Climate Change and Investments Making the Process Transparent

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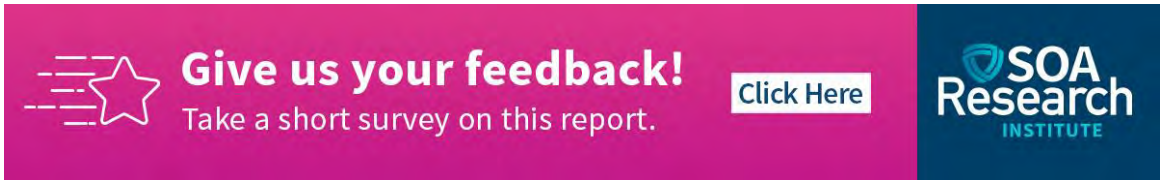

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Executive Summary

Over the years, climate change has changed how businesses operate, impacted government policies, and influenced individual consumption. As a result, various types of investments can be impacted by climate change and the associated risk ramifications. As Russell Investments states, "certain climate factors will ultimately influence which investments turn out to be successful – and which do not."[1] In this paper, we will explore metrics and assessment tools used by insurance companies and asset management firms in the U.S. to measure the climate risk exposures in their investment portfolios and see how they disclose the results. In addition, we further explore how companies may be able to use similar climate risk assessment tools in their Asset-Liability Management and Risk Management.

In general, climate risk can be categorized as physical risks (how asset prices are impacted) and transition risks (how the economy is impacted by the shift toward a lower-carbon environment). Governing bodies and companies have been developing methods to reflect and quantify the impact of climate change on financial institutions and investment instruments. Instead of laser focusing on climate risk, many companies (both insurance as well as non-insurance) are beginning to work on integrating the entire Environmental, Social, and Governance (ESG) framework into their investment policies, though progress varies by type of insurance company. To better understand where insurance companies are in their climate change analysis for their investments, we distributed detailed questionnaires to individuals at a number of rating agencies, large insurance companies, and asset management firms across the Unites States. AM Best's response to the survey indicated that in their recent survey of U.S. insurers, roughly 75% of Life and Annuity companies reported that they have integrated ESG concerns into their investment processes in some form, followed by Health companies at 55% and P&C companies at 46%. Furthermore, 9% of Life and Annuity companies, 14% of P&C companies, and 18% of Health companies plan further integration in the next 12 months. Meanwhile, more than 40% of P&C and Health companies do not incorporate any specific strategies to achieve ESG investment objectives, compared with just 15% of Life and Annuity insurers.

The rating agencies we surveyed indicated that the following groups globally put more focus on climate risk:

- Larger insurers
- Life insurers (because of longer duration assets and more focus on investment risk)
- Reinsurers
- Companies/subsidiaries from Europe and Asia
- Publicly traded companies
- Regions or jurisdictions such as Europe where regulators, policymakers or standard setters place higher emphasis on climate risk evaluation and/or reporting

Depending on the nature of a company's assets, there are several ways to measure climate risk in the company's asset portfolio. Some companies use the historical relationship between climate factors such as temperature or precipitation to quantify climate risk, some apply a carbon footprint methodology by evaluating the security issuers' carbon exposure, and some simply review the impacts of physical risk assumptions as applied to their investments. Many companies in the U.S. have been increasing their usage of third-party data to assess climate risk through private firms such as Morgan Stanley Capital International (MSCI), and this approach helps to bring consistency in climate risk disclosure. Another way to measure climate risk is to use Shared Socioeconomic Pathways (SSP) to

translate narrative climate scenarios into quantitative assumptions for modelers to use in Asset-Liability Management (ALM) assessments.

Of the companies we surveyed in the U.S., most are just beginning to quantify climate risk exposure, and as such their analyses are in the early stages of their development. Companies currently measure their portfolios' climate exposure with a mix of greenhouse gas (GHG) data, carbon-intensity metrics, in-house climate stress testing, MSCI's Climate Value at Risk (CVaR), and proprietary in-house ESG measures. One company that creates their own in-house metrics makes scorecards across industries based on a wide range of ESG issues including carbon emissions, product carbon footprint, financing environmental impact, climate change vulnerability, carbon target and policy, exposure to climate regulation, natural capital, pollution/waste, toxic emissions, water stress, raw material sourcing, biodiversity and land use, as well as opportunities in clean tech, renewable energy and green building. All these factors are considered in addition to social and governance factors in order to assess overall ESG risk.

In seeking how best to model climate risk in portfolios, some consider physical risk in their own company's assets as part of their enterprise risk management process. Most of the companies we surveyed take the route of merely focusing on broadly diversifying across asset classes, regions, countries, regulatory regimes, sectors, industries, etc. And they expressed the challenges in collecting data and in ensuring data consistency and accuracy when trying to build a more robust model. One company from our survey suggested an ideal model to measure climate risk is to align climate-related scenarios across both asset and liability projections, consider diversification of climate cost, and integrate SSPs into the scenario analyses. The carbon footprint data can then be used to assign relevant costs of capital in discounting future cashflows, and portfolio managers would be able to leverage these inputs to project present values of future asset returns. A few companies resisted the carbon footprint idea and expressed skepticism that using carbon footprint methodologies and underlying data to project future asset returns under various ALM scenarios will be worth the trouble, especially due to the high cost in obtaining the necessary data from the third-party to perform such analysis. At this point, there is no consensus among the companies as what the best practices should be.

Our research found that U.S. investors do not follow the climate topic as closely as in Europe. The companies with European counterparts that we surveyed also indicated that their counterparts tend to have more and higher quality data on climate risk available to them. At the same time, they face more defined and structured regulations as well as more pressure from the investors. Hence, European companies are likely to disclose climate risk in higher quality and more consistent manners than U.S. companies. While many companies in the U.S. we surveyed have suggested and utilized multiple ways to measure climate risks in their asset portfolios, most are still in the early stages of forming their strategies. This is not to say the U.S. companies are not making any progress. In their responses to our survey, the rating agencies observe changes in companies' investment strategies that reflect their climate risk policies such as **negative screening** (companies may be excluded from an investment portfolio based on specific ESG criteria), **ESG integration** (include ESG considerations within financial analysis and investment decisions), and **stewardship** (insurers engage the senior management teams within the companies to move them towards adopting better ESG practices.) As Federal and local governments begin to pay more attention to climate change to raise awareness, those we surveyed anticipate legislation requiring increased transparency by companies regarding their climate risk profile, with correspondingly better and more consistent data for making climate-based investment decisions. What began as voluntary recommendations for climate risk disclosure from the organizations like the Task Force on Climate-Related Financial Disclosures (TCFD) may become mandatory in the future.

When companies' climate risk exposures are transparent, investors can better understand their investments and voice their preferences, and the regulators and rating agencies can better establish guidelines and provide clarity.

Section 1: Introduction and Methodology

1.1 INTRODUCTION

A recent report by Deloitte Center for Sustainable Progress (DCSP) estimated the net present value costs of climate change could be at $178 trillion by 2070 and the upside of decarbonizing by midcentury would net $43 trillion over 50 years[2]. Because of the severity of this cost, companies and regulators have been seeking ways to monitor and better disclose the progress made towards decarbonizing. However, a lack of transparency in how companies manage their climate risks can cause inconsistency and confusion for investors and regulators. The danger of letting companies make their own decisions on what they consider as the appropriate climate change disclosures is that they could overstate their climate change risk mitigations, which provides the opportunity for "greenwashing" (providing misinformation to give the appearance of environmental responsibility).

So far, Europe and Asia have taken the lead in identifying and measuring climate risks. Their regulatory bodies, research, and data availability have enabled the progress by establishing clear goals and standards. In the U.S., there is less progress in terms of methodologies. But as climate-related risks have become a more important area of focus for many securities issuers, investors, regulators and policymakers, this subject has become a more prominent point in rating agencies'' discussions with insurers. Hence, companies have been putting more attention to identify, measure, disclose, and manage climate risks recently. At the same time, regulators and rating agencies are also learning and developing tools to integrate climate risks in their assessment of companies' financial health. Consequently, climate risk transparency has become essential for the financial services industry to successfully drive the goal of more accurately and consistently reflecting climate risks in their investment portfolios. With a clearer picture on how and at what level climate risks are impacting companies' portfolios and financials, companies will be better equipped to find pathways to better manage climate risk and find opportunities to advance their competitive positions. In this paper, we will discuss why climate change is a concern to insurance company investment managers, what methods they use to reflect climate-related opportunities and risks in their investment decision-making process, and how they disclose the results. We will also provide information to risk managers and/or ALM actuaries that may help them to use these methods to manage climate risk in their portfolios.

1.2 METHODOLOGY

In order to gain a sense of how companies quantify risks to their investment portfolios accruing from climate change, we distributed detailed questionnaires to individuals at a number of large insurance companies and asset management firms across the Unites States. The individuals were primarily in a portfolio management or similar role involving asset selection and management. The questions included inquiries regarding the climate risks that the company takes into consideration, their approach to measuring these risks, as well as their methods of hedging against or otherwise managing the risk. We also surveyed rating agencies and regulators to better understand how they embed climate-based portfolio risk into their insurance company ratings and their observations on insurance companies' investment strategies. We also interviewed Rimes Technologies, a financial data management firm who provides transformative data management and investment intelligence solutions to the global investment

community. Their perspective and experience in providing ESG and climate data helps us gain a better understanding of rapidly evolving, disparate and non-standardized ESG data sources.

We also posed the following questions in our survey to gain more insight on how various techniques for climate risk analysis may provide value to investment/ALM actuaries and risk managers in evaluation of enterprise risks:

- How portfolio managers' carbon footprint methodologies and underlying data could be used in projecting future asset returns under various ALM scenarios
- Whether third party data and security issuer disclosures might provide helpful information for projecting future asset cash flows, both in baseline and stress scenarios
- Potentially integrating the Shared Socioeconomic Pathways (SSP)s into scenario analysis already being performed
- How to align the climate-related scenarios across both the asset and liability projections, including consideration of diversification benefits

Section 2: Climate Risk Consideration: Why is climate change a concern to investment managers?

As nations around the world change their policies to fight climate change, both the effects of climate change and the resulting changes to regulatory structures and governmental policies will pose novel threats and opportunities to businesses as well as to investors. Concern for climate change has already begun to shape how businesses operate, the policies governments pursue, and the products individual consumers purchase. However, due to the uneven risk posed by climate change to various businesses, investors have now begun to quantify climate related risks in order to control their level of exposure to this new class of risk.

Because climate risks to businesses accrue both from the direct effects of climate change itself as well as from resultant changes in both policy and consumer behavior, climate risks can be sorted into two major types of risks:

- Physical risks, which could be driven by natural events and the long-term shifts in climate patterns. Examples of physical events that could affect the value of investments include: [1]
  - Lost crops from drought
  - Increasing wildfire damage to physical assets
  - Increasing damage to property from flooding
  - Property and infrastructure damage from hurricanes
  - Reduced snowfall which may directly impact certain sectors, but also increase the risk of drought
  - Coastal resorts being damaged by sea level rise
- Transition risks, which include risks posed to businesses by changes in the regulatory and consumer behavioral environment brought about as a response to climate change. Examples of transitional risks include: [1]
  - Higher carbon emission taxes
  - Firms that may have to spend to reduce their emissions
  - Decreased consumer demand for carbon-intensive products
  - Increased demand for environmentally friendly products

Transition risks tend to impact the financial services industry more than the physical risks, and their evolution over time remains largely unknown right now. One of our survey questions asks which type of climate risk is of greater concern, one company states that (in line with TCFD) both transition and physical risks are considered in their

operations while transition risk tends to be a higher focus for their investments. When asked if they think climate risks are being factored into investment prices by investors, most companies we surveyed answered that they have not seen a direct relationship between climate risks and investment prices except maybe for utilities and energy sectors. Investments in the energy and utilities sectors tend to have material exposure to climate risk. The nature of these sectors are generally longer duration, which fits well with the longer liabilities in the life insurance company needs. Of the companies we surveyed, there isn't a uniform level of exposure to these sectors in their total portfolios.

These risks pose different threats to companies depending on their position in the economy. For example, while a resort in Miami, Florida may feel very little business threat from increased carbon taxes; at the same time the resort will be fairly concerned that if sea level rises too far, they might find their business underwater in more ways than one. Conversely, an energy company focused on fossil fuel extraction may find most of its physical assets out of reach of climate-based physical risks yet may face severe business challenges if a carbon-tax were implemented. The difference in the source and severity of possible climate-based risks faced by companies, and therefore to investors, highlights the need to develop tools to quantify and assess climate-based investment risk.

While the companies we surveyed agree that quantifying climate risk is important, most U.S. insurance companies and asset management firms do not currently spike out specific climate risks in their portfolio analysis. Rather, they tend to lump concern for climate risk across their asset classes under the umbrella of ESG considerations and disclosure. Some companies expand their view on climate risk considerations to include liability, underwriting, reputation, and regulatory risks in their climate risk assessments. For example, some pay more attention to their bonds in Florida because of the higher flood risk in that region while others focus on the indirect impacts brought by climate induced events such as disruption of the operation via the supply chain. When there are policy changes related to carbon prices, the higher carbon emitting sectors will experience higher impact compared to the low emitting sector.

Section 3: Climate Risk Identification and Measurement Approaches: What are the methods investment managers can reflect climate-related opportunities and risks in their investment portfolios?

3.1 APPROACHES

There are various ways companies evaluate climate risks in their investments. Some specifically measure the impact of warming average temperatures at levels of less than 1.5°C (for example), and some don't have a formal methodical approach but perform ad hoc quantitative analysis depending on the level of materiality of their assets. In general, current metrics used to measure the climate change exposures include:

- Quantitative modeling: measure physical risk exposures using the historical relationship between climate factors (e.g., temperature or precipitation and security return) or through simulations under certain climate change scenarios.
- Applying a carbon footprint methodology: Carbon exposure refers to a company's carbon emissions and fossil fuel reserves and is generally used to manage transition risk. Firms that emit large quantities of GHG are more likely to face additional costs of reducing emissions or paying fines. Many investors, therefore, use carbon data disclosed by the issuers as a method of managing their portfolio transition risk exposure. In other words, the investors evaluate the level of carbon exposure of the security issuer, as well as trends in that exposure over time, to assess whether the issuer may be materially affected by transition events in

a way that reduces investor value. However, carbon exposure and the expectations of the associated impacts often are not disclosed in the investment professionals' analysis reports, making it hard for investors to understand climate risk and the impacts to their portfolios. The Chartered Financial Analysts (CFA) Institute recommends that[3]:

- Policymakers ensure that regulatory frameworks for carbon markets are designed to deliver transparency, liquidity, ease of access for global market participants, and similar standards across jurisdictions in order to underpin robust and reliable carbon pricing
- Investment professionals account for carbon prices and their expectations thereof in climate risk analysis.

- Understanding and using third party ratings and data Research indicates that Asian and European insurers have, for many years, used a relatively consistent approach for third party data sources and scores, U.S. insurers have more recently been increasing their usage of third-party data to assess climate risk through private firms such as MSCI and Ortec Finance. This finding aligns with the move towards increased regulatory focus and the need for consistency in reported metrics in the U.S.[4] For example:
  - S&P published Global Ratings on Environmental, Social, and Corporate Governance (ESG) Credit Factors
  - The Chartered Financial Analyst (CFA) Institute published the Global ESG disclosure standards in 2021. The Standards seek to address greenwashing as well as the difficulties that investors face when trying to understand, evaluate, and compare investment products that incorporate one or more ESG approaches[5].
  - The U.S. Security & Exchange Commission (SEC) proposed the mandatory disclosure of Climate-Change Risk. The proposal would force publicly traded companies to report greenhouse-gas emissions from their own operations as well as from the energy they consume, and to obtain independent certification of their estimates. In some cases, firms also would be required to report greenhouse-gas output of both their supply chains and consumers, known as Scope 3 emissions. Companies would have to include the information in SEC filings such as annual reports[6].
  - International Sustainability Standards Board (ISSB) launched climate-related disclosure requirements on March 31, 2022, which was built upon the recommendations of the TCFD and incorporates industry-based disclosure requirements derived from Sustainability Accounting Standards Board (SASB) Standards
- Reviewing the impact of physical risk assumptions as applied to investments
  - Physical climate risks have been identified by financial regulators and insurance companies as a major financial risk to portfolios that cuts across a range of traditional natural disaster categories. For example, 34.1% of the coal assets within the fixed income portfolios and 31.8% of the coal mining assets within the equity portfolios were exposed to wildfire risks in 2020. Meanwhile, 16.7% of power assets within the fixed income portfolios and 13.8% of the power assets within the equity portfolios were exposed to flood risks in 2020[7]
- Translation of narrative climate scenarios (e.g., SSPs) into quantitative assumptions for modelers to use in ALM projects
  - SSPs are a concept used for the consideration of socio-economic conditions in science. It organizes climate change impacts in the context of vulnerabilities and the possibilities for adapting and mitigating climate change[8].
  - Based on the socio-economic drivers, the SSPs are developed and used to create climate-related scenarios through modeling. According to the TCFD, these scenarios can serve as the basis for the analysis of the financial implications of climate-relevant risks.
- Other approaches: Use a Certification program, which involves fund managers paying a fee to get certified credit ratings and audits for the funds they manage. For example, the financial crimes advisory firm K2 Integrity Holdings is launching an anti-greenwashing certification for investment firms[9]. The anti-greenwashing certification would verify that asset managers have incorporated robust climate change

targets and have set proper climate change targets for their overall businesses and the funds they offer and that they are hitting those targets. There are other competitors of K2 who offer similar accreditation, and fund managers may pay the firm to be certified for climate risk investment. This is a similar approach as insurance companies or asset management firms already use for credit ratings.

The depth and breadth of the approaches for analyzing climate risk suggests that insurance and asset management firms have quite varied approaches to this topic. In the companies we surveyed, the level of sophistication in climate risk analysis also varied. While some firms have formal policies within their organization governing the identification, measurement and mitigation of climate change risks in their investment portfolios; others have no such structure and have yet to begin collecting any data on climate risk at all. For companies who have formal structures to track climate risk, their level of sophistication ranges from ad-hoc analysis by consulting firms tailored to client needs, to incorporation of ESG factor analysis into the company's investment policy statements. One company in particular has Board level policies to show that they support an investing portfolio aligned with net-zero emissions by 2050.

Some companies use both backward-looking measures such as GHG emission data as well as forward-looking tools like Climate Value-at-Risk (CVaR) frameworks. CVaR is a risk measure for estimating the amount of loss due to climate change within a firm, portfolio, or financial market within a specific investment horizon[10]. The CVaR framework deploys climate scenario analysis to identify where risks reside at a company level. Nearly every company surveyed specifically mentioned MSCI's ESG data and models as tools to help measure and track climate risk. MSCI's tools allow for top-down scenario analysis based on different average temperature increase scenarios (e.g., less than 1.5°C and less than 2°C). These scenario analyses allow the company to generate CVaR estimates for the overall portfolio. Another more qualitative approach was the development of a net-zero alignment indicator that takes multiple data points from traditional ESG providers and climate data sets to assign companies a qualitative alignment status, which then serves as a basis to direct shareholder advocacy. One common feature was a partial reliance on obtaining company self-assessments and annual ESG reports or annual sustainability reports.

Two out of the seven companies we surveyed specifically indicated that they follow TCFD recommendations when performing their analysis and one company indicated being a member of Climate Action 100+ and uses ESG methodologies to create the scoring system with the goal to reduce GHG emissions over time. The rest of the companies who answered our survey did not specifically identify their approach but did indicate that the metrics they use include some or all of the following: CVaR, carbon intensity, GHG emissions, company goals/targets for decarbonization or net zero as well as current progress toward those goals, and some companies also consider natural capital, pollution, biodiversity/land use, and environmental innovations measures.

3.2 DATA CHALLENGES

Because companies differ in the type and sophistication of their analyses, there is corresponding diversity in the type of data they collect. Some companies collect no information at all while others depend on third-party vendors such as MSCI, Bloomberg, S&P Trucost, or Truevalue Labs. Companies that collect their own data tend to collect GHG emission data, although beyond that there is little agreement. The companies we surveyed generally agree that it is difficult to find high quality, accurate and consistent data. Even companies that rely on third-party vendors often require a control process to ensure data accuracy and relevance because of the variability in vendor data and methodology. A few companies lamented the lack of third-party models to reasonably assess decarbonization targets and pathways, taking into account bond maturities, to assess the overall decarbonization trajectory of a portfolio. One of the survey participants responded, "At this point, data is too incomplete or lacks the sort of standardization that makes models reliable". It also makes comparison of the models difficult. In fact, companies

surveyed advised that their greatest impediment to making climate-geared investment decisions is a lack of high-quality, comparable and decision-useful information on material climate information or climate risk factors.

While data collection has improved in some firms regarding climate risk, it is difficult even in principle to gather data measuring transition risks that involve government policies, since future changes in governmental policy are difficult to anticipate. While European firms began incorporating ESG concerns into their investment decisions years ago, many companies in the U.S. are just beginning to explore the quality of data they use to measure climate risk. Changes in the quality of data used to assess climate risk are difficult to measure; therefore, companies are only now just beginning to use the data. However, of the companies who expressed an opinion on the quality of data, most agreed that their ability to measure climate risk has improved over time, but that improvements in market data (i.e., data on climate-labeled investments) are still needed.

In the absence of standardized and comparable climate disclosures, many companies instead rely on consultants to perform the analysis or even build the framework to measure climate risk from the assets they managed. This may introduce inconsistency since there isn't a defined industry standard. As a result, companies recommend that the SEC adopt a set of mandatory disclosures of key climate-related metrics that apply across industries. Such metrics might initially include Scope 1 and 2 GHG emissions and material Scope 3 GHG emissions. This reporting framework for the initial mandatory metrics can then serve as a basis for additional sustainability factors over time as the methodologies for measuring climate risk outcomes mature. Moreover, requiring that all companies annually disclose certain metrics that apply across all industries will give investors access to accurate, timely, relevant and comparable data that is standardized across all companies, which is not the case right now.

Section 4: Climate Risk Investment Disclosure: How do companies disclose climate risk exposures in their investment portfolios?

Surveyed companies that track climate risk universally disclose their climate risk metrics to internal stakeholders such as Board and Investment and Risk Committees, and most disclose them publicly as well through annual reports. Those that do not publicly disclose their metrics yet are just beginning to quantify climate risk considerations, and all expressed the intention to publicly disclose their climate risk metrics once their models are matured. While there are several different frameworks for disclosing climate risks, about half of the companies surveyed use the TCFD framework for this purpose. The sole exception is a signatory to the Carbon Disclosure Project (CDP), who therefore uses both the CDP and TCFD frameworks when submitting their annual climate disclosures. Companies without a formal disclosure framework in place either remained silent on the topic or reported that they were in the process of building out a structure in line with TCFD.

While many companies in the U.S. still have no formal structure for disclosing climate risks, certain European companies and subsidiaries are subject to the Sustainable Finance Disclosure Regulation (SFDR), a European regulation mandating disclosure of certain climate risk factors. European companies with more than 500 employees must therefore display a sustainability risk policy on their websites detailing how sustainability risks are considered in their investment decisions. They must also share a description of how their investments affect a range of sustainability factors, as well as a statement on how sustainability risks are considered in their remuneration policy. As European policymakers continue to implement rules to reduce GHG emissions to achieve the Paris and Glasgow targets, climate risk could become a more important risk factor for insurers around the world. The sectors that are the most exposed to policy changes could suffer impaired valuations. Accordingly, companies we surveyed in the

U.S. report that their overseas clients, especially those in Europe, tend to demand significantly more information regarding ESG risk and have greater aversion to climate risk in their portfolios.

It is the consensus among the companies we surveyed that while concern for the climate is becoming more prevalent in the U.S., investors do not follow the topic as closely as in Europe. However, the companies surveyed also reported that their counterparts in Europe and the UK tend to have more and higher quality data on climate risk, due to the more refined climate disclosure mandates in the region, as well as the more sustainability-focused population. As a result of tighter regulation, better data, and more investor pressure, European companies/subsidiaries tend to disclose climate risk more thoroughly than their U.S. counterparts.

The companies we surveyed universally support the creation of standardized climate risk disclosures, within the U.S. and globally to standardize disclosure across the industry. Several of them have already sent letters to the SEC advocating as much. Their rationale is that the current lack of high-quality, comparable, decision-useful information on material climate information and ESG factors makes it difficult for the market to efficiently allocate capital to companies that can generate strong long-term financial returns. Whereas in Europe, investors are required to disclose climate information pertaining to issuers in which they invest. In the absence of standardized and comparable disclosures on climate risk, investors must instead rely on estimates provided by third parties. Unfortunately, that unambiguously makes for less efficient capital markets. As a result, the companies surveyed recommend the SEC adopt a set of mandatory disclosures of key climate-related metrics (e.g., CVaR). Although most companies surveyed recommended that such metrics apply across industries, one advocated that disclosures could be industry specific, with more heavy disclosure requirements applying to energy and utility companies and more lenient regulations applying to the financial sector.

Section 5: Risk Management for Portfolio Climate Risk: What climate risk assessment tools can risk managers and/or ALM actuaries use to better manage their portfolios?

Although companies recognize the impact of climate change and endorse a need to accelerate a transition to a sustainable economy with net-zero emissions, few have a formal policy to accomplish this or a specific framework to mitigate climate risk in their portfolios. Rather, most are in the early stages of quantifying and tracking exposure to climate risk across asset classes and are therefore primarily focused on evolving and refining their climate risk modeling and assessment.

Almost none of the companies we surveyed currently have a method for the following aspects of climate risk management:

1) Aligning climate related scenarios across both asset and liability projections,
2) Considering diversification of climate cost, or
3) Integrating SSPs into their scenario analyses

One company that accomplishes all three does so by measuring climate impact at the risk factor level and translates estimated climate impacts on macroeconomic variables into changes in yields and spreads. These yield changes are then used to predict effects on fixed income and equities/alternatives on the asset side, as well as the discount rate and cash flows on the liability side to produce consistent asset-liability scenarios. Using this approach, the

diversification effects of climate impact are reflected on both the asset side and liability side through interest rate factors as well as spread factors. This same company plans to use MSCI's Climate Risk tool models to incorporate SSPs into their scenario analyses. However, apart from this one exception, the remaining firms we surveyed have no method for considering the effect of climate risk across both asset and liability projections or for incorporating SSPs, and instead focus on broadly diversifying across asset classes, regions, countries, regulatory regimes, sectors, industries, etc. to mitigate the climate risk impacts. As such, most companies surveyed do not measure or disclose climate risk implications on their portfolio performance, although the two that did tend to use CVaR measures from MSCI's climate risk tools.

To the extent that carbon footprint data can be used to assign relevant costs of capital in discounting future cashflows, portfolio managers should be able to leverage these inputs to project present values of future asset returns. However, while at least one company incorporates issuers' product carbon footprints and carbon emissions into their investment analysis, few companies reported significant opportunities to capitalize on their climate risk analysis at this time. Some expressed skepticism that using carbon footprint methodologies and underlying data to project future asset returns under various ALM scenarios will be worth the trouble. Specifically, they cite insufficient alpha generation for ESG-tilted portfolios to justify the analyses as well as a perception that the third-party data required to perform such analyses were both expensive and of insufficient quality. Accordingly, while a few companies use third party data and issuer disclosures as part of quantifying their climate exposure across asset classes, most do not seem to consider climate risk mitigation as an achievable priority at this point.

When responding to questions about mitigating climate risk to their portfolios, many companies responded by stating how important it was for their company to invest in such a way that they help to mitigate climate change while the end goal or strategies are not yet clearly defined. Their current strategy is not yet at the point of considering how their investment decisions would mitigate specific risks stemming from climate change as part of their ALM strategies or ERM framework. For example, when asked how they planned to mitigate climate-based risks in their portfolios, many companies tended to focus on explaining how their portfolios will divest from carbon intensive industries to help get to net-zero GHG by a certain date and advocated this without any specific mention of how this affects portfolio risk. One company stated that assessment of an issuer's commitment to a strong or improving climate risk profile is a factor when making investment decisions. So, in the event that an issuer does not take sufficient action to mitigate climate risks, then the company might consider divesting from that issuer. In other words, the company mitigates climate risk in the investment portfolio by removing/disinvesting the assets that are unfavorable with respect to climate changes from their portfolios instead of actively managing them. However, as stated earlier in this paper, companies in the U.S. are at the early stage of managing climate risk in their investments. Survey participants anticipate more efforts and resources will be allocated to this important topic as individuals and regulating bodies are paying more attention to it. This may be an area for future research in the future.

In short, the responses we received from a fair number of companies seemed to focus more on forwarding the social/political mission of mitigating climate risk to society by limiting GHG emissions, as opposed to forming specific strategies of mitigating risk to their own holdings stemming from particular physical or transition risks. An Asset Manager with the most advanced climate modeling methodology cited in the response to the survey that the clients' concern for the environmental impact of their portfolio in conjunction with investment performance, suggesting that they may pursue a climate investment policy out of a sense of client service/retention or brand maintenance in addition to a numerically driven sense of portfolio risk-mitigation.

Regardless their reasons, companies all demonstrated some amount of concern for climate in terms of their portfolio allocation, and their plans for addressing it can be broadly classified into two groups: engagement-based

strategies and divestment-based strategies. Engagement strategies attempt to mitigate exposure to transition and physical risks by using shareholder power to encourage issuers to pursue company policies that limit these climate-based risks to the company. This can be done by pressuring issuers to establish formal oversight of climate risk, to disclose emissions and set science-based targets. Companies can also request that issuers disclose how they manage physical or transition risks and can track management responsiveness and issuer progress toward these goals. The efficacy of engagement depends on the ability of a particular shareholder or group of shareholders to successfully shift issuer policy over time, and as such it tends to be a more long-term strategy. It depends crucially on the degree of influence a particular shareholder has over issuer policy. In contrast, divestment strategies are more direct and short-term, since they simply involve selling off shares of companies that are exposed to high climate-based risk in order to reinvest in less risky companies. This serves the dual purpose of punishing risky companies as well as immediately reducing climate-based portfolio risk.

The engagement-based strategies work collaboratively with stakeholders. For example, an asset management firm needs to work with their clients for value creation and to protect their clients' investments by exercising the shareholder rights prescribed in regulations and company bylaws. Any decisions made and issues escalated should be investment-driven, taking into considerations of investment objectives, issuer-specific circumstances, and the history of engagement. Similarly, if an insurance company take the engagement-based approach, their climate risk will be managed collaboratively with other risk considerations within the company. Hence, the engagement-based strategies nurture a collaborative environment for companies to manage their risks more balanced with holistic considerations compared to the divestment-based strategies. This explains why several of the companies we surveyed favor engagement-based strategies in addition to divestment-based strategies for mitigating climate risk.

When asking the rating agencies what they have seen as far as changes in investment strategies at insurance companies reflecting on climate risk, their responses are as follow:

- Negative screening: the most commonly used method among insurers whereby companies or sectors maybe excluded from an investment portfolio based on specific ESG criteria.
- ESG integration: the inclusion of ESG considerations within financial analysis and investment decisions.
- Stewardship: insurers engage the senior management teams of the investee, where appropriate, to move them towards adopting better ESG practices. In addition, their investment strategies as part of the broader market may influence the ESG agenda at those companies. In theory, as investors, insurers can use their voting rights to potentially influence corporate policies and influence the strategy of the investee rather than simply divesting straight away; this method can help firms transition on the investee side, possibly contributing to stronger ESG practices globally

No matter which approach a company takes, the rating agencies we surveyed caution that companies need to be mindful of the downstream impacts of the decision and continue to monitor their overall financial strength. According to our survey to rating agencies, transition risks may result from significant policy, legal, technology, and market changes as countries transition to a low-carbon global economy and climate resilient future and may leave insurance companies investments in companies that have "stranded" assets from certain problematic industries, which lose value and may need to be written down. Hence, ignoring these transition risks may lead to an insurance company having to impair the value of those investments or sell them at a loss which could become a threat to the company's financial strength.

According to our survey, while very few insurance companies and asset management firms have a consistent and formalized method to account for climate risk in their portfolios, nearly all insurance companies have some sort of commitment to align their portfolios with carbon foot-print reduction. This discrepancy, along with consistent complaints from insurance companies and asset management firms about the availability of relevant data and

universal support for regulation requiring mandatory climate risk disclosure suggest that companies are motivated to incorporate climate risk into their portfolios but currently lack the means to do so in an effective way. Further, it suggests that standardization of climate risk disclosure could provide the data necessary for comparing climate risks across companies, thus giving investors the power to quantify and hedge against climate risk in a more rigorous way.

Section 6: Concluding Remarks

Even though most of the U.S. insurance companies and asset management firms are at the early stage of building their ESG frameworks and that much work is ahead of us, most of the companies responding to our survey indicated that they are putting more focus and effort in this important initiative. Regulators currently tell companies to identify, measure, and manage risks with the goal of protecting consumers. In terms of climate risk and investment analysis, they observe that companies are in various stages of implementation and modeling, including some that are not doing anything. Regulators expect companies to integrate climate risk into their companies' risk profiles and manage their risks holistically within their risk appetite. Similarly, rating agencies expect that rated insurers' and reinsurers' ERM programs will change over time to include investing operations and climate risk-impacted investments in the assessment of overall risk exposures. Some participants indicated that climate risk transparency is the building block to reach the goal of integrating climate risk in companies risk profile and be able to assess these climate risk-impacted investments in the companies' overall risk profile.

As U.S. government and financial institutions place more attention on climate risk in investments and desire to have a transparent process in analysis and disclosures, survey participants believe the development of methodologies and data sources will become more of priority for companies. This paper has summarized the many initiatives and research that insurance companies and asset management firms are taking to advance their climate change and investment efforts. This information will assist in making the climate change and investment process more transparent and provide asset managers and actuaries with information to help in the ongoing assessment of climate risk impacts. It may be valuable to conduct similar research again in the near future, at least within three to five years' timeframe, to provide the latest intelligence and to check the progress in making the process transparent.

Section 7: Acknowledgments

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Section 8: List of Participating Companies

AM Best

Athene

Bermuda Monetary Authority (BMA)

Conning Asset Management

Guardian Life

Mass Mutual

Neuberger Berman

New England Asset Management

Rimes

S&P Global Ratings

UNUM

Voya Investment Management

Appendix A: Glossary

CDP – Carbon Disclosure Project
CFA – Chartered Financial Analyst
CVaR – Climate Value-at-Risk
ESG – Environment, Social, Governance
GHG – Greenhouse Gas
ISSB – International Sustainability Standards Board
MSCI – Morgan Stanley Capital International
SEC – Securities and Exchange Commission
SASB – Sustainability Accounting Standards Board
TCFD – Taskforce on Climate-related Financial Disclosures
SFDR – Sustainable Finance Disclosure Regulation

Appendix B: Survey Questionnaire for Insurance Companies and Asset Management Firms

1. Climate risks considered (what is it, why is it a concern):
   a. What climate risks are considered in your company's investment management practices?
   b. Which climate risks (physical, transition, liability, others (please specify)) are more of a concern for your company, and why?
   c. Do you think climate risks are being factored into investment prices by investors? If yes, how and since when were climate risks being considered?
2. Climate risk identification and measurement approaches (portfolio management of climate risk)
   a. What characteristics of the investments (sector, investment type, maturity, etc.) in your portfolios have material exposure to climate risk? Could you provide a rough estimate on the % of investments that are materially exposed to climate risk?
   b. How do you evaluate climate risks in your consideration of new and existing investments? Comment on both quantitative and qualitative approaches.
   c. What types of information do you collect from issuers to help you assess exposure of the investment to climate risk?
   d. How easy or difficult is it to obtain that information (your responses from c above)? Are disclosures made by issuers adequate? Are they reasonably accurate?
   e. What are some of the key metrics you use to measure relative climate risk across different investments?
   f. Do you have climate risk limits (or risk appetite) for the investment portfolios? If so, please describe. Is it part of the regular annual enterprise risk management or only ad hoc?
   g. What tools or models do you use to measure and track climate risk in the portfolio? Do you use outside sources/vendors? If not, what kind of tools would be helpful in doing so?
   h. Do you perform scenario analysis to measure the climate risk impacts on your investment portfolios? How are the assumptions and methodologies developed for the scenarios? Have you consider using Shared Socioeconomic Pathways?
   i. Are there formal policies in your organization that govern the identification, measurement, and mitigation of climate risk in your investment portfolio?
   j. How have the quality of data & ability to measure climate risk in your investment portfolios changed over time?
   k. What changes are needed (e.g., disclosures or regulations) to improve your ability to measure climate risk in your investment portfolio going forward?
3. Climate risk investment disclosure (what do you have)
   a. How do you measure your portfolios' climate exposure currently?
   b. What metrics do you use to disclose portfolio climate risk to stakeholders (i.e., internal stakeholders, external investors, and the general public)? Are these metrics disclosed internally, externally, or both?
   c. Do you aggregate climate risk exposure across other components of the business (i.e., is there an enterprise exposure analysis?) What are/would be the biggest challenges to do so?
   d. Do you use the Task Force on Climate-Related Financial Disclosures (TCFD) framework when designing your climate risk investment disclosures for internal purposes, or do you use different frameworks? If latter, please describe the framework you use/design and if you would plan to consider the TCFD framework. If you do not use the TCFD framework, why not?
   e. If your company conducts business internationally, do you see the differences in your climate risk disclosure in different regions (e.g., due to regulatory requirements or stakeholder demand)?
   f. Do you see differences in the quality of data and/or extent of risk outside of the U.S.?

g. Do you support the creation of standardized climate risk disclosures within the U.S and globally? Why or why not?

4. Risk management for portfolio climate risk
   a. What steps have you taken, or do you plan to take, to mitigate these climate change risks? What risks have you chosen to accept?
   b. How could portfolio managers' carbon footprint methodologies and underlying data be used in projecting future asset returns under various asset-liability management (ALM) scenarios?
   c. Do you consider whether third party data and issuer disclosures might provide helpful information for projecting future asset cash flows, both in baseline and stress scenarios?
   d. Do you plan potentially integrating the Socioeconomic Pathways (SSPs) into scenario analysis already being performed?
   e. How do you plan to align the climate-related scenarios across both the asset and liability projections, including consideration of diversification benefits?
   f. How is diversification considered in your climate risk analysis?
   g. What scenario analysis (other than/in addition to mentioned above) have you done or plan to do to measure the overall portfolio climate risks?
   h. Other than scenario analysis, what other techniques do you use to manage enterprise climate risk?
   i. Do you measure or disclose the corresponding climate risk implications on the portfolio performance?
   j. What opportunities have you found in evaluating climate risk? In other words, are there ways to capitalize on taking these risks with strong risk measurement and management?

Appendix C: Survey Questionnaire for Rating Agencies and Regulators

1. How do the rating agencies reflect the impact of climate risk embedded in the investment portfolios on the insurance company ratings?
    a. How has this changed in recent years?
2. What have the rating agencies seen as far as changes in investment strategies at insurance companies reflecting on climate risk?
3. Do the rating agencies see material differences in approach from different insurer types or regions?
4. What do the rating agencies see, in general, as far as the level of sophistication of senior management and Boards of insurance companies on this topic?
    a. What are differences between those insurers that manage their own portfolios versus those that rely on asset managers?

Appendix D: Survey Questionnaire for Rimes Technologies, a financial data management firm

1. How has data on climate risk within investments changed over time?
2. How complete, reliable, and consistent is the data across different vendors?
3. How is the data organized?
4. What are the key metrics that that market is asking for?

Endnotes

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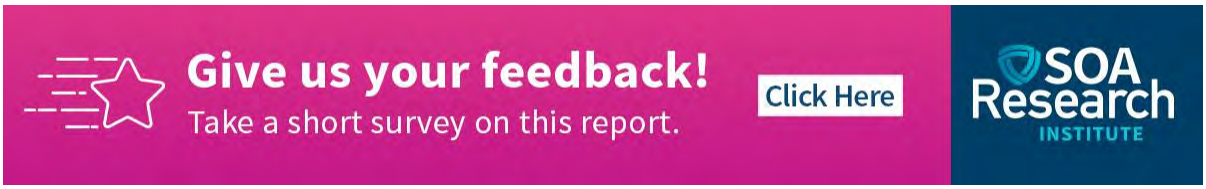
Feedback



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