

# 3SIGMA CAPITAL

Cryptocurrency Trading:  
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February 25, 2021

This paper presents an approach for investing into blockchain also known as cryptocurrency. Blockchain is a digital ledger of economic transactions that can be used to record not just financial transactions, but any object with an intrinsic value. [14]. In its simplest form, a Blockchain is a series of immutable data records with timestamps, which are managed by a cluster of machines that do not belong to any single entity.

Each of these data blocks is protected by cryptographic principle and bound to each other in a chain. Cryptocurrencies like Bitcoin are made on a peer-to-peer network structure. Each peer has a complete history of all transactions, thus recording the balance of each account. For example, a transaction is a file that says “A pays X Bitcoins to B” that is signed by A using its private key.

This is basic public-key cryptography, but also the building block on which cryptocurrencies are based. After being signed, the transaction is broadcast on the network. When a peer discovers a new transaction, it checks to make sure that the signature is valid. If the verification is valid then the block is added to the chain; all other blocks added after it will “confirm” that transaction.

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# 1 Background

Cryptocurrency is a decentralised medium of exchange which uses cryptographic functions to conduct financial transactions[7]. Cryptocurrencies leverage the Blockchain technology to gain decentralisation, transparency, and immutability [12]. In the above, we have discussed how Blockchain technology is implemented for cryptocurrencies.

In general, the security of cryptocurrencies is built on cryptography, neither by people nor on trust [13]. For example, Bitcoin uses a method called "Elliptic Curve Cryptography" to ensure that transactions involving Bitcoin are secure [17]. Elliptic curve cryptography is a type of public key cryptography that relies on mathematics to ensure the security of transactions. When someone attempts to circumvent the aforesaid encryption scheme by brute force, it takes them one-tenth the age of the universe to find a value match when trying 250 billion possibilities every second[8]. Regarding its use as a currency, cryptocurrency has the same properties as money. It has a controlled supply. Most cryptocurrencies limit the supply of tokens. E.g. for Bitcoin, the supply will decrease over time and will reach its final quantity sometime around 2,140. All cryptocurrencies control the supply of tokens through a timetable encoded in the Blockchain.

One of the most important features of cryptocurrencies is the exclusion of financial institution intermediaries [3]. The absence of a "middleman" lowers transaction costs for traders. For comparison, if a bank's database is hacked or damaged, the bank will rely entirely on its backup to recover any information that is lost or compromised. With cryptocurrencies, even if part of the network is compromised, the rest will continue to be able to verify transactions correctly. Cryptocurrencies also have the important feature of not being controlled by any central authority[4]:

read, write transactions to and participate in the consensus process. Key benefits of permissionless blockchains include: complete disintermediation, as entry costs for new participants are minimal, and that no participant has exclusive control over the blockchain network. However, permissionless blockchains provide limited data privacy. This is a serious problem for most financial services applications. Permissionless, public shared ledgers are protocols associated with Bitcoin, Litecoin and Ethereum.

## Cryptocurrency Trading

The volatility of cryptocurrencies are often likely to attract speculative interest and investors. The rapid fluctuations of intraday prices can provide traders with great money-earning opportunities, but it also includes more risk.

The cryptocurrency market is available 24 hours a day, 7 days a week because it is a decentralised market. Unlike buying and selling stocks and commodities, the cryptocurrency market is not traded physically from a single location. Cryptocurrency transactions can take place between individuals, in different venues across the world.

Near Anonymity. Buying goods and services using cryptocurrencies is done online and does not require to make one's own identity public. With increasing concerns over identity theft and privacy, cryptocurrencies can thus provide users with some advantages regarding privacy. Different exchanges have specific Know-Your-Customer (KYC) measures used to identify users or customers. The KYC undertaken in the exchanges allows financial institutions to reduce the financial risk while maximising the wallet owner's anonymity.

Peer-to-peer transactions. One of the biggest benefits of cryptocurrencies is that they do not involve financial institution intermediaries. As mentioned above, this can reduce transaction costs. Moreover, this feature might appeal to users who distrust traditional systems.

Over-the-counter (OTC) cryptocurrency markets offer, in this context, peer-to-peer transactions on the Blockchain. Programmable "smart" capabilities. Some cryptocurrencies can bring other benefits to holders, including limited ownership and voting rights. Cryptocurrencies may also include a partial ownership interest in physical assets such as artwork or real estate.

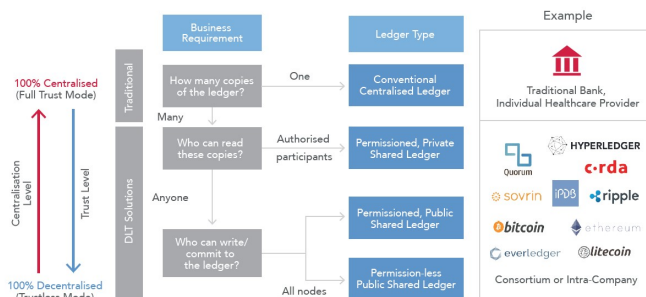


Figure 2. Permissioned vs Permissionless Distributed Ledger Technology

## Figure 1: Permissioned vs Permissionless Distributed Technology

In Figure 2, we categorise distributed ledger platforms into two types: "permissionless" and "permissioned." Permissionless blockchains are public and open to

## 2 Cryptocurrency Trading Strategies

Cryptocurrency trading strategies are the main focus of 3Sigma Capital. There are many trading strategies, which can be broadly divided into two main categories: technical

and fundamental.

They are similar in the sense that they both rely on quantifiable information that can be backtested against historical data to verify their performance. In recent years, a third kind of trading strategy, which we call quantitative, has received increasing attention. Such a trading strategy is similar to a technical trading strategy because it uses trading activity information on the exchange to make buying or selling decisions. Quantitative traders build trading strategies with quantitative data, which is mainly derived from price, volume, technical indicators or ratios to take advantage of inefficiencies in the market and are executed automatically by trading software.

The Cryptocurrency market is different from traditional markets as there are more arbitrage opportunities, higher fluctuation and transparency. Due to these characteristics, most traders and analysts prefer using quantitative trading strategies in cryptocurrency markets.

Cryptocurrency trading can be broken down into.

- Systematic trading: This a way to define trading goals, risk controls and rules.
- Emergent Trading Technologies : based on econometrics and machine learning technologies.

Econometric methods apply a combination of statistical and economic theories to estimate economic variables and predict their values [15]. Statistical models use mathematical equations to encode information extracted from the data [9]. In some cases, statistical modeling techniques can quickly provide sufficiently accurate models [2]. Other methods might be used, such as sentiment-based prediction and long-and-short-term volatility classification based prediction[6]. The prediction of volatility can be used to judge the price fluctuation of cryptocurrencies, which is also valuable for the pricing of cryptocurrency-related derivatives [13]. When studying cryptocurrency trading using econometrics, researchers apply statistical models on time-series data like generalised autoregressive conditional heteroskedasticity(GARCH) and BEKK (named after Baba, Engle, Kraft and Kroner, 1995[10]) models to evaluate the fluctuation of cryptocurrencies[5]. A linear statistical model is a method to evaluate the linear relationship between prices and an explanatory variable [16]. When there exists more than one explanatory variable, we can model the linear relationship between explanatory (independent) and response (dependent) variables with multiple linear models. The common linear statistical model used in the time-series analysis is the autoregressive moving average (ARMA) model[1].

Machine learning is an efficient tool for developing cryptocurrency trading strategies[11] because it can infer data

relationships that are often not directly observable by humans. From the most basic perspective, Machine Learning relies on the definition of two main components: input features and objective function. The definition of Input Features (data sources) is where knowledge fundamental and technical analysis comes into play. The objective function defines the fitness criteria one uses to judge if the Machine Learning model has learnt the task at hand. Typical predictive models try to anticipate numeric (e.g., price) or categorical (e.g., trend) unseen outcomes. The machine learning model is trained by using historic input data (sometimes called in-sample) to generalise patterns therein to unseen (out-ofsample) data to (approximately) achieve the goal defined by the objective function. Clearly, in the case of trading, the goal is to infer trading signals from market indicators which help to anticipate asset future returns.

Portfolio theory advocates diversification of investments to maximize returns for a given level of risk by allocating assets strategically. Market Condition Research Market condition research appears especially important for cryptocurrencies. A financial bubble is a significant increase in the price of an asset without changes in its intrinsic value [48]. Many experts pinpoint a cryptocurrency bubble in 2017 when the prices of cryptocurrencies grew by 900 . In 2018, Bitcoin faced a collapse in its value. This significant fluctuation inspired researchers to study bubbles and extreme conditions in cryptocurrency trading.

### 3Sigma Capital Methodology

Our methodology encompasses the following core pillars which form our framework.

1. Do we have the the ability to deliver alpha beyond what an be explained by a combination of well known risk premia?
2. How do we think of risk and what lessons are taken from the past.
3. Are we aware of the macroeconomic environment and the market environment.

Our core philosophy around the way we decide to invest is based on how we assimilate and analyze data. We are able to pull data from different mediums in order to gain insight into deeper trends and how this maybe changing r impacting the current outlook which may necessitate adjustments to our strategies. An example of this is pulling data both from centralized exchanges, on-chain data (Eg Ethereum transactions for ERC20 tokens) and sentiment data from Reddit & Twitter. For our portfolios we take a top-down approach and assess projects based on their fundamentals, the solution offering and fit as well as the



## References

- [1] Choi B. *ARMA model identification*. Springer Science & Business Media.o, 2012.
- [2] M. Bolduc D. Boersch-Supan A. Brownstone D. Bunch D.S. et al. Ben-Akiva M. McFadden D. Train K. Walker J., Bhat C. Bierlaire. *Hybrid choice models: progress and challenges*. Marketing Letters 13, 163–175, 2002.
- [3] Harwick C. *Cryptocurrency and the problem of intermediation*. The Independent Review 20, 569–588., 2016.
- [4] Rose C. *The evolution of digital currencies: Bitcoin, a cryptocurrency causing a monetary revolution*. Economics Research Journal (IBER) 14, 617–622., 2015.
- [5] McAleer M. Caporin M. *Do we really need both bekk and dcc? a tale of two multivariate garch models*. Journal of Economic Surveys 26, 736–751, 2012.
- [6] Wang Y.H Chang C.C. Hsieh P.F. *Sophistication, sentiment, and misreaction*. Journal of Financial and Quantitative Analysis 50, 903–928., 2015.
- [7] M.D Doran. *A forensic look at bitcoin cryptocurrency*. Ph.D.thesis. Utica College, 2014.
- [8] Grayblock. *Elliptic-curve cryptography*. <https://medium.com/coinmonks/elliptic-curve-cryptography-6de8fc748b8b>, 2018.
- [9] P.J Kaufman. *Trading Systems and Methods*. John Wiley & Sons, 2013.
- [10] Engle R.F. Kroner K.F. *Multivariate simultaneous generalizedarch*. Econometric theory 11, 122–150, 1995.
- [11] Caton S McNally S. Roche, J. *Predicting the price of bitcoin using machine learning, in: 2018 26th Euromicro International Conference on Parallel, Distributed and Network-based Processing (PDP)*. IEEE. pp. 339–343, 2018.
- [12] S Meunier. *Blockchain 101: What is blockchain and how does this revolutionary technology work?, in: Transforming Climate Finance and Green Investment with Blockchains*. Elsevier, pp. 23–34., 2018.
- [13] Narayanan A. Bonneau J. Felten E. Miller A. Goldfeder S. *Bitcoin and cryptocurrency technologies: a comprehensive introduction*. Princeton University Press., 2016.
- [14] Tapscott A Tapscott D. *Blockchain revolution: how the technology behind bitcoin is changing money, business, and the world*. Penguin, 2016.
- [15] B. Vogelpang. *Econometrics: theory and applications with Eviews*. Pearson Education, 2005.
- [16] Neter J. Kutner M.H. Nachtsheim C.J. Wasserman W. *Applied linear statistical models*. Irwin Chicago, 1996.
- [17] He D. Ji Y Wang H. *Designated-verifier proof of assets for bitcoin exchange using elliptic curve cryptography*. Future Generation Computer Systems., 2017.