

Climate Risks and Financial Markets: A Narrative Literature Review

Risques climatiques et marchés financiers : une revue narrative de la littérature

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Abstract:

This paper explores the critical intersection between climate change and financial systems, examining how climate risks are increasingly becoming central to financial market stability through a narrative review of existing literature. As climate hazards continue to cause widespread disruptions – such as droughts, floods, and global temperature irregularities – the role of financial markets and institutions in addressing these challenges has come under scrutiny. This literature review seeks to shed light on how climate risks are classified, identify the key drivers of these risks, and evaluate potential policy frameworks that can mitigate these risks. By synthesizing findings from existing research, this review aims to highlight the urgency of integrating climate considerations into financial decision-making processes. This paper contributes to the ongoing discourse on sustainable finance by offering insights that inform the design of resilient financial strategies to address climate-related challenges.

Keywords: Financial Markets, Sustainable Finance, Climate Risks, Physical Risks, Transition Risks.

JEL Classification: G10, G56

Paper Type: Theoretical Research

Résumé :

Cet article examine l'intersection essentielle entre le changement climatique et les systèmes financiers, en analysant comment les risques climatiques occupent une place croissante dans la stabilité des marchés financiers, à travers une revue narrative de la littérature existante. À mesure que les aléas climatiques – tels que les sécheresses, les inondations et les anomalies de température à l'échelle mondiale – entraînent des perturbations généralisées, le rôle des marchés financiers et des institutions dans la gestion de ces défis suscite un intérêt croissant. Cette revue de la littérature vise à clarifier la classification des risques climatiques, à identifier leurs principaux déterminants et à évaluer les cadres politiques susceptibles de les atténuer. En synthétisant les résultats des recherches existantes, cet article met en évidence l'urgence d'intégrer les considérations climatiques dans les processus de décision financière. Il contribue ainsi aux débats sur la finance durable en apportant des éclairages susceptibles d'informer la conception de stratégies financières résilientes face aux défis climatiques.

Mots clés : Marchés financiers, Finance durable, Risques climatiques, Risques physiques, Risques de transition.

Classification JEL : G10, G56

Type du papier : Recherche Théorique

1. Introduction:

As the global economy grapples with rising inflation, economic instability, and trade imbalances, the impact of climate change emerges as a key driver of these challenges (The Economics of Climate, 2019). These disruptions are no longer isolated incidents, but represent systemic threats capable of destabilizing economies (Mariano, 2022). The convergence of environmental sustainability and financial systems has, therefore, garnered significant attention from researchers, policymakers, and investors. The Task Force on Climate-Related Financial Disclosures defined Climate Risks as the challenges arising from natural events and transitions linked to the intensifying impacts of climate change. These risks include disruptions to production, quality, trade, and overall economic stability, particularly for businesses relying on natural resources. Additionally, this study focuses on sustainable finance, which integrates environmental, social, and governance (ESG) factors into financial decision-making (Edmans & Kacperczyk, 2022), and examines its role in mitigating these risks to ensure financial stability. Finally, Financial Stability is understood as the overall health and resilience of the financial system (Battiston, Dafermos, & Monasterolo, 2021).

Climate risks, driven by the accelerating effects of climate change, present complex challenges for financial markets, influencing asset pricing models (Krueger, Sautner, & Starks, 2019), market volatility, and institutional resilience. Despite the growing body of research on climate-related financial risk; the existing literature has limitations in generalizability. The interdisciplinary nature of the issue—spanning climate science, economics, and finance—has made it challenging to develop a cohesive framework capturing these complex interactions. Additionally, the relatively recent recognition of climate risks as systemic financial risks has left limited time for extensive empirical validation and especially theoretical development. Finally, the unpredictable and long-term nature of climate risks, coupled with limited historical data, complicates the ability to model and predict their financial implications with precision.

By addressing this gap, the current research underscores the urgency of developing a clearer understanding of how climate risks influence financial stability (Ojea Ferreiro et al., 2022), highlighting a critical area that remains underexplored in the existing literature. Generalizability issues can be addressed through various methods; such as diversifying sample selection, variety of methodologies, cross-disciplinary collaboration, and longitudinal studies. Therefore, this study contributes to addressing the existing issue, through approaching the topic from a theoretical perspective, using a narrative literature review methodology aiming to study the existing literature on the field. Narrative literature reviews are important to enhance understanding of climate-related financial risks; as they serve in providing a broad overview of existing research, synthesizing findings from various studies (Baumeister, 1997). This comprehensive approach allows researchers to identify patterns, gaps, and inconsistencies in the literature, which can highlight areas where generalizability may be limited. Furthermore, this literature review contributes to tracing the evolution of ideas and methodologies, which can inform future studies on how to better generalize findings.

The aim through this paper is to answer two key questions: How do climate risks manifest in financial markets? and What are the implications of these risks for financial institutions and investors? The answers to these questions, derived from insights gathered in this narrative literature review, align with the primary objective of the research: to synthesize and critically evaluate existing studies on the impact of climate risks on financial markets and stability. This synthesis seeks to establish a robust theoretical foundation for understanding these dynamics while inspiring further research, particularly empirical studies, to confirm and expand on the findings.

This paper aims to contribute to a deeper understanding of the intersection between climate change and financial systems, encouraging policymakers, academics, and practitioners to

address these pressing challenges proactively. Moreover, this research provides a clear value addition by identifying specific gaps in empirical evidence, offering a comprehensive framework for analyzing climate risks, and proposing actionable insights for mitigating their impact on financial stability. In addressing these critical issues, this research not only bridges significant gaps in the existing literature but also provides a structured theoretical lens to analyze the various impacts of climate risks on financial markets and stability. By doing so, it aims to foster a deeper understanding of how these risks disrupt global financial systems while offering practical insights for stakeholders. Furthermore, this study underscores the pressing need for integrated frameworks and interdisciplinary approaches to mitigate the challenges imposed by physical and transitional hazards. Ultimately, the findings aim to serve as a foundation for future empirical studies and to inform policy development, enabling financial systems to become more resilient in the face of climate-related vulnerabilities.

2. Methodology:

To address the objectives set for this paper, a narrative literature review was conducted to evaluate the current state of the art concerning the key themes underpinning this study. The primary databases used were Google Scholar, Scopus, and CAIRN, as these platforms were chosen for their extensive coverage of academic and professional literature, ensuring a diverse and robust collection of sources. The resources utilized in this review include research papers from influential academic journals and institutions (such as *Review of Finance*, the European Corporate Finance Institute (ECFI), and the National Bureau of Economic Research (NBER)). Additionally, this paper relies on insights from reports of the Task Force on Climate-Related Financial Disclosures (TCFD), the Intergovernmental Panel on Climate Change (IPCC), and data from the World Economic Forum. The analysis spanned a six-year timeframe, from 2019 to 2024, enabling a comprehensive evaluation of recent developments and trends. To avoid language bias, the review incorporated resources primarily in English, with a limited selection of Resources in French.

This narrative literature review followed a structured, multi-step approach to ensure a rigorous selection of articles that are aligned with the study's objectives. The first step consisted of setting the initial keywords, initial terms that were carefully chosen to conduct the first selection; such as "climate risks" and "financial markets". At this stage, the results were quite broad, so the goal was to reach 10 papers to understand whether there is any underlying concept or keyword to refine the results more, and the main observation is that studying the impact of climate risks on financial markets involves studying other factors such as financial stability. Thus, the second step was a comprehensive exploration of the research platforms after defining these new concepts; which yielded between 6000 and 7000 results across Scopus and Google Scholar. Following this, the third and final step consisted of a manual screening of identified articles was performed to ensure the inclusion of high-quality and relevant studies. This multi-step approach culminated in the synthesis of key concepts from the selected literature, addressing themes directly and indirectly related to the research problem and objectives. This synthesis provided a solid theoretical foundation for the study.

To classify the selected papers, a relevance-insight dynamic framework was developed. Articles were categorized based on their theoretical contribution and contextual depth. Papers offering high theoretical insight but limited local context were deemed "high insight but low relevance", while those providing comprehensive analyses of the primary keywords were categorized as both highly relevant and insightful. Conversely, case studies focusing on specific company implementations of climate policies were considered "low insight but high relevance"-useful for supporting the literature review but insufficient as standalone theoretical contributions. This classification system ensured a balanced selection of resources, enriching both the theoretical and practical dimensions of the study.

3. Results and Analysis

3.1 An overview of Climate Risks and Financial Stability

The literature on climate-related financial risk has seen substantial growth over the last decades; focusing on developing theories that serve as the foundation for analyzing the intersection of climate risks and financial markets. Established theories and frameworks, such as the framework set by the Task Force on Climate-Related Financial Disclosures (TCFD) and financial risk assessment models, were set to provide a structured lens through which climate-related challenges can be understood and evaluated. Ultimately, this theoretical framework not only contextualizes the study within existing research but also positions it to contribute to a deeper understanding of the systemic implications of climate risks on financial markets, paving the way for more resilient and sustainable economic systems.

This framework is pivotal in linking conceptual insights with practical applications, bridging gaps between environmental science and financial economics. A critical component of this framework is the exploration of sectoral and geographical variations in vulnerability and adaptability to climate risks. For instance, industries such as agriculture and energy are disproportionately affected by climate change due to their dependence on natural resources. Similarly, geographical disparities highlight the heightened risks faced by developing countries with limited adaptive capacities. By synthesizing these dynamics, the framework provides a comprehensive understanding of how climate risks manifest and propagate across different financial and economic systems. Key concepts central to this study include physical risks (e.g., direct impacts of climate events like floods, hurricanes, and rising sea levels) and transition risks (e.g., regulatory changes, technological advancements, and shifts in consumer preferences). These dimensions of climate risks are analyzed through their implications for financial performance, market stability, and investment strategies. Additionally, the framework integrates concepts from sustainable finance, emphasizing the role of Environmental, Social, and Governance (ESG) factors in shaping corporate strategies and credit risk assessments.

The Task Force on Climate-related Financial Disclosures defines Climate Risks as the various challenges induced by the natural events arising from the increasing consequences of climate change. These risks significantly affect businesses that partially or entirely depend on natural resources for their activities, influencing production quality and quantity, exports and imports, and the venture's financial risks. Among these risks, Beta, a key metric studied in this context, highlights their impact. In 2020, the focus on climate-related financial risk reporting reached unprecedented levels, with endorsements for TCFD recommendations surpassing those of previous years. By October 2020, 1,484 companies endorsed the framework, with 529 new supporters compared to 2019, marking the highest recorded increase in a single year.

The TCFD report provided the classification of climate risks, and it also suggested a framework using this classification to understand how to evaluate climate-related risks, opportunities, and financial impacts on a venture's financial performance, including the updates to the financial statements. However, any company that addresses climate-related risks must aim to reduce both physical and transition risks. Ignoring physical risks in a climate strategy could potentially result in an index with a climate risk mitigation that is comparable to a standard market-cap index, if not higher potential risks (Ranger, Mahul, & Monasterolo, 2021). A priori, physical and transition risks are not connected because they have a negative correlation (Leale-Green & M. Cabrer, 2023).

Climate risks can be categorized broadly into physical risks and transition risks, both of which influence companies' financial performance. These risks negatively affect revenues, increase costs, and can lead to reputational damage. A comprehensive framework to evaluate these risks, as outlined by the TCFD, incorporates their classification and financial implications. Effective mitigation strategies must address both physical and transition risks, as overlooking either could

leave companies vulnerable to significant financial and operational setbacks (Edenhofer et al., 2015).

Physical risks are an important classification of climate risks that has been gaining more interest and importance in understanding (Intergovernmental Panel On Climate Change (IPCC), 2013). Physical Risks represent the direct effects of climate change, including extreme weather events, rising sea levels, and shifting temperature and precipitation patterns. These risks disrupt company operations by damaging assets like buildings, equipment, and infrastructure (Intergovernmental Panel on Climate Change (IPCC), 2023), and they also interrupt supply chains due to adverse weather conditions, increase insurance costs, and potentially lead to loss of coverage. Additionally, physical risks negatively impact the health and well-being of employees, customers, and local communities, reducing productivity and increasing healthcare expenses, and such risks could expose 4% of a country's GDP to losses annually by 2050 based on current commitments (Munday & Bullock, 2023). Physical risks are classified into acute and chronic categories: Acute risks, such as heatwaves, floods, wildfires, and storms, directly impact economies by affecting natural resources, thus influencing sectors like consumer goods. For instance, severe droughts caused by heatwaves and low rainfall negatively impact agricultural performance and crop yields, reducing production levels. Chronic risks, on the other hand, include gradual climatic shifts like rising temperatures (Calvin et al., 2023), sea level increases, and ocean acidification. These are harder to predict in terms of frequency and severity but have significant long-term impacts, such as desertification resulting from prolonged temperature rises.

Transition risks involve indirect impacts of climate change, stemming from societal shifts toward a low-carbon economy. These include changes in policies, technologies, and market preferences. Transition risks affect companies by potentially rendering investments in fossil fuel reserves economically unviable and increasing regulatory scrutiny and costs related to carbon emissions. They also shift consumer behavior towards more sustainable products and services, leading to either reduced demand for certain products or increased costs to meet changing preferences. Moreover, the rising costs of capital reflect a perception of higher financial risks for companies with significant environmental impacts. Transition risks arise from efforts to limit emissions, regulatory changes, consumer preferences for greener environments, and the affordability of clean energy technologies.

The TCFD states that there is an interesting dynamic between risks and opportunities for both types of risks. While risks present challenges, the graphic also highlights opportunities that stem from climate-related factors. These opportunities include improving resource efficiency, transitioning to renewable energy sources, developing innovative products and services, accessing new or expanding markets driven by climate concerns, and building resilience to enhance adaptability in the face of future climate events. The interplay of risks and opportunities requires organizations to integrate them into their strategic planning and risk management frameworks. This ensures they can mitigate challenges while capitalizing on opportunities, thereby positioning themselves better in the evolving climate landscape. (Edenhofer et al., 2015) Finally, these factors directly influence an organization's financial impact, which is reflected in its core financial statements. For example, the income statement captures changes in revenues and expenditures, the cash flow statement reflects operational and investment cash flows, and the balance sheet records adjustments in assets, liabilities, and capital structures.

This framework illustrates the interconnected nature of climate risks and opportunities with financial outcomes, emphasizing the need for organizations to adopt comprehensive strategies that address climate considerations while safeguarding their financial stability. It provides a valuable basis for discussing the measurable impacts of climate-related factors on financial performance in the paper. Ultimately, businesses' ability to navigate climate risks depends on

their capacity to mitigate both physical and transition risks effectively. Studies show that while some countries, such as Japan, implement robust strategies to preserve wealth against natural disasters, lower-income nations often lack the resources to adapt, resulting in significant economic losses. Recognizing and managing these risks is essential for ensuring long-term business resilience and sustainability.

3.2 Manifestation of Climate Risks in Financial Markets

Climate risks, both direct and indirect, profoundly affect financial markets, reshaping asset valuations, market stability, and investment strategies (Stocker & Qin, 2013). These risks manifest in various ways, influencing asset pricing, portfolio management, and financial stability. Natural disasters such as Hurricane Harvey, floods in Pakistan and Spain, and other extreme weather events disrupt economic activity, causing significant financial losses across sectors. The increasing frequency and severity of these events exacerbate uncertainties in financial markets, leading to volatility and investor repricing of assets.

The extent to which industries are affected by climate risks varies significantly based on their exposure and adaptive capacity. Sectors with low and high resilience, such as information technology, healthcare, and professional services, tend to be less vulnerable to climate-related disruptions. In contrast, industries with moderate vulnerability – such as manufacturing and tourism – face considerable exposure to climate risks but maintain some ability to adapt. For example, earthquakes in Turkey have severely impacted tourism revenue, particularly in regions where the economy heavily relies on this sector.

However, industries like agriculture, fisheries, and forestry, classified as highly vulnerable, bear the brunt of climate change due to their heavy dependence on natural resources and limited capacity for adaptation. The 2022 IPCC report underscores the severe consequences of climate change on agricultural production, water security, and food availability, with particularly devastating effects in Africa, South America, and the Mediterranean region. These disruptions threaten livelihoods, exacerbate food insecurity, and heighten financial risks, underscoring the urgent need for climate-resilient policies and adaptive financial strategies.

The pricing of climate transition risks in equity and bond markets has been extensively studied, with growing evidence that investors are integrating climate-related factors into their valuation models. In the equity market, particularly in the energy sector, investors demand higher returns to compensate for elevated transition risks (Broeders et al., 2023). This is evident in the oil and gas sector, where heightened risk perceptions have led to increased investor scrutiny and, in some cases, divestment. Similarly, in the bond market, the average maturity of newly issued bonds in the carbon-intensive coal sector has decreased, signaling concerns about the long-term viability of such industries (Broeders et al., 2023). In contrast, the renewables sector has experienced an increase in bond maturities, reflecting investor confidence in the sustainability and growth potential of low-carbon industries.

The fixed income market is also undergoing a transformation, with sustainable investments playing a crucial role in shaping market dynamics. The rising demand for green bonds, designed to fund environmentally friendly projects, has created new investment avenues for those seeking financial returns alongside positive environmental impact (Fadzli, 2024). This shift aligns with the broader trend of Environmental, Social, and Governance (ESG) considerations in fixed income securities, where investors increasingly prioritize issuers with strong ESG profiles. The positive feedback loop generated by this demand has enhanced transparency and accountability among issuers, ultimately strengthening their creditworthiness and attracting a wider investor base (Fadzli, 2024).

Derivatives markets have emerged as a critical tool for managing climate-related risks, particularly through the development of green derivatives. These financial instruments, such as ESG-linked swaps, emission allowance futures, and extreme weather event derivatives, enable

market participants to hedge against transition and physical climate risks (Saguato, 2023). The European Union's Green Deal has played a pivotal role in promoting the growth of sustainable derivatives markets, with the aim of mobilizing over 1 trillion euros in public and private investments to achieve a carbon-neutral economy by 2050 (Saguato, 2023). Similarly, regulatory bodies such as the Commodities Futures Trading Commission (CFTC) in the United States are actively exploring the role of derivatives in addressing climate-related risks, highlighting the importance of public-private synergies in this space.

Green derivatives not only provide mechanisms for risk management but also facilitate capital raising for sustainable projects. ESG-linked swaps allow companies to tie financing costs to specific sustainability targets, incentivizing improved environmental performance. Emission allowance futures, in turn, help market participants manage exposure to carbon prices, which are expected to rise as governments implement more stringent climate policies. These innovations underscore the potential of derivatives markets to support the transition to a sustainable economy while offering new investment opportunities for risk-averse and ESG-focused investors.

The integration of climate considerations into portfolio management strategies has become increasingly sophisticated, with a growing emphasis on reducing exposure to climate transition risks. Recent research demonstrates that portfolio rebalancing can effectively lower exposure to such risks by incorporating ESG factors and greenhouse gas (GHG) emissions into investment decisions (Bressan et al., 2022). By applying a weaker market neutrality principle—where investments are proportional to the bond amount outstanding within climate policy-relevant sectors—the study achieved a 10% reduction in climate transition risk exposure. This approach also revealed that bonds issued by firms with low ESG risk and GHG emissions are more likely to be purchased, while those with high ESG risk and emissions are more likely to be sold during rebalancing. The implications of these portfolio rebalancing strategies extend beyond risk mitigation to include potential impacts on financial markets. While the study found that changes in yields would be limited to less than 80 basis points on individual bonds, the broader effects on market dynamics could be significant. By influencing the relative demand for bonds issued by high- and low-carbon entities, portfolio rebalancing creates price signals that incentivize companies to adopt more sustainable practices. This aligns with the broader goals of climate-aware investment strategies, which seek to align financial returns with positive environmental outcomes.

The pricing of climate-related risks in financial markets is further complicated by the dynamic nature of these risks, influenced by both physical and transition factors. A dynamic asset pricing framework developed in recent research links carbon emissions and portfolio composition to the stochastically varying probability of climate-related events (Karydas & Xepapadeas, 2019). This framework suggests that climate change implies a positive and increasing risk premium, as investors demand higher returns to compensate for heightened uncertainty associated with climate-related risks. The study also finds that macroeconomic risk can act as a hedge against catastrophic climate change, potentially leaving the aggregate equity premium unaltered. However, the transition risk associated with climate policy significantly lowers the participation of carbon-intensive assets in the market portfolio, highlighting the need for investors to reassess their exposure to such assets.

The implications of these findings are profound, as they suggest that climate change risks are not yet fully reflected in asset prices. This mispricing could have far-reaching consequences for financial stability, as markets may be underestimating the potential impacts of climate-related events. Policymakers and investors must therefore work together to ensure that climate risks are accurately priced and reflected in financial decision-making processes. This includes the development of more robust climate indicators and emission data, which are essential for informed investment choices and effective risk management.

3.3 Policy Implications and the Path Forward

The manifestation of climate risks in financial markets underscores the critical role of policymakers in ensuring a smooth and sustainable transition. The development of consistent and comparable climate indicators is essential for enabling investors and risk managers to make informed decisions (Broeders et al., 2023). Policymakers must also address the current inadequacies in emission data and climate indicators, which can lead to inconsistent and inadequate climate risk pricing across different markets. The European Union's Green Deal and the CFTC's initiatives in the United States provide valuable insights into the potential for public-private synergies in addressing climate-related risks (Saguato, 2023). These efforts highlight the importance of regulatory frameworks that support the growth of sustainable financial markets while mitigating potential risks.

Geographical regions play a crucial role in shaping climate risk mitigation efforts, reflecting the varying degrees of regional, national, and international commitments to sustainability. Areas with stricter regulatory frameworks tend to achieve stronger environmental, social, and governance (ESG) outcomes, as robust policies drive corporate accountability and climate-conscious business practices. For instance, European companies operate under stricter "green" regulations that compel them to disclose climate-related risks and implement sustainable strategies (Jiu, 2024).

Beyond regulatory influence, geographic location also determines a region's vulnerability to climate risks, particularly concerning natural resource availability and resilience to climate-related disruptions. Lower income countries in warmer climate climates often bear a disproportionate burden, facing heightened exposure to extreme weather events, rising sea levels, and prolonged droughts (IPCC, 2014). These nations require adaptive measures to enhance climate resilience, emphasizing the critical link between economic development and climate adaptation (Jiu et al., 2024). Strengthening institutional capacity, securing climate finance, and fostering technological innovation are essential to mitigating the escalating risks these vulnerable regions face.

Overall, climate risks in financial markets represent a complex and evolving issue that demands a multifaceted approach. From the pricing of transition risks in equity and bond markets to the development of green derivatives and climate-aware portfolio strategies, the financial sector plays a critical role in supporting the transition to a sustainable economy (Bua et al., 2024). As the global economy continues to grapple with the challenges of climate change, the integration of climate considerations into financial decision-making processes will remain a key focus for investors, policymakers, and market participants alike.

Implications for Financial Institutions and Investors

As climate-related hazards grow in complexity and impact, financial institutions and investors must adapt their strategies to remain resilient while seizing emerging opportunities. The dual challenges of managing physical and transition requires a paradigm shift in institutional operations, investment portfolios, and overall financial strategies. Climate risks pose significant challenges to the resilience and risk management practices of financial institutions. These organizations must integrate advanced risk assessment frameworks, incorporating climate models alongside traditional financial models to account for the unpredictable and often compounding nature of climate impacts. Regulatory requirements, such as climate stress testing introduced by institutions like the Bank of England, further emphasize the need for robust preparedness. These stress tests push institutions to evaluate their exposure to various climate scenarios and develop strategies to mitigate vulnerabilities, ultimately reshaping institutional operations.

In lending practices, financial institutions face heightened default risks from borrowers in climate-sensitive industries, such as agriculture and manufacturing. Borrowers, exposed to severed climate impacts, including droughts and supply chain disruptions, are increasingly viewed as high-risk unless they adopt effective mitigation strategies. As a result, many financial institutions are pivoting towards green lending practices, including sustainability-linked loans and other financial products incentivizing low-carbon projects. These shifts not only minimize institutional risk but also align with broader goals of promoting a sustainable economic transition. On the other hand, the insurance industry, a critical component of financial institutions, is directly affected by physical climate risks. Rising occurrences of extreme weather events, such as floods and hurricanes, have led to escalating insurance premiums and, in some cases, the withdrawal of coverage for high-risk properties or industries. For instance, real estate in flood-prone regions is becoming increasingly uninsurable, pushing insurers to innovate through products such as parametric insurance, which provides predefined payouts based on event triggers, or by integrating climate models for more precise risk assessment.

Additionally, Investment portfolios are also undergoing transformation as institutions realign their asset allocations to mitigate climate risks. Portfolio managers are divesting from high-risk assets, such as fossil fuel investments, while reallocating funds towards green alternatives like renewable energy projects. Incorporating ESG (Environmental, Social, and Governance) criteria into investment mandates has become a common practice, enabling institutions to manage climate risks proactively while aligning with the expectations of environmentally conscious stakeholders (Stocker & Qin, 2013).

Climate risks are profoundly reshaping investor strategies, with a growing focus on sustainable finance products. Investors are increasingly channeling their resources into green bonds, climate-focused mutual funds, and renewable energy investments. The rising popularity of passive ESG-aligned ETFs further underscores this shift, as these funds allow investors to balance their financial objectives with environmental considerations. Innovations such as carbon-offset initiatives embedded within investment products also offer avenues for investors to actively contribute to climate mitigation efforts. Market trends indicate a growing demand for transparency in how companies address climate risks. Investors now prioritize companies that excel in sustainability reporting and climate risk disclosures, rewarding those with strong climate leadership through increased market valuation and stock performance. This trend drives corporate behavior, pushing organizations to adopt environmentally responsible practices and integrate sustainability into their operational strategies.

Technology is playing a pivotal role in enabling investors to assess climate risks and opportunities more accurately. Advanced tools, including AI and big data analytics, allow for real-time evaluation of climate impacts, enhancing decision-making processes. Innovations such as carbon footprint calculators and climate-risk scoring tools provide granular insights, enabling investors to align their portfolios with both financial returns and sustainability objectives. These technological advancements are not only streamlining investment evaluations but are also reshaping the way investors perceive and manage climate-related risks.

Adapting to climate-related risks and opportunities requires both financial institutions and investors to innovate and align their strategies with evolving market dynamics. Institutions must develop robust frameworks to integrate climate considerations into risk management and operations, while investors increasingly prioritize sustainability in their decision-making. Together, these shifts are not only mitigating risks but also unlocking opportunities for long-term resilience and growth in a rapidly changing global economy.

4. Limitations:

While this study provides valuable insights into the intersection of climate risks and financial markets, it is subject to several limitations inherent to both the scope of the research and the

chosen methodology. The chosen methodology, a narrative literature review, allows for a broad synthesis of existing knowledge but lacks the structured rigor of systematic reviews. The selection of sources was conducted using a developed process and framework, designed to ensure the relevance and theoretical contribution of the included studies. This framework facilitated a structured approach to identifying and categorizing literature. However, as it was not based on a predefined external protocol, there remains a possibility of selection bias (Baumeister, 1997).

Another limitation stems from the generalizability of the findings. While this study draws upon diverse research covering multiple aspects of climate risks and financial markets, the absence of empirical validation makes it difficult to determine the extent to which these conclusions apply across different sectors and geographical contexts (Battiston, Dafermos, & Monasterolo, 2021). Climate finance is an evolving field, and given the rapid pace of regulatory and market developments, the literature reviewed may not fully reflect the most recent shift in financial policies, investor sentiment, and risk assessment methodologies. Furthermore, while theoretical frameworks provide a structured lens for understanding climate hazards, they do not offer measurable indicators of financial disruptions or asset price fluctuations caused by climate-related events. Additionally, the relatively recent recognition of climate risks as systemic financial threats has resulted in limited historical data, posing challenges for long-term analysis and predictive modeling.

The geographical and sectoral scope of the literature represents crucial constraints. A significant portion of existing research is centered on developed economies, particularly Europe and North America, where regulatory frameworks and financial markets are more advanced. Therefore, this focus may overlook the vulnerabilities of emerging markets and lower-income countries, which often face disproportionate climate risks while lacking the financial infrastructure and institutional capacity for effective mitigation. Additionally, while this review provides an overview of key sectors affected by climate risks; it does not offer an in-depth analysis of industry-specific impacts, particularly in sectors such as insurance, energy, and agriculture, where climate risks have the most pronounced financial consequences.

A further challenge lies in regulatory and policy uncertainties. One of the key issues in climate finance is the lack of standardized climate risk metrics, leading to inconsistencies in financial risk assessments and ESG reporting frameworks (Broeders et al., 2023). The absence of harmonized disclosure requirements across jurisdictions complicates market responses to climate-related financial risks, making it difficult for investors and institutions to assess exposure accurately. Additionally, as climate-related financial policies are still evolving, regulatory changes such as carbon pricing and mandatory disclosure rules introduce market volatility and uncertainty, which further complicates financial decision-making (Saguato, 2023).

Facing these limitations future studies should aim to incorporate empirical methodologies, such as stress testing, to quantify the financial impact of climate risks with greater precision. Further research is also needed to expand the geographical scope of climate finance studies, particularly in regions most vulnerable to climate hazards, to develop adaptation strategies tailored to diverse economic contexts. Moreover, greater efforts should be directed towards harmonizing climate risk assessment frameworks to ensure consistency in financial disclosures and risk management practices. By acknowledging these challenges, this study contributes to the ongoing discourse on climate finance and serves as a foundation for future empirical research aimed at strengthening financial resilience in the face of climate-related risks.

5. Conclusion:

This study has explored the intricate relationship between climate risks and financial markets,

as well as the growing significance of climate-related factors in shaping financial stability. Through a comprehensive narrative literature review, this paper has synthesized findings from various disciplines, offering a holistic perspective on how climate risks manifest in financial markets and the broader economic landscape. The classification of climate risks into physical and transition risks has provided a structured framework for analyzing their financial implications, emphasizing the need for proactive risk management strategies and adaptive regulatory approaches (Krueger, Sautner & Starks, 2022).

One of the key takeaways from this study is the increasing integration of climate risks into financial decision-making processes. Institutional investors, financial intermediaries, and regulatory bodies are progressively embedding tools and systems such as Environmental; Social; and Governance (ESG) considerations into their risk assessment models, reflecting a paradigm shift towards sustainable finance (Edmans & Kacperczyk, 2022). Moreover, the pricing of climate risks in equity and bond markets underscores the evolving market perception of sustainability-linked financial instruments, demonstrating the financial sector's role in driving climate resilience (Broeders et al., 2023).

The study also highlights the dual challenge and opportunity presented by climate risks. While climate hazards introduce significant uncertainties into financial markets, they also open new avenues for sustainable investments, green finance, and climate-conscious portfolio management (Bressan, Monasterolo, & Battiston, 2022). The emergence of innovative financial instruments, such as green bonds, ESG-linked derivatives, and sustainability-linked loans, reflects the growing demand for climate-aligned financial solutions (Saguato, 2023). These developments reinforce the financial sector's role in fostering a transition towards a low-carbon economy while mitigating systemic risks posed by climate change.

Despite these advancements, the findings underscore critical gaps in existing research, particularly concerning the empirical validation of climate risk assessment models and their applicability across different financial sectors and geographical contexts. The interdisciplinary nature of climate finance requires more cross-sectoral collaborations and methodological innovations to enhance the robustness of climate risk modeling (Battiston, Dafermos, & Monasterolo, 2021). Additionally, the unpredictability of climate hazards and the limitations of historical financial data pose challenges in accurately forecasting climate-related financial risks, emphasizing the need for dynamic and adaptive financial models (Ojea Ferreiro et al., 2022). From a policy perspective, this research underscores the importance of strengthening regulatory frameworks to enhance transparency and accountability in climate-related financial disclosures. Regulatory frameworks such as the Task Force on Climate-Related Financial Disclosure (TCFD) and the European Green deal set important precedents for integrating climate considerations into financial consideration into financial regulation (Leale-Green & Cabrer, 2023). However, further standardization of climate-related reporting and risk assessment methodologies is required to ensure consistency across financial institutions and jurisdictions (Faccini, Matin, & Skiadopoulos; 2024).

This study contributes to the ongoing discourse on climate finance by providing a structured synthesis of existing literature, identifying key research gaps, and proposing avenues for future inquiry. The findings serve as a theoretical foundation for advancing empirical research on climate-related financial risks on financial stability, and exploring the effectiveness of various mitigation strategies across different financial markets.

To conclude, as climate risks continue to reshape the financial landscape, the urgency of integrating climate considerations into financial decision-making cannot be overstated. By enhancing risk-assessment methodologies, strengthening regulatory oversight, and promoting sustainable investment practices, financial markets can play a pivotal role in addressing climate-related vulnerabilities while fostering long-term economic resilience. The insights presented in this study not only contribute to the theoretical understanding of climate finance but also offer

practical implications for policymakers, investors, and financial institutions navigating the complexities of climate-related financial risks.

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