



Environmental Impact of Bitcoin: An Analysis of Key Factors Driving Electricity Consumption

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Overview:



Bitcoin's Proof of Work (PoW) system requires significant energy. This paper investigates the factors driving its electricity consumption



- Hash rate
- Bitcoin price
- Rewards/ Halving events
- Mining difficulty



Why is it important ?

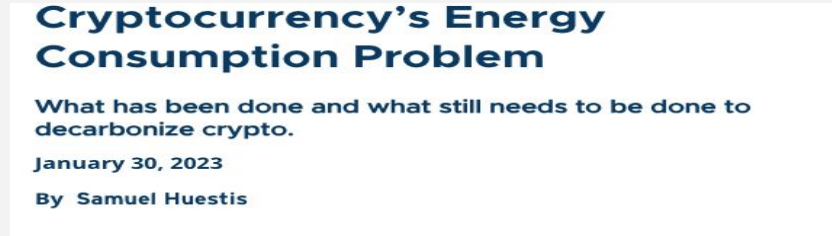
Crypto mining and data centers now account for



2%
Global electricity use

1%
Global greenhouse emissions.

& the footprint is growing...



Understanding what drives Bitcoin's electricity consumption can provide insights into potential strategies for energy optimization in blockchain technology



What has been done in this area already?

- Cambridge Centre for Alternative Finance and Digiconomist, have quantified Bitcoin's annual electricity consumption: based on average efficiency of commonly used mining hardware. [link](#)
- “Economic Estimation of Bitcoin Mining’s Climate Damages” (Jones, Goodkind, & Berrens, 2022): (i) rising climate damages per coin, (ii) periods where mining costs exceeded Bitcoin’s market price, and (iii) Bitcoin’s environmental cost relative to its market value. [link](#)



cont'd..

- Dynamic linkage of the bitcoin market and energy consumption: showing that hash rate and electricity demand drive fluctuating risk spillovers. [Link](#)
- Cryptocurrencies' hashrate and electricity consumption: cryptocurrency hashrate is positively correlated with electricity consumption for Bitcoin and Ether. [link](#)



Data and Sources

Electricity and carbon footprint

Annualized consumption
by [Cambridge Center for
Alternative finance.](#)

Hashrates

Bitcoin Network
Hashrate in Terahashes
per second by [YCharts](#)

Rewards and Halving Dates

Rewards and USD
equivalents from [bitcoin
visuals](#)

Bitcoin Prices

Daily prices and Volume
from [Yahoo Finance](#)

Difficulty

Average difficulty daily in
Trillion by [YCharts](#)



Analysis to conduct

Correlation Analysis

Measures the strength and direction of the relationship between two variables.

Regression Analysis

Quantifies how Bitcoin's variables individually impact its daily electricity consumption.

Causality testing

Determines whether one variable can predict or cause changes in another.

Vector Autoregression

Analyzes the interdependencies between multiple time series variables.

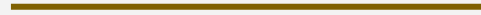
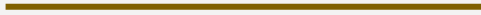


Questions answered with the Analysis

- How do changes in each factor affect Bitcoin's energy use over time?
- What are the most significant drivers of Bitcoin's electricity consumption?
- How do economic incentives like Bitcoin price and mining rewards influence energy demand?
- What is the combined effect of network and economic factors on long-term energy consumption trends?



Outline of Paper



Abstract

Summarizes the study's goal, methods, and implications for Bitcoin's environmental impact

Introduction

Introduces the environmental concerns around Bitcoin's energy use and states the research objectives.

Literature review

Reviews existing studies on Bitcoin's energy consumption, economic drivers, and policy discussions on sustainability.



Outline of Paper (cont'd)



Methodology

Details the data sources and analytical methods used to examine Bitcoin's electricity demand

Results

Presents the main results, identifying which factors most strongly influence electricity consumption.

References

Lists all cited sources, including research articles, data reports

Graphs/Figures

Provides visual support for key results, showing relationships and trends across the analyzed factors.



Timeline

Initial data
cleaning and
preprocessing

**Nov 14
-Nov 17**

Interpret results,
summarize findings,
Draft research paper

**Nov 28
-Dec 03**

Descriptive Stats,
Correlation Analysis,
Regression Analysis,
Causality tests

**Nov 18
-Nov 26**

Submit final paper,
Deliver final
presentation

**Dec 04
-Dec 10**

