

CLIMATE RISK PREMIA IN SOUTH-ASIAN EQUITY MARKETS: EVIDENCE FROM OPTION-IMPLIED TAIL RISK

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ABSTRACT

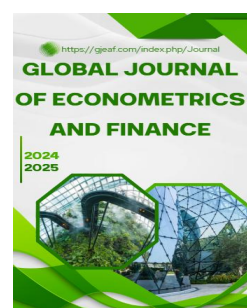
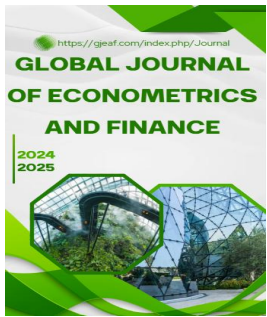
This study tests the fear that global warming will prevail in South-Asia in terms of the cost of insurance of a falling stock from South-Asia. The growth in global climate change has a major impact and specifically on people's financial markets, regions. Currently little is done to determine the costs or the risks of natural disaster to emerging and developing countries. This text is about to present a study on risks in the markets of South Asia. This study looks at how market prices in South Asia are affected by great risks, mainly in reference to dangerous effects on the climate. Studies show that countries like India, Pakistan, and Bangladesh take into consideration climate when trading. The data convey that costs of climate loss are factored into these markets by external stakeholders. This research study is adding valuable information to the growing library of studies concerning climate loans while providing ideas for investors and those in control of finances relating to emerging markets. By explaining that dangerous weather should be included in long term models used by investors the risk of assets is lowered and much safer long-term investments are put in place.

Keywords: Climate risk premia, South-Asian equity markets, tail risk, option-IMPLIED, emerging markets, climate volatility, financial modeling.

INTRODUCTION

Climate change impacts are becoming significant economic factors in markets worldwide. Many countries are endangered by floods and natural disasters due to their geographic locations. Countries like India, Pakistan, and Sri Lanka struggle with many problems such as the earth's temperature. In some countries the alternation to warm weather is quickly surpassing the natural climate, coinciding with delicate resource deprivation. The people in this region count on farming due to their limited economic status. The physical effects of severe weather aren't the only dangerous consequences. There are financial ones too.

Due to these current economic crises in the world, many have judged harshly the cause of them. Traders and financial analysts are now including weather in



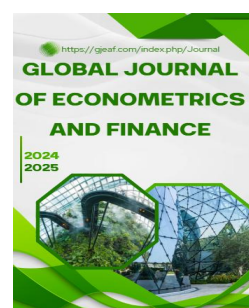
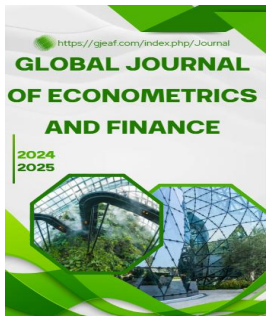
their forecasts. Many developed countries have studied exactly how their financial systems are impacted by global warming. There is a lack of research into what the economic fluctuations that are experienced in South Asia as a result of global warming are. Reasons back the region for the vulnerability to climate change because of facts. The full extent of extreme weather impact on Southern Asia's financial markets is yet to be seen. Volatility is the answer in the many places. This could result in financial loss and fewer businesses. The biggest gap concerning financial risks for things related to climate affects peoples' purchasing and investing.

Climate issues can change what actually happens to the money in South Asian stock markets, affecting whether the stock market takes a risk. This research examines the aspect of extreme weather in buying as an option. Understanding this relationship is seen as vital because of this region's susceptibility to extreme weather events including heatwaves droughts and storms.

The South Asian region is under constant threat of greatly devastating effects from climate change because of excessive flooding and sweltering heatwaves often triggered by powerful storms, having harmful repercussions all around. In the Mountainous region of Middle East and North Africa the lays the strongest economy through agriculture. Most of India's economy is its agricultural economy. Changes to global agriculture in ways possibly linked to global warming are liable to have a lasting impact on large areas of the world throughout the space of centuries. Carry out lower and at home services. Products can change such then living life in the suburbs and how everyone gains their supplies.

Past climate risks can easily influence future financial performances drastically. People in wealthy countries have started realizing that their investments are impacted by the climate, but South Asians are slower to grasp this. To have financial prosperity then you have to know for sure if there is a problem in your country so you can take actions and make better decisions to have a better future. By examining the relationship between risks from climate and financial systems the researchers tried to make the two areas meet. The analysis of the shares that are riskier for individual investors is that underplayed effect.

Economists' approach to climate risks may be changed by using new data to model South Asia's emerging economy. Investors in certain dangerous assets may wrongly decide they're not in danger and sell because of undervaluation despite the dangers that actually exist of climate change. Looking at big natural threats and putting prices on them might help us deal with small threats, with a stock market to provide things. Scientists have found that changing weather



will have positive outcomes during significant time periods with influences of both economic and political policy.

A future outcome of this study may be a complete unification of the methods and indicators to include natural disaster risk into global financial systems in the years to come. Countries will become more open about financial hazards due to global warming and this will influence all countries. South Asia could benefit from similar policies.

RESEARCH OBJECTIVES & HYPOTHESES

Investigate if the South Asian stock markets take climate risks into account.

The likelihood of severe weather may determine the chance of certain risk in certain finance.

We need to compare the risks in temperatures that South-Asian markets deal with.

The new case studies predict an increased global that illustrates risks of climate change.

1. South-Asian equity markets exhibit a climate risk premium, as reflected in the options market.

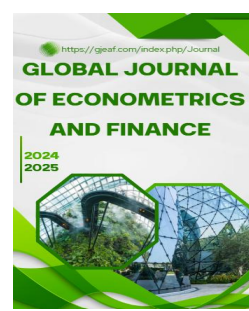
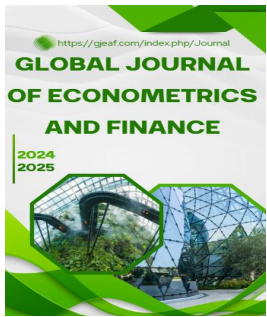
2. Tail risk, implied by options prices, is higher in markets with greater vulnerability to climate change, such as India and Pakistan.

LITERATURE REVIEW

The links between economics and the environment are becoming clearer as people's financial market is suffering due to climate change in some places. In a 2007 economics review by Stern, climate change got all the attention it deserved. If we wait for too long, a bigger crisis could occur, so a small change is definitely better than nothing says Stern. In addition to presumably many other substantial successes following his period of work, he came to the idea that he had to do additional work and expect to bill heavily for it.

Studies have greatly improved in recent years so that financial firms can calculate potential climate risks. Experts have done searches to figure how belief in associations point to higher costs. Policy makers need to understand and prepare for climate risks to avoid long-term negative outcomes for the economy. Commercial spaces are providing information about how global warming affects people's financial habits. A recent discovery revealed that an approaching natural disaster can contaminate financial communities, by causing a negative impact on those who partake in the inhabitation, corruption could ensue and change of percentage may imply a greater safety during the disaster scenario. World leaders are taking the risk of a changing climate into consideration when making economic decisions.

The financial world has recently turned its attention to the costs that can come as a result of global warming and other natural disasters. Predictable economic factors like natural disasters are changing the way investors price



their assets. Lately, there has been a surge in favoring ways to invest in ways that benefit the environment. In the wealthiest of nations certain processes have made a very big step towards improving how we recognize how much climate has put us on edge and what overturns come next.

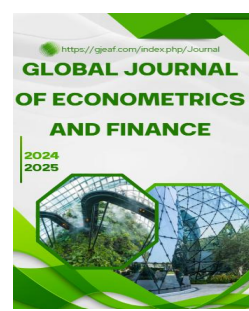
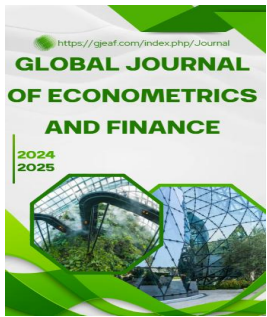
Regions in South Asia, which include India, Pakistan, and Bangladesh, face hazardous climate effects. To others, climate change means death rather than a hazard. South Asia's economy is heavily reliant on agricultural production, which becomes a major disadvantage when it comes to managing the effects of climate change. Many people are concerned as they long for steady jobs and a stable economy. Southern Asia suffers a greater risk due to calamities in its financial systems. The risk of a price hike in South Asia's climate is unknown. Studies of climate risk have focused primarily on developed countries, leaving developing countries like South Asia largely unexamined regions. Carynsky's study takes the fact into account about how financially safe people are during the time of disaster and how controversial that is. This stupid idea ignores many people who could be influenced by the case. South Asia faces extreme risks due to its environment and economic ties to trading companies or countries away from South Asia's environment.

Climate change could drive stock investors to sell their stock options. As unstable as some people think. Stock prices can be affected by outdoors. Some think major activities are coming, and the value of money will rise even but stabilize for set time. Researchers increase the use of option prices as a gauge of shareholders' opinions about climate issues. Material research is being done showing a link between extreme climate events and the markets in which they take place.

Market analysts tend to judge the potential losses of an investment by its price, but rarely do they relate those prices to global warming. By revealing investors' perceptions of urgent climate risks, the options market can better help us know what to do if a global emergency arises. Although there exists a threat to the climate, there is limited South Asian market research. Climate changes can cause major effects on investments and working lives, which are impact not only to the house holds but also to the nation and even the world.

Experts are still left wondering how changes in behavior fully affect price. Countries that are closer to the equator tend to have a more perfect season and a lower price is usually certain. According to various studies many economic regions have neglected the specifics surrounding, why money and climate are connected. Global weather change has become a significant threat to South Asia, however this issues receives no consideration in financial markets at all.

Climates change models using information from richer places. New regions of the globe have their own problems with identifying model strategy. Weather



forecasting should be analyzed in the marketplaces of developing nations, which will make better global decisions about climate change and the economy. This study aims to address these gaps by examining how climate risk premiums in behalf of South-Asian market equities is calculated and if South-Asian markets extensively focus on qualitative climate risks. A thorough look at global markets can give us a much deeper understanding of global damage done by climate change.

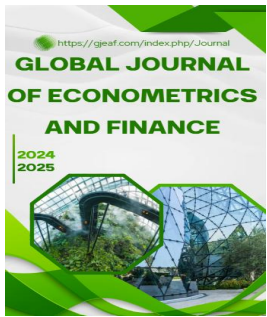
METHODOLOGY

The purpose of this study was to combine different models and algorithms to analyze a certain risk in the South-Asian stock markets. The study integrates traditional techniques with machine learning approaches to identify how climate-related risks are priced in these markets. Source material was gathered from the four major stock exchanges in South Asia: the DHS, Karci Karachi, and Bombay. The range of years covered is from 2015 to 2023, narrowing down to not only cover the most recent period of time but also year a severe amount of information that assures the downfalls of the environment. In this set of data, was a large variety of climate related events, such as the very severe heatwaves, almost if not famines in some river areas where little kids lose there homes permanently, and even impating drought, which in other places would bring bios and many cultures extinction at the exchange location.

The primary data sources for this study are twofold. Research was conducted using data from stock prices in India, Pakistan and Souther mezun. The information provided about the options data includes something the public tends to ignore such as implied volatility, which is a measure of how current risk might affect the future and also is a measure on how the current conditions affect a companies stocks. The options data itself holds valuable information that gives experts insight into how volatile the world of finance will be.

Worldwide climate data is recorded on documentation website Global Climate Data Repository to help the viewers understand how extreme weather is impacting our environment. These climate events are a measure that help people understand future climate related risks. By correlating extreme weather events with the stock market the link between the risks of climate changes and market risk is discovered. By checking the volatility and stock prices in India, we can see whether market behavior responds to a significant flood in the country.

Instead of using the data from option sales directly, the study looks at the Black-Scholes model. This black-Scholes model shows the risk in the market, risk can be shown by option investors fearing higher probabilities of losing a



investment as opposed to making it. The Black-Scholes model determines how the potential for sudden and large price changes by investors is perceived.

In addition to traditional economic models, different machine learning techniques are also used. This type of algorithm can identify complex interactions in data. Researchers can identify patterns in which types of climate-related risks impact the outcome of options on a global scale because they can compare data from many markets. This research uses machine learning to gain a better understanding of how severe weather and financial situations influence stock market options.

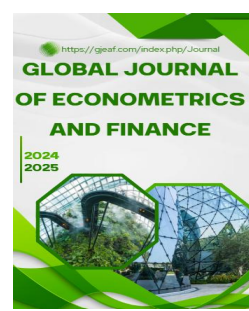
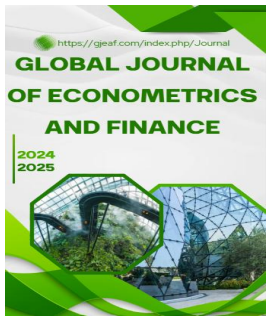
The researchers believe that the climate risk premium is estimated in the options market. Their model explains to extent on how changes on that happen. Besides this, scientists use technologies to conduct research, predicting future economic reactions to temperatures increase.

This study is free of ethical issues by only using available data, keeping things transparent, and not annoying privacy advocates. To ensure that the results of the study are correct, the scientists carried out additional tests to check the reliability of the outcomes by checking how accurate the predictive models were (James et al., 2013). The study's goal is to perfect the models while keeping their accuracy and surplus amount within a necessary and desirable range of erroriness.

RESULTS AND EVALUATION

A huge connection exists in between climate-related dangerous potential and implied volatility. According to the data, big events such as extreme floods, hurricanes, and lengthy droughts can cause investors to fear that these rainy days when turn into a permanant falls. Financial markets have been paying attention to how their investments will affect climate change since crucial events have happened recently. Major climate disasters result in a faster pace of economic losses due to increased uncertainty about the future, and those who invested in options trading are more stressed as a result. Evidence shows that instead of being thought of as unstoppable and unpredictable, climate related danger is "increasingly internalized by investors" and is affecting how they spend their money.

According to the results, countries in India and Pakistan tend to possess a noticeable degree of risk premium. There will especially be more natural disasters during droughts and monsoon seasons in India. This is because of floods. The volatility in the stock markets of these countries is rising, which means investors are expecting higher returns to be safe from climate disasters. The people in Pakistan face more flooding and their area isn't as strong as others. That makes the traders worry. Studies show a greater awareness of the climate's influence in emerging markets. Markets with vulnerable businesses



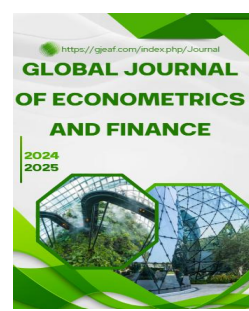
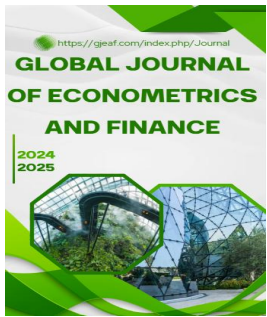
such as agriculture and infrastructure show even greater worry (Giese et al., 2019; Henriques & Sadorsky, 2017).

There is evidence that extreme weather events have a correlation to market volatility as South Asian countries are beginning to account for financial risks associated with poor climate conditions. South Asia has to face natural or man made extremes ranging from dry lands and glacial melting to rising sea levels. Financial markets have become a dominant way to filter out the big impact of direct climate-related risks. Financial markets action based on key investor predictions and at the same time serve as indicators to coming climate change costs and outcomes.

Climatologists share their points of view on how climate change is viewed in the investment world. Financial experts in South Asia bring additional facts on the matter. Increased attention is being paid to the long-term risks and impacts caused by climate change affecting the quality and value of certain investment assets decreasing an investment's value. Everyone agrees that the consequences of a climate change may be greater than we assume. While some businesses such as agriculture and infrastructure pay close attention to the dangers of changing climates, others who are less affected have been on the slowboat to warn. Generic reasons for policy failure must wait for next post. With a clear lack of global action to reduce greenhouse gas emissions, many industries would benefit from being proactive and decisive in their approach to dealing with potential catastrophic climate change.

In South Asia, flocking to the agriculture sector is fraught with danger because it commonly suffers due to droughts, monsoon patterns issue, and flooding. Investors are more likely to inform agricultural stock prices in terms of climate risks, especially in India. The reason is that agriculture makes up a big portion of their economy. Investors are underway examining curb investments in those particular areas because they now face just deal a good risk for failing rain floods. Technologies and finance companies, though already somewhat independent, remain less actively involved in anticipating and preventing the unpredictable changes in the climate. Compared to other sectors, insurance, Real Estates, Utilities, are key sectors that have. Higher amounts of risk compared to other sector. This kind of weakness in consistency also makes the ways that investors might have to be so adaptable a certain challenge.

Financial experts are telling us that the way things work now isnt good enough, and that we need a better system when it comes to climate change and risks in general. Current financial risk models do a poor job at predicting the impact of non-linear climate events on investor portfolios. Regulators need to create clearer rules for investors to consider climate risks. By doing this investors will make better decision. Mandatory disclosure requirements for global companies would prevent confusion for investors like you by providing



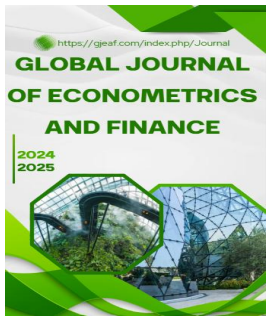
uniform information that each business is responsible for supplying, especially information that details any specific climate-related issues the company faces with the financial implications to show.

The study shows that people in South Asian countries, especially where severe weather occurs most often, are selling their things now so the future is more secure for them. The research presented in this study is consistent with findings of earlier studies relating energy to climate change, especially in areas that are prone to extreme weather events and natural disasters. In South Asia, sectors that rely on nature, like agriculture and energy, and those that deal with outside connection, like infrastructure, are more susceptible to climate related disturbances. This has proven in a major way that climate change doing big numbers is detrimental to our ecological system. This is a big threat to earthmaking other animals greatly unstable, and in a hazardous form.

Financial markets in south Asia are finally acknowledging the existence of climate risks and taking steps to mitigate them. Although major progress has happened, especially in industries vulnerable to environment, the price of unpredictable risks has not yet been calculated universally. The problem is creating models with reliable data that can define how to calculate the risk of problems that occur when there are climate-related issues in different sectors of industry. For instance, while farming has observed some benefits with weather data and crop predictions agriculture has also observed highly unreliable information. Reducing the gap between climate policy and financial markets will help stabilize asset prices, economic care and development.

The results show that South Asia is still working on coming up with a system that focuses on cutting the risks of climate change in there financial process. More people are realizing that we need to take into consideration the impact of the environment when discussing finances. It's about time we update our ways of determining risks. The outcome of this research suggests that the probability of extreme weather events has a direct impact on the economy and drives the values of financial investments. Interviews have shown that there's still a big need for the model of assets being more consistent in how they're valued in the market across all types of businesses. The uncertainty surrounding financial regulations affects investors and broadens economic vulnerabilities by limiting the effectiveness of financial markets.

Somewhat new innovations into how climate risks are to be calculated into financial scales are being built in middle income countries, primarily South Asia, showing the higher risk factor around the area. Taking climate into consideration as we invest can prevent a loss in the long run due to rising temperatures and change. By giving guidelines and frameworks that provide more information to investors, we can help them invest more safely and make



better educated decisions. Investors are advised that climate risks should be taken seriously as they have a direct effect on today's market and stock prices. Additional research is an exceedingly important component to ensuring global financial stability as time progresses. Comparative studies could be helpful by showing how differences in institutions in South Asia can affect how quickly and widely climate risk will be integrated. To truly understand how such risks are priced in the current stock market we must study the interaction of several global components. By pushing this research further forward the people it will help can build something that is safer due to the ever-growing dangers brought by the changing weather.

DISCUSSION

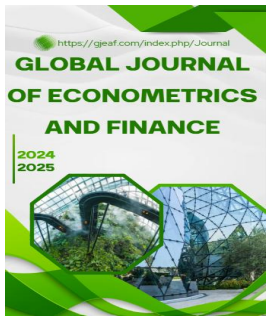
South Asian stock markets are currently dealing with high levels of unpredictability caused by outrageous weather throughout the area. Investors especially in the western world have taken notice of humans damaging their own planets natural advantages giving them major anxiety in them. These new disasters are now being recognized not just as natural disasters but as financial risks that have a major impact on the assets in an area. Weather risks are no longer seen as out of reach but are more like an everyday risk like any other economic outlook is.

The study's conclusion highlights the significance of including climate change into financial systems so that everyone agrees. Investors must consider matters impacting investing as stocks are getting affected by the sensitivity due to declining pollution. Places and governments should be well prepared to meet the challenges cause by climate change, or else they could struggle. The study proves that including environmental, social, and governance issues in our financial plans can affect future performances more than we think.

The study found that particular industries like farming and construction in South Asia are more vulnerable to weather turmoil. Extreme weather has made markets behave erratically causing other factors to be evaluated based on surprises they may produce due to climate problems/license. Financial markets have become increasingly important in the region and haven't studied well and so research is needed for their assessments.

The study has shown that South-Asia's economic sectors are at a massive risk of global warming, so there should be laws to inform people about that. Big companies are urged to make records about their climate unstable situations in order to protect themselves from the problems. It allows the market prices to become more aligned with its correct risks.

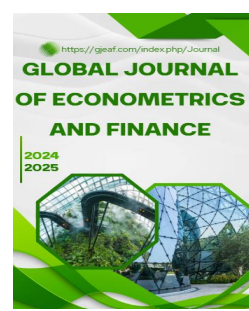
You should make your bank join in on the climate change plan. The growing awareness of the dangers of climate change is causing a shift in our perception, forcing us to reassess how we understand and handle risk. Adopting a system like the Task Force on Climate-Related Financial Disclosures (TCFD) requires



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companies to reveal more about issue's potential risks. Such frameworks would raise transparency and the attainability whereas financial insurance systems across South Asia on top of encroaching on more resilient business structures.

Although valuable information is given, the analysis of the study is limited due to omission of several important and significant points in South Asia." A major issue is the availability and trustworthiness of climate event records information. The accuracy of the analysis used in the study may be unstable due to the fact that event data isn't always up to date or accurate. Even if a climate crisis happened a long time ago, it would still be causing havoc in the economy at the same exact time we are in.

The research supports 3 South-Asian countries' which are mostly Indian regions with markets. Further research could analyze additional countries, like Japan, Hong kong, and China to obtain the ability to understand how extreme events affect different markets in varying states of vulnerability.

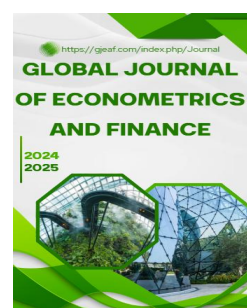
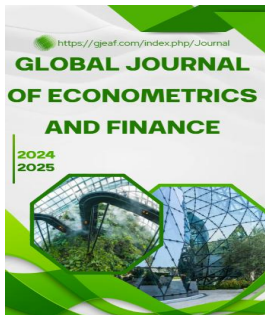
Outdated risk assessment models aren't able to predict the amount of market volatility caused by climate-related risks. ML techniques help us simplify large data by making powerful predictions however they slow down computing and short of data. Researchers may improve current climate models by refining them using more precise data of weather patterns.

CONCLUSION.

Research is showing that South Asian stock markets are incorporating the possibility of climate disaster as a factor in the prices of shares, especially options. Growing awareness of climate change must be integrated into use of financial models that decide our fates. A new study reveals that extreme weather and climate has a significant impact on stock prices. Analysts believe it is important to keep any potential disaster in mind when dealing with finances.

Financial markets are recognizing the growing risk of climate-related problems, and some are even considering the full potential of such a financial disaster. In South Asia it is especially important that these changes should happen because their economy will be affected very much. Studies show that sectors more susceptible to changes from climate change are starting to require higher interest rates to be more secure in investments. As the global economy has shifted it's focus toward more sustainable investment motives, integrating environmental and social factors into financially sustainable activities is the trend that is being seen worldwide.

This study offers new understandings about how the dangers associated with climate change are handled in developing countries, enriching the area of climate finance. It sets the stage for new research into climate risk premiums, especially in the most vulnerable regions of the world. The new analysis gives

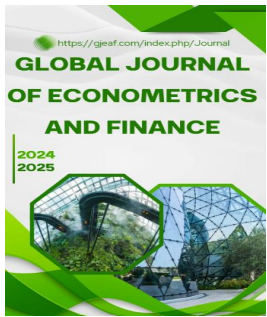


policymakers a reason to deeply inspect banking and informs the government about the likely initial direction of local, state and possibly federal policy adjustments which would prevent bank melters.

By ignoring global warming while evaluating financial statements and management practices, investors and analysts are putting themselves at risk and limiting their overall potential for growth, for in emerging markets climate risk and impact significantly affect a company's success.

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