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DYNAMICS OF GLOBAL ECONOMIC INFLATION AND TEMPERATURE ANOMALIES: A THEORETICAL-EXPERIMENTAL MODELING APPROACH

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Abstract. The intricate interplay between global economic inflation and global warming presents one of the most pressing challenges of our time. In this study, it is provided a comprehensive methodology via a new perspective looking for the interaction dynamics between the two variables, global average temperature anomaly and global inflation rate, are the researchers could not find or could hardly find directly correlated that shaping the future of our planet, considering economic data, global temperature records, technological advancements and various scenarios with the lean understanding approach. Through rigorous modeling, sensitivity analysis and data visualization, the study aims to shed light on the potential opportunities for to determine how temperature affects an inflation rate in the world and making a new discussion basis for the massive research.

Keywords: *Green Economics, global economic inflation, global temperature anomalies, sustainability, global economics.*

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1. Introduction

The intricate relationship between the global economy and the environment is a subject of significant academic scrutiny, demanding a comprehensive analysis. This intricate connection is rooted in the complex interplay between economic growth, environmental degradation and the potential risks of inflation. Economic expansion, often accompanied by increased consumption and heightened energy demands, leads to higher emissions of greenhouse gasses, predominantly carbon dioxide (CO_2), which makes a substantial contribution to global warming.

Furthermore, the process of economic growth, especially prevalent in developing economies, can raise the risk of inflation due to surging aggregate demand and the potential mismanagement of monetary policies. Simultaneously, global warming, characterized by extreme weather events and rising sea levels, poses severe threats to ecosystems and human well-being. The frequency and severity of extreme weather events, such as hurricanes, droughts and wildfires, are on the rise, while rising sea levels imperil coastal communities and their habitats.

To address these multifaceted challenges, the adoption of sustainable practices and green technologies is not merely advisable but essential. Sustainable practices encompass a broad array of strategies, ranging from optimizing resource utilization to embracing renewable energy sources. Similarly, green technologies encompass innovations in energy production, transportation and infrastructure designed to minimize environmental

impact. Significantly, the concept of the Green Tech Revolution embodies a forward-thinking paradigm where accelerated economic growth goes hand in hand with the widespread integration of sustainable technological advancements, offering a promising path to tackle these intricate issues while promoting both economic prosperity and ecological sustainability. Policymakers, scholars, and stakeholders must unite in collaborative efforts to navigate this complex terrain and secure a sustainable future that strikes a harmonious balance between economic growth and environmental preservation (IEA, 2023).

The nexus between the global economy and the environment is a subject of paramount importance in contemporary scholarship. Economic growth, conventionally accompanied by increased consumption and energy demand, is a pivotal driver of environmental change. This growth is invariably linked to heightened greenhouse gas emissions, which, in turn, fuel global warming and its dire consequences, including extreme weather events and rising sea levels, with severe repercussions for ecosystems and human well-being.

As a response to these escalating challenges, the adoption of sustainable practices and green technologies has emerged as an imperative. These encompass a spectrum of strategies, from resource efficiency to renewable energy adoption, aimed at mitigating the environmental toll of economic development. Hasanov and Safarli (2023) studied a new eco-design model leading to sustainable development in the example of a specific industrial area. In addition, Hasanov (2023) evaluated the sustainable development prospects of Azerbaijan's economy by analyzing the green energy sector.

At the forefront of this discourse stands the Green Tech Revolution, a visionary scenario where rapid economic growth coincides with widespread integration of sustainable technologies. This revolution not only facilitates economic prosperity but also effectively counters the adverse effects of climate change, marking a pivotal shift from fossil fuel reliance to sustainable energy sources.

This transformation promises a plethora of benefits, including the creation of green markets, job opportunities and research and development incentives. Furthermore, it aligns with global climate agreements like the Paris Agreement by significantly reducing greenhouse gas emissions. In conclusion, comprehending the intricate connection between the global economy and the environment underscores the urgency of adopting sustainable measures and embracing the Green Tech Revolution as an essential pathway toward a sustainable future that reconciles economic growth with environmental stewardship. Policymakers and scholars must work collaboratively to navigate this complex terrain and secure a sustainable and prosperous future for humanity.

2. Theoretical Background and Data Collection

The field of theoretical research on the interplay between global temperature anomalies and economic inflation is notably lacking in comprehensive analysis. This study seeks to bridge this gap by employing rigorous theoretical methodologies to enhance our understanding of their intricate relationship, aiming to inform more effective policy decisions and strategies. Makkonen et al. (2021) explores the dynamic influence of temperature anomalies and macroeconomic factors on agricultural commodity futures returns, revealing significant effects in extreme market conditions. Agricultural futures returns respond positively to stock returns and negatively to exchange rate changes, with varying impacts across quantiles, while economic activities and uncertainty measures

have limited influence. By the using a Structural Auto-Regression (SVAR) model Iliyasu et al. (2023) demonstrate that climate change has adverse effects on real output and leads to increased food and consumer prices in Egypt, Nigeria and South Africa, with South Africa and Nigeria being the most affected, highlighting the potential for effective emission reduction measures to foster economic growth and combat inflation, thus providing valuable insights for central banks striving to achieve price and output stability. Galloppo et al. (2023) investigate the impact of the new European Climate Benchmark on investor portfolios, particularly when investing in stocks with specific emission-oriented criteria and finds that pursuing high sustainability values does not necessarily lead to inferior financial performance, offering potential compatibility between ethical investments and financial returns. In the context of Europe, Bytiqy et al. (2023) explore the reciprocal relationship between green finance and green economy, discovering a positive and mutually reinforcing connection that emphasizes the significance of policy initiatives promoting environmental investments, sustainable economic growth, international collaboration and the expansion of green finance to simultaneously advance ecological preservation and economic prosperity for both current and future generations.

It is essential to acknowledge the limitations of this study, including its reliance on a single econometric model, which means that the findings are contingent upon the assumptions embedded within that specific model. To facilitate a thorough analysis, we meticulously collected economic data, specifically the Inflation Rate and temperature records data from the Global Land-Ocean Temperature Index, covering the period from 2000 to 2020. These datasets were sourced from well-established and credible repositories, including the World Bank's World Development Indicators (WDI) database and NASA, among others, to ensure data quality and reliability.

3. Methodology

Greenhouse gas emissions, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and fluorinated gasses, trap heat in the Earth's atmosphere and contribute to the greenhouse effect. Global climate warming refers to the long-term increase in the Earth's average surface temperature due to the accumulation of these greenhouse gasses, leading to climate change and its associated impacts.

The global climate crisis represents the heightened urgency and severity of climate change impacts on a global scale. It encompasses extreme weather events, melting ice caps, sea-level rise, biodiversity loss and disruptions to ecosystems. Addressing the global climate crisis requires immediate and collective action to mitigate greenhouse gas emissions and adapt to changing environmental conditions.

Trying to develop an econometric model to analyze the relationship between global economic inflation and the global climate crisis. The model considers key variables from economic data, greenhouse gas emissions and technological advancements.

A statistical model for understanding the relationship between climate data and inflation rates, using linear regression, can be expressed mathematically as follows:

- Y represents the inflation rate;
- X_1 represents the temperature anomalies;
- X_2 represents the precipitation;

In this simple linear regression model, the relationship between climate data (temperature and precipitation) and the inflation rate is represented as:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\epsilon$$

Where:

- Y is the dependent variable (inflation rate);
- β_0 is the intercept (constant) term;
- β_1 is the coefficient for temperature;
- β_2 is the coefficient for precipitation;
- X_1 and X_2 are the independent variables (temperature and precipitation);
- ϵ represents the error term, which accounts for unexplained variance or randomness in the relationship.

The goal of linear regression is to estimate the values of the coefficients (β_0, β_1 and β_2) that best fit the observed data. Once the coefficients are estimated, you can use them to make predictions about the inflation rate based on new values of temperature and precipitation. The linear regression model allows you to quantify the impact of changes in temperature and precipitation on the inflation rate. For example, if β_1 is positive and statistically significant, it means that an increase in temperature is associated with a higher inflation rate, assuming all other factors remain constant. Similarly, if β_2 is positive and significant, it indicates that higher precipitation levels are associated with a higher inflation rate.

4. Results

4.1. Some scenarios for the Future

Scenario analysis helps to project potential outcomes based on different policy pathways and assumptions:

- Scenario 1. Business as Usual:

- Economic Outlook: Steady economic growth with moderate inflation rates.

- Climate Outlook: Continued rise in greenhouse gas emissions, exacerbating global warming.

- Scenario 2. Sustainable Transition:

- Economic Outlook: Balanced economic growth with sustainable practices.

- Climate Outlook: Investments in green technologies lead to a plateau and decline in emissions, mitigating global warming impacts.

- Scenario 3. Climate Crisis:

- Economic Outlook: Inflationary pressures from supply chain disruptions due to extreme weather events.

- Climate Outlook: Escalating greenhouse gas emissions worsen global warming, leading to severe climate-related disasters.

- Scenario 4. Green Tech Revolution (IRENA, 2023):

- Economic Outlook: Accelerated economic growth with sustainable technology advancements.

- Climate Outlook: Rapid reduction in emissions, averting the worst impacts of global warming (EDGAR, 2023).

The Green Tech Revolution is driving innovation and sustainable solutions to combat climate change and build a more environmentally conscious world. The importance of transitioning towards green, sustainable practices in response to the impacts of climate change and the COVID-19 pandemic, emphasizing the role of Green Innovative Technologies (GTI) and Internet of Things (IT) technologies. These

technologies, such as sensors in IT applications, are crucial for monitoring and improving environmental conditions and their implementation is a key step towards achieving the Sustainable Development Goals (SDGs) and Industrial Revolution 4.0 for a more environmentally balanced and sustainable future (Bradu *et al*., 2022).

4.2. Sensitivity Analysis

By varying the values of X_1, X_2, ϵ, β_0 ,β_1 and β_2 in the model, sensitivity analysis reveals the responsiveness of inflation to changes in aggregate demand and greenhouse gas emissions. This aids in understanding the model's robustness and the relative importance of different factors.

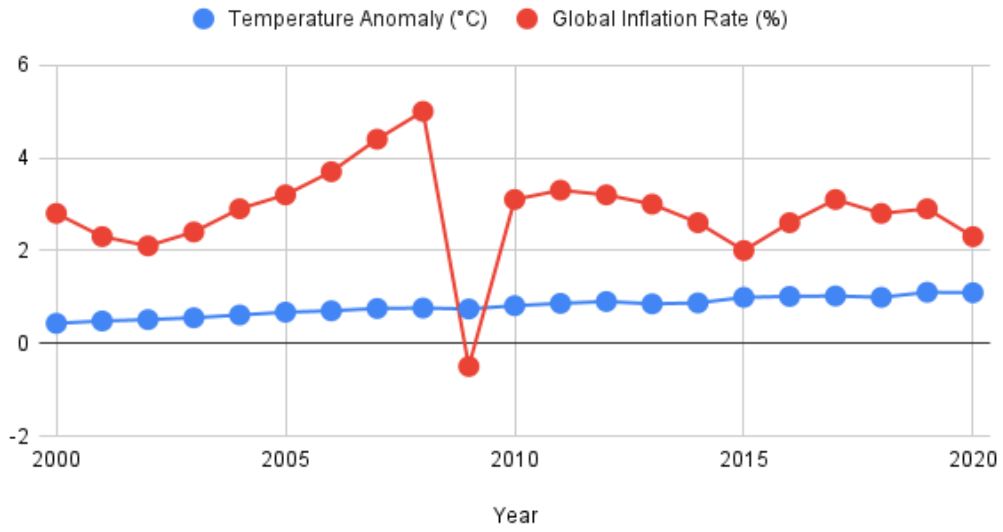
4.3. Data Visualization

The statement underscores the utilization of data visualization to depict temperature anomalies and global inflation rates from 2000 to 2020. This analytical approach allows for a comprehensive examination of both climate trends and economic stability during this critical two-decade period, facilitating potential insights into the interplay between environmental changes and economic fluctuations.

Table 1. Temperature Anomalies and Global Inflation Rates (2000-2020)
Source: IEA

Year	Temperature Anomaly (°C)	Global Inflation Rate (%)
2000	0.43	2.8
2001	0.48	2.3
2002	0.51	2.1
2003	0.55	2.4
2004	0.61	2.9
2005	0.67	3.2
2006	0.7	3.7
2007	0.75	4.4
2008	0.76	5
2009	0.74	-0.5
2010	0.81	3.1
2011	0.86	3.3
2012	0.9	3.2
2013	0.85	3
2014	0.87	2.6
2015	0.99	2
2016	1.01	2.6
2017	1.02	3.1
2018	0.99	2.8
2019	1.1	2.9
2020	1.09	2.3

An in-depth analysis of temperature anomalies and global inflation trends during the 2000-2020 period is paramount for gaining comprehensive insights into the intricate relationship between environmental shifts and economic developments. Examining temperature anomalies aids in understanding climate change patterns, while scrutinizing global inflation rates provides a macroeconomic perspective, allowing researchers and policymakers to explore potential connections between these critical factors for a more holistic understanding of sustainable development.



Graph 1. Exploration of Temperature Anomalies and Global Inflation Rates from 2000 to 2020.
Source: IEA

This illustration shows that both the global average temperature anomaly and the global inflation rate have increased steadily since 2000. However, the rate of increase in the global average temperature anomaly has been accelerating, while the rate of increase in the global inflation rate has been decelerating.

5. Recommendations

Amidst mounting environmental challenges, it is crucial for both policymakers and businesses to prioritize investments in green technologies and the transition toward sustainability. This transformation entails concerted efforts to reduce greenhouse gas emissions, address climate change impacts, promote economic growth and ensure societal equity. Investment in green technologies, such as renewables, energy efficiency and sustainable transportation, is essential for combating climate change, creating economic opportunities and enhancing resource efficiency. Effective and equitable climate policies, including emission reduction targets and carbon pricing, must be implemented accounting for the differential impacts on vulnerable communities. Additionally, international collaboration is imperative and deeper research is needed to understand the intricate relationship between global economic inflation and global warming, particularly in the context of diverse sectoral and regional impacts.

6. Conclusion

The intricate relationship between global economic inflation and global warming necessitates a proactive and integrated approach. Sustainable development emerges as a pivotal strategy, offering a comprehensive framework to harmonize economic prosperity with environmental preservation. Embracing sustainable development enables the charting of a course towards a future where these seemingly divergent objectives thrive in synergy, fostering a more equitable and sustainable global ecosystem.

Analysis highlights the pivotal role played by the adoption of sustainable practices and the integration of green technologies in addressing the adverse consequences stemming from inflation and climate change. Within this context, Scenario 4, commonly known as the Green Tech Revolution, emerges as the most desirable trajectory. It not only presents a compelling vision of sustained economic prosperity but also stands as a powerful testament to our commitment to safeguarding the environment for future generations.

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