or subsidize the rates of policyholders in other states, particularly hurricane prone states such the Gulf Coast states?

A: No, it would be actuarially inappropriate to do so. Each state is evaluated separately, and rates in North Carolina are based only on North Carolina's loss potential. Imposing such a subsidy would not be fair to North Carolina policyholders and would not be permitted by North Carolina regulators. There is a greater risk of hurricane losses in Florida and some other Gulf states than in North Carolina, and it would not be fair or actuarially sound for North Carolina policyholders to be asked pay for their losses or subsidize the insurance costs for persons in those areas. For the same reason, it would not be fair or actuarially sound for the Bureau to attempt to spread the hurricane exposure of the hypothetical one company in North Carolina to persons in other states such as in the Midwest where there is little hurricane exposure. Policyholders and regulators in Iowa, for example, would not be willing to do that. To summarize, using other states losses to determine North Carolina rates is unfair and unequitable, and the Bureau does not do this for these reasons.

Q. Did the Subcommittee review rate level adequacy by territory?

A. Yes, the committee asked ISO to calculate the indicated rate level changes by territory. The indicated change for a particular territory, as you would calculate

indicated change for any given rating group, was calculated by dividing the required base class rate by the existing base class rate and subtracting 1.

First, ISO calculated the indicated base class loss cost by territory. This resulted from calculating the total loss cost by territory and applying the resulting territorial relativity to the indicated statewide base loss cost. The territorial indicated base class loss cost was converted to the required base class rate by performing expense, profit, and deviation adjustments at the territorial level, like how adjustments were performed at the statewide level for these ratemaking elements. The indicated changes by territory show rate levels by territory that are needed to equitably spread the overall rate level.

Q. Can you identify Exhibit RB-1?

A. Yes. This is a large portion of the Filing submitted by the Bureau with respect to revised homeowners insurance rates in North Carolina. Exhibit RB-1 includes numerous exhibits, regulation responses and explanations pertaining to the indicated and filed rate level changes. The Filing also includes the rate manual (Exhibit RB-2), as well as the prefiled testimony and exhibits of six witnesses in addition to mine (Exhibits RB-3 through RB-19).

Q. Can you identify the document marked Exhibit RB-2 and entitled "Homeowners Policy Program Manual"?

A. Yes. As I mentioned, Exhibit RB-2 includes the current manual of rules, rates and classifications used to write homeowners insurance in North Carolina. The manual and any amendments have been approved by and are on file with the Department. Copies are maintained at the offices of the Bureau.

Q. Are you aware of changes in this filing other than to the Homeowners rates?

A. Yes. In addition to the homeowners base rates, the Windstorm or Hail Exclusion Credits and Windstorm Mitigation Program Factors are changing. Additionally, this filing makes changes to several rating rules in the 500 Section of the manual. The details for these changes is contained in Section B of the filing. Finally, there are changes to the Wind Only Program.

Q. What is your opinion as to whether the indicated rate level changes in the Filing are excessive, inadequate or unfairly discriminatory?

A. It is my opinion that the indicated rates in the Filing are actuarially sound and meet the legal standard of producing rates that are not excessive, inadequate or unfairly discriminatory. In that regard, I note that I have relied upon the accuracy of the data and analyses supplied by the statistical agents, the Bureau, Aon Benfield and Milliman as reviewed and checked. I have also relied on the

reinsurance and profit analyses performed by Dr. Appel and Dr. Vander Weide. I qualify my opinion by noting that the filed rates have been developed by applying territory caps to the indicated rates. The filed rates are not excessive and the 17.4% filed rate increase is a reasonable step toward the adequate level.

Q. Does this conclude your prefiled testimony?

A. Yes.

PRE-FILED DIRECT TESTIMONY OF ELIZABETH A HENDERSON

2018 HOMEOWNERS INSURANCE RATE FILING
by the
NORTH CAROLINA RATE BUREAU

Q. Please state your full name and business address for the record.

A. My name is Elizabeth Ann Henderson. My business address is Aon, 200 East Randolph Street, 11th Floor, Chicago, Illinois 60601.

Q. What is your involvement in this matter?

A. My employer, Aon, has been retained by the North Carolina Rate Bureau (NCRB) to provide expertise and analysis with respect to the expected hurricane losses utilized in the NCRB 2018 Homeowners Insurance rate filing. I am part of the team at Aon that performed these services.

Q. What are your primary duties for Aon?

A. Aon's Reinsurance Solutions division is the world's largest reinsurance brokerage firm, and I am a Senior Managing Director of the Catastrophe Risk Analytics group. I lead a catastrophe risk management team, consisting of 25+ catastrophe modeling professionals, engineers, and meteorologists. I am responsible for providing catastrophe modeling support for reinsurance

placements and expected hurricane losses and am charged with positioning my team as a key differentiator in client solutions including support for multi-model analyses, benchmark pricing, data quality peer comparisons, model evaluation, real-time event response, portfolio optimization, catastrophe cost allocations, and rating agency questionnaire support. In effect, we assist our clients in all aspects of managing their exposure to catastrophe risk.

Q. Describe your professional and educational background.

A. I have been with Aon for 15 years since graduating from Northwestern University with Bachelor of Arts degrees in Mathematics and Philosophy. In my role at Aon, I have participated in and led the modeling efforts for reinsurance treaty placements on behalf of Aon's clients. My specializations include providing risk management consulting and catastrophe modeling services to United States property and casualty insurance companies, particularly in personal lines property, small commercial property, and worker's compensation. I have worked directly with companies to help them analyze the amount of risk due to catastrophes against which they are exposing their capital and compare that risk to their risk tolerances. In assessing their catastrophe risk, we utilize two independent modeling firms: Risk Management Solutions (RMS) and Applied Insurance Risk (AIR). We provide detailed analyses of the model results to enable companies to make business decisions around catastrophe risk management, including setting underwriting guidelines, developing rate

indications, determining the appropriate amount of reinsurance to purchase and deploying growth capacity.

Q. Describe your early career at Aon.

A. I began working at Aon 15 years ago as a Catastrophe Risk Analyst. During my tenure at Aon, I have worked within the Catastrophe Risk Analytics Group and have been promoted through six positions (Analyst, Senior Analyst, Associate Director, Director, Managing Director, and now Senior Managing Director). My responsibilities grew with each new job as I expanded my capabilities. When I began my career as an Analyst, I was responsible for the day-to-day modeling for a variety of client accounts. This included processing and profiling raw client data into model-specific import files, importing client data into the models of AIR and RMS, setting up and executing model runs in AIR and RMS, and pulling out results and building exhibits. I was responsible for ensuring the accuracy of my work, and reporting back to my clients about their results and how those results impacted their reinsurance treaties. In my early career, I spent most of my time working within the models' framework and learning how different types of insurance terms are handled in each model, how to properly code client data to ensure accurate results, and how to interpret how portfolio changes and model changes impact results.

I was working in this role in 2004 and 2005 during the very active hurricane seasons that produced Hurricanes Katrina, Wilma, and others. These events were among the first major tests of the hurricane models after Hurricane Andrew in 1992. The utilization of modeling and understanding of how the models worked when these events occurred was greatly impacted, and the new knowledge resulting from those events led to changes that had a far-reaching impact on the insurance industry. It was at this time that both RMS and AIR developed their Medium-Term and Warm Sea-Surface Temperature hurricane event sets.

Q. How has your career progressed and changed over time?

A. In my current role at Aon, I am responsible for the work output of a team of over 25 catastrophe analysts covering many clients. My job has three distinct areas of responsibility. First, I am responsible to my clients. I work directly with clients on specific projects such as reviewing how their internal coding process impacts model results and making recommendations on refining their data to produce more accurate loss estimates. I help clients identify their profitable business opportunities and build out a plan with regular monitoring to achieve the clients' growth plans. In addition to working directly on client projects, I meet regularly with my team to discuss and review other active client projects to ensure that we are delivering best in class analytics to all of our clients.

My second responsibility is to my team. I am a mentor and a coach to all members of my team and I take steps every day to align individual performance goals with business and client needs. The number of clients and amount of support we provide to our clients has increased significantly. As clients have become dependent on using model input across their business, there has been a large demand for support and evaluation of model results. We have increased the number of engagements pertaining to model evaluation and validation.

My third responsibility is to the business unit. I help to set the strategic priorities of the Catastrophe Analytics team within the context of the overall goals of Aon. In that role, I am responsible for delivering innovative analytics solutions for Aon clients. In the past year, I led a team that developed and launched a new, interactive data and analytics platform: Analytics Dashboards. Analytics Dashboards advance the way that business-critical data is visualized, interpreted, and delivered.

Q. Describe the role of Aon Reinsurance Solutions Analytics.

A. Aon Reinsurance Solutions Analytics provides consultative services to clients of Aon who sell primary insurance coverage and assists those insurers in the assessment of the risk of catastrophe loss to their portfolio and in the placement of reinsurance treaties to address that risk of catastrophe loss. The main areas of services to Aon clients include: catastrophe modeling; catastrophe insurance rate making assistance; actuarial services (e.g., range of loss and expense

estimation, enterprise risk management, reinsurance analysis, capital analysis); rating agency modeling and analysis; insurance and reinsurance accounting; and tax and finance related modeling and assistance.

Q. Describe the role of the Catastrophe Analytics group.

A. The Catastrophe Analytics group is a part of Aon's Reinsurance Solutions division. The role of this group is to provide clients of Aon with analytics involving the management of catastrophe risk and how it relates to their reinsurance purchasing decisions. We provide clients with analyses of their catastrophe risk and develop their understanding around different model views for their portfolio. We help our clients develop a management view of their catastrophe risk against which they can evaluate reinsurance purchasing decisions.

Q. Describe your experience with catastrophe models.

A. Beginning 15 years ago in my role as a catastrophe analyst, I have used multiple models to evaluate catastrophe risk for my clients. My daily work requires me to interpret and transform client data into appropriate "model-ready" files. I determine how to best incorporate the client data into the different models. I have prepared data and run analyses in the models RMS RiskLink, AIR Touchstone, Impact Forecasting Elements, and CoreLogic RQE, and have

pulled and analyzed loss output from those models. I have observed and reviewed changes in these models during my tenure at Aon. I use the output of the models, such as Probable Maximum Loss (PML), Average Annual Loss (AAL), Layer Expected Losses, and Historical Loss projections, to help clients determine the exposures at risk to a catastrophe at various confidence intervals. Clients compare those loss projections to their internal risk thresholds to determine how much reinsurance they need to protect their earnings and capital. The models are used by reinsurers to evaluate portfolios and determine an appropriate price for risk transfer.

Q. Describe your experience with catastrophe reinsurance.

A. I work for Aon Reinsurance Solutions, the world's largest reinsurance brokerage. My role as a catastrophe analyst means that I am directly involved with our clients who are seeking to purchase catastrophe reinsurance. Output from our modeling is used by our brokers, clients, and capital markets to determine AALs and the appropriate amount of reinsurance to purchase and what the appropriate fair market price for that reinsurance should be.

Q. Do you speak on topics pertaining to catastrophe modeling?

A. Yes. I speak annually at Aon's Reinsurance Solutions Analytics client conference on various topics related to catastrophe modeling. That conference

is routinely attended by primary insurers, reinsurers, regulatory agencies, and modeling firms.

Q. What was Aon's role in this filing with respect to expected hurricane losses?

A. We provided advice to NCRB regarding how to input the exposure data it provided, how to run the AIR and RMS models consistently based on that exposure data, how to assure that the model output is correct and how to blend the results of the two models in the manner utilized in the marketplace by Aon's clients.

Q. Did the NCRB asked Aon to run the AIR and RMS models?

A. Yes. We ran the models of AIR Touchstone and RMS RiskLink. These are the most commonly relied upon hurricane catastrophe models in the industry, and we run these two models on all of our clients' data, regardless of whether either model is used by the client to set rates. Our view is that it is important to understand the two primary views of risk that exist in the industry. These two models are routinely relied upon by reinsurers in pricing catastrophe risk and by primary insurers in determining anticipated hurricane losses. More than half of our clients use two models when evaluating their catastrophe risk and blend those results, as opposed to relying only on one model for management

decisions. Of those that utilize two models, the vast majority blend the results evenly, taking a straight average. Our recommendation is to use a straight average when calculating a blend of the results. This means that we run the individual models and determine the appropriate allocation of reinsurance and loss costs independently for each model. Then we average the two results to determine the blend. We have used this same approach here for the NCRB to determine the appropriate modeled hurricane losses to use in the rate filing. The vast majority of our clients who blend multiple models use this method. One reason is due to the ease of understanding and auditing of results. Models change frequently in different ways, and it is important for people making business decisions based on those models to be able to track those changes at every point. By first determining the losses from RMS and AIR independently, you can gain insight into how each model interprets the risk differently. It is an approach that balances an insurer's access to detailed information from both models and then uses a blended metric to make purchasing decisions and allocate costs.

Q. Is it customary to run multiple models to determine catastrophe risk for your clients?

A. Yes. At Aon Reinsurance Solutions we believe it is important to understand the various views of catastrophe risk that exist about any particular client's portfolio. In a reinsurance transaction, multiple parties must agree upon a fair

estimate of the cost to transfer the risk. Our clients need to understand how the market will be interpreting their catastrophe risk; therefore it is important for them to understand how various models interpret their portfolios.

Q. Is it common that modeled losses will differ between the various model vendors?

A. Yes. There exists a degree of uncertainty in predicting losses from catastrophes. That is a natural consequence of the substantial volatility associated with the occurrence of relatively infrequent and rare events. While all modeling firms start with relatively similar meteorological and insurance data inputs, such as information on past storm characteristics and claims data from insurance companies, there are differences between modelers in their approaches to interpreting and supplementing this data to build a robust model. The process of developing the models brings with it a degree of uncertainty in the results, although there is no inherent upward or downward bias in this degree of uncertainty. Modelers must take the known meteorological data from actual storms and employ standard statistical techniques to distribute that limited data to create a distribution of storms that may happen in the future. This is how models can take similar input and come up with different results. The spread between two views of the same risk helps companies understand the uncertainty inherent in these models. Through blending of the results of multiple models, clients can better manage their catastrophe risks despite variation between

model results. Given the number of variables involved in the development of a catastrophe model and the degree of uncertainty associated with each variable, it would be unexpected and atypical if two independently derived models resulted in the same output or conclusions on a given set of data.

Q. How do the models change over time?

A. Over time, modelers utilize advanced research and loss analyses to enhance their methodology, applying the most recent and relevant scientific understanding to their models. New research into past events, updates to building practices and building codes, insight from engineering experiments, and findings from recent events are among the many different types of information that are used to inform how the modelers make updates to their models. Each modeling firm takes a different approach to how frequently it updates its models and how it prioritizes the schedule by which perils and regions will be updated.

Q. Do modeled losses change as updated data is entered into the models?

A. Yes. As noted above, the models are reliant on many sources of data. Data on past storms and updated building code data, for example, will be used by modeling firms as inputs in developing their models. For the insurer, changes in coverage and the underlying policies-in-force will change the model output. Also, changes in an insurer's portfolio composition (i.e., where they write new policies

and the geographic concentration of their exposures) over time will change the results of the models.

Q. How do clients typically account for variation in the model losses between different models?

A. It has become increasingly common for companies to use two models. As I said, more than half of our clients use two models when evaluating their catastrophe risk, blending those results. Of those that utilize two models, the vast majority blend the results evenly, taking a straight average, as has been done for the NCRB in this filing. The percentage of clients that blend models to build a management view of risk has grown substantially in recent years. In my opinion, this has been driven by large loss experience, most specifically from hurricanes, that demonstrates the degree of uncertainty around any single selection, as well as what I will call model change volatility. The blending of two models generally produces less volatile and more reliable results over the long term than the use of a single model.

Clients are also exposed to volatility related to model change. When the models make changes to their underlying assumptions around frequency, hazard, and vulnerability, clients will see their catastrophe loss estimates change. The fact that modeling firms make updates on different schedules, and often interpret and apply new research in different ways, results in a changing risk management

environment. Using a blended view will smooth out some of that model change volatility over time.

Q. Please describe further the work Aon Reinsurance Solutions performed for the NCRB for this Homeowners rate filing. Can you describe the client data that was employed as input for the model runs?

A. The data we employed was provided to us by the NCRB. My understanding is that the data had been compiled on behalf of the NCRB by Insurance Services Office (ISO). The NCRB advised us that the data consisted of the aggregate exposure information for all homeowners risks in North Carolina, including those written by the companies and those written by the residual market (which in North Carolina is the NCIUA, or Beach Plan, and the NCJUA, or FAIR Plan). In effect, the NCRB asked us to run the models using the aggregate data as if there were a single company writing all of the homeowners insurance in North Carolina.

Q. Please describe what Aon Reinsurance Solutions then did with the data provided by NCRB.

A. As is customary in our work, we reviewed the data received from the NCRB for completeness and reasonableness before we input it into the AIR and RMS models. Since the two models have different formats for inputting data, we

worked with the NCRB to assure that the exposure data was properly and consistently entered in the required format for each model. We are accustomed to this procedure because we have to do the same thing for the many individual companies that we represent.

The next step was to input the data and run the models. We ran the AIR Standard model and the RMS Historical model for the purpose of determining the modeled hurricane losses. We ran the AIR WSST model and the RMS Medium Term Rate model for the purpose of analyzing the cost of reinsurance against our extensive reinsurance market data, which is what we always do in assisting our clients with their reinsurance placements. In my experience, it is standard practice throughout the industry to rely upon the models we used to determine modeled hurricane losses and to place reinsurance.

After the models were run, we reviewed each model's output individually to be sure that the output resulted from a consistent entry of the same exposure data. We again followed the same procedure for assuring data quality that we follow for all of our clients. Then we blended the results of the two models, taking a straight average of the results as I described earlier. We again reviewed the blended results to assure that the blending procedures were correctly performed and that the blended results were correct. Once we were satisfied that the results were correct, we provided the blended modeled hurricane losses to the NCRB for use in its homeowners rate review. At the NCRB's request, we also

provided the results to Milliman for its use in the work it was doing as part of the NCRB's homeowners rate review. Exhibit RB-6 sets forth the blended modeled hurricane losses resulting from the work I have described. Based on my knowledge and experience and the input data provided by the NCRB, these modeled hurricane losses are reasonable and appropriate projections of expected hurricane losses for use by the NCRB in its homeowners rate review and rate filing.

Also, we employed the modeled hurricane losses as part of our work determining and allocating the cost of reinsurance. My colleague, Steve Fiete, led our analysis of the net cost of reinsurance, and his testimony is also included in this filing. I assisted with that work and, from my perspective, the procedures that we followed were consistent with our standard business practices in assisting our clients with their reinsurance placements and produced results that are reasonable, sound and reliable.

Q. Does that conclude your testimony?

A. Yes.

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North Carolina Rate Bureau
Gross Modeled Hurricane Expected Losses including Cat LAE and Trend

Territory	Owners	Tenants	Condos	AAL
110	34,356,220	33,870	34,139	34,424,229
120	33,620,672	118,943	397,635	34,137,250
130	7,982,013	23,857	22,955	8,028,825
140	88,823,713	801,300	724,525	90,349,538
150	16,874,842	108,828	29,268	17,012,939
160	16,360,139	161,441	93,894	16,615,473
170	511,452	3,243	1	514,696
180	11,960,722	147,026	21,855	12,129,603
190	3,983,051	28,241	852	4,012,143
200	2,225,029	10,726	19	2,235,774
210	3,398,936	31,209	1,278	3,431,423
220	8,921,430	81,932	17,638	9,021,000
230	2,993,311	21,163	1,507	3,015,980
240	9,254,348	62,388	4,550	9,321,286
250	4,131,937	27,853	1,133	4,160,922
260	1,989,853	10,041	212	2,000,106
270	30,914,142	458,341	112,160	31,484,643
280	4,091,243	47,151	21,530	4,159,925
290	3,805,939	22,483	11,701	3,840,123
300	1,059,393	5,003	178	1,064,573
310	12,163,157	137,818	48,110	12,349,085
320	6,255,605	45,511	10,316	6,311,432
330	230,310	941	128	231,379
340	17,447,781	224,062	137,353	17,809,196
350	3,193,839	20,799	5,889	3,220,527
360	4,470,443	31,777	18,262	4,520,481
370	182,364	494	1,895	184,753
380	518,156	2,283	1,241	521,680
390	549,652	1,597	1,030	552,280
Total	332,269,692	2,670,322	1,721,251	336,661,265

Modeled hurricane expected losses for North Carolina Rate Bureau, net of limits and deductibles. Results include demand surge and exclude storm surge. Losses represent 50/50 blend of AIRv5.1 100k Standard event set and RMSv18 Historical event set. Results also include provisions for LAE and loss trend.

EXHIBIT RB-7

PRE-FILED DIRECT TESTIMONY OF STEPHEN C. FIETE

2018 HOMEOWNERS INSURANCE RATE FILING
by the
NORTH CAROLINA RATE BUREAU

Q. Please state your full name and business address for the record.

A. My name is Stephen Charles Fiete. My business address is 200 East Randolph Street, 11th Floor, Chicago, Illinois 60601.

Q. What is your involvement in this matter?

A. I am currently an employee of the Aon Corporation working in the Catastrophe Management area of Aon Reinsurance Services. Aon has been retained by the North Carolina Rate Bureau (NCRB) to provide expertise and analysis with respect to the expected catastrophe losses and net cost of reinsurance utilized in the NCRB's 2018 Homeowners Insurance rate filing. I manage an analytics group within the Catastrophe Management area which focuses on analysis of catastrophe cost as it relates to ratemaking and underwriting.

Q. You indicated that you are employed by the Aon. Who is Aon and what are your primary duties for that employer?

A. Aon is a leading global professional services firm that provides advice and solutions to clients focused on risk, retirement, and health. I work in the Reinsurance Services area which represents insurance carriers in the reinsurance market. My position is Managing Director in the Catastrophe Modeling group. My primary responsibility is to assist insurance company clients of Aon in the areas of managing catastrophe risk. I work with carriers that purchase catastrophe reinsurance and perform analyses to provide insight into how segments of their portfolio contribute to their total catastrophe cost.

Q. Describe the role of the Catastrophe Management area within Aon Reinsurance Services.

A. The Cat Management group provides consultative services to Aon's reinsurance clients. The main areas of services include: catastrophe modeling; catastrophe ratemaking assistance; catastrophe cost allocation; actuarial services; rating agency modeling and analysis; insurance and reinsurance accounting; and tax and finance related modeling and assistance.

Q. Describe the role of the analytics group that you manage.

A. This group performs analysis and provides tools to help Aon's reinsurance clients manage their total cost of catastrophe risk. The total cost of catastrophe risk consists of the following: expected average annual loss from modeled catastrophic perils, net cost of reinsurance, and cost of capital required to support the volatility of retained loss. The group draws on Aon's experience placing catastrophe reinsurance to develop an

understanding of the factors that drive reinsurance cost, which is used to develop a method to allocate portfolio level reinsurance cost to any subset of the portfolio. This method reflects the relationship between modeled loss distributions and market reinsurance prices. The analyses and tools are used in ratemaking, including rate filings, underwriting, and exposure management by carriers.

Q. What is catastrophe reinsurance, who buys it, and why do they buy it?

A. Catastrophe reinsurance is bought by insurance carriers to protect their solvency by transferring risk to other entities. It has some similarities to an individual who buys homeowners insurance. For a homeowner, there is typically a deductible which means the homeowner would have to pay the cost of a portion of a loss when he or she files a claim, and the insurance company would also pay a portion of the loss up to a specified limit. The deductible is thus analogous to the attachment point in a reinsurance agreement. The key differences between an individual buying insurance and a carrier buying catastrophe reinsurance are:

1. The risk subject to reinsurance is typically a group of locations, where a homeowner insures loss to just a single property.
2. There is much more complexity and variation in reinsurance agreements.
3. Homeowners insurance is provided by a single carrier. Reinsurance coverage is typically provided by a group of reinsurers. The reason for this is that loss from a single reinsurance buyer can be very large. To ensure adequate funding is available, a reinsurance broker finds multiple reinsurers to participate in providing coverage for a single reinsurance buyer.

4. Instead of a deductible for a single property, the reinsurance agreement contains a “retention” for aggregate loss to a portfolio.
5. Reinsurance agreements have annual aggregate limits of loss; most homeowners policies do not.

Carriers buy reinsurance so that they will not have their solvency impaired if they experience a year with a large loss or multiple large losses. They also buy reinsurance to reduce income volatility.

Q. Describe your professional and educational background.

A. I have been employed as an actuary since 1992 and have focused on ratemaking for my entire career. From 1992 to 1999 I worked for CNA Insurance and worked in both commercial lines and personal lines pricing. From 2000 to early 2006 I worked in a pricing area of Allstate Insurance. I have performed state rate level indications, workers compensation program pricing, underwriting scorecard development and rating plan development.

I was hired by Aon in 2006 to lead, design, development, and market underwriting tools based on Aon’s catastrophe cost allocation methodologies.

I received a BA in Math from West Virginia University in 1988 and an MS in Math from the University of Illinois at Urbana Champaign in 1991. I am an associate of the Casualty Actuarial Society. I have satisfied the continuing education requirements of and am in good standing with the CAS.

Q. Describe your experience with catastrophe models.

A. I have been using output from catastrophe models since joining Aon in 2006. My initial work was to develop an underwriting tool for carriers which would provide total catastrophe cost allocated to an individual location at the point of sale. I am still responsible for maintaining and enhancing the capabilities of that tool today. I have also designed tools for measuring incremental catastrophe volatility and reinsurance cost impact from changes to a portfolio that are larger than a single policy.

Q. Describe your experience with catastrophe reinsurance.

A. Since joining Aon in 2006 I have been working on projects which involve allocation of average annual loss, ceded average annual loss, allocation of reinsurance premium, and allocation of capital cost for Aon's reinsurance clients. Allocation has been done by geographic area and business division, and all the way to a location level. I have also developed tools for clients to calculate the effect on probable maximum loss (PML), and other volatility metrics, from possible changes to the client portfolio.

I have also collaborated with colleagues at Aon to adjust Aon's reinsurance and capital cost allocation methodology to reflect observed changes in market pricing.

Q. What was your role in this filing with respect to expected catastrophe losses?

A. In collaboration with my colleagues in the Cat Modeling Group, I provided advice to the NCRB regarding best practices for estimating expected catastrophe losses for ratemaking based on my experience advising primary company clients.

Q. Are catastrophe simulation models commonly used by insurers for ratemaking in catastrophe-exposed lines and jurisdictions?

A. Yes, catastrophe models have become the standard method of estimating catastrophe risk in rate filings. I have personally provided data and analysis for Aon clients to use in their rate filings in multiple states.

Q. What is demand surge?

A. Demand surge is simply a function of the economic law of supply and demand. It represents the increase in the cost of labor, materials and services (lodging, for example) needed to repair damaged property following a significant natural catastrophe event or series of events. This increase has been observed following such very large events and it is a natural result of the increased demand for labor, materials and services in those situations. As a result, the models incorporate it into their loss estimates.

Q. Which applications of catastrophe model output typically reflect demand surge?

A. All applications of catastrophe model output should reflect demand surge. There is no reason to underestimate the impact of large events by ignoring the increase in demand for labor and materials as a result of those events. In our experience, all companies run the models with demand surge. In fact, the only times we have ever run a model without demand surge at Aon are to measure the impact of demand surge for testing purposes and where specifically requested. Here, the Rate Bureau requested that we also run the models without demand surge so that it could provide certain statutory information in the filing.

Q. Does any state prohibit the inclusion of demand surge in modeled losses for rate filings?

A. No. I am not aware of any prohibitions against the use of demand surge in rate filings in any jurisdiction. South Carolina asks for the impact of demand surge in filing forms, but does not prohibit its inclusion in expected losses. In fact, the Florida Commission on Hurricane Loss Projection Methodology standards actually require that accepted models incorporate demand surge based on relevant data and actuarially sound methods and assumptions.

Q. North Carolina has laws prohibiting "price gouging" following a hurricane. Does that eliminate demand surge?

A. No. Florida has a similar law. Demand surge can and does occur due to supply and demand economics in situations that would not be considered price gouging and/or that would not be prevented by statutes prohibiting price gouging.

Q. Does it make sense for North Carolina hurricane losses to include demand surge for very large events impacting other states even if those events were less significant in North Carolina?

A. The intent of the model is to reflect economic conditions that will influence construction prices and other aspects of insured loss (such as, for example, the increased period of time a carrier has to pay for hotel rooms for insureds while their damaged homes are repaired) after a hurricane occurs. The model assumes the economic conditions that would drive up costs in a nearby state due to demand for labor and materials would also affect North Carolina in certain situations. This makes sense because materials and labor can be quickly transferred between states.

Q. Are you aware of how the reinsurance program was designed for purposes of this rate filing?

A. Yes, I am. Our team reviewed the actual reinsurance programs currently in force for our client companies writing property insurance predominantly in the Southeast, including North Carolina, along with nationwide writers. (Companies whose peak exposure is in Florida are not included, as those costs would be higher than reasonably expected in the other Southeastern states.) We set the attachment and exhaustion points of the proposed reinsurance program to match average attachment and exhaustion return periods of those actual programs. The reinsurance layers between the attachment and exhaustion points were chosen by analyzing the change in standard deviation relative to the limit. We then sent this information to Aon brokers who work

with companies in the reinsurance market to validate the reasonability of the structure. We then presented our proposed reinsurance structure to the Rate Bureau, and the Rate Bureau approved it. This reinsurance structure, as recommended by Aon and approved by the Rate Bureau, is shown in Exhibit RB-8A accompanying this testimony.

Q. Do you believe the reinsurance structure selected by the Rate Bureau is reasonable?

A. Yes. The structure is consistent with how carriers have recently been purchasing catastrophe reinsurance.

Q. How was the reinsurance premium estimated?

A. Aon's approach relies on a proprietary trend line analysis which fits rate-on-line based on the relationship between loss-on-line and rate-on-line for the most recent renewal period for regional insurers writing property insurance predominantly in the Southeast, including North Carolina, along with nationwide insurers. As stated above, companies whose peak exposure is in Florida are not included, as those costs would be higher than is reasonably expected in the other Southeastern states. The trend line analysis is updated annually to reflect changes in the reinsurance market.

In the prior filing, the loss-on-line method discussed above was blended with our technical pricing model, which reflected ceded margin differences across the reinsurance marketplace due to peak industry ceded loss. In previous years, the loss-on-line trend model and the technical pricing model had produced slightly different results and we felt that blending the two methods produced the most accurate results.

Before finalizing our recommendation to the Rate Bureau for this rate review, we requested a review of our results from some of the more experienced brokers in our office, and they agreed that our rates-on-line were reasonable and consistent with current reinsurance market pricing. Therefore, we did not use our technical pricing model for this filing.

Exhibit RB-8B shows a summary of the reinsurance structure and the rates-on-line that result from our loss-on-line analysis, along with a summary of the resulting components of the reinsurance program.

Q. How was the reinsurance premium allocated?

A. For each territory, the average annual loss & loss adjustment expense (LAE) contributed to the portfolio ceded loss & LAE is calculated for each layer of the reinsurance program. The portfolio premium for each layer is allocated in proportion to the average annual ceded loss & LAE for each territory. Allocation is done separately for each model and the results are averaged to obtain the final allocation. Exhibit RB-8D shows the proportion of hurricane peril reinsurance premium, ceded average annual loss, and reinsurance margin (a.k.a. “net cost of reinsurance”) allocated to each territory for each layer. Exhibit RB-8E shows the dollar amount of reinsurance margin allocated by form and territory.

Last year, we also used our technical pricing model in allocating the reinsurance premium. However, as with estimating the reinsurance premium, we did not use our technical pricing model this year when allocating the reinsurance premium.

Q. Why was the technical pricing model not utilized this year?

A. Technical pricing is designed to measure differences in reinsurance market prices based on capacity constraints of the reinsurance industry. Several years ago we observed that the ratio of reinsurance premium to expected ceded loss was higher in the Gulf and South Atlantic regions than it was further north, or in the Midwest. To quantify this observed trend, we developed a technical pricing model for allocation and pro-forma pricing which accounted for both expected ceded loss and how ceded loss would contribute to the volatility of many reinsurers. Technical pricing was an improvement over allocation based solely on ceded loss and the method became standard practice at Aon for allocation work. Over the past 3 to 5 years, we have seen reinsurance rates on line drop. Over that time, the benefit in accuracy of using the more complicated technical pricing model over the ceded loss method dwindled. This year, Aon has made it standard practice to switch away from technical pricing because the market has changed and that model no longer provides improved accuracy.

Q. How was the net cost of reinsurance calculated?

A. The net cost of reinsurance can be thought of simply as the reinsurance premium paid by the insurance company less expected ceded losses recoverable by the insurance company from the reinsurer. However, there are two adjustments that need to be made.

The first adjustment stems from the standard practice of charging a “reinstatement premium” in the event of a ceded loss in a reinsurance treaty. If there is a big enough loss to trigger a payment from reinsurers, then the cedant must pay a “reinstatement premium” proportional to the size of the ceded loss in order for the full coverage of the reinsurance treaty to continue for the remainder of the reinsurance term. The reinstatement premium contributes to the net cost of reinsurance.

Second, reinsurance treaties typically cover loss adjustment expenses (LAE) that can be allocated to a catastrophe event. Assuming a 6% ratio of “catastrophe LAE” to catastrophe loss, we adjust all modeled loss events by a factor of 1.06. The factor of 1.06 was selected based on a review of LAE factors applied to catastrophe losses in AM Best SRQ submissions of Aon clients as shown in Exhibit RB-8C.

Finally, by simulating thousands of years of events, we determine the expected ceded losses and catastrophe LAE by layer as well as an expected reinstatement premium. Then, the net cost of reinsurance is simply deposit premium plus expected reinstatement premium less expected ceded losses and catastrophe LAE recoverable.

For the NCRB Homeowners filing, our analysis shows that expected premiums are $716,770,269, expected recoverables are $252,477,433, and the net cost of reinsurance is $464,292,836, as shown on Exhibit RB-8E and the summary on Exhibit RB-8B. Allocation by territory is done using the method described above.

Q. Given your experience in catastrophe reinsurance, do you find this approach to be reasonable?

A. Yes. Our approach is based on detailed information on current reinsurance market rates and underlying model output.

Q. Do you know whether the Rate Bureau has used in its 2018 Homeowners filing the Aon net cost of reinsurance results you provided?

A. Yes, I am advised that the Rate Bureau has used in the filing both our statewide net cost of reinsurance results and those results allocated to the territory and policy form level.

Q. Are you aware of the provisions in the North Carolina statutes, in N.C.G.S. 58-36-10(7), that state:

> **Property insurance rates established under this Article may include a provision to reflect the cost of reinsurance to protect against catastrophic exposure within this State. Amounts to be paid to reinsurers, ceding commissions paid or to be paid to insurers by reinsurers, expected reinsurance recoveries, North Carolina exposure to catastrophic events relative to other states' exposure, and any other relevant information may be considered when determining the provision to reflect the cost of reinsurance.**

A. Yes, I am.

Q. Do you have an opinion whether the analysis you and Aon have performed on behalf of the Rate Bureau on the net cost of reinsurance for this filing has taken into consideration the provisions of that statute?

A. Yes. Based on my experience with hurricane models and using modeled hurricane losses and my experience with catastrophe reinsurance and determining catastrophe reinsurance costs for rate filings, it is my opinion that the analysis we have performed on the net cost or reinsurance for this filing properly considers all of the items set out in that statute. Further, it is my opinion based on my experience in the actual marketplace that a reasonable and appropriate provision for the net cost of reinsurance must be incorporated into homeowners insurance rates in North Carolina in order for those rates to properly reflect and protect against the catastrophe exposure in this state.

Q. Do you have an opinion regarding the appropriateness of the net cost of reinsurance provision incorporated into this Homeowners filing?

A. Yes. Based on my experience with hurricane models and using modeled hurricane losses and my experience with catastrophe reinsurance and determining catastrophe reinsurance costs for rate filings, it is my opinion that the provision for the net cost of reinsurance in the filing, at the statewide, territory and policy form levels, is reasonable and appropriate.

Q. Does that conclude your testimony?

A. Yes.

North Carolina Rate Bureau
Support for Selected Reinsurance Structure

Attachment Points	All Perils Homowners 50/50 Blend			
	1,000	20,939	Over the Top	
	500	16,331		
213	250	11,911		11.0B
	200	10,665	$4.00B xs $7.00B	
94	100	7,236		7.0B
48	50	4,624	$2.50B xs $4.50B	4.5B
25	25	2,787	$1.75B xs $2.75B	2.8B
	20	2,312	$1.25B xs $1.50B	
13	15	1,783		1.5B
6	10	1,147	$0.90B xs $0.60B	0.6B
	5	437	Retention	
	Avg Annual	647		
	Std Dev	1,799		

in $Millions

The table above shows the trended PML curve with Catastrophe LAE for the North Carolina Rate Bureau portfolio, along with the selected reinsurance program.

North Carolina Rate Bureau
Reinsurance Program Summary

Reinsurance Layer	Rate-On-Line	Deposit Premium	Expected Reinstatement Premium	Expected Total Premium	Expected Ceded Loss	Net Cost of Reinsurance
$4.00B xs $7.00B	3.03%	121	1	122	24	97
$2.50B xs $4.50B	5.20%	130	2	132	31	100
$1.75B xs $2.75B	7.30%	128	3	131	43	88
$1.25B xs $1.50B	11.28%	141	7	147	60	88
$0.90B xs $0.60B	18.73%	169	17	185	94	91
Total		688	29	717	253	464

Amounts are in millions of dollars

The table above shows indicated rates-on-line for the filing's reinsurance structure along with analysis of modeled catastrophe losses. Rate-on-Line values have been selected using the current Loss-On-Line approach, which is a benchmarking analysis done using reinsurance treaties placed by Aon.

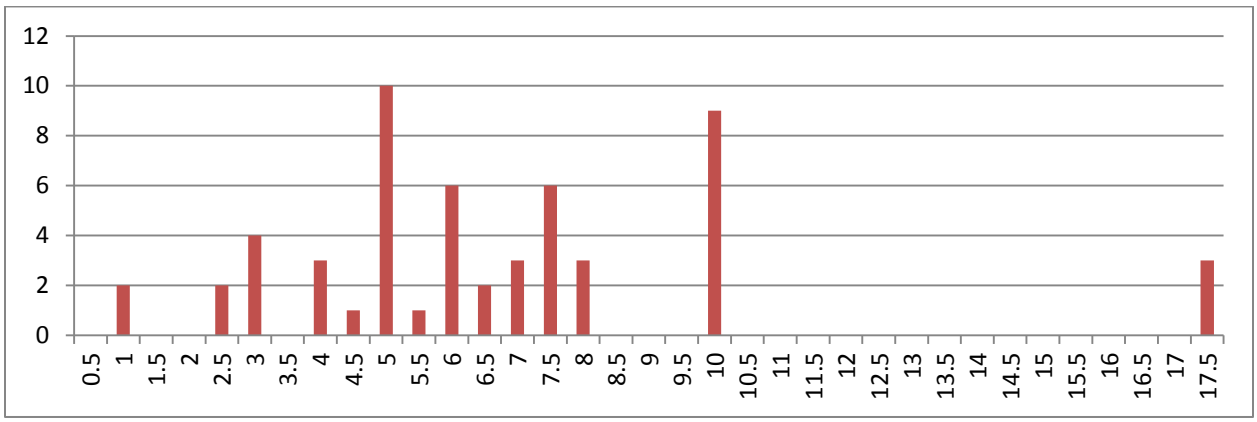
Deposit Premium is Rate-On-Line * Layer Limit

Expected Ceded Loss and Expected Reinstatement premium are the average annual amounts of each based on a simulation of catastrophe losses subject to the reinsurance program.

Expected Total Premium = Deposit Premium + Expected Reinstatement Premium

Net Cost of Reinsurance = Expected Total Premium – Expected Ceded Loss

North Carolina Rate Bureau
Support for Selected Catastrophe LAE Factor



This chart shows Catastrophe LAE factors applied to modeled catastrophe event losses in AM Best SRQ Submissions by Aon Benfield clients in 2016.

- Factors were rounded to the nearest 0.5
- A weighted average was used where factors varied by peril
- Multiple factors were counted where factors varied by company within a group
- Reflects all clients that included a provision for LAE

The mean factor is 6.8, the median is 6.0, and the mode is 5.0.

North Carolina Rate Bureau
Reinsurance Cost Allocation
CY 2016
Homeowners
AIR v5.0 / RMS v18.0

		Layer 1 0.9B xs 0.6B		
Peril	Territory	Premium	Ceded AAL	Reins Margin
		[1]	[2]	[3]
FF		0.0%	0.0%	0.0%
HU	110	8.1%	7.4%	8.8%
HU	120	7.3%	7.2%	7.5%
HU	130	1.9%	1.8%	2.1%
HU	140	19.0%	18.7%	19.2%
HU	150	4.2%	4.0%	4.4%
HU	160	3.7%	3.6%	3.9%
HU	170	0.1%	0.1%	0.1%
HU	180	3.0%	2.7%	3.2%
HU	190	0.9%	0.9%	1.0%
HU	200	0.5%	0.5%	0.5%
HU	210	0.8%	0.8%	0.9%
HU	220	1.9%	1.8%	2.1%
HU	230	0.7%	0.6%	0.7%
HU	240	2.2%	2.0%	2.4%
HU	250	0.9%	0.8%	0.9%
HU	260	0.5%	0.4%	0.5%
HU	270	6.9%	6.4%	7.5%
HU	280	0.9%	0.8%	0.9%
HU	290	0.8%	0.8%	0.9%
HU	300	0.2%	0.2%	0.2%
HU	310	2.6%	2.4%	2.8%
HU	320	1.3%	1.2%	1.4%
HU	330	0.0%	0.0%	0.1%
HU	340	3.8%	3.7%	3.9%
HU	350	0.7%	0.7%	0.7%
HU	360	1.0%	0.9%	1.1%
HU	370	0.0%	0.0%	0.0%
HU	380	0.1%	0.1%	0.1%
HU	390	0.1%	0.1%	0.1%
OW		18.0%	19.9%	15.9%
WT		7.8%	9.5%	6.1%

North Carolina Rate Bureau
Reinsurance Cost Allocation
CY 2016
Homeowners
AIR v5.0 / RMS v18.0

		Layer 2 1.25B xs 1.5B		
Peril	Territory	Premium	Ceded AAL	Reins Margin
		[1]	[2]	[3]
FF		0.0%	0.0%	0.0%
HU	110	6.7%	6.1%	7.1%
HU	120	8.2%	8.2%	8.2%
HU	130	1.8%	1.6%	1.9%
HU	140	21.8%	21.7%	21.8%
HU	150	4.2%	4.0%	4.4%
HU	160	4.3%	4.1%	4.5%
HU	170	0.1%	0.1%	0.1%
HU	180	3.3%	3.1%	3.5%
HU	190	1.1%	1.0%	1.1%
HU	200	0.6%	0.6%	0.6%
HU	210	1.0%	0.9%	1.0%
HU	220	2.5%	2.3%	2.6%
HU	230	0.8%	0.7%	0.8%
HU	240	2.6%	2.4%	2.8%
HU	250	1.1%	1.1%	1.2%
HU	260	0.6%	0.5%	0.6%
HU	270	9.0%	8.2%	9.5%
HU	280	1.2%	1.1%	1.2%
HU	290	1.0%	1.0%	1.1%
HU	300	0.3%	0.3%	0.3%
HU	310	3.4%	3.1%	3.6%
HU	320	1.6%	1.6%	1.7%
HU	330	0.1%	0.1%	0.1%
HU	340	4.4%	4.3%	4.5%
HU	350	0.8%	0.8%	0.8%
HU	360	1.0%	0.9%	1.0%
HU	370	0.0%	0.0%	0.0%
HU	380	0.1%	0.1%	0.1%
HU	390	0.1%	0.1%	0.1%
OW		13.0%	16.9%	10.2%
WT		3.3%	3.1%	3.5%

North Carolina Rate Bureau
Reinsurance Cost Allocation
CY 2016
Homeowners
AIR v5.0 / RMS v18.0

Peril	Territory	Layer 3 1.75B xs 2.75B Premium [1]	Ceded AAL [2]	Reins Margin [3]
FF		0.0%	0.0%	0.0%
HU	110	5.6%	4.7%	6.0%
HU	120	8.8%	8.9%	8.7%
HU	130	1.6%	1.4%	1.7%
HU	140	23.4%	23.6%	23.3%
HU	150	4.1%	3.8%	4.2%
HU	160	4.7%	4.4%	4.8%
HU	170	0.1%	0.1%	0.1%
HU	180	3.4%	3.2%	3.5%
HU	190	1.2%	1.1%	1.2%
HU	200	0.7%	0.6%	0.7%
HU	210	1.0%	0.9%	1.0%
HU	220	2.8%	2.5%	2.9%
HU	230	0.9%	0.8%	0.9%
HU	240	2.8%	2.6%	2.9%
HU	250	1.3%	1.2%	1.4%
HU	260	0.6%	0.6%	0.6%
HU	270	10.2%	9.5%	10.6%
HU	280	1.4%	1.3%	1.4%
HU	290	1.2%	1.1%	1.3%
HU	300	0.3%	0.3%	0.3%
HU	310	4.1%	3.7%	4.3%
HU	320	2.0%	1.8%	2.0%
HU	330	0.1%	0.1%	0.1%
HU	340	5.0%	4.8%	5.2%
HU	350	0.9%	0.8%	0.9%
HU	360	1.1%	1.0%	1.1%
HU	370	0.0%	0.0%	0.0%
HU	380	0.1%	0.1%	0.1%
HU	390	0.1%	0.1%	0.1%
OW		8.9%	13.9%	6.5%
WT		1.7%	1.2%	2.0%

North Carolina Rate Bureau
Reinsurance Cost Allocation
CY 2016
Homeowners
AIR v5.0 / RMS v18.0

		Layer 4 2.5B xs 4.5B		
Peril	Territory	Premium	Ceded AAL	Reins Margin
		[1]	[2]	[3]
FF		0.0%	0.0%	0.0%
HU	110	5.1%	3.7%	5.5%
HU	120	9.2%	9.5%	9.0%
HU	130	1.5%	1.2%	1.6%
HU	140	24.4%	25.8%	24.0%
HU	150	3.9%	3.5%	4.1%
HU	160	4.9%	4.8%	5.0%
HU	170	0.1%	0.1%	0.1%
HU	180	3.4%	3.2%	3.5%
HU	190	1.2%	1.2%	1.3%
HU	200	0.7%	0.7%	0.7%
HU	210	1.0%	1.0%	1.0%
HU	220	3.0%	2.8%	3.1%
HU	230	1.0%	0.9%	1.0%
HU	240	2.9%	2.8%	3.0%
HU	250	1.4%	1.3%	1.4%
HU	260	0.6%	0.6%	0.6%
HU	270	11.1%	10.5%	11.3%
HU	280	1.5%	1.4%	1.6%
HU	290	1.3%	1.3%	1.4%
HU	300	0.3%	0.3%	0.3%
HU	310	4.7%	4.2%	4.9%
HU	320	2.2%	2.0%	2.2%
HU	330	0.1%	0.1%	0.1%
HU	340	5.1%	5.0%	5.1%
HU	350	0.8%	0.8%	0.8%
HU	360	1.0%	1.0%	1.0%
HU	370	0.0%	0.0%	0.0%
HU	380	0.1%	0.1%	0.1%
HU	390	0.0%	0.0%	0.0%
OW		6.1%	9.2%	5.1%
WT		1.1%	0.8%	1.2%

North Carolina Rate Bureau
Reinsurance Cost Allocation
CY 2016
Homeowners
AIR v5.0 / RMS v18.0

		Layer 5 4.0B xs 7.0B		
Peril	Territory	Premium	Ceded AAL	Reins Margin
		[1]	[2]	[3]
FF		0.0%	0.0%	0.0%
HU	110	4.4%	3.1%	4.7%
HU	120	9.5%	9.9%	9.4%
HU	130	1.4%	1.1%	1.5%
HU	140	25.5%	28.0%	24.9%
HU	150	3.7%	3.3%	3.8%
HU	160	5.1%	5.0%	5.1%
HU	170	0.1%	0.1%	0.1%
HU	180	3.4%	3.2%	3.5%
HU	190	1.3%	1.2%	1.3%
HU	200	0.7%	0.7%	0.7%
HU	210	1.1%	1.0%	1.1%
HU	220	3.2%	3.1%	3.2%
HU	230	1.0%	1.0%	1.0%
HU	240	3.1%	2.9%	3.2%
HU	250	1.5%	1.4%	1.5%
HU	260	0.7%	0.7%	0.7%
HU	270	12.1%	11.4%	12.3%
HU	280	1.7%	1.6%	1.7%
HU	290	1.5%	1.4%	1.5%
HU	300	0.4%	0.3%	0.4%
HU	310	5.2%	4.6%	5.4%
HU	320	2.3%	2.2%	2.4%
HU	330	0.1%	0.1%	0.1%
HU	340	5.1%	5.1%	5.1%
HU	350	0.8%	0.8%	0.7%
HU	360	0.9%	1.0%	0.9%
HU	370	0.0%	0.0%	0.0%
HU	380	0.0%	0.1%	0.0%
HU	390	0.0%	0.0%	0.0%
OW		3.4%	5.2%	3.0%
WT		0.8%	0.5%	0.8%

North Carolina Rate Bureau
Reinsurance Cost Allocation
CY 2016
Homeowners
AIR v5.0 / RMS v18.0

Exhibit RB-8E

Reinsurance Margin

Territory	Owners	Tenant	Condominium Unit Owners	Total
110	30,013,744	31,863	35,596	30,081,204
120	39,436,129	144,612	493,154	40,073,895
130	8,134,955	25,747	25,843	8,186,545
140	103,768,840	983,524	878,660	105,631,023
150	19,336,238	124,015	33,201	19,493,454
160	22,305,742	221,023	129,091	22,655,855
170	575,830	3,195	1	579,027
180	15,966,102	181,594	25,100	16,172,796
190	5,548,459	37,349	1,070	5,586,878
200	3,005,695	13,966	27	3,019,688
210	4,984,015	42,291	1,852	5,028,157
220	13,172,979	109,958	22,399	13,305,336
230	4,212,553	27,679	1,958	4,242,190
240	14,241,979	87,679	7,039	14,336,697
250	6,238,620	37,606	1,499	6,277,725
260	3,056,209	12,971	295	3,069,475
270	52,949,496	716,541	180,497	53,846,535
280	8,007,033	88,591	41,055	8,136,679
290	5,933,695	31,348	17,336	5,982,379
300	1,738,090	7,465	302	1,745,857
310	25,439,564	270,430	96,332	25,806,325
320	12,577,089	89,106	19,733	12,685,929
330	437,935	1,749	222	439,905
340	37,685,151	510,596	391,183	38,586,930
350	5,568,898	38,955	12,350	5,620,203
360	10,129,098	91,125	57,983	10,278,206
370	404,957	1,090	6,531	412,578
380	1,093,880	4,626	2,575	1,101,081
390	1,898,394	5,881	6,009	1,910,283
Total	457,861,369	3,942,574	2,488,893	464,292,836

PREFILED TESTIMONY
OF
PAUL D. ANDERSON

2018 HOMEOWNERS INSURANCE RATE FILING BY THE NORTH CAROLINA RATE BUREAU

Q. Please state your name and business address.

A. My name is Paul D. Anderson. My business address is 15800 West Bluemound Road, Brookfield, WI 53005.

Q. By whom are you employed?

A. I am employed by Milliman, Inc. (Milliman) and have been employed by Milliman since February 1, 2007.

Q. What is your educational background?

A. I received a Bachelor of Science in Actuarial Science from Drake University in Des Moines, Iowa in 1993.

Q. Do you have any additional certifications or qualifications?

A. Yes. I have been a Fellow of the Casualty Actuarial Society since 2002. Since then, I have participated on several committees of the organization. I was on the Examination Committee of the Casualty Actuarial Society between 2004 and 2006. I served on the Volunteer Support Task Force from February 2012 until April 2013. I have been a member of the Volunteer Resources Committee since April 2013. I have also been a member of the American Academy of Actuaries since 2002, and meet all of the continuing education requirements of that organization as well as those of the Casualty Actuarial Society.

Q. What is your employment background?

A. I was employed by Allstate Insurance Company from June 1993 until January 2007. While at Allstate, I held various actuarial roles. I began my career as an Auto Pricing Analyst and over time, I assumed increasing responsibility in various departments that included Property Pricing, Auto Pricing, Property Research, and Auto Research. On the pricing teams, I assisted in developing rates for property and auto insurance products in most states across the country. On the research teams, I assisted in developing new property and auto risk classification plans to be implemented by Allstate's pricing teams. From 2006 until January 2007, I served as a Senior Manager for Allstate's Eastern region, which included

assisting in the oversight of the pricing strategies for approximately half the country, including North Carolina.

In February 2007 I began my career at Milliman. Since 2007 I have completed, managed, or overseen numerous property and auto pricing analyses for a variety of clients. My clients have included small single-state insurance companies, industry-leading national insurance companies, government entities, the North Carolina Rate Bureau, and other entities with similar coastal property exposure in states such as Florida and Texas. These client assignments have included such projects as pricing analyses to evaluate overall rate adequacy, predictive modeling assignments to develop new risk classification plans, and analyses of catastrophe losses to evaluate the adequacy and allocation of property premiums corresponding to catastrophe risk.

Q. What is Milliman?

A. Milliman is among the world's largest independent actuarial and consulting firms. Milliman was founded in Seattle in 1947 as Milliman & Robertson and today has offices in principal cities worldwide, covering markets in North America, Latin America, Europe, Asia and the Pacific, the Middle East, and Africa. Milliman employs more than 3,500 people, including actuaries and specialists ranging from clinicians to economists. The firm has consulting practices in employee benefits, financial services, healthcare, life insurance, and property and casualty insurance. Milliman serves the full spectrum of business, education, financial, governmental, union, and nonprofit organizations.

Q. What are your current responsibilities at Milliman?

A. I am responsible for managing and overseeing the personal lines and insurance-related predictive analytics portion of Milliman's Milwaukee Casualty practice. The personal lines and predictive analytics team conducts a variety of property and auto pricing, product development, and predictive modeling assignments, primarily for insurance companies. Over the last five years, we have completed property analyses for nearly every state in the country, including North Carolina.

Q. Were you engaged to provide actuarial services to the North Carolina Rate Bureau (the Rate Bureau) in relation to its 2018 homeowners rate filing?

A. Yes, I was.

Q. What was the scope of that engagement?

A. Milliman was engaged for several aspects of the 2018 homeowners rate filing. My role was to review the compensation for assessment risk provision and to conduct an independent review and provide feedback on the actuarial analyses underlying the filing. In these roles, I participated in many of the discussions in

which ISO presented the preliminary data to the Rate Bureau. In addition, my role also included participating in the Rate Bureau's Property Rating Subcommittee meetings in which the 2018 homeowners filing was discussed. During these discussions, I offered feedback and insights to assist in the subcommittee's selections and decisions related to this filing.

In addition to my role in this homeowners filing, Dr. David Appel of Milliman's New York office was also engaged to review the underwriting profit provision.

Q. Is your firm being compensated for this engagement?

A. Yes, it is.

Q. Is that compensation in any way contingent on the provision of favorable testimony in support of the proposed filing?

A. No, it is not.

Q. Have you completed your review of the 2018 homeowners rate filing?

A. Yes, I have.

Q. Were there any constraints placed on your review, such as limited or delayed access to data or limited time that may have hindered your complete review?

A. No, I was provided all the data and information that were necessary and I had adequate time for a complete review. My review was not limited in any way.

Q. What is the overall indicated change in homeowners rates in this filing?

A. This filing shows the need for an overall 26.1% statewide average rate increase. This includes a 26.8% change to owners rates, a 10.6% change to tenants rates, and a 12.9% change to condominium unit owners rates.

Q. Please describe the overall ratemaking methodology that underlies the filing.

A. The approach in this filing is generally consistent with prior homeowners filings submitted by the Rate Bureau. Consistent with the *Statement of Principles Regarding Property and Casualty Insurance Ratemaking* as published by the Casualty Actuarial Society, the indicated rates reflect the expected costs associated with insuring homeowners policies. These expected costs include claims, claim settlement expenses, operational and administrative expenses, and the cost of capital.

The statewide rate-level indications for homeowners policies are developed based on a loss cost methodology (instead of a loss ratio methodology). The indicated rate-level change is calculated for each segment (i.e., owners, tenants, and condominium unit owners) by comparing the required base rate per policy to the current base rate. The required base rate per policy is calculated by first projecting the losses and loss adjustment expenses for the policy period for which the filed rates are expected to be in effect. For the owners, tenants, and condominium unit owners forms, losses are projected excluding historical hurricane losses. In addition to the exclusion of those hurricane losses, the projected losses for owners forms are adjusted to remove excess wind losses and an excess factor is applied based on an average of the excess wind losses over more than 60 years of historical experience. Base class loss costs are calculated by dividing the adjusted incurred losses and loss adjustment expenses for each historical accident year by the corresponding earned house years and average rating factors. The base class loss costs by year are weighted together to develop a weighted trended non-hurricane base class loss cost. For each homeowners segment (owners, tenants, and condominium unit owners), a trended modeled hurricane base class loss cost and a provision for fixed expense per policy are also developed and added to the weighted trended non-hurricane base class loss cost to determine the total base class loss cost with fixed expense.

Following the development of the base class loss cost with fixed expense, other expected underwriting expenses associated with issuing homeowners insurance policies are incorporated to determine the required base rate per policy. These expected underwriting expenses include provisions for underwriting profit, contingencies, dividends, compensation for assessment risk, the net reinsurance cost per policy, and deviations. As mentioned above, the required base rate per policy is compared to the current average base rate to develop the overall statewide indicated rate-level change. This comparison of the required and current base rates is consistent with the *Statement of Principles* referenced above, is commonly used throughout the industry, and as such, is an actuarially sound method of developing an indicated rate-level change.

Q. Are there any changes in the ratemaking methodology compared to prior filings?

A. Yes. Although the 2018 homeowners filing is generally consistent with prior filings, there are a couple components of this filing that rely on different approaches as compared to the 2017 homeowners filing.

The first revised approach is that loss development factors are calculated separately for each policy form (i.e., owners, tenants, and condominium unit owners). In the 2017 homeowners filing, loss development factors were calculated for all policy forms combined. This change impacts the non-hurricane losses in the statewide and by-territory rate-level indications.

A second change in methodology in this homeowners filing is that the reinsurance costs are allocated to owners, tenants, and condominium unit owners based on information provided by Aon. By comparison, in the 2017 homeowners filing, the distribution of earned premium by policy form within each territory was used to allocate the reinsurance costs. This change impacts the statewide and by-territory net cost of reinsurance per policy, and it has a greater impact on the rate-level indications for the tenants and condominium unit owner forms than on the rate-level indications for the owners form.

Both of these updated approaches used to develop the statewide and by-territory rate-level indications are reasonable and actuarially sound.

Q. How are the expected losses determined?

A. This filing uses five years of historical loss experience including accident years ending December 31, 2012 through December 31, 2016. Using five years of experience is consistent with North Carolina statutes and prior homeowners rate filings. It is also consistent with generally accepted ratemaking practices because the use of five years of historical experience balances stability of the overall rate level with responsiveness to the most recent conditions. Because severe weather-related events can cause volatility in the loss experience, hurricane losses and excess wind losses (for owners forms only) have been removed from the base loss experience. Each of the five years of losses has been developed to ultimate amounts and has been adjusted to a common $1,000 deductible level for owners forms and a $500 deductible level for tenants and condominium unit owners forms. Losses are developed to ultimate because the final incurred losses for an accident year are often different than initial loss estimates due to late-reporting of claims or as yet unknown settlement amounts on known claims.

After these initial adjustments, a provision for excess wind losses is applied to each accident year for the owners forms, and a provision for loss adjustment expenses is applied to each accident year for all homeowners forms. The excess loss factor of 1.068 for the owners forms in the filing is determined using ISO's standard excess wind procedure. This procedure evaluates historical non-hurricane wind experience back to 1950 to develop a ratio of the long-term average excess loss ratio to the long-term average normal loss ratio.

Following these additional adjustments, in order to reflect the expected change in costs, the losses are trended from the midpoint of each experience period to the midpoint of the trend period. Similar to prior homeowners filings, both external trend information and actual pure premium data are considered to select the loss trends. In this filing, additional adjustments are made to the owners and condominium unit owners loss trends based on the review of actual pure premium data. In reviewing external trends, the CoreLogic Residential Index

(successor to the Boeckh Residential Index) and the Modified Consumer Price Index are averaged together using an appropriate weight on each to develop the Current Cost Index. The weights used to combine the CoreLogic Residential Index and the Modified Consumer Price Index were updated in the 2017 homeowners filing and are unchanged with this filing. The Current Cost Index for each year is compared to the Current Cost Index for the trend period to determine Current Cost Factors for each accident year.

In addition to reflecting a loss trend, a premium trend is also determined by calculating Current Amount Factors for each accident year. The Current Amount Factors are developed by comparing the average policy amount relativity for each year to the comparable relativity for the trend period. The ratio of the Current Cost Factor and the Current Amount Factor is calculated for each year in order to apply a net trend (i.e., the net difference between the loss trend and premium trend) to each year's adjusted incurred losses.

In my opinion, all of the selections referenced above, including the excess loss factor, the loss adjustment expense factors, the loss trend factors, and the premium trend factors, are reasonable and actuarially sound.

After adjusting the losses for each of the items mentioned above, each year's trended losses and loss adjustment expenses are divided by the earned house years to determine the average trended loss cost. The average trended loss costs are multiplied by a Composite Projection Factor, which reflects the combined impact of a loss projection factor and premium projection factor. This Composite Projection Factor adjusts the loss costs to the policy period for which the filed rates are expected to be in effect. Those loss costs are converted to Trended Base Class Loss Costs by dividing by the Average Rating Factor applicable to each accident year. Finally, these base class loss costs are weighted together to develop a Weighted Trended Non-Hurricane Base Class Loss Cost. The weights applied to each accident year are consistent among all of the policy forms and assign more weight to the more recent years in order to be more responsive to the most recent loss experience.

In my opinion, the methodology used to develop average loss costs and the weights assigned to each of the homeowners policy forms are reasonable and are consistent with widely-used actuarial ratemaking practices.

Q. In the previous response, you mentioned a loss adjustment expense provision. How are the homeowners provisions for loss adjustment expense determined?

A. The allocated and unallocated loss adjustment expenses are included with non-hurricane losses by applying a trended loss adjustment expense factor. Using information received from the Rate Bureau's data call for expense experience, loss adjustment expenses are summarized for calendar years 2012 through

2016. Consistent with prior homeowners filings, a three-year average is calculated after removing the highest and lowest ratio of expenses to losses. By excluding the highest and lowest ratios observed in the historical experience period, this methodology reduces the volatility in the average loss adjustment expense ratio that may result from variation in the underlying incurred losses from year to year. After the average loss adjustment expense ratio is calculated, it is adjusted to reflect the difference in the loss adjustment expense trend and the loss trend.

A separate provision for hurricane-related loss adjustment expenses is included in the modeled hurricane losses based on data and a recommendation provided by Aon.

Q. In your opinion, are the provisions for loss adjustment expenses reasonable?

A. Yes, the loss adjustment expense provisions are reasonable. It is common practice in the industry to use an average of historical experience to determine a loss adjustment expense provision, and it is reasonable to adjust that provision for expected differences in the loss adjustment expense trend and the loss trend.

Q. Is credibility considered in the rate-level indication?

A. Yes, credibility is considered. At the statewide level, based on the volume of data supporting the statewide rate-level indications, all three homeowners segments (owners, tenants, and condominium unit owners) are considered fully credible. The full credibility standards are 240,000 house years for owners, 285,000 house years for tenants, and 190,000 house years for condominium unit owners. When the territorial rate-level indications are calculated, partial credibility is determined using the square root rule and full credibility standards of 60,000 house years for owners, 75,000 house years for tenants, and 50,000 house years for condominium unit owners. The application of the square root rule is a long-standing actuarial methodology used throughout the industry.

Q. How is hurricane exposure reflected in each policy form's rate-level indication?

A. Similar to the Rate Bureau's prior homeowners filing, this filing reflects hurricane exposure in each of the owners, tenants, and condominium unit owners sections of the rate-level indication by using modeled hurricane losses rather than actual hurricane loss experience. Although there are actual hurricane losses in the experience period, the hurricane and excess wind losses have been removed from the base loss experience, as noted in my comments above. Actual hurricane losses have a significant amount of variability even when evaluating twenty or more years of historical loss experience in a state. As such, it is universally accepted by the property and casualty insurance industry that

hurricane models provide the most reliable basis of determining anticipated average annual hurricane losses over an extended time period. Hurricane models can be used to simulate 100,000 or more years of events, which provides a broader perspective on potential insured losses as compared to only evaluating the last several decades of losses. This broader perspective provides a more reliable estimate of the average frequency and severity of insured hurricane losses. Similarly, it provides a more reliable estimate of the frequency and severity of rare, but very severe events that may not have occurred within the last 100 years of recorded history, but have the potential to occur next year.

Q. How is the provision for expected hurricane losses different from prior homeowners rate filings?

A. The provision for average annual hurricane losses in this filing is consistent with the prior homeowners filing in that expected hurricane losses are developed through the use of hurricane models of two independent catastrophe modelers. It is my understanding that, prior to the 2017 homeowners filing, all prior Rate Bureau homeowners filings containing a provision for modeled hurricane losses included estimated hurricane losses that were developed by AIR Worldwide (or its predecessor). With this filing (and previously in the 2017 homeowners filing), in addition to relying on AIR's hurricane model, the Rate Bureau also relied upon hurricane losses derived from the RMS (Risk Management Solutions) hurricane model. To facilitate the use of two hurricane models, the Rate Bureau retained Aon to run both models and to develop modeled hurricane losses using the blended results of these two models. I reviewed the exposure data provided as input to each model, and it is my opinion that the data was reasonable and consistent with other sections of this filing. I am also familiar with the assumptions selected as inputs to each model, and it is my opinion that the assumptions were applied consistently in both the AIR and RMS models such that the resulting output of both models are comparable. However, because Aon ran both models, I am relying on the work and opinions of Aon as it relates to specific details about the modeling process. The reliance on Aon to run both models and to develop modeled hurricane losses using the blended results of these two models is consistent with the prior homeowners filing.

The Rate Bureau requested that Aon combine the results of the two hurricane models by averaging the results from each model. This approach of giving equal weight to each model is intuitive, easy to understand, and the most reasonable method of blending two hurricane models. This blending approach (i.e., averaging) is also a common practice among insurance companies that consider multiple hurricane models. Based on my review of the blended model results, it is my opinion that the resulting hurricane losses reflected in this filing are reasonable and can be relied upon for the various purposes for which modeled hurricane losses are used in this filing. Additionally, since both models are equally credible, it is also my opinion that assigning equal weight to each model

is the most reliable blending method and the most actuarially sound manner to consider two hurricane models.

Q. What model versions and modeling assumptions were used to develop estimated hurricane losses?

A. The current AIR model is Touchstone v5.0 and the current RMS model is RiskLink v18.0. To develop the expected hurricane losses, Aon relied on AIR's Standard event set and on RMS' Historical event set. These event sets were used instead of AIR's Warm Sea-Surface Temperature (WSST) event set and RMS' Medium-Term Rate event set. Although many primary insurance companies consider the WSST and Medium-Term Rate events sets when developing expected hurricane losses for indicated rates in states other than North Carolina, the event sets selected for this filing are reasonable and actuarially sound.

Both the AIR and RMS models were run with aggregate demand surge included, which was identified as loss amplification in the RMS model. This standard procedure accounts for the expected additional cost for labor and materials after a very large hurricane occurs. Historical experience shows that, when major catastrophic events occur, the increased demand for building materials, labor, temporary housing, and other basic necessities can exceed the supply of these same items, which consequently increases their cost. Running models with demand surge is consistent with the Rate Bureau's prior homeowners filings, and is the common practice by insurance companies when developing rates based on modeled hurricane losses. Although the demand surge component of each model was used in this filing, the storm surge component of each model was not used to develop hurricane losses.

Q. Were any other calculations applied to the hurricane losses derived from the models?

A. Yes. Before providing the blended hurricane losses, Aon trended the modeled hurricane losses and applied a hurricane-specific provision for loss adjustment expense. After Aon provided the trended modeled hurricane losses (including LAE), ISO calculated a Trended Modeled Hurricane Base Class Loss Cost for each segment. The Trended Modeled Hurricane Base Class Loss Costs have been adjusted for LAE and trend in a consistent manner as the Weighted Trended Non-Hurricane Base Class Loss Costs.

Q. How is the provision for commission and brokerage determined?

A. The provision for commission and brokerage is determined based on the three-year average of the ratio of homeowners commission and brokerage expense relative to homeowners written premium including deviations. Deviations are included in the premium amounts underlying this calculation to be consistent with

the actual calculation of commission and brokerage amounts paid by individual companies within the industry.

Q. In your opinion, is the provision for commission and brokerage reasonable?

A. Yes, the commission and brokerage provision is reasonable. It is common practice in the industry to use a three-year average to determine a commission and brokerage provision.

Q. How is the provision for taxes, licenses, and fees determined?

A. The provision for taxes, licenses, and fees is determined based on the three-year average of the ratio of homeowners taxes, licenses, and fees expense relative to homeowners written premium including deviations. Deviations are included in the premium amounts underlying this calculation to be consistent with the actual calculation of taxes, licenses, and fees paid by individual companies within the industry.

Q. In your opinion, is the provision for taxes, licenses, and fees reasonable?

A. Yes, the taxes, licenses, and fees provision is reasonable. It is common practice in the industry to use a three-year average to determine a taxes, licenses, and fees provision.

Q. How is the provision for other acquisition expense determined?

A. The provision for other acquisition expense is determined based on the three-year average of the ratio of homeowners other acquisition expense relative to homeowners earned premium excluding deviations.

The three-year average provision is then trended from the midpoint of the experience period to the midpoint of the trend period based on an expense trend derived from cost indices. Following this, the trended other acquisition expense provision is added to the trended general expense provision and applied to the statewide average homeowners premium (adjusted for premium trend) to develop an average all-forms fixed expense load. This all-forms fixed expense load is allocated to each policy form based on a relativity of 1.00 for owners and a relativity of 0.50 for tenants and condominium unit owners. The average fixed expense load for each policy form is then adjusted to the base class level by dividing by each policy form's average rating factor, current amount factor, and premium projection factor. The resulting amounts are the fixed expense amounts per policy for each policy form.

Q. In your opinion, is the provision for other acquisition expense reasonable?

A. Yes, the other acquisition expense provision is reasonable. It is common practice in the industry to use a three-year average to determine an other acquisition expense provision, and to trend fixed expense provisions to account for inflation.

Q. How is the provision for general expense determined?

A. The provision for general expense is determined based on the three-year average of the ratio of homeowners general expense relative to homeowners earned premium.

The three-year average provision is then trended from the midpoint of the experience period to the midpoint of the trend period based on an expense trend derived from cost indices. As noted above, the trended general expense provision is added to the trended other acquisition expense provision. This sum is applied to the statewide average trended homeowners premium, allocated to each policy form, and adjusted to the base class level to develop the fixed expense amounts per policy for each policy form.

Q. In your opinion, is the provision for general expense reasonable?

A. Yes, the general expense provision is reasonable. It is common practice in the industry to use a three-year average to determine a general expense provision, and to trend fixed expense provisions to account for inflation.

Q. Is a provision for policyholder dividends included in the filing?

A. Yes, the Rate Bureau reviewed historical data and developed a provision for expected policyholder dividends. The Rate Bureau evaluated five years of historical experience and selected a provision for policyholder dividends to be 0.40% based on a five-year average ratio of the total policyholders dividends issued by homeowners insurers in North Carolina to the total direct written premium of those same companies.

The Actuarial Standard of Practice (ASOP) No. 29 regarding *Expense Provisions in Property/Casualty Insurance Ratemaking* states the following:

> The *Statement of Principles Regarding Property and Casualty Insurance Ratemaking* of the Casualty Actuarial Society (CAS) classifies policyholder dividends as an expense to operations. When the actuary determines that policyholder dividends are a reasonably expected expense and are associated with the risk transfer, the actuary may include a provision in the rate for the expected amount of policyholder dividends. In making this determination, the actuary should consider the following: the company's dividend payment history, its current dividend policy or practice, whether dividends are related to loss

experience, the capitalization of the company, and other considerations affecting the payment of dividends.

As stated in ASOP NO. 29, policyholder dividends are classified as an operating expense. In addition to the above excerpt from the *Statement of Principles Regarding Property and Casualty Insurance Ratemaking*, the Statement also articulates that indicated rates should reflect the expected costs associated with insuring homeowners policies, including all operating expenses. As such, since policyholder dividends are classified as an operating expense, it is consistent with the *Statement of Principles Regarding Property and Casualty Insurance Ratemaking* and ASOP No. 29 to include a provision for policyholder dividends in the proposed rates reflected in this filing.

Q. In your opinion, is the provision for policyholder dividends reasonable?

A. Yes, the policyholder dividends provision is reasonable. It is reasonable and actuarially sound to calculate a five-year average ratio to determine a provision for policyholder dividends, and to treat this provision in a similar manner as a variable underwriting expense.

By reviewing five years of historical experience to determine a provision for policyholder dividends, the Rate Bureau is complying with the *Statement of Principles Regarding Property and Casualty Insurance Ratemaking* by considering the dividend payment history and ensuring that the selected provision is a reasonably expected expense.

Q. Is a contingency provision included in the filing?

A. Yes, the Rate Bureau is including a 1% contingency provision in this filing. This is consistent with the prior homeowners rate filings submitted by the Rate Bureau.

In addition to being consistent with prior Rate Bureau filings, the use of a contingency provision is common within the property and casualty insurance industry. According the *Actuarial Standard of Practice No. 30: Treatment of Profit and Contingency Provisions and the Cost of Capital in Property/Casualty Insurance Ratemaking,* "the actuary should include a contingency provision if the assumptions used in the ratemaking process produce cost estimates that are not expected to equal average actual costs, and if this difference cannot be eliminated by changes in other components of the ratemaking process." There are several reasons why expected cost estimates may not be equal to actual costs. Some of these reasons include adverse court decisions, extension of coverage for unforeseen or unintended exposures, regulatory delay or reduction in filed rate changes, and unexpected large losses not sufficiently recognized in the normal ratemaking process. Based on reasons such as those listed above, the Rate Bureau believes a contingency provision is appropriate and necessary.

Included with this filing as Exhibit RB-10 is an exhibit I prepared that summarizes the estimated impact of delays in the filing process within the State of North Carolina. The delay in filed rate changes, whether caused by the regulatory review process or other delays inherent in the filing process, is one of several items listed above that supports the use of a contingency provision in a rate-level indication. Exhibit RB-10 lists the ten property rate filings submitted by the North Carolina Rate Bureau between 2008 and 2018. For each filing, I compare the effective date assumed in the rate filing to the actual effective date. This difference, which reflects the delay due to the filing process, ranges from 1 month in the 2012 homeowners filing, to 22 months in the 2011 dwelling filing. After determining the length of delay for each filing, I apply the net trend (i.e., the loss trend offset by the premium trend) in that filing for the number of months of delay to determine the estimated impact of the delay in the filing process on the overall rate level. The estimated impact of delay varies across the ten filings, ranging from -1.2% in the 2018 dwelling filing to +5.9% in the 2008 MH(C) mobile homeowners filing, with an average impact of +1.2%.

Based on prior filings submitted by the North Carolina Rate Bureau, my experience with property filings submitted by insurance companies in other states, and the 1.2% estimated impact of delays in the North Carolina filing process, it is my opinion that a 1% contingency provision is reasonable, consistent with common actuarial practice, and appropriate based on fundamental actuarial principles.

Q. Are you providing expert testimony concerning the underwriting profit provision?

A. No, I am relying on the work and opinions of Dr. Vander Weide and Dr. Appel as to the underwriting profit provision. The scope of my analysis and testimony relates to other aspects of the proposed rate filing.

Q. Earlier you said that one of your roles related to this filing was to review the compensation for assessment risk provision. Can you please explain this issue?

A. Yes. There is considerable risk to primary insurers that is attributable to the exposures written in the North Carolina Insurance Underwriting Association (i.e., the Coastal Property Insurance Pool, or “Beach Plan”) and the North Carolina Joint Underwriting Association (i.e., the FAIR Plan). Together, the Beach Plan and FAIR Plan serve as the “residual market” for residential property insurance in North Carolina. These two entities provide property insurance when policyholders are unable to purchase insurance coverage from companies in the voluntary market. In states with significant exposure to catastrophic events, property insurance residual markets may grow to represent a sizable portion of the total insured risk in the exposed regions of the state. In North Carolina, the

Beach Plan has become the predominant writer of homeowners insurance in the 18 coastal counties that it covers.

Similar to voluntary insurance companies, the Beach and FAIR Plans use the premiums collected from policies they issue to fund the losses and expenses attributable to the coverages they insure. When premiums are greater than losses and expenses during a fiscal year, the Beach and FAIR Plans accumulate surplus. That surplus is available to pay losses in the event that future losses and expenses exceed collected premiums plus investment income. However, if the surplus of either the Beach Plan or FAIR Plan is exhausted, then additional losses are passed through to property insurers in North Carolina in the form of an assessment. The potential overall industry assessment from the Beach Plan is limited to $1 billion, but the potential assessment from the FAIR Plan is unlimited. If losses in the Beach Plan exceed the retained surplus, the $1 billion industry assessment, and any other resources of the Beach Plan (such as reinsurance), any additional losses are passed through directly to residential property insurance policyholders in North Carolina.

This risk of potential assessment by the Beach Plan or FAIR Plan on property insurers in North Carolina requires that insurance companies be compensated for the additional risk to their capital. To quantify this risk, I have applied a procedure developed by Milliman to incorporate a provision in the homeowners rates that compensates insurers for that risk.

Q. Can you please explain the procedure you applied?

A. Yes. The methodology developed by Milliman to quantify the compensation for assessment risk involves two steps. The first step is to calculate the magnitude of the exposure itself, and the second step is to determine the fair compensation to be paid to insurers for being required to bear that risk.

To quantify the magnitude of the exposure, it was necessary to estimate the expected value of the assessments on insurers arising from catastrophic losses incurred by the Beach Plan or FAIR Plan. Because an assessment on insurers results only after either the Beach or FAIR Plan has exhausted other resources available to pay losses, I needed to determine the likelihood of that occurring as well as the amount by which the losses exceed those other resources. As such, I obtained information from the Beach and FAIR Plans regarding the reinsurance programs in place for the 2018 storm season, along with assumptions of each plan's accumulated surplus available for the season. The accumulated surplus and available reinsurance represent the "other resources" that are available to pay for hurricane losses during the 2018 storm season. I then obtained the AIR and RMS hurricane model runs used by the Beach and FAIR Plans, and evaluated the estimated losses corresponding to each event simulated by the models. For each modeled loss, I determined the amount of loss that would be covered by reinsurance and the remaining losses that would be funded either

from the plans' accumulated surplus, through assessments on property insurers in the state, or ultimately through assessments on North Carolina property insurance policyholders. I subtracted the accumulated surplus of the Beach and FAIR Plans from the losses remaining after reinsurance, limited the assessable losses due to Beach Plan exposures to $1 billion, and calculated the average assessment on property insurers across all events simulated by the models. This average assessment on property insurers is equal to the expected value of the losses that would be funded through assessments on North Carolina property insurers.

As noted above, this calculation produces a measure of the magnitude of the exposure. That is, it represents the risk to insurers' capital that is associated with the exposure to Beach or FAIR Plans assessments. The second step in Milliman's analysis is to develop a method of measuring the fair compensation to insurers for bearing this risk.

Q. Can you please explain how you measured the compensation for bearing this risk?

A. Yes. To measure the fair compensation for bearing this risk, I relied on publicly-available data that quantifies the market price of catastrophe risk, taken from recently-issued insurance linked securities. Insurance linked securities (ILS) are securities such as bonds, which have conditional payoffs that are very similar to reinsurance. Investors purchase these securities at significant yield premiums compared to risk-free bonds because the investors are exposed to loss of principal and interest if certain "insured events" occur.

Q. What kind of data is available and how is this information used to determine the compensation for assessment risk?

A. Lane Financial, LLC is a firm that specializes in the analysis of insurance linked securities. In March of each year, Lane publishes a table of data that summarizes a variety of information that can be used to evaluate the fair compensation for bearing catastrophe risk. For each ILS in the table, Lane publishes the following data: the yield on the security; the excess return over the risk-free rate; the probability that the security will suffer a loss; and the expected value of loss anticipated on the security. These data elements provide the foundation for my analysis of the proper compensation for bearing the risk of Beach or FAIR Plan assessments.

Before describing the mechanics of the analysis, I will first define several terms that will prove useful in this discussion.

- The "*yield spread*" is simply the difference between the yield on a particular ILS and the risk-free rate. If a $100 million bond is issued with a yield spread of 10%, this implies that the insurer issuing the bond would pay $10 million in

interest in excess of the risk-free rate to encourage investors to purchase such a security.

- Now assume that the distribution of hurricane losses is such that, based on the probability and amount of potential hurricane losses, an investor would anticipate having an average loss of $2 million per year. This amount is identified as the "*expected loss*."
- Since the investor in this example receives compensation of $10 million in excess of the risk-free rate for bearing the risk of loss, the "*expected profit*" to the investor is $8 million (i.e., $10 million in interest in excess of the risk-free rate minus $2 million of expected losses).
- Finally, I define a term known as the "*profit multiple*," which is the ratio of expected profit to expected loss. In the above example, the profit multiple would be $8 million of expected profit divided by $2 million of expected loss, or a profit multiple of 4.0.

The profit multiples derived from insurance linked securities provide an estimate of the compensation that investors require to bear catastrophe risk, in that they tell us what investment returns are required in order to take on the risk of loss from a catastrophic event. One particularly important feature of this metric is that it is a measure of compensation per dollar of expected loss. As a result, because the first step of my analysis determines the expected value of losses that would be funded through assessments, the profit multiple can be applied to those expected values to develop an estimate of the fair compensation for bearing such risk. This is the measure of risk I rely upon in evaluating the fair compensation for property insurers whose capital is exposed to Beach or FAIR Plan assessments.

Q. Generally speaking, which insurance linked securities have larger risk premiums and higher profit multiples?

A. For exposures such as catastrophic events, securities that have a lower probability of incurring a loss have greater volatility and as a result, have larger risk premiums. Securities with larger risk premiums have a larger ratio of expected profit to expected loss and as such, have higher profit multiples.

Q. Have you developed any exhibits that summarize the calculations used to develop the fair compensation to insurers for bearing the risk of Beach Plan or FAIR Plan assessments?

A. Yes. Exhibit RB-11 contains ten pages of information required to develop the fair compensation for bearing Beach and FAIR Plan assessment risk.

- *Page 1* of Exhibit RB-11 shows a summary of the Beach Plan's reinsurance program, and *Page 6* shows a similar summary of the FAIR Plan's reinsurance program. These summaries include the various layers of reinsurance purchased and the coverage levels within those layers.

- *Page 2* shows the curve I fit to the ILS profit multiples based on all catastrophe-related securities issued in the last ten years. This exhibit also includes the equation of the fitted curve, which can be used to determine the average profit multiple for any layer to which insurer capital is exposed.

- *Pages 3 and 7* display the profit multiples calculated for each layer of the Beach and FAIR Plan's loss distributions, based on the equation shown on Page 2. In order to determine the fair compensation to voluntary insurers for bearing the risk of assessments, I need to determine which layers contain losses that will be funded by assessments, as well as the corresponding expected losses within those layers. The profit multiples can then be applied to the expected losses to determine the appropriate compensation per dollar of expected loss in each layer.

- *Pages 4 and 8* illustrate how potential losses for the Beach Plan Residential Account and FAIR Plan are funded. (The Beach Plan determines losses and assesses voluntary insurers separately for each account, while the FAIR Plan has only one account.) Because of the $1 billion limit on Beach Plan assessments, any amounts needed to pay claims in excess of the assessable amounts are to be collected through surcharges on property insurance policyholders statewide.

  For each event simulated by the hurricane models, losses are separated by account (Beach Plan Residential, Beach Plan Commercial, and FAIR Plan). Then, the losses for each account are divided into layers based on the source of funding for those losses – Beach or FAIR Plan surplus, assessments on voluntary insurers, private reinsurance, and ultimately any additional amounts in the Beach Plan to be covered by policyholder surcharges. Finally, the losses associated with each event are accumulated in each of the loss layers to determine expected values.

- Although Pages 4 and 8 illustrate the funding of potential losses within each layer, the purpose of my analysis is to determine the fair compensation for the risk of assessments on private insurers. As such, the analysis must take into account the probability of losses occurring within each layer and the expected value of losses that will be borne by private insurers. *Pages 5 and 9* of Exhibit RB-11 provide that analysis. They show the expected value of the losses that would be covered by the Beach Plan Residential and FAIR Plan accounts, and the average annual amount of those losses that would be assessed to private insurers. Pages 5 and 9 also display the average profit multiples associated with each layer of the loss distribution, and the product of the indicated profit multiples times the expected losses within each layer. The sum of those values is the indicated compensation for assessment risk for each account.

- The final step in my calculation is to determine the appropriate provision to be included in the homeowners rates to compensate insurers for the risk of Beach Plan or FAIR Plan assessments. This provision, expressed as a percent of premium, is developed on *Page 10* of Exhibit RB-11. Since assessments for Beach or FAIR Plan losses are applied to all property insurance lines in the state, the bottom table on Exhibit RB-11, Page 10 shows the development of a charge that will produce an amount of revenue equal to the total required compensation of $89.23 million. As shown on this exhibit, that charge amounts to 2.8% of total property insurance premium in the state.

Q. In your opinion, is it appropriate to include a 2.8% provision for the compensation for assessment risk in homeowners rates in North Carolina?

A. Yes. Insurance companies writing homeowners policies in North Carolina are exposed to the risk of Beach Plan or Fair Plan assessments as a result of writing voluntary market property insurance in the state. As such, those insurance companies are entitled to receive fair compensation for bearing that risk and it is appropriate to include that compensation in the homeowners rates. The model Milliman has developed relies on a widely-accepted measure of compensation to determine a provision that will fairly reward insurers for bearing this additional risk to their capital.

Q. Earlier, when describing the overall ratemaking methodology that underlies this filing, you said that the expected underwriting expenses include a provision for the net reinsurance cost per policy. Can you please explain this issue?

A. Yes. Homeowners insurance is one of several types of coverages that has exposure to potential catastrophic events. In such coverages (homeowners, mobile homeowners, and other property coverages), individual catastrophic events can result in significant losses that exceed the amount of liability the typical insurer can reasonably assume for solvency and financial stability considerations. As a result, in these lines of business, insurers routinely purchase reinsurance to mitigate their exposure to extreme events. In order to accurately reflect the expected costs associated with insuring property policies, as discussed in the *Statement of Principles Regarding Property and Casualty Insurance Ratemaking*, it is appropriate to include the cost of this reinsurance in the ratemaking process for these lines of insurance.

Q. In your opinion, is it appropriate to include a provision for the net reinsurance cost per policy in homeowners rates in North Carolina?

A. Yes. Insurance companies writing homeowners policies in North Carolina incur a significant cost for bearing the risk of properties exposed to catastrophic events. Regardless of whether the risk of catastrophic losses is retained by the primary

insurer or transferred to a reinsurer, the market cost of bearing that risk must be included in the rates. This is a foundational actuarial principle included in the *Statement of Principles Regarding Property and Casualty Insurance Ratemaking* and is a legitimate cost of the risk transfer inherent in the purchase of property insurance. As such, the net reinsurance cost per policy should be included in the North Carolina homeowners rates.

Q. How does this filing reflect the net reinsurance cost per policy?

A. For many years, the Rate Bureau has included a provision for the net reinsurance cost per policy. To support this filing, the Rate Bureau has engaged Aon, the world's largest reinsurance broker, to develop the provision for the net reinsurance cost per policy. It is my understanding that Aon was retained by the Rate Bureau based on their ability to access relevant data and experience from the reinsurance market, their expertise with catastrophe-related issues, and their prominence with respect to the reinsurance industry. This is consistent with the previous homeowners rate filing submitted by the Rate Bureau.

Q. In your opinion, is it appropriate to allocate reinsurance costs within North Carolina in a way that is proportional to risk?

A. Yes. The risk associated with insuring properties exposed to catastrophic events varies geographically within North Carolina. As such, the cost for bearing that risk should be allocated proportional to the measurement of risk. In its analysis of reinsurance costs for this filing, Aon provides the statewide provision for the net reinsurance cost per policy and also allocates the reinsurance costs to each policy form and each territory. This allocation is appropriate and consistent with the objective of producing rates that are fair, reasonable, and not unfairly discriminatory across policyholders.

Q. Are you providing expert testimony concerning the development of the net cost of reinsurance provision?

A. No, I am relying on the work and opinion of Aon as to the development of the net cost of reinsurance provision.

Q. Is a provision for deviations included in the filing?

A. No, the Rate Bureau reviewed historical data and considered whether to apply a provision for deviations, but elected not to include one in this filing.

Q. Does the filing review the rate-level adequacy by territory?

A. Yes. With this filing, the Rate Bureau developed indicated rate-level changes by territory using a similar methodology as the statewide indication. A base loss cost is calculated for each territory using the historical loss experience. In

addition, a credibility value is assigned to each territory for each policy form based on the number of house years underlying each loss cost. As mentioned earlier, for territorial ratemaking, the full credibility standards are 60,000 house years for the owners forms, 75,000 house years for the tenant form, and 50,000 house years for the condominium unit owners form. Using the credibility for each territory, a Credibility-Weighted Base Loss Cost is determined by territory. Additional calculations are applied to each territory to reflect expenses, dividends, and reinsurance in a similar manner as applied at a statewide level. The result of these calculations is an Indicated Rate-Level Change by territory.

In my opinion, the methodology used to develop the indicated rate-level change by territory and by policy form is reasonable and is consistent with widely-used actuarial ratemaking practices.

Q. Does the filing review the wind exclusion credits and wind mitigation credits?

A. Yes. Based on the indicated rates by territory (for Territories 110 to 160) and by policy form that are being proposed with this filing, the wind exclusion credits and wind mitigation credits are being updated in a corresponding manner. Using the underlying formula for the statewide rate-level indication, an adjustment is made to the appropriate components of the indication formula to reflect the non-wind losses as a percent of the total losses. The indicated non-wind rate is subtracted from the indicated overall rate to determine the indicated wind exclusion credit for each territory. For those territories where the proposed rate is less than the indicated rate, the wind exclusion credit is similarly reduced such that the resulting non-wind rate remains consistent with the indicated non-wind rate. The wind mitigation credits for Territories 110 to 160 are being revised in a manner proportional to the wind exclusion credits.

In my opinion, the methodology used to develop the revised wind exclusion credits and wind mitigation credits is reasonable and is consistent with widely-used actuarial ratemaking practices.

Q. Does the filing review the wind-only rates?

A. Yes. Based on the indicated wind exclusion credits by territory (for Territories 110 to 160) and by policy form that are being proposed with this filing, the wind-only rates are also being updated in a corresponding manner. Using the proposed wind exclusion credits by territory, a fixed expense component is added to each credit to develop the proposed wind-only rates.

In my opinion, the methodology used to develop the revised wind-only rates is reasonable and is consistent with widely-used actuarial ratemaking practices.

Q. What is the difference between the indicated rate level and the filed rate level?

A. The indicated rate level is the actuarially sound and correct rate level for each territory and each policy form. It is the indicated rate change by territory that is needed to sufficiently cover the expected losses and expenses while still providing a fair and reasonable profit. The indicated rate level is also the rate level that complies with the statutory requirement that rates not be excessive, inadequate, or unfairly discriminatory.

For owners forms, the statewide indicated rate-level change is 26.8%. Due to differences by territory in historical loss experience, modeled hurricane losses, and other expenses, the indicated change by territory varies throughout the state. For many of the western territories, the indicated change is less than 26.8%, but for several of the territories closer to the coast, the indicated change is greater than 26.8%. In contrast to this, the statewide indicated rate-level changes for tenants and condominium unit owners are 10.6% and 12.9%, respectively, and similar to the owners forms, the indicated changes by territory vary across the state.

In order to mitigate the impact of these indicated rate changes on policyholders, the Rate Bureau has filed rates that reflect a cap on the changes by territory for each policy form. The filing proposes to cap the rate changes by territory at 20%, 25%, or 30% for owners forms, depending on the magnitude of the indicated territorial rate change. For tenants and condominium unit owners forms, the filing proposes to cap the rate changes by territory at 5%, 10%, or 15%, depending on the magnitude of the indicated territorial rate change. This capping results in an overall statewide rate-level change of 17.4% instead of the indicated rate-level change of 26.1%.

In my opinion, the Rate Bureau's selected by-territory caps of 20% to 30% for owners forms and 5% to 15% for tenants and condominium unit owners forms is reasonable and is an effective strategy to mitigate the impact of this filing on policyholders in those territories with the highest indicated rate changes. However, for those territories that are impacted by the cap (i.e., their indicated rate changes are greater than 20% or 5%), it should be noted that the proposed rates in those territories will continue to be inadequate.

Q. I understand that you are not providing an opinion concerning the underwriting profit (profit) provision or the development of the net cost of reinsurance (NCOR) provision. If I ask you to assume that the provisions for profit and NCOR are reasonable and actuarially sound, then in your opinion, is the overall rate-level indication shown in the homeowners filing by the North Carolina Rate Bureau reasonable?

A. Yes, if I assume that the provisions for profit and NCOR are reasonable, then in my opinion, the overall homeowners rate-level indication shown by the Rate Bureau, and the rate-level indications for each policy form, are reasonable and actuarially sound.

Q. Again, assuming that the provisions for profit and NCOR are reasonable, do you have an opinion whether the proposed rates, as capped in the filing, reasonably provide for the expected costs for homeowners insurance in North Carolina?

A. If I assume that the provisions for profit and NCOR are reasonable, then in my opinion, the proposed rates in this filing reasonably reflect the expected costs for homeowners insurance. However, in those territories where the Rate Bureau has capped the rates in this filing to mitigate the impact on affected policyholders, the proposed rates do not reflect all expected costs. The expected costs that can be quantified by the difference between a territory's indicated rate change and its capped rate change are not being reflected in the proposed rates.

Q. Assuming that the provisions for profit and NCOR are reasonable, in your opinion, are the proposed homeowners rates not excessive, inadequate, or unfairly discriminatory?

A. If I assume that the provisions for profit and NCOR are reasonable, then in my opinion, the proposed homeowners rates in this filing are not excessive or unfairly discriminatory. Similarly, the rates in those territories unaffected by the proposed cap are not inadequate; however, in those territories where the Rate Bureau is proposing to cap the effect of this filing, the proposed rates continue to be inadequate by the difference between the indicated rate change and the capped rate change.

Q. Does this conclude your testimony?

A. Yes, it does.

NORTH CAROLINA
HOMEOWNERS INSURANCE

Development of the Estimated Impact of Delay in Rate Filing Process

NCRB Rate Filing	Policy Type / Coverage	Premium Weight	(1) Assumed Effective Date	(2) Actual Effective Date	(3) Selected Loss Trend	(4) Selected Premium Trend	(5) Estimated Impact of Delay in Filing Process
2018 Dwelling	Fire	$102,088,428	6/1/18	2/1/19	0.2%	2.3%	-1.3%
	EC	187,663,877	6/1/18	2/1/19	0.4%	2.1%	-1.1%
	Total	$289,752,305					-1.2%
2017 HO	Owners	$2,010,516,565	6/1/18	10/1/18	3.1%	1.1%	0.7%
	Tenants	62,551,401	6/1/18	10/1/18	-3.1%	-1.0%	-0.7%
	Condos	24,591,783	6/1/18	10/1/18	1.9%	0.5%	0.5%
	Total	$2,097,659,749					0.6%
2014 HO	Owners	$2,257,970,589	7/1/14	6/1/15	5.3%	2.3%	2.7%
	Tenants	45,065,871	7/1/14	6/1/15	2.9%	-1.0%	3.6%
	Condos	22,629,842	7/1/14	6/1/15	5.4%	0.0%	5.0%
	Total	$2,325,666,302					2.7%
2014 MH(C)	Property	$77,349,418	6/1/15	10/1/15	3.0%	2.8%	0.1%
	Liability	1,546,804	6/1/15	10/1/15	2.8%	n/a	0.9%
	Total	$78,896,222					0.1%
2014 MH(F)	Owners	$44,750,216	6/1/15	10/1/15	4.6%	2.2%	0.8%
	Tenants	100,658	6/1/15	10/1/15	2.5%	-0.2%	0.9%
	Total	$44,850,874					0.8%
2012 HO	Owners	$2,168,814,729	6/1/13	7/1/13	5.4%	3.0%	0.2%
	Tenants	32,405,190	6/1/13	7/1/13	4.0%	0.0%	0.3%
	Condos	18,252,996	6/1/13	7/1/13	4.0%	2.0%	0.2%
	Total	$2,219,472,915					0.2%
2011 Dwelling	Fire	$84,664,174	6/1/11	4/1/13	3.6%	2.9%	1.3%
	EC	150,823,062	6/1/11	4/1/13	4.1%	2.8%	2.3%
	Total	$235,487,236					2.0%
2008 HO	Owners	$1,498,766,325	1/1/09	5/1/09	4.4%	3.9%	0.2%
	Tenants	24,074,875	1/1/09	5/1/09	0.2%	2.7%	-0.8%
	Condos	13,213,524	1/1/09	5/1/09	0.2%	2.9%	-0.9%
	Total	$1,536,054,724					0.1%
2008 MH(C)	Property	$76,284,985	10/1/07	12/1/08	7.5%	2.4%	5.9%
	Liability	1,161,840	10/1/07	12/1/08	4.0%	n/a	4.7%
	Total	$77,446,825					5.9%
2008 MH(F)	Owners	$43,659,180	10/1/07	12/1/08	6.6%	5.8%	0.9%
	Tenants	158,638	10/1/07	12/1/08	0.4%	-4.1%	5.5%
	Total	$43,817,818					0.9%
					Average Impact of Delay in Filing Process:		**1.2%**

(1), (3), (4) From historical NCRB rate filings

(2) From historical NCRB settlement agreements or circulars

(5) = {[1 + (3)] / [1 + (4)]} ^ {[(2) - (1)]/365} - 1

North Carolina Insurance Underwriting Association (NCIUA) -- Beach Plan

Summary of 2018 Catastrophe Reinsurance

Risk Finance Structure [1]	Attachment Point ($ Millions)	Exhaustion Point ($ Millions)	Coverage	Reinstatement
Reinsurance Layer 1	$1,000.0	$1,100.0	100.0%	No
Reinsurance Layer 2	2,690.0	2,940.0	100.0%	No

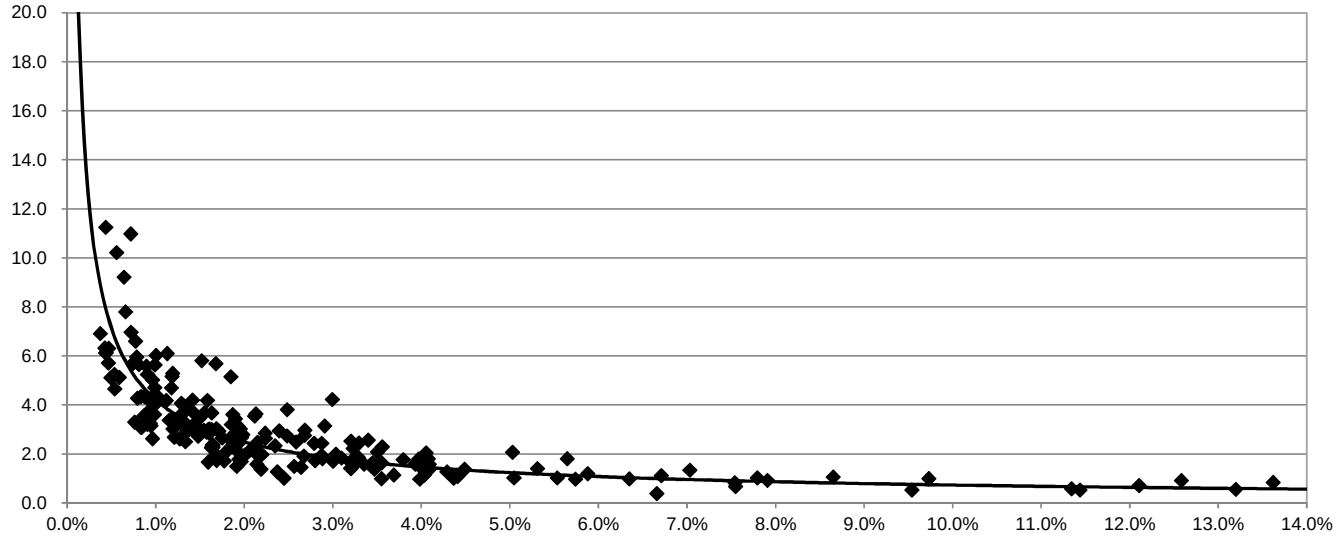
Notes: The above reinsurance covers aggregate loss for all accounts combined (Residential & Commercial).

(1) Reinsurance provides Annual Aggregate coverage.

North Carolina Insurance Underwriting Association (NCIUA) -- Beach Plan
North Carolina Joint Underwriting Association (NCJUA) -- FAIR Plan

Catastrophe Bond Profit Multiples

Adjusted Profit Multiples by Average Probability of Loss



Source: Lane Financial LLC, Annual Securitization Reviews.

Notes: Based on near-term cat bonds issued from January 2009 to March 2018.
Includes all U.S. bonds with a probability of first loss between 0.05% and 20.0%; excludes bonds with no stated profit multiples.
Profit multiples were adjusted based on the year each bond was issued in order to normalize for different market conditions by year.

Equation of the fitted curve: $y = 0.12591 \times^{-0.76195}$

Equation to determine average Profit Multiple over specific interval: $\text{Avg PM} = \int_a^b 0.12591 \times^{-0.76195} dx / (b-a)$

North Carolina Insurance Underwriting Association (NCIUA) -- Beach Plan

Catastrophe Bond Profit Multiples

Annual Aggregate Layer	Source of Funding	Total Beach Plan Layer Attachment	Total Beach Plan Layer Exhaustion [1]	Attachment Probability	Exhaustion Probability	Profit Multiple
$0 to 1,000	Surplus	$0.0	$1,000.0	46.39%	5.82%	0.42
$1,000 to 1,100	Reinsurance	1,000.0	1,100.0	5.82%	5.32%	1.14
$1,100 to 1,790	Surplus	1,100.0	1,790.0	5.32%	3.16%	1.42
$1,790 to 2,690	Company Assessments	1,790.0	2,690.0	3.16%	1.91%	2.10
$2,690 to 2,940	Reinsurance	2,690.0	2,940.0	1.91%	1.71%	2.68
$2,940 to 3,040	Company Assessments	2,940.0	3,040.0	1.71%	1.63%	2.85
$3,040 & Higher	Policyholder Surcharges	3,040.0	52,755.2	1.63%	0.0005%	10.41

(1) The Layer Exhaustion for the highest layer was selected to be equal to the largest amount of modeled annual hurricane losses after blending 100,000 years of AIR and RMS modeled losses.

North Carolina Insurance Underwriting Association (NCIUA) -- Beach Plan
Residential Accounts Only

Illustration of How Hurricane Losses are Funded
Voluntary Market Assessments Limited to $1 Billion on All Beach Plan Accounts Combined
($ in Millions)

	Total Beach Plan			Beach Plan:	Hurricane Losses Funded by:			
Annual Aggregate Layer	Layer Attachment	Layer Exhaustion	Total Losses in Layer	Residential Portion	Beach Plan Surplus	Private Reinsurance	Assessments on Member Companies [1]	Policyholder Surcharges
$0 to 1,000	$0.0	$1,000.0	$1,000.0	$874.6	$874.6	-	-	-
$1,000 to 1,100	1,000.0	1,100.0	100.0	85.6	-	$85.6	-	-
$1,100 to 1,790	1,100.0	1,790.0	690.0	685.9	685.9	-	-	-
$1,790 to 2,690	1,790.0	2,690.0	900.0	634.7	-	-	$634.7	-
$2,690 to 2,940	2,690.0	2,940.0	250.0	214.7	-	214.7	-	-
$2,940 to 3,040	2,940.0	3,040.0	100.0	100.0	-	-	100.0	-
$3,040 & Higher	3,040.0	52,755.2	49,715.2	32,368.1	-	-	-	$32,368.1
Total					$1,560.4	$300.3	$734.7	$32,368.1

(1) Total losses paid by Member Companies ($734.7 M) reflects the Residential portion of the $1 Billion Beach Plan assessment on the total Voluntary Market.

North Carolina Insurance Underwriting Association (NCIUA) -- Beach Plan
Residential Accounts Only

Determination of the Cost of Reinsurance Provided to the NCIUA by the Voluntary Market
Voluntary Market Assessments Limited to $1 Billion on All Beach Plan Accounts Combined
($ in Millions)

Annual Aggregate Layer	Beach Plan: Residential Losses in Layer	Assessments Paid by Member Companies [1]	Expected Losses [2] Total	Expected Losses [2] Exposed [3]	Indicated Profit Multiple [4]	Cost of Providing Reinsurance [5]
$0 to 1,000	$874.6	-	$105.93	-	0.42	-
$1,000 to 1,100	85.6	-	4.77	-	1.14	-
$1,100 to 1,790	685.9	-	27.45	-	1.42	-
$1,790 to 2,690	634.7	$634.7	15.79	$15.79	2.10	$33.16
$2,690 to 2,940	214.7	-	3.90	-	2.68	-
$2,940 to 3,040	100.0	100.0	3.04	3.04	2.85	8.67
$3,040 & Higher	32,368.1	-	41.51	-	10.41	-
Total		$734.7	$202.40	$18.83		$41.83

(1) See Exhibit RB-11, Page 4.
(2) From AIR & RMS hurricane models.
(3) Expected loss subject to Beach Plan assessments of Voluntary Market.
(4) See Exhibit RB-11, Page 3.
(5) = Exposed Expected Losses x Profit Multiple (from Cat Bond data).

North Carolina Joint Underwriting Association (NCJUA) -- FAIR Plan

Summary of 2018 Catastrophe Reinsurance

Risk Finance Structure [1]	Attachment Point ($ Millions)	Exhaustion Point ($ Millions)	Coverage	Reinstatement
Reinsurance Layer 1	$130.0	$281.0	100.0%	No

Notes: The above reinsurance covers aggregate losses for all FAIR Plan accounts combined (Residential & Commercial).

(1) Reinsurance provides Annual Aggregate coverage.

North Carolina Joint Underwriting Association (NCJUA) -- FAIR Plan

Catastrophe Bond Profit Multiples

Annual Aggregate Layer [1]	Total FAIR Plan Layer Attachment	Total FAIR Plan Layer Exhaustion [2]	Attachment Probability	Exhaustion Probability	Profit Multiple
$0 to 130	$0.0	$130.0	46.24%	5.82%	0.42
$0 to 23.4	*0.0*	*23.4*	*46.24%*	*16.61%*	*0.32*
$23.4 to 130	*23.4*	*130.0*	*16.61%*	*5.82%*	*0.71*
$130 to 281	130.0	*281.0*	5.82%	2.57%	1.46
$281 & Higher	281.0	6,039.0	2.57%	0.0005%	7.49

(1) The first layer was selected to be equal to the FAIR Plan's surplus as of June 30, 2018 ($23.4 million).

(2) The Layer Exhaustion for the highest layer was selected to be equal to the largest amount of modeled annual hurricane losses after blending 100,000 years of AIR and RMS modeled losses.

North Carolina Joint Underwriting Association (NCJUA) -- FAIR Plan
Residential & Commercial Accounts

Illustration of How Hurricane Losses are Funded
Reflecting Unlimited Industry Exposure to FAIR Plan Assessments
($ in Millions)

	Total FAIR Plan			Hurricane Losses Funded by:		
Annual Aggregate Layer	Layer Attachment	Layer Exhaustion	Total Losses in Layer	FAIR Plan Surplus	Private Reinsurance	Assessments on Member Companies
$0 to 23.4	$0.0	$23.4	$23.4	$23.4	-	-
$23.4 to 130	23.4	130.0	106.6	-	-	$106.6
$130 to 281	130.0	281.0	151.0	-	$151.0	-
$281 & Higher	281.0	6,039.0	5,758.0	-	-	5,758.0
Total				$23.4	$151.0	$5,864.6

North Carolina Joint Underwriting Association (NCJUA) -- FAIR Plan
Residential & Commercial Accounts

Determination of the Cost of Reinsurance Provided to the NCJUA by the Voluntary Market
Reflecting Unlimited Industry Exposure to FAIR Plan Assessments
($ in Millions)

Annual Aggregate Layer	Total FAIR Plan Losses in Layer	Assessments Paid by Member Companies [1]	Expected Losses [2] Total	Expected Losses [2] Exposed [3]	Indicated Profit Multiple [4]	Cost of Providing Reinsurance [5]
$0 to 23.4	$23.4	-	$5.20	-	0.32	-
$23.4 to 130	106.6	$106.6	10.17	$10.17	0.71	$7.22
$130 to 281	151.0	-	5.82	-	1.46	-
$281 & Higher	5,758.0	5,758.0	8.08	8.08	7.49	60.49
Total		$5,864.6	$29.26	$18.25		$67.71

(1) See Exhibit RB-11, Page 8.
(2) From AIR & RMS hurricane models.
(3) Expected loss subject to FAIR Plan assessments of Voluntary Market.
(4) See Exhibit RB-11, Page 7.
(5) = Exposed Expected Losses x Profit Multiple (from Cat Bond data).

North Carolina Insurance Underwriting Association (NCIUA) -- Beach Plan
North Carolina Joint Underwriting Association (NCJUA) -- FAIR Plan
Residential Accounts Only

Determination of the Compensation for Bearing the Risk of Beach Plan & Fair Plan Assessments
($ in Millions)

(1) Cost of Reinsurance Provided by the Voluntary Market to the Residential Accounts in the NCIUA (Beach Plan):	$41.83
(2) Cost of Reinsurance Provided by the Voluntary Market to the NCJUA (FAIR Plan):	$67.71
(3) Residential Premium as % of Total FAIR Plan Assessment Base:	70%
(4) Cost of Reinsurance Provided by the Voluntary Market to the Residential Accounts in the NCJUA (FAIR Plan):	$47.40
(5) Total Cost of Reinsurance Provided by the Voluntary Market to the Residential Accounts in the NCIUA & NCJUA:	$89.23

	(6)	(7) = (6) / Total (6)	(8) = (5) x (7)	(9) = (8) / (6)
Policy Form	Estimated 2018 Industry Written Premium @ Manual Rates	% of Total Industry Premium	Allocated Compensation for Risk of Assessment	Compensation for Assessment Risk as % of 2018 Manual Premium
Homeowners	$2,658.4	84.6%	$75.46	2.8%
Dwelling Fire & EC	348.6	11.1%	9.89	2.8%
MobileHome	136.5	4.3%	3.88	2.8%
Total	$3,143.5	100.0%	$89.23	2.8%

(1) From Exhibit RB-11, Page 5.
(2) From Exhibit RB-11, Page 9.
(4) = (2) x (3)
(5) = (1) + (4)
(6) 2018 Industry Premium includes NCIUA and NCJUA.

PREFILED TESTIMONY
OF
JAMES H. VANDER WEIDE

2018 HOMEOWNERS INSURANCE RATE FILING
BY THE NORTH CAROLINA RATE BUREAU

Q. WHAT IS YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS?

A. My name is James H. Vander Weide. I am President of Financial Strategy Associates, a firm that provides strategic and financial consulting services to corporate clients. My business address is 3606 Stoneybrook Drive, Durham, North Carolina 27705.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PRIOR ACADEMIC EXPERIENCE.

A. I graduated from Cornell University with a Bachelor's Degree in Economics and then attended Northwestern University where I earned a Ph.D. in Finance. I joined the faculty of the School of Business at Duke University where I was subsequently named Assistant Professor, Associate Professor, Professor, and Research Professor. I have published research in the areas of finance and economics and taught courses in these fields at Duke for more than thirty-five years. I am now retired from my teaching duties at Duke.

I have taught courses in corporate finance, investment management, and management of financial institutions. I also taught a graduate seminar on the theory of public utility pricing and lectured in executive development seminars on

the cost of capital, financial analysis, capital budgeting, mergers and acquisitions, cash management, short-run financial planning, and competitive strategy.

I have served as Program Director and taught in numerous executive education programs at Duke, including the Duke Advanced Management Program, the Duke Management Challenge, the Duke Executive Program in Telecommunications, Competitive Strategies in Telecommunications, and the Duke Program for Manager Development for managers from the former Soviet Union. I have also taught in tailored programs developed for corporations such as ABB, Accenture, Allstate, AT&T, Progress Energy, GlaxoSmithKline, Lafarge, MidAmerican Energy, Norfolk Southern, The Rank Group, Siemens, TRW, and Wolseley PLC.

In addition to my teaching and executive education activities, I have written research papers on such topics as portfolio management, the cost of capital, capital budgeting, the effect of regulation on the performance of public utilities, and cash management. My articles have been published in *American Economic Review, Financial Management, International Journal of Industrial Organization, Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Bank Research, Journal of Accounting Research, Journal of Cash Management, Management Science, The Journal of Portfolio Management, Atlantic Economic Journal, Journal of Economics and Business,* and *Computers and Operations Research.* I have written a book titled *Managing Corporate Liquidity: an Introduction to Working Capital Management*, a chapter for *The Handbook of*

Modern Finance, "Financial Management in the Short Run," and a chapter for the book, *The Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques,* "Principles for Lifetime Portfolio Selection: Lessons from Portfolio Theory."

Q. HAVE YOU PREVIOUSLY PRESENTED EVIDENCE ON THE COST OF CAPITAL AND OTHER REGULATORY ISSUES?

A. Yes. As an expert on financial and economic theory and practice, I have participated in more than five hundred regulatory and legal proceedings before the public service commissions of forty-five states and four Canadian provinces, the Federal Energy Regulatory Commission, the National Energy Board (Canada), the Federal Communications Commission, the Canadian Radio-Television and Telecommunications Commission, the United States Congress, the National Telecommunications and Information Administration, the insurance commissions of five states, the Iowa State Board of Tax Review, the National Association of Securities Dealers, and the North Carolina Property Tax Commission. In addition, I have prepared expert testimony in proceedings before the United States District Court for the District of Nebraska; the United States District Court for the District of New Hampshire; the United States District Court for the District of Northern Illinois; the United States District Court for the Eastern District of North Carolina; the Montana Second Judicial District Court, Silver Bow County; the United States District Court for the Northern District of California; the Superior Court, North Carolina; the United States Bankruptcy Court for the

Southern District of West Virginia; the United States District Court for the Eastern District of Michigan; and the Supreme Court of the State of New York.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I have been asked by the North Carolina Rate Bureau to make an independent appraisal of the aggregate cost of equity capital for the companies writing homeowners insurance in North Carolina and to recommend a rate of return on equity that is fair, that allows those companies in the aggregate to attract and retain capital on reasonable terms, that is commensurate with returns on investments of comparable risk, and that maintains the financial integrity of those companies in the aggregate.

Q. WHAT DO YOU MEAN BY THE PHRASE “COST OF EQUITY CAPITAL?”

A. A firm’s cost of equity capital is the rate of return expectation that is required in the marketplace on equity investments of comparable risk. If an investor does not expect to earn a return on an equity investment in a firm that is at least as large as the return the investor could expect to earn on other investments of comparable risk, then the investor will not invest in that firm’s shares. Thus, a firm’s cost of equity capital is also the rate of return expectation that is required in the marketplace in order to induce equity investors to purchase shares in that firm.

Q. IS THE COST OF EQUITY CAPITAL THE SAME AS THE RETURN ON EQUITY?

A. No. The cost of equity capital is a market-based concept that reflects investors' future expectations, while the return on equity is an accounting concept that measures results of past performance. The return on equity is equal to income available for common equity divided by the book value of common equity.

Q. HAVE YOU FORMED AN OPINION REGARDING THE COST OF EQUITY CAPITAL FOR THE AVERAGE COMPANY WRITING HOMEOWNERS INSURANCE IN NORTH CAROLINA?

A. Yes.

Q. WHAT IS YOUR OPINION IN THAT REGARD?

A. The cost of equity capital for such a company is in the range 9.0 percent to 13.8 percent.

Q. WHAT ECONOMIC PRINCIPLES DID YOU CONSIDER IN ARRIVING AT THAT OPINION?

A. There are two primary economic principles relevant to my appraisal of the cost of equity capital. The first, relating to the demand for capital, states that a firm should continue to invest in its business only so long as the return on its investment is greater than or equal to its cost of capital. In the context of a regulated firm, this principle suggests that the regulatory agency should establish revenue levels which will offer the firm an opportunity to earn a return on its investment that is at least equal to its cost of capital.

The second principle, relating to the supply of capital, states that rational investors are maximizing their total return on capital only if the returns they expect to receive on investments of comparable risk are equal. If these returns are not equal, rational investors will reduce or completely eliminate investments in those activities yielding lower expected returns for a given level of risk and will increase investments in those activities yielding higher expected returns. The second principle implies that regulated firms will be unable to obtain the capital required to expand service on reasonable terms unless they are able to provide investors returns equal to those expected on investments of comparable risk.

Q. DO THESE ECONOMIC PRINCIPLES APPLY TO THE SETTING OF INSURANCE RATES?

A. Yes. These are general economic principles that apply to investing in any business activity, including insurance.

Q. HOW DID YOU GO ABOUT DETERMINING THE COST OF EQUITY CAPITAL FOR THE AVERAGE COMPANY WRITING HOMEOWNERS INSURANCE IN NORTH CAROLINA?

A. I used two generally accepted methods to estimate the cost of equity: (1) the Discounted Cash Flow (DCF) Model, and (2) the Risk Premium Approach.

Q. PLEASE DESCRIBE THE DCF MODEL.

A. The DCF Model suggests that investors value an asset on the basis of the future cash flows they expect to receive from owning the asset. Thus, investors value

an investment in a bond because they expect to receive a sequence of semi-annual coupon payments over the life of the bond and a terminal payment equal to the bond's face value at the time the bond matures. Likewise, investors value an investment in a firm's stock because they expect to receive a sequence of dividend payments and, perhaps, expect to sell the stock at a higher price sometime in the future.

A second fundamental principle of the DCF approach is that investors value a dollar received in the future less than a dollar received today. This is because, if they had the dollar today, they could invest it in an interest earning account and increase their wealth. This principle is called the time value of money.

Applying the two fundamental DCF principles noted above to an investment in a bond suggests that investors should value their investment in the bond on the basis of the present value of the bond's future cash flows. Thus, the price of the bond should be equal to:

Equation 1

$$P_B = \frac{C}{(1+i)} + \frac{C}{(1+i)^2} + \ldots + \frac{C+F}{(1+i)^n}$$

where:

P_B	=	Bond price;
C	=	Cash value of the coupon payment (assumed for notational convenience to occur annually rather than semi-annually);
F	=	Face value of the bond;
i	=	The rate of interest the investor could earn by investing his money in an alternative bond of equal risk; and
n	=	The number of periods before the bond matures.

Applying these same principles to an investment in a firm's stock suggests that the price of the stock should be equal to:

Equation 2

$$P_S = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_n + P_n}{(1+k)^n}$$

where:

P_S	=	Current price of the firm's stock;
$D_1, D_{2...}D_n$	=	Expected annual dividend per share on the firm's stock;
P_n	=	Price per share of stock at the time the investor expects to sell the stock; and
k	=	Return the investor expects to earn on alternative investments of the same risk, i.e., the investor's required rate of return.

Equation (2) is frequently called the Annual Discounted Cash Flow (DCF) Model of stock valuation.

Q. HOW DO YOU USE THE DCF MODEL TO DETERMINE THE COST OF EQUITY CAPITAL?

A. The "k" in the equation is the cost of equity capital. We make certain simplifying assumptions regarding the other factors in the equation and then mathematically solve for "k."

Q. WHAT ARE THE ASSUMPTIONS YOU MAKE?

A. Most analysts make three simplifying assumptions. First, they assume that dividends are expected to grow at the constant rate ("g") into the indefinite future.

Second, they assume that the stock price at time “n” is simply the present value of all dividends expected in periods subsequent to “n.” Third, they assume that the investors’ required rate of return, “k,” exceeds the expected dividend growth rate, “g.”

Q. DOES THE ANNUAL DCF MODEL OF STOCK VALUATION PRODUCE APPROPRIATE ESTIMATES OF A FIRM’S COST OF EQUITY CAPITAL?

A. No. The Annual DCF Model of stock valuation produces appropriate estimates of a firm’s cost of equity capital only if the firm pays dividends just once a year. Since most firms pay dividends quarterly, the Annual DCF Model produces downwardly biased estimates of the cost of equity. Investors can expect to earn a higher annual effective return on an investment in a firm that pays quarterly dividends than in one which pays the same amount of dollar dividends once at the end of each year. A complete analysis of the implications of the quarterly payment of dividends on the DCF Model is provided in Exhibit RB-15. For the reasons cited there, I employed the Quarterly DCF Model throughout my calculations.

Q. PLEASE DESCRIBE THE QUARTERLY DCF MODEL YOU USED.

A. The Quarterly DCF Model I use is described by Equation 10 on page 10 in Exhibit RB-15. This equation shows that the cost of equity is: the sum of the dividend yield and the growth rate, where the dividend in the dividend yield is the equivalent dividend at the end of the year, and the growth rate is the expected growth in dividends or earnings per share.

Q. HOW DO YOU APPLY THE DCF APPROACH TO OBTAIN THE COST OF EQUITY CAPITAL FOR THE COMPANIES WRITING HOMEOWNERS INSURANCE IN NORTH CAROLINA?

A. I apply the DCF approach to two groups of companies: Value Line's group of property/casualty insurance companies and the S&P 500.

Q. WHY DO YOU APPLY THE DCF APPROACH TO THE S&P 500 AS WELL AS TO VALUE LINE'S PROPERTY/CASUALTY INSURANCE COMPANIES?

A. As I noted previously, the cost of equity is defined as the rate of return investors expect to earn on investments in other companies of comparable risk. I apply the DCF approach to the S&P 500 because they are a large group of companies that, on average, are typically viewed as being comparable in risk to the property/casualty insurance industry. The use of a larger set of comparable risk companies should provide an accurate estimate of the cost of equity for the companies writing homeowners insurance in North Carolina.

Q. DO YOU INCLUDE ALL THE VALUE LINE PROPERTY/CASUALTY INSURANCE COMPANIES?

A. No. Among the Value Line property/casualty insurance companies, I only include companies which pay a quarterly dividend, have not lowered their dividends, and have a positive five-year earnings growth forecast available from I/B/E/S (formerly known as the Institutional Brokers Estimate System, now part of

Thomson Reuters). The Value Line property/casualty companies I use are shown in Exhibit RB-13.

Q. WHAT CRITERIA DO YOU USE TO SELECT COMPANIES IN THE S&P 500?

A. I include those firms which pay dividends and which have at least three five-year earnings forecasts available from I/B/E/S. I exclude the insurance companies in the S&P 500, as identified by I/B/E/S Thomson Reuters, because I have already calculated DCF results for the Value Line property/casualty insurance companies. The S&P 500 companies I use are shown in Exhibit RB-14.

Q. WHY DO YOU ELIMINATE ANY COMPANY WHICH HAD RECENTLY LOWERED ITS DIVIDEND OR WHICH FAILS TO PAY DIVIDENDS?

A. I eliminate those companies because it is difficult to make a reliable estimate of the future dividend growth rate for companies that have recently lowered their dividends or do not pay dividends. If a company has recently lowered its dividend, investors do not know whether the company will again lower its dividend in the future, or whether the company will attempt to increase its dividend back toward its previous level. If a company does not pay a dividend, one cannot mathematically apply the DCF approach.

Q. HOW DO YOU ESTIMATE THE GROWTH COMPONENT OF THE QUARTERLY DCF MODEL?

A. I use the average of analysts' estimates of future earnings per share (EPS) growth reported by I/B/E/S. As part of their research, financial analysts working at

Wall Street firms periodically estimate EPS growth for each firm they follow. The EPS forecasts for each firm are then published. The forecasts are used by investors who are contemplating purchasing or selling shares in individual companies.

Q. WHAT IS I/B/E/S?

A. I/B/E/S is a collection of analysts' forecasts for a broad group of companies expressed in terms of a mean forecast and a standard deviation of forecast for each firm. The mean forecast is used by investors as an estimate of future firm performance.

Q. WHY DO YOU USE THE I/B/E/S GROWTH ESTIMATES?

A. The I/B/E/S growth rates (1) are widely circulated in the financial community, (2) include the projections of reputable financial analysts who develop estimates of future growth, (3) are reported on a timely basis to investors, and (4) are widely used by institutional and other investors. For these reasons, I believe these estimates represent unbiased estimates of investors' expectations of each firm's long-term growth prospects and, accordingly, are incorporated by investors into their return requirements. Consequently, in my opinion, they provide the best available estimate of investors' long-term growth expectations.

Q. WHY DO YOU RELY EXCLUSIVELY ON ANALYSTS' PROJECTIONS OF FUTURE EPS GROWTH IN ESTIMATING THE INVESTORS' EXPECTED

GROWTH RATE RATHER THAN LOOKING AT PAST HISTORICAL GROWTH RATES?

A. There is considerable empirical evidence that analysts' forecasts are more highly correlated with stock prices than are firms' historical growth rates, and, thus, that investors actually use these forecasts.

Q. HAVE YOU PERFORMED ANY STUDIES CONCERNING THE USE OF ANALYSTS' FORECASTS AS THE BEST ESTIMATE OF INVESTORS' EXPECTED GROWTH RATE, G?

A. Yes, I prepared a study with Willard T. Carleton, Professor of Finance Emeritus at the University of Arizona, on why analysts' forecasts provide the best estimate of investors' expectations of future long-term growth. This study is described in a paper entitled "Investor Growth Expectations: Analysts vs. History," published in *The Journal of Portfolio Management*.

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR STUDY.

A. First, we performed a correlation analysis to identify the historically-oriented growth rates which best described a firm's stock price. Then we did a regression study comparing the historical growth rates with the consensus analysts' forecasts. In every case, the regression equations containing the average of analysts' forecasts statistically outperformed the regression equations containing the historical growth estimates. These results are consistent with those found by Cragg and Malkiel, the early major research in this area. These results are also consistent with the hypothesis that investors use analysts' forecasts, rather than

historically-oriented growth calculations, in making buy and sell decisions. They provide overwhelming evidence that the analysts' forecasts of future growth are superior to historically-oriented growth measures in predicting a firm's stock price.

Q. WHAT PRICE DO YOU USE IN YOUR DCF MODEL?

A. I use a simple average of the monthly high and low stock prices for each firm for the three-month period, June, July, and August 2018. These high and low stock prices are obtained from Thomson Reuters.

Q. WHY DO YOU USE THE THREE-MONTH AVERAGE STOCK PRICE, P_0, IN APPLYING THE DCF METHOD?

A. I use a three-month average stock price in applying the DCF method because stock prices fluctuate daily, while financial analysts' forecasts for a given company are generally changed less frequently, often on a quarterly basis. Thus, to match the stock price with an earnings forecast, it is appropriate to average stock prices over a three-month period.

Q. PLEASE EXPLAIN YOUR INCLUSION OF FLOTATION COSTS.

A. All firms that have sold securities in the capital markets have incurred some level of flotation costs, including underwriters' commissions, legal fees, printing expense, etc. These costs are paid from the proceeds of the stock sale and must be recovered over the life of the equity issue. Costs vary depending upon the size of the issue, the type of registration method used and other factors, but

in general these costs range between four percent and five percent of the proceeds from the issue. In addition to these costs, the underwriter's offer price is set below the most recent closing price before the public offering in order to reduce the risk that the underwriters will be unable to sell the entire offering at the offer price. The difference between the offer price and the recent closing price is generally in the range two percent to three percent. Thus, the total flotation cost, including both issuance expense and underwriter discount, could range anywhere from five percent to eight percent of the proceeds of an equity issue. These cost ranges have been developed and confirmed in a number of generally accepted studies. I believe a combined five percent allowance for flotation costs is a conservative estimate that should be used in applying the DCF model in this proceeding.

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR APPLICATION OF THE DCF METHOD TO THE PROPERTY/CASUALTY INSURANCE COMPANIES AND THE S&P 500.

A. As shown in Exhibits RB-13 and RB-14, the average DCF cost of equity capital for my group of Value Line property/casualty companies is 12.9 percent; and for the S&P 500 companies, 13.8 percent.

Q. WHAT CONCLUSION DO YOU REACH FROM YOUR DCF ANALYSIS ABOUT THE COST OF EQUITY CAPITAL FOR COMPANIES WRITING HOMEOWNERS INSURANCE IN NORTH CAROLINA?

A. On the basis of my DCF analysis, I would conclude that for companies writing homeowners insurance in North Carolina the cost of equity is approximately 13.4 percent.

Q. YOU NOTE THAT THE SECOND METHOD YOU USE TO ESTIMATE THE COST OF EQUITY CAPITAL FOR COMPANIES WRITING HOMEOWNERS INSURANCE IN NORTH CAROLINA IS A RISK PREMIUM APPROACH. PLEASE DESCRIBE THAT APPROACH.

A. I perform a study of the comparable returns received by bond and stock investors over the last ninety-two years. I estimate the returns on stock and bond portfolios, using stock price and dividend yield data on the S&P 500 stock portfolio and bond yield data on Moody's A–rated utility bonds.

My study consists of analyzing the historically achieved returns on broadly based stock and bond portfolios going back to 1926. For stocks, I use the S&P 500 stock portfolio; and for bonds, I use Moody's A-rated utility bonds. The resulting annual returns on the stock and bond portfolios purchased in each year from 1926 through 2017 are shown on Exhibit RB-16. The difference between the stock return and the bond return over that period of time on an arithmetic average basis is 4.76 percentage points.

Q. WHAT CONCLUSIONS DO YOU DRAW FROM YOUR RISK PREMIUM ANALYSES?

A. My own studies, combined with my analysis of other studies, provide strong evidence for the belief that investors today require an equity return of at least

4.76 percentage points above the expected yield on A-rated long-term debt issues.

The average yield on Moody's seasoned A-rated utility bonds for the three months June through August 2018 was 4.27 percent. On the basis of this information and my knowledge of bond market conditions, I conclude that the long-term yield on A-rated utility bonds is approximately 4.27 percent. Adding a 4.76 percentage point risk premium to the 4.27 percent expected yield on A-rated utility bonds, I obtain an expected return on equity of 9.0 percent.

Q. ARE THERE REASONS TO BELIEVE THAT THE RESULT OF YOUR EX POST RISK PREMIUM ANALYSIS MAY UNDERESTIMATE THE COST OF EQUITY AT THIS TIME?

A. Yes. The ex post risk premium model may produce an unrealistically low result because the model result is highly sensitive to the estimate of the bond yield. At this time, bond yields are unusually low, reflecting policy decisions of the United States government and the Federal Reserve Bank to keep interest rates low in order to stimulate the economy. The ex post risk premium cost of equity result is the sum of the risk premium and the bond yield; and, as a result, the use of an unusually low bond yield in the model may cause the ex post risk premium model result to underestimate the cost of equity. Further, because the cost of equity is a forward-looking concept, it would be reasonable to apply the ex post risk premium model using a forecast of the expected bond yield, rather than a recent bond yield. Because bond yields are expected to increase over the next several

years, the use of a forecasted bond yield would produce a significantly higher ex post risk premium estimate of the cost of equity. Thus, I consider my ex post risk premium model result to be conservative.

Q. BASED ON YOUR ANALYSES, WHAT IS YOUR OPINION AS TO THE COST OF CAPITAL FOR THE AVERAGE INSURANCE COMPANY WRITING HOMEOWNERS INSURANCE IN NORTH CAROLINA?

A. Based on my review and studies, I believe that a conservative estimate of the cost of common equity capital for the average insurance company writing homeowners insurance in North Carolina is in the range 9.0 percent to 13.8 percent.

SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS FOR
PROPERTY/CASUALTY INSURANCE COMPANIES

	COMPANY	MOST RECENT QUARTERLY DIVIDEND (d_0)	STOCK PRICE (P_0)	FORECAST OF FUTURE EARNINGS GROWTH	DCF MODEL RESULT
1	Allstate Corp.	0.460	94.700	13.0%	15.3%
2	Amer. Financial Group	0.350	110.110	12.3%	13.9%
3	Berkley (W.R.)	0.350	75.752	15.5%	16.8%
4	Chubb Ltd.	0.730	132.785	10.0%	12.6%
5	Cincinnati Financial	0.530	72.038	4.7%	7.9%
6	CNA Fin'l	0.350	46.652	5.8%	8.9%
7	Erie Indemnity	0.840	121.098	10.0%	13.3%
8	Old Republic	0.195	21.014	10.0%	14.5%
9	RLI Corp.	0.220	71.432	9.8%	11.2%
10	Selective Ins. Group	0.180	58.775	13.1%	14.6%
14	Average				12.9%

Note:[1]

d_0	=	Latest quarterly dividend.
d_1, d_2, d_3, d_4,	=	Expected next four quarterly dividends, calculated by multiplying the last four quarterly dividends per Value Line, by the factor (1 + g).
P_0	=	Average of the monthly high and low stock prices during the three months ending August 2018 per Thomson Reuters.
FC	=	Flotation costs.
g	=	I/B/E/S forecast of future earnings growth August 2018.
k	=	Cost of equity using the quarterly version of the DCF Model and a five percent allowance for flotation costs as shown by the formula below:

$$k = \frac{d_1(1+k)^{.75} + d_2(1+k)^{.50} + d_3(1+k)^{.25} + d_4}{P_0(1 - FC)} + g$$

[1] At August 2018, I have conservatively eliminated DCF model results equal to 20.6 percent, 24.1 percent, and 46.5 percent.

SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS FOR S&P 500 COMPANIES

	COMPANY	STOCK PRICE (P_0)	DIVIDEND (D_0)	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT
1	3M	202.10	5.44	9.70%	12.8%
2	ABBOTT LABORATORIES	63.47	1.12	11.84%	13.9%
3	ABBVIE	95.02	3.84	16.12%	21.1%
4	ACTIVISION BLIZZARD	74.57	0.34	15.10%	15.7%
5	ADV.AUTO PARTS	142.30	0.24	13.98%	14.2%
6	AETNA	188.44	2.00	9.69%	10.9%
7	AGILENT TECHS.	64.53	0.60	10.84%	11.9%
8	ALBEMARLE	94.84	1.34	12.70%	14.4%
9	ALLEGION	80.93	0.84	12.20%	13.4%
10	ALLERGAN	175.28	2.88	5.79%	7.6%
11	AMERICAN EXPRESS	100.92	1.40	11.80%	13.4%
12	AMERISOURCEBERGEN	86.00	1.52	10.20%	12.3%
13	AMGEN	190.21	5.28	5.38%	8.5%
14	ANTHEM	245.84	3.00	15.49%	17.0%
15	APPLE	196.75	2.92	12.78%	14.6%
16	APPLIED MATS.	47.49	0.80	17.82%	19.9%
17	APTIV	94.56	0.88	13.37%	14.5%
18	AT&T	32.36	2.00	6.20%	13.3%
19	AUTOMATIC DATA PROC.	136.88	2.76	14.60%	17.1%
20	AVERY DENNISON	107.27	2.08	13.31%	15.6%
21	BALL	37.83	0.40	10.57%	11.8%
22	BANK OF NEW YORK MELLON	54.00	1.12	8.13%	10.5%
23	BAXTER INTL.	73.17	0.76	13.00%	14.2%
24	BECTON DICKINSON	242.70	3.00	14.57%	16.1%
25	BEST BUY	76.03	1.80	13.70%	16.6%
26	BLACKROCK	505.21	12.52	13.80%	16.8%
27	BOEING	346.89	6.84	19.01%	21.5%
28	BORGWARNER	45.45	0.68	6.77%	8.5%
29	BRISTOL MYERS SQUIBB	56.92	1.60	10.98%	14.3%
30	BROADCOM	231.67	7.00	14.03%	17.7%
31	CARDINAL HEALTH	50.73	1.91	4.94%	9.2%
32	CARNIVAL	59.70	2.00	12.73%	16.8%
33	CBS 'B'	54.13	0.72	17.36%	19.0%
34	CENTERPOINT EN.	27.36	1.11	8.62%	13.3%
35	CH ROBINSON WWD.	90.24	1.84	13.21%	15.7%
36	CHURCH & DWIGHT CO.	53.58	0.87	10.34%	12.2%
37	CIGNA	177.76	0.04	14.48%	14.5%
38	CISCO SYSTEMS	43.40	1.32	10.28%	13.9%
39	CLOROX	133.51	3.84	7.46%	10.8%
40	CMS ENERGY	47.06	1.43	6.97%	10.4%
41	COCA COLA	44.83	1.56	7.25%	11.2%
42	COLGATE-PALM.	65.50	1.68	7.25%	10.2%

	COMPANY	STOCK PRICE (P_0)	DIVIDEND (D_0)	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT
43	CONSTELLATION BRANDS 'A'	216.43	2.08	12.00%	13.1%
44	CORNING	30.57	0.72	9.81%	12.6%
45	COSTCO WHOLESALE	214.44	2.28	11.96%	13.2%
46	COTY CL.A	13.39	0.50	15.23%	19.8%
47	CSX	68.70	0.88	20.38%	22.0%
48	CUMMINS	138.76	4.56	11.70%	15.6%
49	DANAHER	101.26	0.64	9.00%	9.7%
50	DARDEN RESTAURANTS	106.11	3.00	12.35%	15.7%
51	DISCOVER FINANCIAL SVS.	73.37	1.60	13.07%	15.7%
52	DOLLAR GENERAL	98.60	1.16	15.86%	17.3%
53	DOMINION ENERGY	68.66	3.34	6.34%	11.9%
54	DTE ENERGY	105.22	3.53	5.49%	9.3%
55	DUKE ENERGY	79.00	3.71	4.13%	9.4%
56	ECOLAB	143.35	1.64	13.65%	15.0%
57	ELI LILLY	93.31	2.25	12.10%	15.0%
58	ESTEE LAUDER COS.'A'	141.87	1.52	15.56%	16.9%
59	EVERSOURCE ENERGY	58.80	2.02	5.80%	9.7%
60	EXELON	42.21	1.38	4.30%	7.9%
61	EXPEDIA GROUP	127.84	1.28	17.69%	18.9%
62	EXPEDITOR INTL.OF WASH.	74.11	0.90	11.13%	12.6%
63	FEDEX	242.34	2.60	13.44%	14.7%
64	FIDELITY NAT.INFO.SVS.	105.77	1.28	13.41%	14.9%
65	FOOT LOCKER	52.05	1.38	7.64%	10.7%
66	GAP	30.87	0.97	12.08%	15.8%
67	GENERAL DYNAMICS	194.66	3.72	12.47%	14.7%
68	GENERAL ELECTRIC	13.28	0.48	6.17%	10.3%
69	GENERAL MOTORS	39.11	1.52	10.40%	15.0%
70	GLOBAL PAYMENTS	115.70	0.04	19.39%	19.4%
71	HARLEY-DAVIDSON	43.11	1.48	10.43%	14.5%
72	HCA HEALTHCARE	116.06	1.40	13.64%	15.1%
73	HERSHEY	95.85	2.69	9.37%	12.6%
74	HOME DEPOT	196.52	4.12	14.85%	17.4%
75	HONEYWELL INTL.	151.59	2.98	10.54%	12.8%
76	HP	23.47	0.56	9.46%	12.2%
77	HUMANA	310.29	2.00	15.23%	16.0%
78	HUNT JB TRANSPORT SVS.	123.67	0.96	20.81%	21.8%
79	ILLINOIS TOOL WORKS	141.44	4.00	12.31%	15.7%
80	INTEL	50.44	1.20	10.22%	13.0%
81	INTERCONTINENTAL EX.	74.35	0.96	12.20%	13.7%
82	INTERNATIONAL PAPER	53.38	1.90	14.99%	19.4%
83	INTERPUBLIC GROUP	22.82	0.84	7.30%	11.5%
84	JACOBS ENGR.	66.68	0.60	16.07%	17.2%
85	JOHNSON & JOHNSON	127.32	3.60	7.73%	11.0%
86	JP MORGAN CHASE & CO.	111.02	2.48	9.32%	11.9%
87	KELLOGG	68.94	2.24	6.92%	10.6%
88	KIMBERLY-CLARK	108.67	4.00	6.00%	10.2%

	COMPANY	STOCK PRICE (P_0)	DIVIDEND (D_0)	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT
89	KLA TENCOR	111.54	3.00	11.07%	14.2%
90	KRAFT HEINZ	61.31	2.50	5.31%	9.9%
91	KROGER	28.78	0.56	6.71%	8.9%
92	L BRANDS	33.27	2.40	7.38%	15.8%
93	LOWE'S COMPANIES	99.75	1.92	16.00%	18.4%
94	MARRIOTT INTL.'A'	128.95	1.64	18.16%	19.7%
95	MARTIN MRTA.MATS.	213.69	1.92	13.60%	14.7%
96	MASCO	38.48	0.42	14.77%	16.1%
97	MCCORMICK & COMPANY NV.	115.99	2.08	10.61%	12.7%
98	MEDTRONIC	88.93	2.00	7.10%	9.7%
99	MERCK & COMPANY	63.96	1.92	7.20%	10.6%
100	MICROSOFT	104.45	1.68	12.42%	14.3%
101	MOLSON COORS BREWING 'B'	66.74	1.64	7.44%	10.2%
102	MONDELEZ INTERNATIONAL CL.A	41.76	1.04	9.77%	12.7%
103	MOTOROLA SOLUTIONS	118.54	2.08	13.58%	15.7%
104	NETAPP	78.63	1.60	15.95%	18.5%
105	NEXTERA ENERGY	166.78	4.44	9.44%	12.5%
106	NIKE 'B'	77.81	0.80	12.21%	13.4%
107	NISOURCE	25.84	0.78	5.71%	9.1%
108	NORFOLK SOUTHERN	162.06	3.20	16.61%	19.1%
109	NORTHERN TRUST	108.11	2.20	15.14%	17.6%
110	NORTHROP GRUMMAN	307.72	4.80	15.89%	17.8%
111	OMNICOM GROUP	71.65	2.40	7.03%	10.9%
112	ORACLE	46.75	0.76	8.33%	10.2%
113	PACKAGING CORP.OF AM.	113.64	3.16	12.43%	15.8%
114	PARKER-HANNIFIN	164.26	3.04	8.03%	10.2%
115	PAYCHEX	69.59	2.24	8.33%	12.0%
116	PEPSICO	110.50	3.71	7.23%	11.1%
117	PERKINELMER	79.13	0.28	14.90%	15.3%
118	PFIZER	38.46	1.36	7.00%	11.0%
119	PHILIP MORRIS INTL.	81.13	4.56	8.15%	14.7%
120	PPG INDUSTRIES	106.21	1.83	9.60%	11.6%
121	PROCTER & GAMBLE	79.05	2.87	6.50%	10.6%
122	PUB.SER.ENTER.GP.	52.34	1.80	6.34%	10.2%
123	PVH	153.37	0.15	12.27%	12.4%
124	QUEST DIAGNOSTICS	110.25	2.00	9.87%	12.0%
125	RALPH LAUREN CL.A	135.40	2.50	10.05%	12.2%
126	REPUBLIC SVS.'A'	70.82	1.50	13.83%	16.4%
127	ROCKWELL AUTOMATION	175.55	3.68	12.17%	14.7%
128	ROCKWELL COLLINS	136.57	1.32	12.51%	13.7%
129	ROSS STORES	87.03	0.90	10.89%	12.1%
130	S&P GLOBAL	204.66	2.00	15.17%	16.4%
131	SEAGATE TECH.	55.50	2.52	7.12%	12.3%
132	SEMPRA EN.	113.77	3.58	8.89%	12.5%
133	SHERWIN-WILLIAMS	422.88	3.44	16.71%	17.7%
134	SKYWORKS SOLUTIONS	96.92	1.52	13.03%	14.9%

	COMPANY	STOCK PRICE (P_0)	DIVIDEND (D_0)	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT
135	SOUTHERN	46.22	2.40	2.10%	7.8%
136	SOUTHWEST AIRLINES	55.19	0.64	17.08%	18.5%
137	STANLEY BLACK & DECKER	140.78	2.64	10.82%	13.0%
138	STARBUCKS	52.03	1.44	13.87%	17.2%
139	STATE STREET	91.04	1.88	11.38%	13.8%
140	STRYKER	169.67	1.88	10.00%	11.3%
141	SYMANTEC	20.40	0.30	10.56%	12.3%
142	SYSCO	69.07	1.44	12.58%	15.1%
143	TAPESTRY	47.38	1.35	9.74%	13.1%
144	TE CONNECTIVITY	93.08	1.76	10.39%	12.6%
145	TECHNIPFMC	31.15	0.52	14.57%	16.6%
146	TEXAS INSTRUMENTS	112.48	2.48	14.41%	17.1%
147	THERMO FISHER SCIENTIFIC	221.65	0.68	11.91%	12.3%
148	TIFFANY & CO	133.42	2.20	10.91%	12.8%
149	TJX	97.71	1.56	10.63%	12.5%
150	TOTAL SYSTEM SERVICES	90.29	0.52	15.24%	15.9%
151	TRACTOR SUPPLY	79.22	1.24	13.64%	15.5%
152	TWENTY-FIRST CENTURY FOX CL.B	45.67	0.36	11.91%	12.8%
153	UNION PACIFIC	146.01	3.20	18.01%	20.8%
154	UNITED PARCEL SER.'B'	115.46	3.64	11.38%	15.1%
155	UNITEDHEALTH GROUP	253.92	3.60	15.37%	17.1%
156	UNIVERSAL HEALTH SVS.'B'	118.95	0.40	10.74%	11.1%
157	US BANCORP	51.88	1.20	6.80%	9.4%
158	V F	88.10	1.84	13.17%	15.7%
159	VERIZON COMMUNICATIONS	51.25	2.36	5.39%	10.6%
160	VIACOM 'B'	29.36	0.80	4.79%	7.8%
161	VISA 'A'	137.54	0.84	19.11%	19.9%
162	WALGREENS BOOTS ALLIANCE	65.58	1.76	11.64%	14.8%
163	WALMART	88.46	2.08	5.07%	7.7%
164	WALT DISNEY	109.37	1.68	11.23%	13.0%
165	WASTE MANAGEMENT	85.93	1.86	12.60%	15.2%
166	WEC ENERGY GROUP	64.43	2.21	4.54%	8.4%
167	WESTERN DIGITAL	74.20	2.00	5.63%	8.7%
168	WESTERN UNION	20.20	0.76	4.17%	8.4%
169	WHIRLPOOL	139.43	4.60	9.63%	13.5%
170	XCEL ENERGY	45.75	1.52	5.95%	9.7%
171	XILINX	70.86	1.44	14.02%	16.5%
172	ZOETIS	87.04	0.50	16.46%	17.2%
173	Average				13.8%

Note: In applying the DCF Model to the S&P 500, I include in the DCF analysis only those companies in the S&P 500 group which pay a dividend, have a positive growth rate, and have at least three analysts' long-term growth estimates. In addition, I exclude all companies in the I/B/E/S group of insurance companies. I also eliminate those companies with DCF results that vary from the mean by one standard deviation or more.

D_0	=	Latest dividend per Thomson Reuters.
d_0	=	Latest quarterly dividend.
P_0	=	Average of monthly high and low stock prices June, July, and August 2018 per Thomson Reuters.
FC	=	Selling and flotation costs.
g	=	I/B/E/S forecast of future earnings growth August 2018.
k	=	Cost of equity using the quarterly version of the DCF Model and a five percent allowance for flotation costs as shown by the formula below:

$$k = \left[\frac{d_0(1+g)^{\frac{1}{4}}}{P_0(1-FC)} + (1+g)^{\frac{1}{4}} \right]^4 - 1$$

THE QUARTERLY DCF MODEL

The simple DCF Model assumes that a firm pays dividends only at the end of each year. Since firms in fact pay dividends quarterly and investors appreciate the time value of money, the annual version of the DCF Model generally underestimates the value investors are willing to place on the firm's expected future dividend stream. In this appendix, we review two alternative formulations of the DCF Model that allow for the quarterly payment of dividends.

When dividends are assumed to be paid annually, the DCF Model suggests that the current price of the firm's stock is given by the expression:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_n + P_n}{(1+k)^n} \quad \textbf{(1)}$$

where

P_0	=	current price per share of the firm's stock,
$D_1, D_2, \ldots, D_n$	=	expected annual dividends per share on the firm's stock,
P_n	=	price per share of stock at the time investors expect to sell the stock, and
k	=	return investors expect to earn on alternative investments of the same risk, i.e., the investors' required rate of return.

Unfortunately, expression (1) is rather difficult to analyze, especially for the purpose of estimating k. Thus, most analysts make a number of simplifying assumptions. First, they assume that dividends are expected to grow at the constant rate g into the indefinite future. Second, they assume that the stock price at time n is simply the present value of all dividends expected in periods subsequent to n. Third, they assume that the investors' required rate of return, k, exceeds the expected dividend growth rate g. Under the above simplifying assumptions, a firm's stock price may be written as the following sum:

$$P_0 = \frac{D_0(1+g)}{(1+k)} + \frac{D_0(1+g)^2}{(1+k)^2} + \frac{D_0(1+g)^3}{(1+k)^3} + \ldots, \qquad (2)$$

where the three dots indicate that the sum continues indefinitely.

As we shall demonstrate shortly, this sum may be simplified to:

$$P_0 = \frac{D_0(1+g)}{(k-g)}$$

First, however, we need to review the very useful concept of a geometric progression.

Geometric Progression

Consider the sequence of numbers 3, 6, 12, 24,…, where each number after the first is obtained by multiplying the preceding number by the factor 2. Obviously, this sequence of numbers may also be expressed as the sequence 3, 3 x 2, 3 x 2^2, 3 x 2^3, … This sequence is an example of a geometric progression.

Definition: A geometric progression is a sequence in which each term after the first is obtained by multiplying some fixed number, called the common ratio, by the preceding term.

A general notation for geometric progressions is: a, the first term, r, the common ratio, and n, the number of terms. Using this notation, any geometric progression may be represented by the sequence:

$$a, ar, ar^2, ar^3, \ldots, ar^{n-1}.$$

In studying the DCF Model, we will find it useful to have an expression for the sum of n terms of a geometric progression. Call this sum S_n. Then

$$S_n = a + ar + \ldots + ar^{n-1} . \qquad \textbf{(3)}$$

However, this expression can be simplified by multiplying both sides of equation (3) by r and then subtracting the new equation from the old. Thus,

$$rS_n = ar + ar^2 + ar^3 + \ldots + ar^n$$

and

$$S_n - rS_n = a - ar^n \quad ,$$

or

$$(1 - r)\, S_n = a\,(1 - r^n) \ .$$

Solving for S_n, we obtain:

$$S_n = \frac{a(1 - r^n)}{(1 - r)} \qquad \textbf{(4)}$$

as a simple expression for the sum of n terms of a geometric progression. Furthermore, if $|r| < 1$, then S_n is finite, and as n approaches infinity, S_n approaches $a \div (1 - r)$. Thus, for a geometric progression with an infinite number of terms and $|r| < 1$, equation (4) becomes:

$$S = \frac{a}{1 - r} \quad \textbf{(5)}$$

Application to DCF Model

Comparing equation (2) with equation (3), we see that the firm's stock price (under the DCF assumption) is the sum of an infinite geometric progression with the first term

$$a = \frac{D_0(1+g)}{(1+k)}$$

and common factor

$$r = \frac{(1+g)}{(1+k)}$$

Applying equation (5) for the sum of such a geometric progression, we obtain

$$S = a \bullet \frac{1}{(1-r)} = \frac{D_0(1+g)}{(1+k)} \bullet \frac{1}{1-\frac{1+g}{1+k}} = \frac{D_0(1+g)}{(1+k)} \bullet \frac{1+k}{k-g} = \frac{D_0(1+g)}{k-g}$$

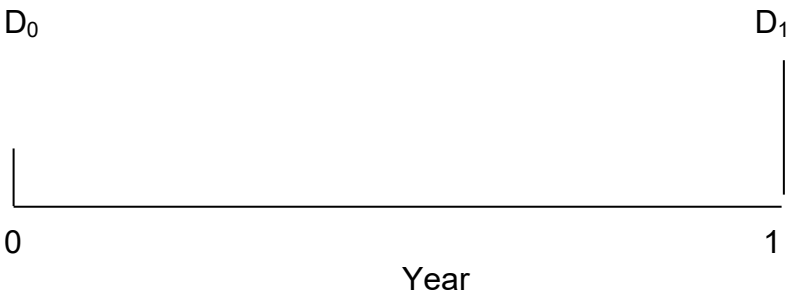
as we suggested earlier.

Quarterly DCF Model

The Annual DCF Model assumes that dividends grow at an annual rate of g% per year (see Figure 1).

Figure 1

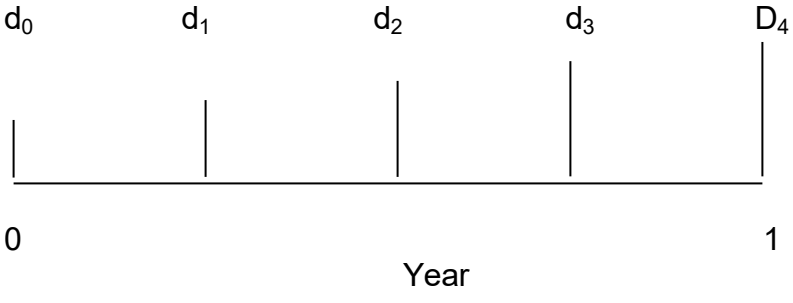
Annual DCF Model



$D_0 = 4d_0$ $D_1 = D_0(1 + g)$

Figure 2

Quarterly DCF Model (Constant Growth Version)



$d_1 = d_0(1+g)^{.25}$ $d_2 = d_0(1+g)^{.50}$

$d_3 = d_0(1+g)^{.75}$ $d_4 = d_0(1+g)$

In the Quarterly DCF Model, it is natural to assume that quarterly dividend payments differ from the preceding quarterly dividend by the factor $(1 + g)^{.25}$, where g is expressed in terms of percent per year and the decimal .25 indicates that the growth has only occurred for one quarter of the year. (See Figure 2.) Using this assumption, along with the assumption of constant growth and ***k*** > ***g***, we obtain a new expression for the firm's stock price, which takes account of the quarterly payment of dividends. This expression is:

$$P_0 = \frac{d_0(1+g)^{\frac{1}{4}}}{(1+k)^{\frac{1}{4}}} + \frac{d_0(1+g)^{\frac{2}{4}}}{(1+k)^{\frac{2}{4}}} + \frac{d_0(1+g)^{\frac{3}{4}}}{(1+k)^{\frac{3}{4}}} + \ldots \qquad \textbf{(6)}$$

where d_0 is the last quarterly dividend payment, rather than the last annual dividend payment. (We use a lower case d to remind the reader that this is not the annual dividend.)

Although equation (6) looks formidable at first glance, it too can be greatly simplified using the formula [equation (4)] for the sum of an infinite geometric progression. As the reader can easily verify, equation (6) can be simplified to:

$$P_0 = \frac{d_0(1+g)^{\frac{1}{4}}}{(1+k)^{\frac{1}{4}} - (1+g)^{\frac{1}{4}}} \qquad \textbf{(7)}$$

Solving equation (7) for ***k***, we obtain a DCF formula for estimating the cost of equity under the quarterly dividend assumption:

$$k = \left[\frac{d_0(1+g)^{\frac{1}{4}}}{P_0} + (1+g)^{\frac{1}{4}} \right]^4 - 1 \qquad \textbf{(8)}$$

An Alternative Quarterly DCF Model

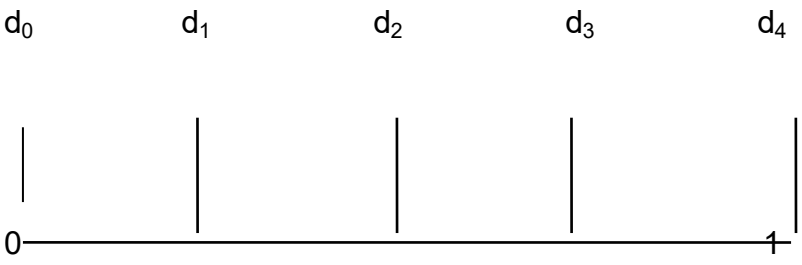
Although the constant growth Quarterly DCF Model [equation (8)] allows for the quarterly timing of dividend payments, it does require the assumption that the firm increases its dividend payments each quarter. Since this assumption is difficult for some analysts to accept, we now discuss a second Quarterly DCF Model that allows for constant quarterly dividend payments within each dividend year.

Assume then that the firm pays dividends quarterly and that each dividend payment is constant for four consecutive quarters. There are four cases to consider, with each case distinguished by varying assumptions about where we are evaluating the firm in relation to the time of its next dividend increase. (See Figure 3.)

Figure 3

Quarterly DCF Model (Constant Dividend Version)

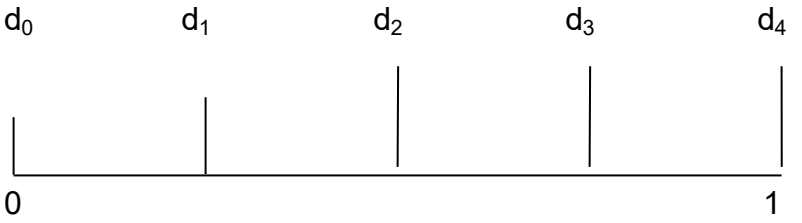
Case 1



Year

$d_1 = d_2 = d_3 = d_4 = d_0(1+g)$

Case 2



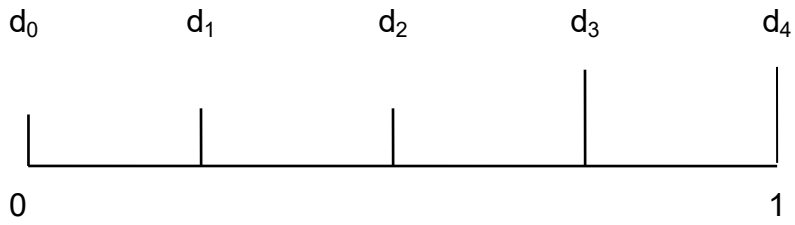
Year

$d_1 = d_0$

$d_2 = d_3 = d_4 = d_0(1+g)$

Figure 3 (continued)

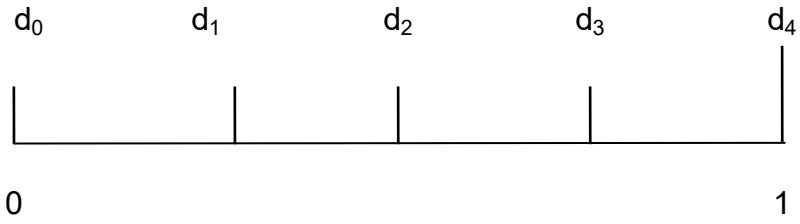
Case 3



$d_1 = d_2 = d_0$

$d_3 = d_4 = d_0(1+g)$

Case 4



$d_1 = d_2 = d_3 = d_0$

$d_4 = d_0(1+g)$

If we assume that the investor invests the quarterly dividend in an alternative investment of the same risk, then the amount accumulated by the end of the year will in all cases be given by

$$D_1^* = d_1 (1+k)^{3/4} + d_2 (1+k)^{1/2} + d_3 (1+k)^{1/4} + d_4$$

where d_1, d_2, d_3 and d_4 are the four quarterly dividends. Under these new assumptions, the firm's stock price may be expressed by an Annual DCF Model of the form (2), with the exception that

$$D_1^* = d_1 (1 + k)^{3/4} + d_2 (1 + k)^{1/2} + d_3 (1 + k)^{1/4} + d_4 \qquad \textbf{(9)}$$

is used in place of $D_0(1+g)$. But, we already know that the Annual DCF Model may be reduced to

$$P_0 = \frac{D_0(1+g)}{k-g}$$

Thus, under the assumptions of the second Quarterly DCF Model, the firm's cost of equity is given by

$$k = \frac{D_1^*}{P_0} + g \qquad \textbf{(10)}$$

with D_1^* given by (9).

Although equation (10) looks like the Annual DCF Model, there are at least two very

important practical differences. First, since D_1* is always greater than $D_0(1+g)$, the estimates of the cost of equity are always larger (and more accurate) in the Quarterly Model (10) than in the Annual Model. Second, since D_1* depends on k through equation (9), the unknown "k" appears on both sides of (10), and an iterative procedure is required to solve for k.

COMPARATIVE RETURNS ON S&P 500 STOCKS AND MOODY'S A-RATED UTILITY BONDS 1926-2017

YEAR	S&P 500 STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RATE OF RETURN	RISK PREMIUM
2017	2,275.12	0.0209	24.71%	$96.13	10.75%	13.97%
2016	1,918.60	0.0222	20.80%	$95.48	4.87%	15.93%
2015	2,028.18	0.0208	-3.32%	$107.65	-7.59%	4.26%
2014	1,822.36	0.0210	13.39%	$89.89	24.20%	-10.81%
2013	1,481.11	0.0220	25.24%	$97.45	-3.65%	28.89%
2012	1,300.58	0.0214	16.02%	$94.36	7.52%	8.50%
2011	1,282.62	0.0185	3.25%	$77.36	27.14%	-23.89%
2010	1,123.58	0.0203	16.18%	$75.02	8.44%	7.74%
2009	865.58	0.0310	32.91%	$68.43	15.48%	17.43%
2008	1,378.76	0.0206	-35.16%	$72.25	0.24%	-35.40%
2007	1,424.16	0.0181	-1.38%	$72.91	4.59%	-5.97%
2006	1,278.72	0.0183	13.20%	$75.25	2.20%	11.01%
2005	1,181.41	0.0177	10.01%	$74.91	5.80%	4.21%
2004	1,132.52	0.0162	5.94%	$70.87	11.34%	-5.40%
2003	895.84	0.0180	28.22%	$62.26	20.27%	7.95%
2002	1,140.21	0.0138	-20.05%	$57.44	15.35%	-35.40%
2001	1,335.63	0.0116	-13.47%	$56.40	8.93%	-22.40%
2000	1,425.59	0.0118	-5.13%	$52.60	14.82%	-19.95%
1999	1,248.77	0.0130	15.46%	$63.03	-10.20%	25.66%
1998	963.36	0.0162	31.25%	$62.43	7.38%	23.87%
1997	766.22	0.0195	27.68%	$56.62	17.32%	10.36%
1996	614.42	0.0231	27.02%	$60.91	-0.48%	27.49%
1995	465.25	0.0287	34.93%	$50.22	29.26%	5.68%
1994	472.99	0.0269	1.05%	$60.01	-9.65%	10.71%
1993	435.23	0.0288	11.56%	$53.13	20.48%	-8.93%
1992	416.08	0.0290	7.50%	$49.56	15.27%	-7.77%
1991	325.49	0.0382	31.65%	$44.84	19.44%	12.21%
1990	339.97	0.0341	-0.85%	$45.60	7.11%	-7.96%
1989	285.41	0.0364	22.76%	$43.06	15.18%	7.58%
1988	250.48	0.0366	17.61%	$40.10	17.36%	0.25%
1987	264.51	0.0317	-2.13%	$48.92	-9.84%	7.71%
1986	208.19	0.0390	30.95%	$39.98	32.36%	-1.41%
1985	171.61	0.0451	25.83%	$32.57	35.05%	-9.22%
1984	166.39	0.0427	7.41%	$31.49	16.12%	-8.72%
1983	144.27	0.0479	20.12%	$29.41	20.65%	-0.53%
1982	117.28	0.0595	28.96%	$24.48	36.48%	-7.51%
1981	132.97	0.0480	-7.00%	$29.37	-3.01%	-3.99%
1980	110.87	0.0541	25.34%	$34.69	-3.81%	29.16%
1979	99.71	0.0533	16.52%	$43.91	-11.89%	28.41%
1978	90.25	0.0532	15.80%	$49.09	-2.40%	18.20%
1977	103.80	0.0399	-9.06%	$50.95	4.20%	-13.27%
1976	96.86	0.0380	10.96%	$43.91	25.13%	-14.17%
1975	72.56	0.0507	38.56%	$41.76	14.75%	23.81%

COMPARATIVE RETURNS ON S&P 500 STOCKS AND MOODY'S A-RATED UTILITY BONDS 1926-2017

YEAR	S&P 500 STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RATE OF RETURN	RISK PREMIUM
1974	96.11	0.0364	-20.86%	$52.54	-12.91%	-7.96%
1973	118.40	0.0269	-16.14%	$58.51	-3.37%	-12.77%
1972	103.30	0.0296	17.58%	$56.47	10.69%	6.89%
1971	93.49	0.0332	13.81%	$53.93	12.13%	1.69%
1970	90.31	0.0356	7.08%	$50.46	14.81%	-7.73%
1969	102.00	0.0306	-8.40%	$62.43	-12.76%	4.36%
1968	95.04	0.0313	10.45%	$66.97	-0.81%	11.26%
1967	84.45	0.0351	16.05%	$78.69	-9.81%	25.86%
1966	93.32	0.0302	-6.48%	$86.57	-4.48%	-2.00%
1965	86.12	0.0299	11.35%	$91.40	-0.91%	12.26%
1964	76.45	0.0305	15.70%	$92.01	3.68%	12.02%
1963	65.06	0.0331	20.82%	$93.56	2.61%	18.20%
1962	69.07	0.0297	-2.84%	$89.60	8.89%	-11.73%
1961	59.72	0.0328	18.94%	$89.74	4.29%	14.64%
1960	58.03	0.0327	6.18%	$84.36	11.13%	-4.95%
1959	55.62	0.0324	7.57%	$91.55	-3.49%	11.06%
1958	41.12	0.0448	39.74%	$101.22	-5.60%	45.35%
1957	45.43	0.0431	-5.18%	$100.70	4.49%	-9.67%
1956	44.15	0.0424	7.14%	$113.00	-7.35%	14.49%
1955	35.60	0.0438	28.40%	$116.77	0.20%	28.20%
1954	25.46	0.0569	45.52%	$112.79	7.07%	38.45%
1953	26.18	0.0545	2.70%	$114.24	2.24%	0.46%
1952	24.19	0.0582	14.05%	$113.41	4.26%	9.79%
1951	21.21	0.0634	20.39%	$123.44	-4.89%	25.28%
1950	16.88	0.0665	32.30%	$125.08	1.89%	30.41%
1949	15.36	0.0620	16.10%	$119.82	7.72%	8.37%
1948	14.83	0.0571	9.28%	$118.50	4.49%	4.79%
1947	15.21	0.0449	1.99%	$126.02	-2.79%	4.79%
1946	18.02	0.0356	-12.03%	$126.74	2.59%	-14.63%
1945	13.49	0.0460	38.18%	$119.82	9.11%	29.07%
1944	11.85	0.0495	18.79%	$119.82	3.34%	15.45%
1943	10.09	0.0554	22.98%	$118.50	4.49%	18.49%
1942	8.93	0.0788	20.87%	$117.63	4.14%	16.73%
1941	10.55	0.0638	-8.98%	$116.34	4.55%	-13.52%
1940	12.30	0.0458	-9.65%	$112.39	7.08%	-16.73%
1939	12.50	0.0349	1.89%	$105.75	10.05%	-8.16%
1938	11.31	0.0784	18.36%	$99.83	9.94%	8.42%
1937	17.59	0.0434	-31.36%	$103.18	0.63%	-31.99%
1936	13.76	0.0327	31.10%	$96.46	11.12%	19.99%
1935	9.26	0.0424	52.84%	$82.23	22.17%	30.66%
1934	10.54	0.0336	-8.78%	$66.78	29.13%	-37.91%
1933	7.09	0.0542	54.08%	$79.55	-11.03%	65.11%
1932	8.30	0.0822	-6.36%	$70.67	18.23%	-24.59%
1931	15.98	0.0550	-42.56%	$84.49	-11.63%	-30.93%

COMPARATIVE RETURNS ON S&P 500 STOCKS AND MOODY'S A-RATED UTILITY BONDS 1926-2017

YEAR	S&P 500 STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RATE OF RETURN	RISK PREMIUM
1930	21.71	0.0438	-22.01%	$81.19	8.99%	-31.00%
1929	24.86	0.0336	-9.31%	$83.95	1.48%	-10.79%
1928	17.53	0.0431	46.12%	$86.71	1.43%	44.69%
1927	13.40	0.0502	35.84%	$83.28	8.92%	26.92%
1926	12.65	0.0446	10.39%	$80.81	8.01%	2.38%
Average 1926 - 2017			11.57%		6.82%	4.76%

Note: See Page 4 for an explanation of how stock and bond returns are derived and the source of the data presented.

COMPARATIVE RETURNS ON S&P 500 STOCKS
AND MOODY'S A-RATED UTILITY BONDS 1926-2017

RISK PREMIUM APPROACH

SOURCE OF DATA

Stock price and yield information is obtained from Standard & Poor's Security Price publication. Standard & Poor's derives the stock dividend yield by dividing the aggregate cash dividends (based on the latest known annual rate) by the aggregate market value of the stocks in the group. The bond price information is obtained by calculating the present value of a bond due in thirty years with a $4.00 coupon and a yield to maturity of a particular year's indicated Moody's A-rated Utility bond yield. The values shown on the ex post risk premium schedule are the January values of the respective indices.

Calculation of Stock and Bond Returns

Sample calculation of "Stock Return" column:

$$\text{StockReturn}(2017) = \left[\frac{\text{StockPrice}(2018) - \text{StockPrice}(2017) + \text{Dividend}(2017)}{\text{StockPrice}(2017)} \right]$$

where Dividend (2017) = Stock Price (2017) x Stock Div. Yield (2017)

Sample calculation of "Bond Return" column:

$$\text{Bond Return}(2017) = \left[\frac{\text{Bond Price}(2018) - \text{Bond Price}(2017) + \text{Interest}\ (2017)}{\text{Bond Price}(2017)} \right]$$

where Interest = $4.00.

Exhibit RB-17

PREFILED TESTIMONY
OF
DAVID APPEL

2018 HOMEOWNERS INSURANCE RATE FILING
BY THE NORTH CAROLINA RATE BUREAU

I. QUALIFICATIONS AND SUMMARY

Q. Please state your name and present business address.

A. My name is David Appel, and my business address is 1 Pennsylvania Plaza, New York, NY.

Q. What is your occupation?

A. I am a Senior Consultant with the firm of Milliman, Inc.

Q. What is Milliman, Inc.?

A. Milliman (formerly Milliman & Robertson) is one of the nation's largest independently owned firms of actuaries and consultants. The company has more than 3500 employees, and operates offices in over 60 cities in the U.S., Europe, Asia, Africa, Australia and Latin America. Our clients number in the thousands: they include insurers, self-insured entities, Federal and State Governments, private corporations, non-profit organizations, unions, and many others.

Q. Please describe your educational and employment history.

A. A complete statement of my educational, employment and academic credentials is included as Exhibit RB-18 filed with this testimony.

To summarize, I have a B.A. in economics from Brooklyn College, City University of New York, and M.A. and Ph.D. degrees in economics from Rutgers University. Prior to 1980, I was an instructor in economics at Rutgers University. For the following nine years, I was employed by the National Council on Compensation Insurance (NCCI), the nation’s largest workers compensation insurance statistical, research and ratemaking organization. I joined NCCI as Research Economist in 1980, and ultimately became Vice President for Research in 1985. In 1989, I joined Milliman, where I founded the economics consulting practice for the firm.

Q. Would you please describe some of your other professional activities?

A. Yes. Throughout my professional career, I have participated in a variety of academic and business activities related to insurance. I have twice been a member of the Board of Directors of the American Risk and Insurance Association, the leading learned society of insurance academics. For many years I was a member of the editorial board of the Journal of Insurance Regulation, the official research publication of the National Association of Insurance Commissioners, and I acted as a peer referee for a number of scholarly journals in economics and insurance. In addition, I was, for twelve years, an Adjunct Professor of Economics at Rutgers University.

Q. Have you ever published any papers or books?

A. Yes. I have authored many papers on various aspects of insurance that have been published in refereed books or scholarly journals. In addition, I have published a large number of papers in non-refereed journals as well. I have also co-edited three volumes of research papers dealing with various aspects of workers compensation and property-casualty insurance. My refereed publications are listed in Exhibit RB-18 filed with this testimony.

Q. Are you a member of any professional associations?

A. Yes. I am a member of the American Risk and Insurance Association, the leading association of insurance academicians. I have also been an elected fellow of the National Academy of Social Insurance, a member of the panel of neutrals of the American Arbitration Association, and a certified arbitrator and umpire of ARIAS, the world's leading insurance and reinsurance arbitration society.

Q. Have you ever testified in insurance rate regulatory proceedings?

A. Yes. I have testified on many occasions in such proceedings during my career, including numerous occasions in North Carolina. A complete list is contained in Exhibit RB-18 filed with this testimony.

Q. What was the general nature of your testimony in these cases?

A. I have addressed a wide variety of insurance issues during public testimony, including such diverse topics as the impact of economic and demographic factors on insurance costs, the effects of regulation on insurance availability, the use of econometric and statistical models in insurance forecasting, and the use of modern financial theory in developing insurance prices. In North Carolina, my testimony has tended to focus on matters relating to the cost of capital and the returns

expected from the underwriting profit provisions selected for use in the rates. However, in property rate filings, I have had substantial involvement in issues relating to catastrophe risk and the net cost of reinsurance, hence my testimony has addressed these issues as well.

Q. Have you been retained by the North Carolina Rate Bureau as a consultant in this rate case?

A. Yes. I have been asked to consider the following specific matters in connection with this case:

1. Whether Dr. Vander Weide's analysis provides a reasonable estimate of the cost of capital.

2. Whether other factors – including interest rate sensitivity, the small firm size typical of homeowners insurers in North Carolina, and the nature of the homeowners insurance exposure – create additional sources of risk which affect insurers' cost of capital.

3. Whether the return insurers would expect to earn from underwriting homeowners insurance in North Carolina, given that the filed underwriting profit provision is realized, are fair and reasonable.

I have performed various studies and analyses on these matters.

Q. Can you please summarize the conclusions you have reached in regard to the matters noted above?

A. Yes. I will summarize them in bullet form here, and then discuss them each more fully later in the testimony.

1. I have reviewed Dr. Vander Weide's cost of capital estimates, which rely on the two most widely recognized models used for this purpose, and find them to be reasonable. However, Dr. Vander Weide's estimates are based on the implicit assumption that insurers present investors with roughly average risk, relative to all possible investment activities. I believe that investors in the property-casualty insurance industry, and particularly in the lines of business at issue in this rate hearing, are subject to an above average degree of risk, and therefore I think it would be prudent to view Dr. Vander Weide's estimates as a conservative estimate of the return to which insurers are entitled.

2. I have also considered the impact of two factors on the risk and required return for insurers – interest rate sensitivity and firm size. These factors

affect the required return for insurers generally, regardless of the line of business. As regards interest rate sensitivity, because of the high degree of financial leverage and the substantial share of medium and long term bonds in insurer asset portfolios, insurers are particularly subject to interest rate risk that cannot be diversified away. Based on my previous analyses, I have found that investors must be compensated for this risk in the form of an additional risk premium above that required for the average security. As regards firm size, I have on many occasions studied the size distribution of insurers in North Carolina and found that the firms providing insurance coverage in the state tend to be smaller than those used in Dr. Vander Weide's cost of capital analysis. Since there is conclusive evidence that, over the long run, smaller firms have earned higher returns, this finding must be considered evidence that investors expect higher returns from small firms.

These analyses provide support for my opinion that Dr. Vander Weide's cost of capital estimates should be viewed as a conservative estimate of the return to which insurers are entitled.

3. In addition to these risk factors, I also note that the homeowners insurance at issue in this case is subject to significant catastrophe risk, which is not adequately reflected in Dr. Vander Weide's cost of capital estimates. This is yet another factor supporting my opinion that Dr. Vander Weide's cost of capital estimates should be viewed as conservative.

4. In order to test the underwriting profit provision selected and filed by the Rate Bureau, I have estimated the returns insurers would expect to earn from North Carolina homeowners insurance assuming the filed underwriting profit provision is fully earned, and assuming all of the other assumptions embedded in the rate calculations actually materialize. I am aware that North Carolina law provides that insurers are entitled to expect to earn a return equal to the returns of industries of comparable risk, and that in calculating that expected return, investment income from capital and surplus funds is not to be considered. I refer to that operating return as the statutory return. However, as is evident from the attached exhibits, I have estimated insurer pro forma returns both including and excluding expected investment income from capital and surplus. (I refer to the return including investment income on surplus as the total return.) I have done this to demonstrate that, if the filed underwriting profit provision is actually realized, and even if investment income on surplus is considered, insurer returns will not be excessive. Obviously, if returns are not excessive including investment income from capital and surplus, they will be non-excessive excluding such income.

5. I am aware that the North Carolina Rate Bureau has chosen to cap certain territorial rate increases in order to ameliorate the impact on policyholders

in those territories of the large indicated rate increases there and to obtain approval of the filing by the Commissioner of Insurance. The effect of that capping is to lower the requested rate change below the indicated rate change in the filing. In fact, while the indicated rate increase is 26.1%, the result of the territorial capping is to reduce the requested overall rate change to 17.4%. Assuming the losses and expenses projected in the filing actually materialize, the further result of that capping is that insurers will not collect sufficient revenue to produce the 9.0% underwriting profit selected and filed by the Rate Bureau; instead, the underwriting profit, and resulting rate of return, will fall short of the values I have estimated in the pro forma return calculations in the filing.

6. Based on my calculations, the selected underwriting profit provision of 9.0% would generate the following returns for homeowners insurers in North Carolina: a statutory return on net worth of 6.8% and a total return on net worth (i.e., including investment income on surplus) of 10.4%. Since these returns, even those that include investment income on surplus funds, are near or below the lower bound of Dr. Vander Weide's range for the fair rate of return, I conclude that the underwriting profit provisions are clearly not excessive. In addition, given the territorial capping noted above and assuming the losses and expenses projected in the filing actually materialize, the expected underwriting profit provision will be significantly less than the selected 9.0%. As a consequence, insurers would expect returns well below the lower bound for the range of fair returns.

II. COST OF CAPITAL REVIEW

Q. You said your first assignment was to review Dr. Vander Weide's estimate of the cost of capital. Are you familiar with Dr. Vander Weide's approach to estimating the cost of capital in insurance rate cases?

A. Yes. I am aware of the methodology upon which Dr. Vander Weide relies to estimate the cost of capital and have reviewed it on a number of occasions in the course of previous rate cases in North Carolina. Dr. Vander Weide has used the most widely recognized and accepted models for this purpose, namely the Discounted Cash Flow (DCF) model and the risk premium method. These models, when taken together and properly applied to a reasonably selected data set, provide acceptable estimates of the cost of capital for regulated insurers.

Q. What has Dr. Vander Weide concluded with respect to the fair rate of return in this case?

A. Dr. Vander Weide has concluded that the fair rate of return for insurers is in the range of 9.0% to 13.8% on net worth as determined under generally accepted accounting principles (GAAP).

Q. In your opinion, is this an appropriate estimate of the required rate of return?

A. Yes, however as I indicated a moment ago, I believe that Dr. Vander Weide may have been conservative in his calculation of the required rate of return. Dr. Vander Weide has assumed that the property-casualty industry presents investors with average risk. However, based on my studies, I conclude the following:

1. There is evidence that the property casualty industry is considerably above average with respect to the volatility of the returns that it provides to investors. This higher volatility of returns makes the property-casualty industry an investment of above average risk.

2. Since investors require higher returns from smaller firms, and since the firms in Dr. Vander Weide's cost of capital analysis are significantly larger than the average property-casualty insurer in North Carolina, his approach tends to underestimate the true cost of capital for North Carolina homeowners insurers.

III. ADDITIONAL FACTORS AFFECTING RISK

Q. Your comments suggest that Dr. Vander Weide's cost of capital may be understated for insurers writing homeowners insurance in North Carolina. Can you please elaborate on this?

A. Certainly. As mentioned in the summary, I have considered whether other factors not addressed in the standard cost of capital analysis conducted by Dr. Vander Weide might indeed affect the risk and therefore the required return in this case. In fact, there were two such factors – interest rate risk and the small size of firms writing homeowners insurance in the state – that I have studied for a number of years and which clearly increase the cost of capital, or required return, in this case. Based on analyses I have conducted for previous rate hearings in North Carolina, I have concluded that both these factors create additional risks that require additional compensation above that demanded for the average security.

In addition to these factors (which affect risk and required returns for all lines of insurance), for the lines of coverage at issue in this case, the exposure to catastrophic losses associated with hurricanes in North Carolina contributes to additional risk that is otherwise not reflected in standard cost of capital analyses. As with interest rate risk and small firm size, this additional risk requires

compensation in the market, beyond that implied by the analyses conducted by Dr. Vander Weide. I will discuss these issues briefly below.

Q. You have made reference to the term interest rate risk. Can you please define this term?

A. Yes. Interest rate risk refers to the risk that the value of fixed income investments (such as bonds) will fluctuate with changes in interest rates. This means that there is a risk associated with holding bonds, particularly those with a relatively long term to maturity. While investments in equities are still considerably riskier than investments in long term bonds, as evidenced by the fact that returns to large company stocks have had a much higher mean and standard deviation than returns on long term government bonds over the past 80+ years, bonds investments impose risk as well.

Q. Does interest rate risk affect investments in property-casualty insurance stocks?

A. Yes. Property-casualty insurance companies invest large amounts of funds in bonds issued by both corporations and governmental bodies. The risk that investors face is that when interest rates change, the values of the bonds also change, and hence their investments in property-casualty stocks are subject to interest rate risk. This fact is widely recognized by the financial community. Since investors cannot diversify away interest rate risk, only the prospect of higher returns will induce them to purchase interest-sensitive stocks. That is, investors must be compensated for purchasing interest-sensitive stocks because they are increasing their exposure to interest rate risk. This is a risk separate and apart from the market risk investors face.

Q. Why is interest rate risk different from market risk?

A. In general, risk that is not diversifiable is known as systematic risk, or market risk. Systematic risk stems from events that take place on an economy-wide basis. Investors can only diversify away risks that have offsetting factors somewhere else in the economy. For instance, if one company has a bad year due to reasons specific to it alone, it is highly likely that another company will have a good year which will offset the bad performance. That sort of risk is diversifiable. However, the risk associated with events that take place economy-wide without offsetting factors is not diversifiable. It is this risk that is referred to as systematic risk or market risk.

Interest rate risk is a separate source of volatility for insurance stocks. Interest rates often change as a result of changes in expectations of future inflation. These changes primarily affect firms that hold what are called nominal assets and

liabilities. Nominal assets and liabilities have cash flows that are fixed in nominal terms (for example, accounts receivable, most contracts, and bonds) and are thus subject to erosion in value due to inflation. On the other hand, the cash flows associated with manufacturing and service operations tend to fluctuate with the price level. Since most non-financial firms hold relatively few nominal assets and liabilities, their stocks are not particularly sensitive to changes in interest rates that are due to changes in expected inflation. Therefore interest rate risk adds additional risk to insurance stocks, above and beyond market risk, that is not diversifiable.

Changes in interest rates that are not associated with changes in expected inflation will affect all stocks. This accounts for the moderate degree of correlation between changes in long term interest rates and returns to common stocks. However, the fact that most stocks are not very sensitive to changes in interest rates that are due to changes in expected inflation means that interest rate risk is not fully captured in measures of market risk.

Q. Is it possible to measure interest rate risk?

A. Yes, and in the past I have conducted a number of studies designed specifically to address this issue. The principal conclusions of those studies is that since insurer assets on average have a substantially longer financial duration than insurance liabilities, when interest rates change, the value of insurer equity is subject to potentially wide fluctuation. While the market risk for insurers as measured by beta is roughly average, the degree of interest rate risk to which the industry is exposed is considerably higher than average. Since this risk cannot be entirely diversified away, the overall risk associated with an investment in property/casualty insurance is greater than average.

Insurers are entitled to a rate of return above that allowed for the average risk investment in the U.S. economy for several reasons.

First, as noted, the high degree of financial leverage and mismatched durations of assets and liabilities contributes to the volatility of returns to investors in insurance stocks.

Second, the insurance industry is in the business of bearing risk. Individuals and corporations transfer to property-casualty insurers the potential liability for a wide range of possible adverse events, ranging from property damage to professional liability. In light of the unforeseen events that can occur, and, in the recent past, actually have occurred, investors in property-casualty insurance stocks are subject to considerable risk.

Finally, insurance is in the unique position of being a highly competitive industry that is also subject to a high degree of regulation. This combination of regulation

and competition creates an environment in which insurers are subject not only to the demands of the market but also to the pressures of the political process. There is substantial evidence that regulation can increase risk for a regulated enterprise, and when that is combined with an aggressively competitive industrial structure, risk is increased.

Q. You said that the combination of regulation and competition increased risk for insurers. Can you describe what you mean?

A. Yes. Traditionally, direct price and rate of return regulation has been imposed on industries known as "public utilities," such as generation and transmission of electric power, distribution of natural gas, provision of local water and sewer service and the like. Because of the nature of the production process, these industries are characterized as "natural monopolies," meaning that it is most efficient for a single producer to provide the service in question. In such circumstances, the state normally grants a monopoly to a single provider and then regulates that firm directly to prevent abuse of monopoly power.

Property-casualty insurance differs dramatically from this model. Rather than a single firm providing service, there are in most states literally hundreds of firms competing in the market, none of which typically have significant market power. These firms compete aggressively to increase market share and attract the best insureds by offering a variety of price and quality combinations that are best tailored to their business objectives. This vigorous competition provides discipline in the marketplace, and, when combined with direct rate of return regulation, the risk for insurers is increased.

I should note that historically, a number of competitively structured industries (such as airlines, trucking, and telecommunications) were subject to regulation, but in the past several decades there has been a movement to deregulate these activities. This is due in part to the widespread agreement that competition itself is an adequate regulator.

Q. You also said that you considered whether the size distribution of North Carolina insurers should impact the cost of capital in this case. Can you please describe this issue briefly and discuss its implications for this case?

A. Yes. It is a well established fact of empirical finance that small stocks tend to outperform large stocks. Ibbotson Associates, for instance, annually reports on the performance of firms in the ninth and tenth deciles of stocks listed on the principal U.S. stock exchanges; in recent years the data show that since 1926 these small firms have outperformed the market as a whole by approximately 4 to 5 percentage points, even after accounting for the fact that these firms have above average betas. Therefore an adjustment should be made to the cost of capital to

the extent that the property-casualty insurance industry is composed of small stocks.

Q. Have you conducted any studies with respect to the significance of the small stock effect?

A. Yes. As with interest rate risk, I have conducted a number of studies of this issue in previous years, and in each instance I found that (1) investors have earned higher returns from small stocks than from large stocks, and (2) the insurers in Dr. Vander Weide's cost of capital analysis are among the largest companies in the U.S. economy. The insurers in Dr. Vander Weide's analysis are larger, on average, than the companies in the property-casualty insurance industry, and they are larger, on average, than the companies writing homeowners insurance in North Carolina.

These facts suggest that the cost of capital for insurers writing homeowners insurance in North Carolina should be higher than for those firms contained in Dr. Vander Weide's cost of capital analysis. This reaffirms my conclusion that the cost of capital Dr. Vander Weide has presented is conservative.

Q. You also mentioned the impact of catastrophe risk on the cost of capital. Can you please discuss that briefly?

A. Yes. The potential for catastrophic losses from hurricanes produces additional risk to insurers beyond that captured in the cost of capital models relied upon by Dr. Vander Weide. For one thing, the estimated cost of capital for the insurers in Dr. Vander Weide's sample reflects the risk of the average activity for those insurers, not the risk of catastrophe exposures alone (as is relevant in this case). Since catastrophe exposed lines of business are significantly riskier than average, the cost of capital for those lines is higher as well.

In addition, as respects Dr. Vander Weide's risk premium model, since the occurrence of hurricanes is generally uncorrelated with the market, the losses associated with such events would not be captured in the estimated betas of insurers, and hence those values would tend to understate the risk associated with these lines of insurance. Because the betas for insurers indicate they are of average risk, but those values do not adequately incorporate the risk from extreme events like hurricanes, they understate the true risk to which insurers are subject.

Q. Can you please summarize your testimony on the cost of capital of the property-casualty insurance industry?

A. Yes. Dr. Vander Weide has assumed that the property-casualty insurance industry presents investors with risks comparable to the average investment in equities. My analysis has shown that property-casualty insurance stocks are subject to additional volatility due to interest rate sensitivity, are relatively small when compared with the broad cross section of publicly traded firms in the U.S. economy, and are subject to risk from catastrophic events. Since each of these additional risks require compensation in the form of a higher return, I conclude that Dr. Vander Weide has been conservative in his calculation of the required rate of return on property-casualty insurance investments.

IV. PROJECTED RETURN ATTRIBUTABLE TO INSURANCE OPERATIONS

Q. Earlier you said that you had calculated the statutory return insurers would expect from underwriting homeowners insurance in North Carolina. Have you conducted such an analysis?

A. Yes, I have. I developed a model using traditional insurance profitability analyses and have calculated the statutory returns on equity that would be expected to arise assuming that actual underwriting and investment results materialize exactly as projected in this filing. The results are contained in Exhibit RB-19 filed with this testimony.

Q. What do you mean when you use the term pro forma in that exhibit in connection with rate of return?

A. I use this term to indicate that the rate of return presented in these exhibits is based on a series of assumptions regarding such inputs as underwriting profit, investment gain, leverage and the like. If these assumptions actually materialize, then the “pro forma” rates of return calculated in the exhibits will prevail. However, to the extent that these assumptions are not realized, the rate of return will differ from that calculated in the exhibits.

Q. Do you have any reason to believe that the target underwriting profit of 9.0% included in this filing will not be realized during the period the upcoming homeowners insurance rates will be in effect?

A. Yes. It is obvious that if the projections of losses and expenses in the filing are correct, insurers must obtain a rate increase of 26.1% in order to achieve the targeted underwriting profit of 9.0%. However, the rate increase actually filed by the NCRB is considerably lower than that, due to the capping of rate increases in certain territories. In fact, the impact of capping is to reduce the overall increase from 26.1% to 17.4%, the amount actually requested by the Bureau. If the 17.4%

rate increase is approved in its entirety, and the remaining assumptions in the filing materialize as projected, then the realized underwriting profit will be significantly less than the 9.0% target in the filing. Clearly, if the underwriting profit is lower, then insurer returns will be lower as well.

Q. Can you please now describe the components of the model you developed?

A. Yes. The model really consists of a single page that calculates the rate of return on equity attributable to undertaking the insurance activity. It sets forth estimates of income derived from underwriting, installment fees and investment of reserves and estimates of costs, comprised of losses, expenses and taxes. This exhibit is supported by several other exhibits which provide calculations of investment yield rates, tax rates, premium to surplus and net worth to surplus ratios, and installment fee income.

Q. Can you now please describe the principal elements of the rate of return analysis?

A. Yes.

1. Underwriting profit is the difference between earned premiums and projected incurred losses and expenses. This provision was selected by the appropriate committees of the Rate Bureau.

2. Installment fee income is projected based on historical installment revenues, taking into consideration the most recent information on the installment fee program.

3. Taxes are calculated assuming that the regular corporate tax rate applies to statutory underwriting (plus installment fee) income, and that an additional tax liability applies due to the reserve discounting and revenue offset provisions that are applicable to property casualty insurers. Taxes on investment income are calculated assuming that the current statutory tax rates apply to the various classes of investment income earned.

4. Investment gain on the insurance transaction is estimated as the product of an investment yield rate and the investible funds available from loss, loss adjustment expense and unearned premium reserves (i.e., policyholder supplied funds). The investment yield rate is derived as the average of the "embedded yield" and the "current yield," based on the actual portfolios of securities held by insurers. This estimated yield rate includes income from interest, dividends, real estate, and other assets, as well as realized capital gains. The investible funds in this calculation are estimated using the well known ISO State-X model, with one modification as described below.

Q. In previous testimony in North Carolina, you identified certain changes you made to the traditional rate of return analysis that is performed using this model. Did you continue these changes for this year's filing?

A. Yes. I removed the reduction of investible funds by the amount of agents' balances from the ISO State-X calculation. However, it continues to be true that the funds represented by agents' balances are not available for investment by insurers. Therefore, in the rate of return calculation, the investment income from this modified State-X calculation is reduced by the investment income attributable to agents' balances. This calculation recognizes (1) that the majority of agents' balances represent premiums not yet paid by insureds because of installment payment plans, and hence is unavailable for investment and (2) that for the small minority of agents' balances that is premiums collected by agents but not yet remitted to the companies, the investment income on that premium is additional compensation to the agents and a cost to the companies as part of the insurance transaction.

In addition, I adjusted the trended loss, LAE and fixed expense ratios to reflect the proposed rate change. That is to say, I have divided the trended loss and fixed expense ratios at present rates by one plus the proposed rate change to reflect the change in these ratios that occur when rates are changed.

Q. Could you please clarify how the underwriting profit provision contained in the rate filing was determined?

A. Yes. The issue of how the Rate Bureau determines the underwriting profit and contingency factor has routinely arisen in rate hearings in North Carolina over the past several years. Although it is evident from my exhibits that the Rate Bureau selects an underwriting profit and contingency provision to be included in the rates, there has been lengthy cross examination on this issue in every rate hearing in recent memory. Therefore, to clarify this matter, I will briefly discuss the procedure used by the Rate Bureau to determine the underwriting profit and contingency factor that is included in the proposed rates.

As part of the process of preparing a property insurance rate filing, the Property Rating Sub-Committee of the Rate Bureau meets to review data and determine values for a number of the important components of the proposed rates. One of these components is the underwriting profit factor. To determine this value, a procedure is followed in which I provide the committee with the estimated returns on equity (both statutory returns as well as returns adjusted to include investment income on surplus) associated with alternative underwriting profit provisions, and the committee then selects a provision after considering the cost of capital that has been developed by Dr. Vander Weide. Thus, the process is best described as one

in which I test alternative underwriting profit provisions, and the committee selects a value based on these tests.

Q. How do you know what values of the underwriting profit provision to test?

A. I have been performing this type of analysis on behalf of the Rate Bureau for many years, and I am quite familiar with the dynamics of these models. Therefore, it is relatively easy to know the general range of values around which the underwriting profit is likely to fall. Normally, I will select approximately five or six values of the underwriting profit provision to test, that comprise a range of perhaps two to three percentage points, and the committee typically selects a value within that range. (For example, for this filing, I believe I tested underwriting profit provisions for homeowners insurance in one half percentage point increments ranging from 7.0% to 11.0%, and the committee selected a value of 9.0%.) Of course, if the committee is not satisfied with the range of values I propose, I provide the returns associated with alternative values proposed by the committee.

Q. From what you've said, it appears that the Rate Bureau *selects* an underwriting profit provision, rather than *deriving* such a provision from the cost of capital. Is that correct, and if so, isn't it true that actuarial standards of practice require that the underwriting profit provision be *derived* from an underlying cost of capital?

A. It is correct that the Rate Bureau committee selects an underwriting profit provision and then tests whether that provision results in an expected rate of return on net worth that is consistent with the cost of capital. However, despite what has been suggested in the past by DOI witnesses, it is *not true* that actuarial standards of practice require that an underwriting profit be derived from the cost of capital. In fact, that issue is addressed explicitly in Actuarial Standard of Practice #30, entitled "Treatment of Underwriting Profit and Contingency Factors and the Cost of Capital in Property/Casualty Insurance Ratemaking." Section 3.1 of that ASOP states the following:

> Estimating the Cost of Capital and the Underwriting Profit Provision – Property/casualty insurance rates should provide for all expected costs, including an appropriate cost of capital associated with the specific risk transfer. This cost of capital can be provided for by estimating that cost and translating it into an underwriting profit provision, after taking leverage and investment income into account. Alternatively, the actuary may develop an underwriting profit provision and test that profit provision for consistency with the cost of capital. The actuary may use any appropriate method, as long as such method is consistent with the considerations in this standard.

The procedure utilized by the Rate Bureau is exactly the approach articulated in this section (i.e., “the actuary may develop an underwriting profit provision and test that profit provision for consistency with the cost of capital”).

Q. Could you please clarify how you selected your investment yield rate and premium to surplus ratio?

A. Yes. To select the investment yield rate, I was asked by the Rate Bureau to compute the average of what are known as the "embedded" and "current" yields, where each was based on the actual asset portfolios insurers currently hold. There has been a long-standing debate regarding the choice between embedded and current yields in insurance profitability calculations. Since the Commissioner himself adopted an approach of averaging the embedded and current yields in his 1994 automobile decision (and in his decision in the 1996 case, he selected a yield which approximated the yield obtained from this approach), the Rate Bureau has chosen to follow that methodology since that time.

To estimate the embedded yield, I calculated the ratio of investment income divided by average invested assets and added to that an estimate of the ten year average ratio of realized capital gains to invested assets. The sum of these two is the estimated embedded yield.

To estimate the current yield, I determined the yields available in today's capital markets for the portfolio of securities currently held by the property-casualty insurance industry. I then calculated a weighted average of these yield rates based on the proportion of assets held by the industry in each of the various securities such as stocks, bonds, real estate and the like.

As far as the premium to surplus ratio is concerned, I also relied on information which reflects the actual degree of leverage for insurers writing homeowners insurance in North Carolina. The premium to surplus ratio I used is the ten year average premium to surplus ratio for the top 30 company groups which wrote homeowners insurance in North Carolina in each of those years.

Q. Can you please provide the results of your calculations regarding the projected rate of return to the insurance transaction if your underlying assumptions are realized?

A. Yes. I estimate that insurers in North Carolina should expect to earn a statutory return on net worth of 6.8% for homeowners insurance in North Carolina. In addition, the total return on net worth (i.e., including investment income on surplus) is 10.4% for homeowners coverage. While the statutory return is well below the lower bound of Dr. Vander Weide's range for the cost of capital, the total return falls within (albeit at the lower end of) that range.

Q. Are there any factors that might impact the realization of these projected returns?

A. Yes. In order for the aggregate industry to achieve the returns projected in these exhibits, every assumption in the model must be realized exactly, and the industry must receive the full indicated 26.1% rate increase. I have already mentioned one prominent reason why the projected returns will not be realized; the rate increase has been capped in various territories, such that the requested overall increase is only 17.4% (compared to the indicated 26.1%). If the other assumptions in the model are realized, the impact of this capping is to reduce the expected underwriting profit well below 9.0% and to reduce the statutory return on net worth and the expected total return on net worth well below the lower bound of Dr. Vander Weide's range for the cost of capital.

In addition to the capping, and even if every other projection in the filing is exactly realized, the industry will still not realize these projected returns because the filing does not reflect the current surplus position of the aggregate industry. For the sake of stability in the ratemaking process, the premium to surplus ratios used in my calculations are based on long term historical data. The most recent data show that the aggregate industry writing homeowners insurance in North Carolina has more surplus in relation to premiums that the historical averages used in my calculations. Therefore, even if all other assumptions were realized exactly, the calculated rate of return would overstate the returns the aggregate industry would reasonably expect.

VII. CONCLUSION

Q. Based on the studies and analyses you have performed, have you come to any conclusions regarding the provision for underwriting profit that has been filed by the Rate Bureau as part of the filing in this case?

A. Yes. Based on my evaluation of Dr. Vander Weide's cost of capital estimates, my consideration of insurer specific risk characteristics, and my estimation of projected and expected returns, I believe that the underwriting profit provision selected by the Rate Bureau and used in determining the indicated rate level changes complies with North Carolina law and is not excessive. Furthermore, given the territorial capping of the filed rate level changes, the underwriting profit and returns *expected* to be realized by insurers will be substantially lower than those expected to be realized under the indicated rate level changes, and hence will also not be excessive. Finally, assuming that the actuarial estimates in the filing are reasonable, it is my opinion that including the filed underwriting profit provision would produce rates that are just, reasonable and not excessive, inadequate or unfairly discriminatory.

Q. Does this conclude your testimony?

A. Yes, it does.

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PROFESSIONAL EXPERIENCE:

1989 to present	**MILLIMAN, INC.**
2017	Senior Consultant
1989 to 2016	Principal & Director - Economics Consulting Responsible for the formation, development and management of a national consulting practice in insurance economics.
1980 to 1989	**NATIONAL COUNCIL ON COMPENSATION INSURANCE** Economic and Social Research Division
1985 to 1989	Vice President
1983	Assistant Vice President Responsible for all economic and social research of NCCI
1982	Director of Economic and Social Research
1981	Senior Research Economist
1980	Associate Research Economist
1976 to 1997	**RUTGERS UNIVERSITY**
1981-97	Associate of the Graduate Faculty, Department of Economics, Newark, New Jersey
1981-93	Teach variety of graduate courses including: Microeconomic Theory, Industrial Organization, Public Finance
1978-80	Instructor, Department of Economics, New Brunswick, New Jersey
1976-78	Adjunct Instructor, Department of Economics, Newark, New Jersey

EDUCATION:

1980	Ph.D., Economics, Rutgers University
1976	M.A., Economics, Rutgers University
1972	B.A., Economics, Brooklyn College, CUNY
	Fellow: National Academy of Social Insurance

PAPERS AND PUBLICATIONS

"Comment on Jaffee and Russell" in Deregulating Property-Liability Insurance, J. David Cummins, Editor, Brookings Institution Press, Washington, DC, 2002

"Dynamic Financial Analysis of a Workers Compensation Insurer", CAS Call Papers Program, 1997 (with Susan Witcraft and Mark Mulvaney)

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"Survivorship and the Size Distribution of the Property-Liability Insurance Industry", Journal of Risk and Insurance, October 1985, (with John Worrall and Richard Butler).

"Regulating Competition-The Case of Workers' Compensation Insurance", Journal of Insurance Regulation, (with James Gerofsky), June 1985.

"The Wage Replacement Rate and Benefit Utilization in Workers" Compensation Insurance", Journal of Risk and Insurance, September 1982 (with John Worrall)

"Property Damages", in Joseph Seneca and Peter Asch, The Benefits of Air Pollution Control in New Jersey, Center for Coastal and Environmental Studies, Rutgers University, 1979

WORKING PAPERS

"Workers' Compensation Pricing: The Role of Policyholder Dividends" (with David Durbin)

"The Impact of Lifetime Work on Mortality: Do Unisex Pensions Matter?" (with Richard J. Butler)

"Regulatory Survival: Rate Changes in Workers' Compensation" (with Richard J. Butler and John D. Worrall)

"Framing, Firm Size and Financial Incentives in Workers' Compensation Insurance" (with Richard J. Butler and John D. Worrall)

"Application of NAIC Profitability Models to Long Tailed Lines of Insurance" (with James Gerofsky)

INVITED PRESENTATIONS

Huntington Beach, California, March 11, 2013
CAS RPM Seminar
“Risk Loads for Property Catastrophe Covers: Primary and Reinsurer Perspectives”

Huntington Beach, California, March 11, 2013
CAS RPM Seminar
“The Actuary as Expert Witness”

Philadelphia, Pennsylvania, March 20, 2012
CAS Ratemaking Seminar
“How Reinsurers Consider Risk Loads and Cost of Capital for Property Cat Covers”

Chicago, IL , March 17, 2010
CAS Ratemaking Seminar
“Logic, Fallacies and Paradoxes in Risk/Profit Loading in Ratemaking: A Socratic Dialogue”

Chicago, IL , March 16, 2010
CAS Ratemaking Seminar
“Quantifying Risk Loads for Property Catastrophe Exposure”

Las Vegas, NV, March 10, 2009
CAS Ratemaking Seminar
“Using Catastrophe Bonds to Infer Risk Loads/Profit Margins/Reinsurance Costs”

Boston, MA, March 17, 2008
CAS Ratemaking Seminar
“Using Catastrophe Bonds to Infer Risk Loads/Profit Margins/Reinsurance Costs”

Pinehurst, North Carolina, May 21, 2007
Workers Compensation Insurance Organizations Annual Meeting
“Enterprise Risk Management: What Is It and Why Is It Important?”

Salt Lake City, Utah, March 13, 2006
CAS Ratemaking Seminar
“Including Reinsurance Costs in Primary Insurance Rates”

New Orleans, Louisiana, March 11, 2005
CAS Ratemaking Seminar
“Including Reinsurance Costs in Primary Insurance Rates”

Philadelphia, Pennsylvania, March 11, 2004
CAS Ratemaking Seminar
“The Consideration of Risk Loads and Reinsurance Costs in Primary Insurance Ratemaking”

New York, New York, December 12, 2003
Goldman Sachs Insurance Conference
“Interest Rate Changes and Insurance Underwriting”

San Antonio, Texas, March 28, 2003
CAS Ratemaking Seminar
"The Consideration of Risk Loads and Reinsurance Costs in Primary Insurance Ratemaking"

San Antonio, Texas, March 27, 2003
CAS Ratemaking Seminar
"Rate of Return Models in Insurance Ratemaking"

San Diego, California, May 20, 2002
CAS Annual Meeting
“The Actuary as an Expert Witness”

Tampa, Florida, March 7, 2002
CAS Ratemaking Seminar
"Parameterizing Rate of Return Models in Insurance Ratemaking"

Chicago, Illinois, December 10, 2001
NAIC Meeting
“The Impact of Proposition 103 in California”

Kansas City, Missouri, April 30, 2001
NAIC Meeting
“Personal Lines Regulation”

Las Vegas, Nevada, March 12, 2001
CAS Ratemaking Seminar
"Parameterizing Rate of Return Models in Insurance Ratemaking"

Washington DC, January 18, 2001
Brookings Institution Conference on Insurance Regulation
“Auto Insurance Experience in California”

Bermuda, September 14, 2000
Ace Insurance Worldwide Actuarial Conference
“Rate of Return Models In Property Casualty Insurance Ratemaking”

Orlando, Florida, June 9, 1998
Florida Managed Care Institute Annual Conference
"Issues in Integrated Health Care"

Seattle, Washington, July 21, 1997
CAS Dynamic Financial Analysis Seminar
"Dynamic Financial Analysis of a Workers Compensation Insurer"

Boston, Massachusetts, March 14, 1997
CAS Ratemaking Seminar
"Discounted Cash Flow Models in Insurance Ratemaking"

East Lansing, Michigan, July 15, 1996
National Symposium on Workers Compensation
"Managed Care in Workers Compensation"

New Orleans, Louisiana, March 20, 1996
Global Business Research Seminar: Partnerships Between Insurers and Providers
"Integrating the Data Systems"

Orlando, Florida, November 15, 1995
Global Business Research Seminar: Documenting Savings From Managed Care
"Evaluating Savings From Managed Care"

Orlando, Florida, October 27, 1995
Self Insurance Association of America Annual Meeting
"Managed Care in Workers Compensation: A Magic Act or Humbug?"

San Diego, California, October 16, 1995
Global Business Research Seminar: Documenting Savings From Managed Care
"Technical Issues in Measuring Savings From Managed Care"

Durham, North Carolina, September 6, 1995
North Carolina HMO Association Annual Meeting
"Workers Compensation in North Carolina: Risks and Opportunities for HMO's"

Washington, DC, May 22, 1995
Global Business Research Seminar: Outcomes for Workers' Compensation Managed Care
"Measuring and Reporting the Savings"

Orlando, Florida, April 13, 1995
NCCI Annual Meeting
"Managed Care in Workers Compensation"

Phoenix, Arizona, April 3, 1995
Casualty Actuarial Society Seminar on Profitability
"Rate of Return Models - Selecting the Parameters"

New Orleans, Louisiana, March 16, 1995
Casualty Actuarial Society Ratemaking Seminar
"Discounted Cash Flow Models for Insurance Ratemaking"

Orlando, Florida, March 14, 1995
Standard & Poor's Rating Conference
"Consolidation in the Property/Casualty Insurance Industry"

Minneapolis, Minnesota, October 11, 1994
Casualty Actuarial Society Seminar on Medical Cost Containment
"Managed Care and Workers' Compensation"

Toronto, Ontario, August 22, 1994
American Risk and Insurance Association Annual Meeting
"Current Issues in Workers' Compensation"

Boston, Massachusetts, May 17, 1994
Casualty Actuarial Society Annual Meeting
"Standard Of Practice on Profit and Contingency"

Hartford, Connecticut, April 20, 1994
University of Connecticut Blue Cross/Blue Shield Symposium
"24 Hour Coverage - What Will It Involve"

Atlanta, Georgia, March 10, 1994
Casualty Actuarial Society Ratemaking Seminar
"Cash Flow Models for Insurance Ratemaking"

Cambridge, Massachusetts, March 2, 1994
Workers' Compensation Research Institute Health Care Reform Conference
"Early Results of the Florida Pilot Project"

Phoenix, Arizona, November 15, 1993
Casualty Actuarial Society Annual Meeting
"The Use Of Managed Care in Workers' Compensation"

New York, New York, October 20, 1993
Insurance Information Institute/Reinsurance Association of America Research Conference
The Impact of Health Care Reform on Casualty Insurance"

Somerset, New Jersey, July 13, 1993
National Symposium on Workers' Compensation
"Economic Analysis of Workers' Compensation Issues"

Boston, Massachusetts, June 30, 1993
Institute of Actuaries of Japan Special Meeting
"Health Care Costs in Workers' Compensation"

Dallas, Texas, June 15, 1993
Stirling-Cooke Workers' Compensation Seminar
"Workers' Compensation Medical Costs: Trends, Causes and Solutions"

New York, New York, June 3, 1993
New York Business Group On Health
"The Crisis in Workers' Compensation Health Care"

Mauna Lani Bay, Hawaii, May 3, 1993
Western Association of Insurance Brokers Annual Meeting
"Trends in Insurance Insolvency"

Kingston, Ontario, April 28, 1993
Queen's University Workers' Compensation Conference
"Exposure Bases for Workers' Compensation: Equity vs. Practicality"

Sanibel Island, Florida, March 29, 1993
Workers' Compensation Reinsurance Bureau Annual Meeting
"The Use of Managed Care in Workers' Compensation"

Baltimore, Maryland, March 23, 1993
CAMAR Annual Meeting
"Estimating the Cost of Capital in Insurance Ratemaking"

Philadelphia, Pennsylvania, December 1, 1992
Economic Issues in Workers' Compensation Seminar,
"Rate of Return Regulation in Workers' Compensation"

Seattle, Washington, October 16, 1992
Casualty Actuarial Society Seminar on Profitability
"Risk Based Capital Standards for Property Casualty Insurers"

Washington, DC, August 18, 1992
American Risk and Insurance Association Annual Meeting
"The Crisis in Workers' Compensation"

New York, New York, May 19, 1992
Executive Enterprises Institute Seminar: Winning Approval of Rate and Form Filings
"Determining a Fair Rate of Return for Property/Casualty Insurers"

Palm Beach, Florida, April 23, 1992
NCCI Annual Meeting
"Is the Workers' Compensation Industry Competitive?"

Philadelphia, Pennsylvania, March 20, 1992
University of Pennsylvania/Duncanson & Holt Special Seminar
"Current Issues in Workers' Compensation"

Dallas, Texas, March 12, 1992
Casualty Actuarial Society Ratemaking Seminar
"Profitability Models in Insurance Ratemaking: Estimating the Parameters"

Houston, Texas, December 11, 1991
NCCI/NAIC Commissioners Symposium
"Rate Adequacy: Solvency and Safety Implications"

New York, New York, November 17, 1991
Executive Enterprises Institute Seminar: Winning Approval of Rate and Form Filings
"Determining a Fair Rate of Return for Property/Casualty Insurers"

Philadelphia, Pennsylvania, November 12, 1991
Casualty Actuarial Society Annual Meeting
"The Impact of Medical Costs on Casualty Coverages"

New York, New York, May 17, 1991
Executive Enterprises Institute Seminar: Winning Approval of Rate and Form Filings
"Determining a Fair Rate of Return for Property/Casualty Insurers"

Kiawah Island, South Carolina, April 15 & 16, 1991
Casualty Actuarial Society Seminar on Profitability
"Cost of Capital Estimation: Lessons From Public Utilities"

Chicago, Illinois, March 14, 1991
Casualty Actuarial Society Ratemaking Seminar
"The Use of Profitability Models in Insurance Ratemaking"

Orlando, Florida, October 24, 1990,
Financial Management Association Annual Meeting,
"Current Issues in Insurance Rate Regulation: California Prop. 103 and Pennsylvania Act 6"

New Brunswick, New Jersey, May 18, 1990,
Joint Conference on Workers' Compensation,
"Current State Issues and Benefit Reforms"

Orlando, Florida, May 8, 1990,
National Association of Insurance Commissioners Southeast Zone Raters Conference,
"Loss Cost Rating for Workers' Compensation"

Orlando, Florida, April 3, 1990,
Workers' Compensation Reinsurance Bureau Annual Meeting,
"Medical Costs in Workers' Compensation: Recent Trends in Cost Containment"

Philadelphia, Pennsylvania, March 15, 1990,
CAS Ratemaking Seminar,
"Rate of Return Models in Insurance Regulation: Return on Sales vs. Return on Equity"

Chicago, Illinois, November 10, 1989,
Alliance of American Insurers Research Committee,
"Recent Developments in Rate Regulation: California Proposition 103"

New York, New York, October 5, 1989,
NCCI Legal Trends Seminar,
"Medical Cost Containment in Workers' Compensation"

Philadelphia, Pennsylvania, September 7, 1989,
Workers' Compensation Congress,
"Medical Cost Containment in Workers' Compensation"

Denver, Colorado, August 21, 1989,
American Risk and Insurance Association Annual Meeting,
"Regulatory Survival: Rate Changes in Workers' Compensation" (with Richard J. Butler)

Hilton Head, South Carolina, April 4,1989,
Workers' Compensation Reinsurance Bureau Annual Meeting,
"Prospects for Workers' Compensation in the 1990's"

Mountain Lakes, New Jersey, March 29, 1989,
St. Clares-Riverside Medical Center,
"Stress in the Workplace"

Dallas, Texas, March 16, 1989,
Casualty Actuarial Society Ratemaking Seminar,
"The Impact of Tax Reform on Insurance Profitability"

New Orleans, Louisiana, December 15, 1988,
NAIC-NCCI Commissioners School,
"A Forecast for Workers' Compensation"

Philadelphia, Pennsylvania, November 17,1988,
Economic Issues in Workers' Compensation Seminar,
"The Impact of Regulation on the Probability of Insolvency" (with John D. Worrall and David Durbin)

Boston, Massachusetts, November 14, 1988,
American Public Health Association Annual Meeting,
"Stress in the Workplace"

Atlanta, Georgia, September 14, 1988,
Casualty Loss Reserve Seminar,
"Estimating the Cost of Social Inflation in Workers' Compensation"

Reno, Nevada, August 15, 1988,
American Risk and Insurance Association Annual Meeting,
"Benefit Increases in Workers' Compensation"

New York, New York, June 13, 1988,
National Association Of Insurance Commissioners Annual Meeting,
"Alternative Rate of Return Models for Insurance Regulation"

Syracuse, New York, May 5, 1988,
Current Issues in Workers' Compensation Symposium,
"Workers' Compensation Stress Claims"

Hilton Head, South Carolina, April 22, 1988,
Workers' Compensation Reinsurance Bureau Annual Meeting,
"A Forecast for Workers' Compensation Insurers"

Absecon, New Jersey, April 19, 1988,
Pennsylvania Coal Mine Rating Bureau Annual Meeting,
"The Use of Rate of Return Models in Insurance Rate Regulation"

Philadelphia, Pennsylvania, November 17, 1987,
Economic Issues in Workers' Compensation Seminar,
"The Transition to Permanent Disability Status" (with John D. Worrall and David Durbin)

Charlotte, North Carolina, October 20, 1987,
American Insurance Association Government Affairs Conference,
"Prospects for Workers' Compensation in 1988"

Minneapolis, Minnesota, September 29, 1987,
Minnesota Workers' Compensation Reinsurance Association Annual Meeting,
"Economic and Demographic Characteristics of Workers' Compensation Claims"

Airlie, Virginia, July 7, 1987,
National Symposium on Workers' Compensation,
"Forecasting Workers' Compensation Experience"

Santa Clara, California, June 30, 1987,
Symposium on Recent Advances in Ratemaking,
"Econometric Models of Workers' Compensation Losses"

Storrs, Connecticut, May 1, 1987,
University of Connecticut Symposium on Current Issues in Workers' Compensation,
"Current Research in Workers' Compensation"

Philadelphia, Pennsylvania, April 16, 1987,
Wharton School Graduate Seminar Series,
"Impact of Tax Reform on Workers' Compensation Profitability"

Boca Raton, Florida, December 4, 1986,
National Association of Insurance Commissioners/NCCI Commissioners School,
Panel Discussion on Current Issues in Workers' Compensation

Philadelphia, Pennsylvania, November 7, 1985,
Wharton School, University of Pennsylvania, Graduate Seminar Series,
"Litigation in Workers' Compensation"

Vancouver, British Columbia, August 19, 1985,
American Risk and Insurance Association Annual Meeting,
"Earnings Loss and Permanent Disability"

Washington, D.C., April 23, 1985,
Washington Conference on the Economics of Disability,
"Employment Effects of Workers' Compensation Insurance"

Schenectady, New York, January 18, 1985,
Union University Graduate Business Seminar Series,
"The Use of Modern Portfolio Theory in Insurance Regulation"

EXPERT TESTIMONY

Utica, New York, July 6, 2016
Village of Ilion, et.al., v. County of Herkimer, et.al.

San Francisco, California, November 19, 2015
State Farm General Homeowners Insurance Rate Hearing

Tallahassee, Florida, October 21, 2015
NCCI Workers Compensation Insurance Rate Hearing

Raleigh, North Carolina, October 27, 2014
Homeowners Insurance Rate Hearing

Tallahassee, Florida, October 14, 2014
NCCI Workers Compensation Insurance Rate Hearing

New York, NY, June 24, 2014
Omar Tigbao and Dorothy Tigbao, *et. al.,*v. QBE Financial Institutions Risk Services, Deposition

New York, NY, March 7, 2014
Thrift Development Corporation v. American International Group, et. al., Deposition

New York, New York, January 28, 2014
Cheryl Hall, *et. al.* v. Bank of America, N.A., *et. al.*, Deposition

Santa Fe, New Mexico, November 7, 2013
Biennial Title Insurance Rate Hearing

Tallahassee, Florida, October 1, 2013
NCCI Workers Compensation Insurance Rate Hearing

New York, New York, July 10, 2013
Larry Arnett and Ronda Arnett, *et. al.* v. Bank of America, N.A., *et. al.*, Deposition

Austin, Texas, April 25, 2013
State Farm Lloyds Homeowners Rate Hearing

Tallahassee, Florida, October 4, 2012
NCCI Workers Compensation Insurance Rate Hearing

Boston, Massachusetts, May 14, 2012
Massachusetts Workers Compensation Rate Hearing

New York, New York, February 17, 2012
Temporary Services, Inc. *et. al.* v. American International Group, *et. al.*, Deposition

San Francisco, California, January 19, 2012
Mercury Insurance Company Homeowners Insurance Rate Hearing

Santa Fe, New Mexico, November 16, 2011
Biennial Title Insurance Rate Hearing

Tallahassee, Florida, October 11, 2011
NCCI Workers Compensation Insurance Rate Hearing

Tampa, Florida, September 13, 2011
Citizens Property Insurance Corporation Homeowners Insurance Hearing

Raleigh, North Carolina, July 25, 2011
Dwelling Fire and Extended Coverage Insurance Rate Hearing

Tallahassee, Florida, October 6, 2010
NCCI Workers Compensation Insurance Rate Hearing

Irvine, CA, April 21, 2010
Eastwood Insurance Services, Inc. *et. al*., vs. Titan Auto Insurance of NM, *et. al.* Deposition

San Francisco, California, March 9, 2010
Century National Insurance Company Proposition 103 Rollback Hearing

Santa Fe, New Mexico, November 18, 2009
Annual Title Insurance Rate Hearing

Tallahassee, Florida, October 29, 2009
NCCI Workers Compensation Insurance Rate Hearing

Austin, Texas, September 14, 2009
Biennial Title Insurance Rate Hearing

Austin, Texas, April 1, 2009
State Farm Lloyds Homeowners Rate Hearing

Santa Fe, New Mexico, November 19, 2008
Annual Title Insurance Rate Hearing

New York, New York, November 13, 2008
Georgia Hensley, *et. al*., vs. Computer Sciences Corp. *et. al*., Deposition

Tallahassee, Florida, October 29, 2008
State Farm Florida Homeowners Insurance Hearing

Raleigh, North Carolina, July 1, 2008
Auto Insurance Rate Hearing

San Francisco, California, May 5, 2008
GeoVera Insurance Company Earthquake Rate Hearing

Tallahassee, Florida, January 23, 2008
Hartford Insurance Group Homeowners Insurance Rate Hearing

Boston, Massachusetts, January 9, 2008
Commerce Insurance Group Auto Insurance Rate Hearing

San Francisco, California, November 29, 2007
Explorer Insurance Company Automobile Rate Hearing

Santa Fe, New Mexico, November 19, 2007
Annual Title Insurance Rate Hearing

Reno, Nevada, June 14, 2007
Public Hearing Regarding Merger Between UnitedHealth Group and Sierra Health Systems

Austin, Texas, May 31, 2007
State Farm Lloyds Homeowners Rate Hearing

Reno, Nevada, October 26, 2006
Public Hearing Regarding Demutualization of Employers Insurance Group

San Francisco, California, August 30, 2006
Hearing on Proposed Title Insurance Rate Regulations

Austin, Texas, August 14, 2006
Biennial Title Insurance Rate Hearing

Raleigh, North Carolina, September 28, 2005
Auto Insurance Rate Hearing

Providence, Rhode Island, September 27, 2005
Norcal Medical Malpractice Insurance Rate Hearing

San Francisco, California, August 23, 2005
Safeco Insurance Company Earthquake Rate Hearing

Boston, Massachusetts, April 15, 2005
Massachusetts Workers Compensation Rate Hearing

Lawrence, Massachusetts, February 14, 2005
Highground, Inc. v. Mazonson

New York, NY, January 21, 2005
NFHA v. Prudential Deposition

Austin, Texas, July 13, 2004
Medical Protective Insurance Company Medical Malpractice Insurance Rate Hearing

Austin, Texas, December 16, 2003
Biennial Title Insurance Rate Hearing

Providence, Rhode Island, November 17, 2003
Norcal Medical Malpractice Insurance Rate Hearing

San Francisco, California, September 16, 2003
Century National Proposition 103 Rollback Hearing

Austin, Texas, September 11, 2003
Farmers Insurance Exchange Homeowner Rate Rollback Hearing

Austin, Texas, September 2, 2003
State Farm Lloyds Homeowners Rate Rollback Hearing

Austin, Texas, May 21, 2003
Farmers Insurance Group Settlement Hearing

Boston, Massachusetts, April 29, 2003
Massachusetts Workers Compensation Rate Hearing

Los Angeles, California, March 12, 2003
SCPIE Medical Malpractice Rate Hearing

Raleigh, North Carolina, July 17, 2002
Auto Insurance Rate Hearing

Tallahassee, Florida, February 25, 2002
NCCI Workers Compensation Insurance Rate Hearing

Austin, Texas, February 5, 2002
Biennial Title Insurance Rate Hearing

Raleigh, North Carolina, September 24, 2001
Auto Insurance Rate Hearing

Boston, Massachusetts, August 14, 2001
Massachusetts Auto Insurance Bureau Rate Hearing

Austin, Texas, March 6, 2001
Texas Auto Benchmark Rate Hearing

Boston, Massachusetts, August 23, 2000
Massachusetts Auto Insurance Bureau Rate Hearing

Austin, Texas, December 7, 1999
Texas Auto Insurance Plan Association Rate Hearing

Raleigh, North Carolina, December 3, 1999
Auto Insurance Rate Hearing

Austin, Texas, November 3, 1999
Biennial Title Insurance Rate Hearing

Austin, Texas, September 8, 1999
Texas Auto Benchmark Rate Hearing

Boston, Massachusetts, August 13, 1999
Massachusetts Auto Insurance Bureau Rate Hearing

Austin, Texas, June 22, 1999
Texas Property Benchmark Rate Hearing

Honolulu, Hawaii, December 16, 1998
NCCI Workers Compensation Insurance Rate Hearing

Richmond, Virginia, November 15, 1998
NCCI Workers Compensation Insurance Rate Hearing

Boston, Massachusetts, October 9, 1998
Massachusetts Auto Insurance Bureau Rate Hearing

Austin, Texas, May 19, 1998
Texas Auto Insurance Plan Association Rate Hearing

Austin, Texas, April 7, 1998
Auto Insurance Benchmark Rate Hearing

Austin, Texas, February 17, 1998
Property Insurance Benchmark Rate Hearing

Austin, Texas, November 18, 1997
Biennial Title Insurance Rate Hearing

Tallahassee, Florida, September 8, 1997
NCCI Workers Compensation Insurance Rate Hearing

Austin, Texas, April 8, 1997
Texas Auto Insurance Plan Association Rate Hearing

Austin, Texas, March 10, 1997
Auto Insurance Benchmark Rate Hearing

San Francisco, California, March 4, 1997
Insurance Department Hearing on Rating Factors

Raleigh, North Carolina, July 16, 1996
Auto Insurance Rate Hearing

San Francisco, California, March 11, 1996
Century National Proposition 103 Rollback Hearing

Sacramento, California, January 30, 1996
Hartford Steam Boiler Proposition 103 Rollback Hearing

San Francisco, California, January 8, 1996
SAFECO Insurance Company Earthquake Rate Hearing

Austin, Texas, December 21, 1995
Residential Property Insurance Benchmark Rate Hearing

Clearwater, Florida, December 8, 1995
Florida Windstorm Underwriting Association Rate Hearing

Austin, Texas, November 28, 1995
Private Passenger Auto Insurance Benchmark Rate Hearing

Austin, Texas, October 31, 1995
Texas Automobile Insurance Plan Association Rate Hearing

Sacramento, California, April 18, 1995
California Insurance Department Hearing on Auto Insurance Rating Factors

Portland, Maine, April 13, 1995
Workers Compensation Assigned Risk Pool Fresh Start Hearing

San Francisco, California, February 6, 1995
Farmers Insurance Group Earthquake Insurance Rate Hearing

Austin, Texas, January 6, 1995
Special Hearing on Classification Rules for Automobile Insurance

Austin, Texas, December 15, 1994
Residential Property Insurance Benchmark Rate Hearing

Austin, Texas, October 4, 1994
Texas Automobile Insurance Plan Association Rate Hearing

Austin, Texas, September 27, 1994
Private Passenger Auto Insurance Benchmark Rate Hearing

Raleigh, North Carolina, July 19, 1994
Private Passenger Auto Insurance Rate Hearing

San Francisco, California, December 22, 1993
Century National Homeowner's Insurance Rate Hearing

Raleigh, North Carolina, October 13, 1993
Homeowners/Farmowners Insurance Rate Hearing

Tallahassee, Florida, October 4, 1993
Workers' Compensation Insurance Rate Hearing

Boston, Massachusetts, September 9, 1993
Automobile Insurance Rate Hearing

Austin, Texas, March 4, 1993
Residential Property Insurance Benchmark Rate Hearing

Austin, Texas, February 10, 1993
Automobile Insurance Benchmark Rate Hearing

Honolulu, Hawaii, November 18, 1992
Liberty Mutual Insurance Automobile Rate Hearing

Raleigh, North Carolina, November 13, 1992
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, October 29, 1992
Workers' Compensation Insurance Rate Hearing

San Francisco, California, October 14, 1992
Workers' Compensation Insurance Rate Hearing

Atlanta, Georgia, September 24, 1992
Workers' Compensation Insurance Rate Hearing

Nashville, Tennessee, May 27, 1992
Workers' Compensation Insurance Rate Hearing

San Francisco, California, May 13, 1992
Workers' Compensation Insurance Rate Hearing

Los Angeles, California, April 10, 1992
Mercury General Proposition 103 Rollback Proceedings

Austin, Texas, January 27, 1992
Texas Automobile Insurance Plan Rate Hearing

Austin, Texas, December 17, 1991
Automobile Insurance Rate Hearing

Raleigh, North Carolina, December 16, 1991
Workers' Compensation Insurance Rate Hearing

San Francisco, California, October 22, 1991
Workers' Compensation Rate Hearing

Los Angeles, California, May 23, 1991,
Proposition 103 RCD-2 Proceedings

San Francisco, California, April 9, 1991
California Workers' Compensation Rate Study Commission

Nashville, Tennessee, March 20, 1991
Workers' Compensation Insurance Rate Hearing

Los Angeles, California, March 12, 1991,
California Workers' Compensation Rate Study Commission

Olympia, Washington, February 26, 1991,
House Financial Institutions/Insurance Committee Hearing on Rules for Insurance Regulatory Legislation

Olympia, Washington, November 27, 1990,
Insurance Department Public Hearing on Proposed Rules for Ratemaking

Harrisburg, Pennsylvania, November 12, 1990,
Allstate Insurance Company Automobile Insurance Rate Hearing

Tallahassee, Florida, November 1, 1990,
Scanlan v. Martinez, et.al., Superior Court of Leon County

San Bruno, California, October 1, 1990,
SAFECO Insurance Group Proposition 103 Rate Rollback Hearing

Austin, Texas, July 23, 1990,
Texas State Board of Insurance Special Hearing on Investment Income in Ratemaking

Harrisburg, Pennsylvania, July 18, 1990,
Pennsylvania National Mutual Insurance Company Automobile Insurance Rate Hearing

Harrisburg, Pennsylvania, June 28, 1990,
Harleysville Mutual Insurance Company Automobile Insurance Rate Hearing

Columbia, South Carolina, March 30, 1990,
Workers' Compensation Insurance Rate Hearing

San Bruno, California, March 19, 1990,
California Proposition 103 Generic Hearing

Denver, Colorado, December 12, 1989,
Workers' Compensation Insurance Rate Hearing

Tampa, Florida, October 23, 1989,
Workers' Compensation Insurance Rate Hearing

Austin, Texas, October 17, 1989,
Workers' Compensation Insurance Rate Hearing

Los Angeles, California, September 25, 1989,
SAFECO Insurance Company of America Proposition 103 Rate Hearing

Austin, Texas, August 29, 1989,
Texas Insurance Advisory Association Property Insurance Rate Hearing

Providence, Rhode Island, April 13, 1989,
Workers' Compensation Insurance Rate Hearing

Augusta, Maine, January 24, 1989,
Workers' Compensation Insurance Rate Hearing

Hartford, Connecticut, November 14, 1988,
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, November 3, 1988,
Workers' Compensation Insurance Rate Hearing

Austin, Texas, November 2, 1988,
Workers' Compensation Insurance Rate Hearing

Montgomery, Alabama, June 30, 1988,
Workers' Compensation Insurance Rate Hearing

Augusta, Maine, March 24, 1988,
Workers' Compensation Insurance Rate Hearing

Austin, Texas, October 27, 1987,
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, October 9, 1987,
Workers' Compensation Insurance Rate Hearing

Atlanta, Georgia, August 6, 1987,
Workers' Compensation Insurance Rate Hearing

Augusta, Maine, February 24, 1987,
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, November 14, 1986,
Workers' Compensation Insurance Rate Hearing

Austin, Texas, November 18, 1986,
Workers' Compensation Insurance Rate Hearing

Augusta, Maine, May 28, 1986,
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, December 6, 1985,
Workers' Compensation Insurance Rate Hearing

Oklahoma City, Oklahoma, October 10, 1985,
Workers' Compensation Insurance Rate Hearing

Austin, Texas, July 23, 1985,

Workers' Compensation Insurance Rate Hearing

Austin Texas, June 14, 1985,
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, November 18, 1984,
Workers' Compensation Insurance Rate Hearing

Austin, Texas, August 29, 1984,
Workers' Compensation Insurance Rate Hearing

Portland, Oregon, March 6, 1984,
NA IC Public Hearing on Investment Income and Insurance Profitability

Tallahassee, Florida, February 25, 1984,
Workers' Compensation Insurance Rate Hearing

Tallahassee, Florida, August 18, 1983,
Workers' Compensation Insurance Rate Hearing

Austin Texas, July 13, 1983,
Workers' Compensation Insurance Rate Hearing

Oklahoma City, Oklahoma, March 6, 1983,
Workers' Compensation Insurance Rate Hearing

Baton Rouge, Louisiana, March 16, 1982,
Louisiana Insurance Commission Public Hearing on Investment Income

Providence, Rhode Island, February 3, 1982,
Workers' Compensation Insurance Rate Hearing

Augusta, Maine, October 1, 1981,
Workers' Compensation Insurance Rate Hearing

NCRB - PRO FORMA STATUTORY RATE OF RETURN

HOMEOWNERS INSURANCE

	Pre-Tax	Tax Liability	Post-Tax
1. Premiums	100.00%		
Loss & Loss Adjustment Expense	47.79%		
Commission & Brokerage	12.00%		
General Expense	3.81%		
Other Acquisition Expense	5.63%		
Taxes, Licenses and Fees	2.70%		
Policyholder Dividends	0.40%		
Net Cost of Reinsurance	16.71%		
Compensation for Assessment Risk	1.95%		
2. Pro-Forma Underwriting Profit	9.00%		
3. Installment Fee Income	0.38%		
4. Regular tax		1.97%	
5. Additional tax due to TRA		0.10%	
6. Total Return from Underwriting (post-tax)			7.31%
7. Investment Gain on Insurance Transaction	1.81%		
Less Investment Income on Agents Balances	0.63%		
Net Investment Gain on Insurance Transaction	1.19%	0.19%	1.00%
8. Total Return as a % of Premium (post-tax)			8.31%
9. Premium-to-Net Worth Ratio			0.823
10. Total Return as a % of Net Worth (post-tax)			6.84%

Note: Lines (1) to (8) are all expressed as a % of premium.

Assumptions

(a) UW Tax Rate =	21.00%
(b) Inv. Income Tax Rate =	15.97%
(c) Inv. Yield =	3.93%
(d) P/S Ratio =	0.94
(e) NW/S Ratio =	1.14
(f) Installment Fee Income=	0.38%
(g) Additional TRA tax=	0.10%
(h) Net Cost of Reinsurance=	16.71%

NOTES TO EXHIBIT RB-19, Page 1

1. The expense provisions are those used on page C-2, C-3 and C-4 of Exhibit RB-1, as adjusted for the proposed rate change

2. Selected by Rate Bureau.

3. See assumption (f) below.

4. [(2.)+(3.)] x (a.).

5. See assumption (g) below.

6. (2.) + (3.) - [(4.) + (5.)].

7. Pages 7-13. Investment income on agents' balances equals 0.157 x 1.022 x (c), where 0.157 is agents balances for premiums due less than 90 days and 1.022 is the factor to include the effect of agents' balances or uncollected premiums overdue for more than 90 days.

8. (6.) + (7.).

9. (d.)/(e.).

10. (8.) x (9.).

ASSUMPTIONS

(a) Internal Revenue Code.

(b) See RB-19, pp. 11-13; 1-avg post-tax yield/avg pre-tax yield.

(c) See RB-19, pp. 11-13; average of current and embedded yields.

(d) See RB-19, p. 14

(e) See RB-19, pp. 15

(f) See RB-19, p. 3

(g) See RB-19, pp. 4-6

(h) See prefiled testimony

NCRB - PRO FORMA TOTAL RATE OF RETURN
INCLUDING INVESTMENT INCOME ON SURPLUS
HOMEOWNERS INSURANCE

	Pre-Tax	Tax Liability	Post-Tax
1. Premiums	100.00%		
Loss & Loss Adjustment Expense	47.79%		
Commission & Brokerage	12.00%		
General Expense	3.81%		
Other Acquisition Expense	5.63%		
Taxes, Licenses and Fees	2.70%		
Policyholder Dividends	0.40%		
Net Cost of Reinsurance	16.71%		
Compensation for Assessment Risk	1.95%		
2. Pro-Forma Underwriting Profit	9.00%		
3. Installment Fee Income	0.38%		
4. Regular tax		1.97%	
5. Additional tax due to TRA		0.10%	
6. Total Return from Underwriting (post-tax)			7.31%
7. Investment Gain on Insurance Transaction	1.81%		
Less Investment Income on Agents Balances	0.63%		
Net Investment Gain on Insurance Transaction	1.19%	0.19%	1.00%
8. Investment Gain on Surplus (Including Prepaid Expense Adjustment)	5.10%	0.81%	4.28%
9. Total Return as a % of Premium (post-tax)			12.59%
10. Premium-to-Net Worth Ratio			0.823
11. Total Return as a % of Net Worth (post-tax)			10.36%

Note: Lines (1) to (9) are all expressed as a % of premium.

Assumptions

(a) UW Tax Rate =	21.00%
(b) Inv. Income Tax Rate =	15.97%
(c) Inv. Yield =	3.93%
(d) P/S Ratio =	0.94
(e) NW/S Ratio =	1.14
(f) Installment Fee Income=	0.38%
(g) Additional TRA tax=	0.10%
(h) Net Cost of Reinsurance=	16.71%

NOTES TO EXHIBIT RB-19, Page 1A

1. The expense provisions are those used on page C-2, C-3 and C-4 of Exhibit RB-1, as adjusted for the proposed rate change

2. Selected by Rate Bureau.

3. See assumption (f) below.

4. [(2.)+(3.)] x (a.).

5. See assumption (g) below.

6. (2.) + (3.) - [(4.) + (5.)].

7. Pages 7-13. Investment income on agents' balances equals 0.157 x 1.022 x (c), where 0.157 is agents balances for premiums due less than 90 days and 1.022 is the factor to include the effect of agents' balances or uncollected premiums overdue for more than 90 days.

8. (c.) x [1/(d.) + (0.4477 x 0.5185)], where 0.4477 is the prepaid expense ratio from page 7 . and 0.5185 is the unearned premium reserve to premium ratio from page 7.

9. (6.) + (7.) + (8.).

10. (d.)/(e.).

11. (9.) x (10.).

ASSUMPTIONS

(a) Internal Revenue Code.

(b) See RB-19, pp. 11-13; 1-avg post-tax yield/avg pre-tax yield.

(c) See RB-19, pp. 11-13; average of current and embedded yields.

(d) See RB-19, p. 14

(e) See RB-19, pp. 15

(f) See RB-19, p. 3

(g) See RB-19, pp. 4-6

(h) See prefiled testimony

NORTH CAROLINA
HOMEOWNERS INSURANCE
INSTALLMENT PAYMENT INCOME

Year	Inst. Charges	Statutory P. 14 Written Premium	Inst. Charges as a % of Prem.
2017	9,400,022	2,550,833,862	0.37%
2016	9,269,104	2,449,748,507	0.38%
2015	8,487,731	2,363,450,359	0.36%
2014	8,449,380	2,300,687,625	0.37%
2013	9,624,737	2,166,606,381	0.44%
Selected Value			0.38%

Source: ISO.

NORTH CAROLINA
HOMEOWNERS INSURANCE
CALCULATION OF TAXABLE INCOME

1	Collected Earned Premium for current year	100.00%
2	UEPR 12/31/current	52.97%
3	UEPR 12/31/prior	50.59%
4	Increase = (2) - (3)	2.38%
5	20% of Increase = Taxable Income	0.48%
6	Tax Liability = (5)x.21	0.10%
7	Unpaid Losses current yr.	10.150%
8	Discounted unpaid losses current yr.	9.819%
9	Unpaid Losses prior yr	9.694%
10	Discounted unpaid losses prior yr.	9.378%
11	Additional Income	0.015%
12	Tax Liability	0.000%
	Other Tax Liabilities	
13	UEP	0.10%
14	Discounting of Loss Reserves	0.00%
15	Total	**0.10%**

NORTH CAROLINA
HOMEOWNERS INSURANCE
CALCULATION OF TAXABLE INCOME

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
AY Avg Acc Date	AY Pay Pattern	Percent Unpaid	Total Losses	Unpaid Losses	AY at 12/31/yr. t	Discount Factor	Discounted Weight	AY at 12/31/yr. t-1	Weight	Discount Factor	Discounted Weight
0.5	84.27%	15.73%	47.795	7.5	2017	0.971096	7.3				
1.5	96.37%	3.63%	45.646	1.7	2016	0.958627	1.6	2016	7.181	0.971096	7.0
2.5	98.71%	1.29%	43.594	0.6	2015	0.953261	0.5	2015	1.583	0.958627	1.5
3.5	99.45%	0.55%	41.634	0.2	2014	0.957413	0.2	2014	0.537	0.953261	0.5
4.5	99.74%	0.26%	39.763	0.1	2013	0.954145	0.1	2013	0.219	0.957413	0.2
5.5	99.87%	0.13%	37.975	0.1	2012	0.944441	0.0	2012	0.099	0.954145	0.1
6.5	99.93%	0.07%	36.268	0.0	2011	0.938655	0.0	2011	0.049	0.944441	0.0
7.5	100.00%	0.00%	34.638	0.0	2010	0.942357	0.0	2010	0.025	0.938655	0.0
8.5	100.00%	0.00%	33.081	0.0	2009	0.946737	0.0	2009	0.000	0.942357	0.0
9.5	100.00%	0.00%	31.593	0.0	2008	0.953998	0.0	2008	0.000	0.946737	0.0
10.5	100.00%	0.00%	30.173	0.0	2007	0.961346	0.0	2007	0.000	0.953998	0.0
11.5	100.00%	0.00%	28.817	0.0	2006	0.968791	0.0	2006	0.000	0.961346	0.0
12.5	100.00%	0.00%	27.521	0.0	2005	0.968791	0.0	2005	0	0.968791	0.0
13.5	100.00%	0.00%	26.284	0.0	2004	0.968791	0.0	2004	0	0.968791	0.0
14.5	100.00%	0.00%	25.103	0.0	2003	0.968791	0.0	2003	0	0.968791	0.0
15.5	100.00%	0.00%	23.974	0.0	2002	0.968791	0.0	2002	0	0.968791	0.0
16.5	100.00%	0.00%	22.896	0.0	2001	0.968791	0.0	2001	0	0.968791	0.0
17.5	100.00%	0.00%	21.867	0.0	2000	0.968791	0.0	2000	0	0.968791	0.0
18.5	100.00%	0.00%	20.884	0.0	1999	0.968791	0.0	1999	0	0.968791	0.0
19.5	100.00%	0.00%	19.945	0.0	1998	0.968791	0.0	1998	0	0.968791	0.0
20.5	100.00%	0.00%	19.049	0.0	1997	0.968791	0.0	1997	0	0.968791	0.0
21.5	100.00%	0.00%	18.192	0.0	1996	0.968791	0.0	1996	0	0.968791	0.0
22.5	100.00%	0.00%	17.375	0.0	1995	0.968791	0.0	1995	0	0.968791	0.0
23.5	100.00%	0.00%	16.593	0.0	1994	0.968791	0.0	1994	0	0.968791	0.0
24.5	100.00%	0.00%	15.848	0.0	1993	0.968791	0.0	1993	0	0.968791	0.0
25.5	100.00%	0.00%	15.135	0.0	1992	0.968791	0.0	1992	0	0.968791	0.0
26.5	100.00%	0.00%	14.455	0.0	1991	0.968791	0.0	1991	0	0.968791	0.0
27.5	100.00%	0.00%	13.805	0.0	1990	0.968791	0.0	1990	0	0.968791	0.0
28.5	100.00%	0.00%	13.184	0.0	1989	0.968791	0.0	1989	0	0.968791	0.0
29.5	100.00%	0.00%	12.592	0.0	1988	0.968791	0.0	1988	0	0.968791	0.0
30.5	100.00%	0.00%	12.026	0.0	1987	0.968791	0.0	1987	0	0.968791	0.0
31.5	100.00%	0.00%	11.485	0.0	1986	0.968791	0.0	1986	0	0.968791	0.0
32.5	100.00%	0.00%	10.969	0.0	1985	0.968791	0.0	1985	0	0.968791	0.0
33.5	100.00%	0.00%	10.476	0.0	1984	0.968791	0.0	1984	0	0.968791	0.0
34.5	100.00%	0.00%	10.005	0.0	1983	0.968791	0.0	1983	0	0.968791	0.0
35.5	100.00%	0.00%	9.555	0.0	1982	0.968791	0.0	1982	0	0.968791	0.0
36.5	100.00%	0.00%	9.125	0.0	1981	0.968791	0.0	1981	0	0.968791	0.0
37.5	100.00%	0.00%	8.715	0.0	1980	0.968791	0.0	1980	0	0.968791	0.0
38.5	100.00%	0.00%	8.323	0.0	1979	0.968791	0.0	1979	0	0.968791	0.0
39.5	100.00%	0.00%	7.949	0.0	1978	0.968791	0.0	1978	0	0.968791	0.0
40.5	100.00%	0.00%	7.592	0.0	1977	0.968791	0.0	1977	0	0.968791	0.0
41.5	100.00%	0.00%	7.251	0.0	1976	0.968791	0.0	1976	0	0.968791	0.0
42.5	100.00%	0.00%	6.925	0.0	1975	0.968791	0.0	1975	0	0.968791	0.0
43.5	100.00%	0.00%	6.613	0.0	1974	0.968791	0.0	1974	0	0.968791	0.0
44.5	100.00%	0.00%	6.316	0.0	1973	0.968791	0.0	1973	0	0.968791	0.0
45.5	100.00%	0.00%	6.032	0.0	1972	0.968791	0.0	1972	0	0.968791	0.0
46.5	100.00%	0.00%	5.761	0.0	1971	0.968791	0.0	1971	0	0.968791	0.0
47.5	100.00%	0.00%	5.502	0.0	1970	0.968791	0.0	1970	0	0.968791	0.0
48.5	100.00%	0.00%	5.255	0.0	1969	0.968791	0.0	1969	0	0.968791	0.0
49.5	100.00%	0.00%	5.018	0.0	1968	0.968791	0.0	1968	0	0.968791	0.0
50.5	100.00%	0.00%	4.793	0.0	1967	0.968791	0.0	1967	0	0.968791	0.0
51.5	100.00%	0.00%	4.577	0.0	1966	0.968791	0.0	1966	0	0.968791	0.0
52.5	100.00%	0.00%	4.372	0.0	1965	0.968791	0.0	1965	0	0.968791	0.0
53.5	100.00%	0.00%	4.175	0.0	1964	0.968791	0.0	1964	0	0.968791	0.0
54.5	100.00%	0.00%	3.987	0.0	1963	0.968791	0.0	1963	0	0.968791	0.0
55.5	100.00%	0.00%	3.808	0.0	1962	0.968791	0.0	1962	0	0.968791	0.0
56.5	100.00%	0.00%	3.637	0.0	1961	0.968791	0.0	1961	0	0.968791	0.0
57.5	100.00%	0.00%	3.473	0.0	1960	0.968791	0.0	1960	0	0.968791	0.0
58.5	100.00%	0.00%	3.317	0.0	1959	0.968791	0.0	1959	0	0.968791	0.0
59.5	100.00%	0.00%	3.168	0.0	1958	0.968791	0.0	1958	0	0.968791	0.0
60.5	100.00%	0.00%	3.026	0.0	1957	0.968791	0.0	1957	0	0.968791	0.0
61.5	100.00%	0.00%	2.890	0.0	1956	0.968791	0.0	1956	0	0.968791	0.0
62.5	100.00%	0.00%	2.760	0.0	1955	0.968791	0.0	1955	0	0.968791	0.0
63.5	100.00%	0.00%	2.636	0.0	1954	0.968791	0.0	1954	0	0.968791	0.0
64.5	100.00%	0.00%	2.517	0.0	1953	0.968791	0.0	1953	0	0.968791	0.0
65.5	100.00%	0.00%	2.404	0.0	1952	0.968791	0.0	1952	0	0.968791	0.0
66.5	100.00%		2.296	0.0	1951	0.968791	0.0	1951	0	0.968791	0.0
Sum				10.15	Sum		9.82	Sum			9.38

NOTES TO PAGES 4 AND 5

Page 4

1-3 Annual Statement, Statutory page 14, for all companies writing homeowners insurance in North Carolina.

4 Line (2) - line (3)

5 Line (4) x .20.

6 Line (5) x .21.

7 Unpaid current-year losses at year-end as a percent of premium. Sum of Page 5, Column (5).

8 Discounted unpaid current-year losses at year-end as a percent of premium. Sum of Page 5, Column (8).

9 Unpaid prior-year losses at year-end as a percent of premium. Sum of Page 5, Column (5) divided by 5% assumed growth rate.

10 Discounted unpaid current-year losses at year-end as a percent of premium. Sum of Page 5, Column (12).

11 Line (7) - Line (8) - {Line (9) - Line (10)]

12 Line (11) x .21

13 Line (6)

14 Line (12)

15 Line (13) + Line (14)

Page 5

1 Midpoint of number of years since end of accident period.

2 Accident year payout pattern developed from policy year developed losses.

3 1 - Column (2)

4 Losses, given historical growth rate.

5 Column (3) x Column (4)

6 Accident Year at current year end

7 Discount factor per IRS Regulations.

8 Column (5) x Column (7)

9 Accident Year at prior year end

10 Column (3), previous period x Column (4), current period

11 Discount factor per IRS Regulations.

12 Column (10) x Column (11)

NCRB INVESTMENT INCOME CALCULATION
HOMEOWNERS INSURANCE
Projected Investment Earnings on Loss, Loss
Adjustment Expense and Unearned Premium Reserves

A. UNEARNED PREMIUM RESERVES		
1. Direct Earned Premiums		1,000,000
2. Mean UEPR	51.85%	518,544
3. Deductions for prepaid expenses:		
Commissions & Brokerage	12.00%	
Taxes, Licenses & Fees (5/6)	2.25%	
Other Acquisition (1/2)	2.82%	
General Expense (1/2)	1.90%	
Cost of Reinsurance	25.80%	
Total	44.77%	
4. Deduction for Prepaid Expenses: (2) x (3)		232,172
5. Net UEPR Subject to Inv (2) - (4)		286,372
B. Loss and Loss Expense Reserves		
1. Direct Earned Premium		1,000,000
2. Expected Inc L & LAE to Premium Ratio	47.79%	477,945
3. Expected Mean L&LAE Reserve to Inc. L & LAE Ratio	36.61%	174,994
C. Net PH Funds Subj to Inv (A5 + B3)		461,366
D. Average Rate of Return		3.93%
E. Investment Earnings from Net Reserves (C) x (D)		18,142
F. Average Rate of Return as a Percent of Direct Earned Premium (E) / (A1)		1.81%

ESTIMATED INVESTMENT EARNINGS ON UNEARNED
PREMIUM RESERVES AND ON LOSS RESERVES

EXPLANATORY NOTES

Line A-1
All calculations are displayed per $1,000,000 direct earned premiums.

Line A-2
The mean unearned premium reserve is determined by multiplying the direct earned premiums in line (1) by the ratio of the mean unearned premium reserve to the collected earned premium for calendar year ended 12/31/current year for all companies writing homeowners insurance in North Carolina. These data are from statutory page 14 of the Annual Statement.

1. Collected Earned Premium for Calendar Year ended 12/31/current year	2,495,257,062
2. Unearned Premium Reserve as of 12/31/current year	1,321,709,572
3. Unearned Premium Reserve as of 12/31/prior year	1,266,093,354
4. Mean Unearned Premium Reserve 1/2 [(2) + (3)]	1,293,901,463
5. Ratio (4) ÷ (1)	51.85%

Line A-3
Deduction for prepaid expenses:
Production costs and a large part of the other company expenses in connection with the writing and handling of homeowners policies, exclusive of claim adjustment expenses, are incurred when the policy is written and before the premium is paid. The deduction for these expenses is determined from data provided by the NCRB.

ESTIMATED INVESTMENT EARNINGS ON UNEARNED PREMIUM RESERVES AND ON LOSS RESERVES

EXPLANATORY NOTES

Line B-2
The expected loss and loss adjustment expense ratio reflects the expense provisions utilized in the filing.

Line B-3
The mean loss reserve is determined by multiplying the incurred losses in line (2) by the North Carolina ratio of mean loss reserves to incurred losses. This ratio is based on North Carolina companies' statutory page 14 annual statement data and has been adjusted to include loss adjustment expense reserves.

6	Incurred Losses	2013	933,427,119
7	Incurred Losses	2014	1,019,648,184
8	Incurred Losses	2015	1,010,529,329
9	Incurred Losses	2016	1,374,922,785
10	Incurred Losses	2017	1,236,962,609
11	Loss Reserves	2012	369,147,458
12	Loss Reserves	2013	347,285,705
13	Loss Reserves	2014	333,183,711
14	Loss Reserves	2015	369,147,458
15	Loss Reserves	2016	451,983,968
16	Loss Reserves	2017	403,160,415
17	Mean Loss Reserve	2013	358,216,582
18	Mean Loss Reserve	2014	340,234,708
19	Mean Loss Reserve	2015	341,701,298
20	Mean Loss Reserve	2016	401,101,426
21	Mean Loss Reserve	2017	427,572,192
22	Ratio	2013	38.38%
23	Ratio	2014	33.37%
24	Ratio	2015	33.81%
25	Ratio	2016	29.17%
26	Ratio	2017	34.57%
27	Average Loss Reserve		33.86%
28	Ratio of LAE Reserves to Loss Reserves		0.260
29	Ratio of Incurred LAE to Incurred Losses		0.165
30	Loss and LAE Reserve [((27)x(1.0+(28)))/(1.0+(29))]		0.366

ESTIMATED INVESTMENT EARNINGS ON UNEARNED
PREMIUM RESERVES AND ON LOSS RESERVES

EXPLANATORY NOTES

Line E

The average rate of return is calculated as the arithmetic mean of the embedded and current yields. The embedded yield is the sum of two ratios: the most recent ratio of investment income to invested assets (see page 12), plus the ten year average ratio of capital gains to invested assets (see page 13). The current yield is the estimated, currently available rate of return (including income and expected capital gains) on the property/casualty industry investment portfolio (see page 11).

Embedded Yield =	3.05% + 0.37% =	3.42%
Current Yield =		4.45%
Average =		3.93%

PORTFOLIO YIELD AND TAX RATE - CURRENT YIELD

(1) Investable Asset	(2) Percent of Assets	(3) Estimated Prospective Pre-Tax Return	(4) Tax Rate	(5) Estimated Prospective Post-Tax Return
Bonds				
U.S. Govt	9.80%	2.56%	21.00%	2.02%
States & territories	8.36%	2.17%	5.25%	2.06%
Special revenue	17.45%	2.30%	5.25%	2.18%
Industrial	28.53%	3.37%	21.00%	2.66%
Preferred stock	0.34%	5.57%	13.13%	4.84%
Common stock	26.13%	10.23%	19.45%	8.24%
Mortgage Loans	1.10%	4.55%	21.00%	3.59%
Real estate	0.82%	5.90%	21.00%	4.66%
Cash & short-term invs.	7.46%	1.96%	21.00%	1.55%
Rate of Return Pre-Inv Exp	100.00%	4.73%	18.15%	3.87%
Investment Expenses		0.28%	35.00%	0.18%
Portfolio Rate of Return		**4.45%**	17.08%	**3.69%**

Sources:

Various issues of Federal Reserve Statistical Release, H.15(519).
Mergent Bond Record.
Standard & Poor's CreditWeek.
Value Line Investment Survey, Part II.
Ibbotson Associates, 2017 Yearbook
Ibbotson and Siegel, AREUEA Journal, 1984.
A.M. Best's Aggregates & Averages, 2018 edition.

PORTFOLIO YIELD AND TAX RATE
EMBEDDED YIELD

	Income	Tax Rate
Bonds		
Taxable	23,362,682	21.00%
Non-Taxable	9,714,339	5.25%
Stocks		
Taxable	7,610,774	13.13%
Non-Taxable	1,785,853	5.25%
Mortgage Loans	755,495	21.00%
Real Estate	1,839,346	21.00%
Contract Loans	622	21.00%
Cash / Short Term Inv.	980,167	21.00%
All Other	10,228,290	21.00%
Total	56,277,568	16.72%
Inv. Expenses	5,185,109	21.00%
Net Inv. Income	51,092,459	16.29%
Mean Invested Assets	1,676,831,258	
Inv. Inc. Yield Rate	3.05%	16.29%
Capital Gains (10 yr. avg) (% Of Inv. Assets)	0.37%	0.00%
Invest. Yield Rate (pre-tax)	3.42%	14.53%
Invest. Yield Rate (post-tax)	2.92%	

Source: Best's Aggregates and Averages, 2018 Edition, p. 12 (Exhibit of Net Investment Income, Col. 2 (Earned During Year)).

CAPITAL GAINS OR LOSSES
AS A PERCENT OF MEAN ASSETS
(All amounts in thousands of dollars)

Calendar Year	Mean Total Invested Assets	Realized Capital Gains	
		Amount	Percent
2008	1,288,393,875	(21,018,623)	-1.63%
2009	1,274,678,809	(8,079,575)	-0.63%
2010	1,330,998,082	8,100,143	0.61%
2011	1,366,568,026	7,563,305	0.55%
2012	1,400,656,619	9,035,405	0.65%
2013	1,473,600,934	12,163,890	0.83%
2014	1,543,882,475	12,093,078	0.78%
2015	1,567,611,077	9,887,732	0.63%
2016	1,596,937,470	8,086,268	0.51%
2017	1,676,831,258	15,725,303	0.94%
Total	14,520,158,622	53,556,926	0.37%

*Mean total invested assets is the average of the current year and prior year values of total invested assets (annual statement page 2, Line 9).

Source: "Best's Aggregates & Averages--Property-Casualty," various editions

NORTH CAROLINA
HOMEOWNERS INSURANCE

PREMIUM-TO-SURPLUS RATIOS

Year	Homeowners Insurance
2017	0.91
2016	0.88
2015	0.90
2014	0.89
2013	0.90
2012	0.97
2011	1.02
2010	0.93
2009	0.97
2008	1.04
Five-Year Average	0.90
Ten - Year Average	0.94

Notes:
1 Data from Best's Data Service
and Best's Aggregates & Averages, various editions
2 Top 30 groups writing in each year

NORTH CAROLINA HOMEOWNERS INSURANCE
CALCULATION OF GAAP NET WORTH TO SURPLUS RATIO

	2012	2013	2014	2015	2016
Policyholder Surplus	587,061,063,988	653,380,281,255	675,233,591,461	674,150,481,028	700,833,588,840
+ Deferred Acquisition Costs	28,717,782,350	30,010,149,317	31,242,614,928	32,401,590,297	33,046,102,666
+ Non-Admitted DTA Provision	12,829,214,564	11,638,345,594	11,237,499,832	12,112,807,244	11,544,280,333
+ Non-admitted Assets (non-tax part)	36,238,971,886	33,348,888,924	33,563,586,431	40,260,421,135	43,722,898,341
+ Provision for Reinsurance	2,595,871,371	2,471,928,096	2,392,301,235	2,251,585,712	2,185,395,913
+ Provision for FASB 115(after-tax)	42,220,449,087	14,722,750,582	25,814,318,855	16,081,984,811	10,015,172,605
- Surplus Notes	(12,279,333,642)	(12,190,299,603)	(11,673,768,635)	(12,446,044,946)	(12,027,889,160)
GAAP-adjusted Net Worth	697,384,019,604	733,382,044,165	767,810,144,106	764,812,825,281	789,319,549,538
Ratio of GAAP Net Worth to Statutory Surplus	1.19	1.12	1.14	1.13	1.13
Five Year Average	1.14				

Source: ISO