

Cryptocurrency Yearly Market Analysis Database

Project Overview:

This project analyzes the real-time impact of the cryptocurrency market on global and national levels. This project is based on yearly data. It explores how crypto mining, ETFs, new investors and traders, and decentralized finance influence employment, the environment, and the economy. The study highlights both positive outcomes, such as job creation, financial inclusion, and innovation, and negative effects, such as energy consumption, financial risk, and regulatory challenges. Real-world examples include the USA, Canada, and El Salvador's adoption of Bitcoin, the rise of crypto-based freelancing, and increased global investment through crypto ETFs. It has also become a new financial weapon for some countries, as they use crypto for their strategic reserves. This project serves as a foundational tool for the crypto industry, bridging technical, financial, and regulatory domains to foster innovation, compliance, and market efficiency in real-time scenarios.

Tools & Data Sources Used in This Project:

- **Database Engine:** MySQL, MSSQL
- **Design Tools:** DB Diagram (for ER diagram), DataGrip (for schema diagram)
- **IDE:** DataGrip, SSMS (SQL Server Management Studio)
- **Data Sources:**
 - CoinMarketCap, Statista, Global Crypto Adoption Index, Chainalysis (historical crypto prices, market cap, dominance).
 - Cambridge Bitcoin Electricity Consumption Index (energy metrics).
 - FATF, IMF, World Bank reports, government publications (GDP, unemployment rates, education percentages, Global Crypto Regulations).
 - CryptoCompare (transaction fees, hash rate data).
 - Whattomine (historical hashrate, halving data)
 - Bitcoin Whitepaper, Ethereum documentation, project-specific whitepapers (Block Reward)
 - SEC Filings, Bloomberg, DTCC (ETF and Financial Firms)

Database Tables Overview:

1. BLOCKCHAIN_ACCESS_TYPE

- **Description:** Stores types of blockchain access (e.g., public, private) and their descriptions.
- **Attributes:**
 - TYPE (VARCHAR(200), PK, NOT NULL): Unique identifier for the access type.
 - DESCRIPTION (TEXT, NOT NULL): Explanation of the access type.
- **Normalization:** In 3NF. No partial or transitive dependencies; TYPE uniquely determines DESCRIPTION.
- **Cardinality:**
 - **1:N with CRYPTO (BLOCKCHAIN_ACCESS_TYPE):** One access type can be associated with multiple cryptocurrencies, ensuring standardized categorization.
- **Real-Time Usage:** Used to classify cryptocurrencies by access type for regulatory compliance and investor analysis in the crypto market.

2. BLOCKCHAIN_TOKEN_TYPE

- **Description:** Defines types of blockchain tokens (e.g., utility, security) with their descriptions.
- **Attributes:**
 - TYPE (VARCHAR(200), PK, NOT NULL): Unique token type identifier.
 - DESCRIPTION (TEXT, NOT NULL): Details about the token type.
- **Normalization:** In 3NF. No dependencies.
- **Cardinality:**
 - **1:N with CRYPTO (BLOCKCHAIN_TOKEN_TYPE):** One token type applies to multiple cryptocurrencies, ensuring consistent token classification.
- **Real-Time Usage:** Helps in token classification for tax purposes, risk assessment, and market trend analysis.

3. CONSENSUS_ALGORITHM_TYPE

- **Description:** Stores types of consensus algorithms (e.g., Proof of Work, Proof of Stake) with descriptions.
- **Attributes:**
 - TYPE (VARCHAR(200), PK, NOT NULL): Unique algorithm type identifier.
 - DESCRIPTION (TEXT, NOT NULL): Explanation of the algorithm.
- **Normalization:** In 3NF. No redundancy or dependencies.
- **Reason for Process Failure:** None. Simple and normalized.
- **Cardinality:**
 - 1:N with CRYPTO (CONSENSUS_ALGORITHM_TYPE): One algorithm type applies to multiple cryptocurrencies.
 - 1:N with HASH_ALGO_NAME (CONSENSUS_ALGORITHM_TYPE): One algorithm type can be linked to multiple hash algorithms.
- **Real-Time Usage:** Used to evaluate the security, scalability, and energy efficiency of cryptocurrencies based on their consensus mechanisms.

4. BLOCKCHAIN_NETWORK_TYPE

- **Description:** Categorizes blockchain network types (e.g., mainnet, testnet) with examples and features.
- **Attributes:**
 - TYPE (VARCHAR(200), PK, NOT NULL): Unique network type identifier.
 - DESCRIPTION (TEXT, NOT NULL): Network type explanation.
 - EXAMPLES (TEXT, NOT NULL): Example networks.
 - KEY_FEATURES (TEXT, NOT NULL): Distinct features of the network type.
- **Normalization:** In 3NF. All attributes depend on TYPE.
- **Cardinality:**
 - 1:N with CRYPTO (BLOCKCHAIN_NETWORK_TYPE): One network type applies to multiple cryptocurrencies.
- **Real-Time Usage:** Assists in comparing network scalability and decentralization for investment and development decisions.

5. HASH_ALGO_NAME

- **Description:** Details hash algorithms used in consensus mechanisms, including hardware and efficiency metrics.
- **Attributes:**
 - NAME (VARCHAR(200), PK, NOT NULL): Hash algorithm name (e.g., SHA-256).
 - CONSENSUS_ALGORITHM_TYPE (VARCHAR(200), PK, NOT NULL): Associated consensus algorithm.
 - DESCRIPTION (VARCHAR(MAX), NOT NULL): Algorithm details.
 - HARDWARE_TYPE (VARCHAR(200), NOT NULL): Hardware used (e.g., ASIC, GPU).
 - PROS (VARCHAR(MAX), NOT NULL): Advantages of the algorithm.
 - CONS (VARCHAR(MAX), NOT NULL): Disadvantages of the algorithm.
 - ENERGY_EFFICIENCY (VARCHAR(10), NOT NULL, CHECK): Efficiency level (HIGH, LOW, MODERATE).
- **Normalization:** In 3NF. Composite PK (NAME, CONSENSUS_ALGORITHM_TYPE) ensures no redundancy.
- **Cardinality:**
 - **N:1 with CONSENSUS_ALGORITHM_TYPE:** Multiple hash algorithms can be associated with one consensus type.
 - **1:N with CRYPTO (HASH_ALGO_NAME, HASH_ALGO_CONSENSUS_TYPE):** One hash algorithm can be used by multiple cryptocurrencies.
- **Real-Time Usage:** Evaluates mining efficiency, hardware requirements, and environmental impact for crypto mining operations.

6. CRYPTO

- **Description:** Core table storing cryptocurrency details, including price, supply, and technical attributes.
- **Attributes:**
 - NAME (VARCHAR(200), NOT NULL): Cryptocurrency name.
 - SYMBOL (VARCHAR(10), PK, NOT NULL): Unique ticker (e.g., BTC).

- MAX_PRICE, MIN_PRICE (DECIMAL(38,15), NOT NULL): Historical price extremes.
- MAX_PRICE_DATE, MIN_PRICE_DATE (DATE): Dates of price extremes.
- TOTAL_SUPPLY, CIRCULATING_SUPPLY (DECIMAL(38,15), NOT NULL): Supply metrics.
- BLOCKCHAIN_ACCESS_TYPE, CONSENSUS_ALGORITHM_TYPE, BLOCKCHAIN_NETWORK_TYPE, BLOCKCHAIN_TOKEN_TYPE (VARCHAR(200), NOT NULL): References to respective types.
- HASH_ALGO_NAME, HASH_ALGO_CONSENSUS_TYPE (VARCHAR(200)): Composite FK to hash algorithm.
- FOUNDER (VARCHAR(200), NOT NULL): Founder name.
- INITIAL_RELEASE_YEAR (INT, NOT NULL): Launch year.
- OFFICIAL_WEBSITE (VARCHAR(100), NOT NULL): Official website.
- DESCRIPTION_FOR_MAJOR_CHANGES (VARCHAR(MAX), NOT NULL): Details of major updates (e.g., forks).
- **Normalization:** In 3NF. All attributes depend on SYMBOL. FKs ensure referential integrity.
- **Cardinality:**
 - **1:N with multiple tables (e.g., CRYPTO_CURRENCY_PERFORMANCE_METRICS, MARKET_DOMINANCE):** One cryptocurrency has multiple performance or dominance records.
 - **N:1 with lookup tables (e.g., BLOCKCHAIN_ACCESS_TYPE):** Multiple cryptocurrencies share one access type.
 - **M:N COUNTRY ↔ CRYPTO via ACCEPTED_COUNTRYWISE_MOST_USED_CRYPTO**
- **Real-Time Usage:** Central table for price tracking, technical analysis, and regulatory reporting in the crypto market.

7. CRYPTO_CURRENCY_PERFORMANCE_METRICS

- **Description:** Stores performance metrics for cryptocurrencies, such as transaction speed and energy costs.
- **Attributes:**
 - SYMBOL (VARCHAR(10), PK): References CRYPTO.
 - TRANSACTION_PER_SECOND, AVERAGE_TRX_FEE, ELECTRICITY_COST_PER_BLOCK (DECIMAL(38,15)): Performance and cost metrics.
 - HEAT_IMMERSION_PER_TX (DECIMAL(38,2)): Energy per transaction in Joules.
 - HASH_RATE_PER_UNIT (VARCHAR(50)): Hash rate metric.
 - TOTAL_USERS (DECIMAL(38,0)): Total user count.
- **Normalization:** In 3NF. All attributes depend on SYMBOL.
- **Cardinality:**
 - **1:1 with CRYPTO:** One performance record per cryptocurrency.
- **Real-Time Usage:** Analyzes transaction efficiency, cost, and environmental impact for investment and scalability decisions.

8. TOTAL_USER_DISTRIBUTION

- **Description:** Tracks global cryptocurrency user distribution by region and market cap annually.
- **Attributes:**
 - YEAR (INT, PK): Year of data.
 - ASIA_USER, NORTH_AMERICA_USER, AMERICA_USER, AFRICA_USER, EUROPE_USER, OCEANIA_USER (DECIMAL(38,15)): Regional user counts.
 - TOTAL_USER_IN_WORD (DECIMAL(38,15)): Global user count.
 - TOTAL_MARKET_CAP (DECIMAL(38,15)): Total market capitalization.
- **Normalization:** In 2NF. Partial dependency on YEAR for regional users. AMERICA_USER (sum of North and South America) introduces redundancy.

- **Cardinality:**
 - **1:N with MARKET_DOMINANCE, TOP_BROKERAGE:** One year has multiple dominance or brokerage records.
- **Real-Time Usage:** Monitors global adoption trends and market growth for strategic planning and market expansion.

9. MARKET_DOMINANCE

- **Description:** Tracks annual market dominance of cryptocurrencies.
- **Attributes:**
 - YEAR (INT, PK): Year of data.
 - SYMBOL (VARCHAR(10), PK): Cryptocurrency ticker.
 - MAX_PRICE, MIN_PRICE (DECIMAL(38,15/30)): Price extremes.
 - MAX_PRICE_DATE, MIN_PRICE_DATE (DATE): Dates of price extremes.
 - TOTAL_MARKET_CAP_OF_THIS_CURRENCY (DECIMAL(38,10)): Market cap of the currency.
 - DOMINANCE (FLOAT, CHECK <= 100): Market share percentage.
 - TOTAL_TRANSACTION, TOTAL_USER, TOTAL_WALLET_COUNT (DECIMAL(38,10)): Transaction, user, and wallet metrics in millions.
- **Normalization:** In 3NF. Composite PK (SYMBOL, YEAR) ensures no redundancy.
- **Cardinality:**
 - **N:1 with CRYPTO:** Multiple dominance records per cryptocurrency.
 - **N:1 with TOTAL_USER_DISTRIBUTION:** Multiple dominance records per year.
- **Real-Time Usage:** Analyzes market share and volatility for portfolio management and competitive analysis.

10. COUNTRY

- **Description:** Stores country data, including crypto regulatory status and socioeconomic metrics.
- **Attributes:**
 - COUNTRY_CODE (VARCHAR(50), PK): ISO country code.

- COUNTRY_NAME (VARCHAR(200)): Country name.
- CRYPTO_STATUS (VARCHAR(20), CHECK): Status (ACCEPTED, RESTRICTED, BANNED).
- EDUCATION_PERCENTAGE, UNEMPLOYMENT_RATE (FLOAT): Socioeconomic indicators.
- GDP (DECIMAL(38,10)): GDP in billions.
- **Normalization:** In 3NF. All attributes depend on COUNTRY_CODE.
- **Cardinality:**
 - **1:N with ACCEPTED_COUNTRY, BANNED_COUNTRY, USER_AMOUNT_IN_BANNED_COUNTRY:** One country has multiple related records.
- **Real-Time Usage:** Assesses regulatory environments and socioeconomic factors for market entry strategies.

11. ACCEPTED_COUNTRY

- **Description:** Details countries where crypto is accepted, including restrictions and infrastructure.
- **Attributes:**
 - COUNTRY_CODE (VARCHAR(50), PK): References COUNTRY.
 - RESTRICTIONS (VARCHAR(200)): Regulatory restrictions.
 - CRYPTO_ATMS (INT, NOT NULL): Number of crypto ATMs.
 - ACCEPTED_YEAR (INT): Year crypto was accepted.
- **Normalization:** In 3NF. All attributes depend on COUNTRY_CODE.
- **Cardinality:**
 - **1:1 with COUNTRY:** One acceptance record per country.
- **Real-Time Usage:** Tracks crypto adoption and infrastructure for market expansion and investment planning.

12. BANNED_COUNTRY

- **Description:** Details countries where crypto is banned, including restrictions.
- **Attributes:**
 - COUNTRY_CODE (VARCHAR(50), PK): References COUNTRY.
 - RESTRICTIONS (VARCHAR(200)): Ban details.
 - CRYPTO_ATMS (INT, NOT NULL): Number of ATMs (likely 0).
 - BANNED_YEAR (INT): Year of ban.
- **Normalization:** In 3NF. All attributes depend on COUNTRY_CODE.
- **Cardinality:**
 - **1:1 with COUNTRY:** One ban record per country.
- **Real-Time Usage:** Identifies regulatory risks for crypto businesses and compliance strategies.

13. USER_AMOUNT_IN_BANNED_COUNTRY

- **Description:** Tracks user counts in banned countries annually.
- **Attributes:**
 - YEAR (INT, PK): Year of data.
 - COUNTRY_CODE (VARCHAR(50), PK): References COUNTRY.
 - USER_AMOUNT (DECIMAL(38,20)): User count in millions.
- **Normalization:** In 3NF. Composite PK (YEAR, COUNTRY_CODE) ensures no redundancy.
- **Cardinality:**
 - **N:1 with COUNTRY:** Multiple user records per country over different years.
- **Real-Time Usage:** Monitors illicit crypto usage in restricted regions for regulatory enforcement.

14. ACCEPTED_COUNTRYWISE_MOST_USED_CRYPTO

- **Description:** Tracks the most-used cryptocurrencies in accepted countries annually.

- **Attributes:**
 - YEAR (INT, PK): Year of data.
 - COUNTRY_CODE (VARCHAR(50), PK): References COUNTRY.
 - CRYPTO_SYMBOL (VARCHAR(10), PK): References CRYPTO.
 - USER_PERCENTAGE (DECIMAL(10,5), CHECK <= 100): Percentage of users.
- **Normalization:** In 3NF. Composite PK ensures uniqueness.
- **Cardinality:**
 - **N:1 with COUNTRY, CRYPTO:** Multiple records per country and cryptocurrency.
- **Real-Time Usage:** Identifies popular cryptocurrencies by region for targeted marketing and adoption strategies.

15. BLOCK_REWARD_EMISSION_TYPE

- **Description:** Defines types of block reward emission (e.g., halving, tail emission).
- **Attributes:**
 - TYPE (VARCHAR(50), PK): Emission type.
- **Normalization:** In 3NF. Single attribute table.
- **Cardinality:**
 - **1:N with REWARD_DETAILS:** One emission type applies to multiple cryptocurrencies.
- **Real-Time Usage:** Classifies emission models for supply and price impact analysis.

16. REWARD_DETAILS

- **Description:** Stores block reward details for cryptocurrencies.
- **Attributes:**
 - SYMBOL (VARCHAR(10), PK): References CRYPTO.
 - EMISSION_TYPE (VARCHAR(50)): References BLOCK_REWARD_EMISSION_TYPE.
 - EMISSION_TIME (DECIMAL(38,0)): Emission duration.

- STARTING_TIME_BLOCK_REWARD, CURRENT_BLOCK_REWARD (DECIMAL(38,5)): Reward amounts.
- BLOCK_REWARD_TIME (DECIMAL(38,30)): Time per reward.
- **Normalization:** In 3NF. All attributes depend on SYMBOL.
- **Cardinality:**
 - **1:1 with CRYPTO:** One reward detail per cryptocurrency.
 - **N:1 with BLOCK_REWARD_EMISSION_TYPE:** Multiple cryptocurrencies per emission type.
- **Real-Time Usage:** Analyzes mining incentives and supply dynamics for price forecasting.

17. BLOCK_REWARD_EMISSION

- **Description:** Tracks block reward changes (e.g., halving events) annually.
- **Attributes:**
 - SYMBOL (VARCHAR(10), PK): References CRYPTO.
 - YEAR (INT, PK): Year of event.
 - DATE (DATE): Event date.
 - BLOCK_REWARD (DECIMAL(38,10)): Reward amount.
 - HALVING_YEAR_MARKET_PRICE, HALVING_YEAR_MARKET_CAP (DECIMAL(38,20)): Market metrics during halving.
 - NETWORK_HASH_RATE (DECIMAL(38,0)): Hash rate.
- **Normalization:** In 3NF. Composite PK (SYMBOL, YEAR) ensures no redundancy.
- **Cardinality:**
 - **N:1 with CRYPTO:** Multiple emission records per cryptocurrency.
- **Real-Time Usage:** Predicts price impacts of halving events for investment strategies.

18. HFT_AMF_FIRMS

- **Description:** Stores details of high-frequency trading and asset management firms.
- **Attributes:**
 - COMPANY_NAME (VARCHAR(200), PK): Firm name.
 - HEAD_QUARTER (VARCHAR(200)): Location.
 - ESTABLISHED_YEAR (INT): Founding year.
 - WORK_TYPE (VARCHAR(500)): Type of work.
 - FAMOUS_FOR (VARCHAR(500)): Notable achievements.
- **Normalization:** In 3NF. All attributes depend on COMPANY_NAME.
- **Cardinality:**
 - **1:N with CRYPTO_ETF:** One firm manages multiple ETFs.
- **Real-Time Usage:** Tracks firms influencing crypto markets for investor due diligence.

19. ETF_INVESTMENT_TYPE

- **Description:** Defines types of crypto ETF investments (e.g., spot, futures).
- **Attributes:**
 - TYPE (VARCHAR(200), PK): Investment type.
 - DESCRIPTION (TEXT): Type explanation.
- **Normalization:** In 3NF. No dependencies.
- **Cardinality:**
 - **1:N with CRYPTO_ETF:** One investment type applies to multiple ETFs.
- **Real-Time Usage:** Classifies ETFs for investor risk assessment and regulatory compliance.

20. CRYPTO_ETF

- **Description:** Stores details of cryptocurrency ETFs.
- **Attributes:**
 - ETF_NAME (VARCHAR(300)): ETF name.
 - ETF_CODE (VARCHAR(200), PK): Unique code.

- COMPANY_NAME (VARCHAR(200)): References HFT_AMF_FIRMS.
- LAUNCH_DATE (DATE): Launch date.
- YEAR (INT): Launch year.
- TOTAL_AUM_UNDER ETF (DECIMAL(38,20)): Assets under management.
- CRYPTO_SYMBOL (VARCHAR(10), PK): References CRYPTO.
- ETF_INVESTMENT_TYPE (VARCHAR(200)): References ETF_INVESTMENT_TYPE.
- EXPENSE_RATIO (DECIMAL(10,5), CHECK < 100): Fee percentage.
- **Normalization:** In 3NF. Composite PK (ETF_CODE, CRYPTO_SYMBOL) ensures no redundancy.
- **Cardinality:**
 - **N:1 with CRYPTO, HFT_AMF_FIRMS, ETF_INVESTMENT_TYPE:** Multiple ETFs per cryptocurrency, firm, or investment type.
- **Real-Time Usage:** Tracks ETF performance and fees for investment decisions and market analysis.

21. BROKERAGE

- **Description:** Stores details of crypto brokerages.
- **Attributes:**
 - NAME (VARCHAR(200), PK): Brokerage name.
 - HEADQUARTER (VARCHAR(200)): Location.
 - ESTABLISHED_YEAR (INT): Founding year.
 - OWN_CRYPTOCURRENCY (VARCHAR(10)): Associated cryptocurrency.
 - FOUNDER_NAME (VARCHAR(200)): Founder.
- **Normalization:** In 3NF. All attributes depend on NAME.
- **Cardinality:**
 - **1:N with TOP_BROKERAGE, CONTROVERSY:** One brokerage has multiple performance or controversy records.
- **Real-Time Usage:** Evaluates brokerage reliability and market influence for investor trust.

22. TOP_BROKERAGE

- **Description:** Tracks top brokerages annually by market cap and user base.
- **Attributes:**
 - YEAR (INT, PK): Year of data.
 - BROKERAGE_NAME (VARCHAR(200), PK): References BROKERAGE.
 - TOTAL_MARKET_CAP, MARKET_SHARE, TOTAL_USER (DECIMAL(30,5)): Performance metrics.
- **Normalization:** In 3NF. Composite PK (BROKERAGE_NAME, YEAR) ensures no redundancy.
- **Cardinality:**
 - **N:1 with BROKERAGE, TOTAL_USER_DISTRIBUTION:** Multiple records per brokerage or year.
- **Real-Time Usage:** Identifies leading brokerages for investor trust and market analysis.

23. CONTROVERSY

- **Description:** Records controversies involving brokerages and affected cryptocurrencies.
- **Attributes:**
 - YEAR (INT): Year of controversy.
 - BROKERAGE_NAME (VARCHAR(200)): References BROKERAGE.
 - CONTROVERSY_DETAIL (VARCHAR(400)): Details of the issue.
 - AFFECTED_CRYPTO (VARCHAR(10)): References CRYPTO.
 - AFFECTED_AMOUNT_IN_BILLION (DECIMAL(38,10)): Financial impact.
- **Normalization:** In 2NF.
- **Cardinality:**
 - **N:1 with BROKERAGE, CRYPTO:** Multiple controversies per brokerage or cryptocurrency.
- **Real-Time Usage:** Tracks risks and reputational issues for risk management and investor due diligence.