Cryptocurrency exchange landscape in the EU

How regulation impacts success of cryptocurrency exchanges

Laura Szepesi

33904

International Masters in Finance

Nova School of Economics and Business

Work project carried out under the supervision of Afonso Eça

2020

Abstract

Ever since the emergence of digital assets, bitcoin (BTC) and other cryptocurrencies created huge debates and discussions globally. Demand has transformed trading opportunities in the digital era, and a new ecosystem has been created around cryptocurrencies. Not only the coins, but the underlying technology has found many applications worldwide as well, especially in the financial markets.

However, since the market infrastructure is growing expeditiously, regulations have a hard time keeping up with the speed of innovation. Merging this complex and fast evolving area into the established traditional legal framework has already proved to be a difficult and lengthy process. Due to the absence of a global harmony in the regulatory frameworks, digital service providers can take advantage of the regulatory arbitrage. In order to maximize profitability, the decision on how to cope with the regulatory framework can be crucial for any service provider.

The attitude towards regulation in this environment is just as fragmented as the legislations itself. Founder and CEO of bitFlyer, Yuzo Kano made an announcement at the opening of the European office of bitFlyer:

"When I set up bitFlyer in 2014, I did so with global ambitions and the belief that approved regulatory status is fundamental to the long-term future of Bitcoin and the virtual currency industry. I am proud that we are now the most compliant virtual currency exchange in the world; this coveted regulatory status gives our customers, our company and the virtual currency industry as a whole a very positive future outlook[1]."

A completely different approach was expressed by the CEO of Binance, Changpeng Zhao:

> "If you do fiat to crypto [...] you have to have a bank account that can accept money," he says. "That has its own advantages and problems. You have to deal with regulatory issues and usually you're tied to one country."The more you deal with fiat, the more [authorities] can control you," says Zhao. "The bank will freeze your bank account. They can make the wire transfer slow"[44].

The strategical decisions of digital currency exchanges can be derived from their view on regulation. This paper will examine some of the top exchanges with a regional footprint in the European Union (EU). Furthermore, the impact of regulation on crypto exchanges will be analysed, based on the exchanges' strategy and different success factors. The diversity of jurisdictions covered by this paper provides also an overview how various governments have approached regulating digital exchanges. Even though the cryptocurrency market outside of Europe should not be underestimated, this paper focuses on the comparative analysis on digital exchanges operating within the EU. Including other exchanges would alter the conclusion since the quoted crypto-fiat pairs, users, and many other factors diverge from the European landscape.

The expectation is to conclude that regulatory compliant digital exchanges are more successful on a long-term perspective.

Keywords: *Cryptocurrency, Blockchain, Bitcoin, Digital exchanges, Peer-to-Peer, Finance, Crypto regulation*

Contents

List of Tables

1 Introduction

1.1 Blockchain and cryptocurrencies

After the global financial crisis in 2008, many have lost their trusts in the financial system. Bitcoin's whitepaper has been published in the same year, and proposed answers to the existing problems in the financial industry. The paper explains the idea of using cryptography in order to eliminate the need of financial intermediaries in transactions. The code behind bitcoin was firstly implemented in 2009 and resulted in the creation of the first blockchain[2]. Even though Satoshi did not mention the term blockchain in his whitepaper, the term has been propagated quickly. There has been a wide usage of different terms of cryptoassets and in this paper, the terminology of crypto- or digital currency will be used with the exception of where regulators clearly refer to them as "cryptoassets", "cryptotokens" or "virtual currencies". The term of digital (currency) exchange refers to exchanges dealing in cryptocurrencies.

Bitcoin is based on a peer-to-peer (P2P) technology which does not require a central authority neither for the approval of transactions nor for the issuance of new coins. Both actions are undertaken by computers involved in the network. In this distributed and permissionless network, anyone with an internet connection can get access to the system. The terminology blockchain refers to the whole database, which consists of "blocks" containing information about previous transactions labeled with a unique code (the public key). These blocks are then connected in a chain. Before a bundle of transactions can be assigned to a block, they need to be verified. The verification takes places through the computers connected to the network, which are called miners. Miners have to solve complex mathematical problems to help the system by the verification of transactions and are rewarded with BTC for their contribution. After a block has been created and successfully assigned to the chain, it cannot be deleted, which means that no previously validated data can be erased. This feature makes the whole process even more unique. Users can get access to the cryptocurrencies through their private key. The key consists of a a series of numbers and letters, making it more secure against hacks, as the whole database is automated on the base of the outlined mathematical process. Without the private key, it is impossible to transfer or receive the coins[3].

By cutting out the financial intermediaries such as banks of the transaction process, the implementation of blockchain technology can lower transaction fees, enable transactions to take place after trading hours and eliminate human errors. Other industries can also significantly benefit from the technology. There are already many use cases, such as the identification of blood diamonds, validation of origin in the supply-chain, or safely storage of medical data, just to name a few[4].

Bitcoin's enter in the market has accelerated the development of other cryptocurrencies. These cryptocurrencies are either altcoins (with same or similar programming capabilities to bitcoin) or tokens (which are used on decentralized applications). The quality of a certain cryptocurrency is mostly determined by its underlying technology and security.

Similar to the Initial Public Offering (IPO) process, new coins are being brought to the market in form of an Initial Coin Offering (ICO), followed by the listing of the coin on trading venues. Opposite to fiat currencies, which can be printed theoretically in an unlimited amount, the circulation supply of certain cryptocurrencies (such as bitcoin) can be capped. Their price fluctuates in a wider range as traditional stocks, making them more appealing for speculators. Altcoins have usually a strong positive correlation to BTC's price and the price stability is influenced by the so called whale traders (investors holding a great amount of coins) amongst others. Transactions carried out by whale investors can significantly impact the prices and result in market manipulation.

Nowadays, digital currencies are accepted as a mean of exchange in many stores and are widely used for portfolio diversification purposes, due to their low correlation to traditional stocks. Since the introduction of futures on cryptocurrencies, hedging and taking on short positions became also possible. The availability of margin trading has increased the risk of trading and resulted in an even higher amount of speculators betting on cryptocurrencies' prices.

1.2 Development of the cryptocurrency industry

What first started with the publication of the whitepaper on bitcoin, resulted later in an emergence of a whole new market and an industry built around various kind of projects related to cryptocurrencies and blockchain. Back when bitcoin was the only well-known cryptocurrency, majority of the

investors were doubting its long-term success. Plenty of exchanges offering BTC opened and closed shortly after, due to hacking activities and the absence of required technical background of the business operators. Just as in any maturing market, the behaviour of the marketplaces has also changed with time. Many stakeholders (mainly retail traders speculating on the price) entered the market and boosted the demand of cryptocurrencies. Due to the lack of quick regulatory responses, service providers were mostly unregulated. The interaction of market participants, such as miners, investors, developers, financial intermediaries, exchanges, regulators has affected the price of cryptocurrencies. The cryptocurrencies' increasing acceptance resulted in higher liquidities and a deep market depth leading to a continuously tightening spread.

The size of the market has been rapidly growing and is reflected in the aggregated market capitalization of the cryptocurrencies. The major part of the market size is captured by the main coins, such as BTC and Ethereum (ETH)[9]. As the result of the enormous volatility in the price of the cryptocurrencies, the market capitalization has been fluctuating as well. Traders are taking advantage of not only the significant volatility but the price differences between the trading venues as well. The price difference creates space for arbitrage, which is usually quickly eliminated as traders discover these opportunities. The efficiency varies between cryptocurrencies, with the most traded coins having extremely efficient markets, and newly established cryptocurrencies lacking sufficient liquidity to support it.

As for the latest key developments in the cryptocurrency market, several progresses can be noticed. In the last few years, with the contribution of Facebook's plans on Libra, there has been a rising demand in stablecoins. These types of cryptocurrencies are backed by a reserve asset with their values pegged to a fiat currency. This trend can be noticed in the increasing trading volumes of stablecoins, as well as in the various responses from the regulatory side. As cryptocurrencies are being examined and brought under legal framework, organizations dealing with them have been also affected. The number of regulated trading venues has been increasing and those who do not want to comply with the new laws either relocate or disappear from the market. As an answer to the lack of shorting capability in the crypto markets, exchanges have launched derivative products. With better options on margin trading, many facilities also offer the availability of P2P lending of cryptocurrencies, granting traders the opportunity of earning interest on their coins.

Furthermore, governments are starting to actively working on their own digital currencies. With a steady decline in the cash circulation in Sweden, Riksbank is testing the implementation of the E-krona[10]. The other European country known for its advanced digital programs, Estonia, had planned to issue its own central bank digital currency (CBDC). However, the country abandoned its plans due to a warning statement from the European Central Bank (ECB) and is examining other options[11]. SIX, Switzerland's main stock exchange also revealed its intentions to develop a stablecoin pegged to Swiss Franc[12]. Globally, China seems to be a pioneer in the integration of the blockchain technology and has made a huge step towards the issuance of their CBDC, with the digitalization of the Chinese yuan already being tested[13].

Even though that the crypto industry is still in maturing phase, it is a fast-changing market with a constant technology development, and it is therefore highly probable that the innovation will further continue and might take over the traditional financial market.

2 Trading venues

Cryptocurrencies can be bought and sold on various trading venues, either through an exchange or over-the-counter (OTC). OTC desks enable the private trade of assets without supervision and are mainly used by whale investors in order to transfer a large amount of some cryptocurrency. Digital currency exchanges enable registered users the trading of digital currencies and fiat currencies and/or the exchange of one digital currency to another one. These cryptocurrency exchanges have some similarities to conventional exchanges.

2.1 Cryptocurrency exchanges

In order to have a better understanding of the characteristics of digital currency exchanges, it is important to clarify the difference between centralized and decentralized exchanges.

2.1.1 Centralized vs decentralized exchanges

Intuitively, many think that since digital currencies are decentralised, stock exchanges in the crypto space must be decentralized as well. Although Binance recently launched its decentralized platform[32],the trading volume on these exchanges only accounts for a marginal portion of the overall volume in the crypto market[29]. A decentralized exchange (DEX) is operating without a supervising body, on an open protocol, with the principle of consensus. Trading takes place on a P2P basis, which eliminates the need of intermediation. The exchange is not responsible for the asset storage, making it less vulnerable for hack attacks and giving users more control on their assets. Fees are usually more favourable for clients, but this benefit is offset by the low liquidity these exchanges can offer.

A centralized exchange is run by a 3rd party operator who serves as an intermediary in the trades with the aim of connecting market participants. The central governing body ensures the stability of the trading environment, monitors the trades, manages the order book. Traditional stock exchanges fall under this category as well. Most of the well-known digital currency exchanges are centralized and this paper focuses on their analysis.

2.1.2 Characteristics of centralized digital currency exchanges

Digital currency exchanges (DCE) provide the necessary market infrastructure for investors willing to trade digital assets for fiat currencies or for other digital currencies. Through the interaction of buyers and sellers, the market price of an asset is established.

The service of the exchanges is not limited to marketplace provision but can cover the entire financial market transaction process chain. This involves pre-trading (data), trading and post trading (settlement, custody, collateral) services. Their revenue stream consists mainly of market services (for example transaction fee, data provision), corporate services (information services, index licensing). Most of the exchanges guarantee a 24/7 service hotline, mobile application, efficient Application Programming Interface (API) designed to integrate trading applications such as Trading View. Others services are dependent on the exchange provider, and can include lending or offering conversion services to merchants who accept payments in cryptocurrencies. Very few exchanges offer margin trading and short selling features as highlighted in the previous chapter. The earnings are cyclical and are highly dependent

on the trading activity. In turbulent times, exchanges experience higher trading activities resulting in significantly bigger revenues than usual. Such an example would be BTC halving and its effect on the volatility[15].

Although they operate online, due to the legal implications, the choice of their base location is definitely crucial. Based on their legal jurisdiction or the services they offer, they might be excluded from the existing legal framework, granting them a much bigger operational freedom. The majority of the trading venues is still unregistered in the country they are based in. Furthermore, many unreliable exchanges emerge and then quickly disappear from the market. In some cases, exchanges do not disclose their location or the location of the HeadQuarters (HQ) is differentiated from the Incorporation (Inc.). Most of the crypto exchanges are centred in the US, UK, Japan, Singapore, Hong Kong, as well as offshore locations like Seychelles, British Virgin Islands, Bermuda, and the Cayman Islands. In Europe, major exchanges are concentrated in the UK, Gibraltar, Malta, Luxembourg and there is also a rising number of exchanges in Estonia, Netherlands and Switzerland.

In order to assure a safe trading environment and protect investors, they have to provide necessary market supervision processes. In this way, they can help authorities detect various crime activities, such as insider-, wash trading or terrorism financing.

While traditional exchanges are only open during certain trading hours, DCEs often operate 0-24.

As outlined in the previous chapters, market participants in the crypto space vary from stakeholders in the traditional financial market. Therefore, the client base of DCEs is also different. Traditional exchanges are specialized to provide services for institutional clients, private clients can gain access through a professional broker. On the other hand, DCEs may also offer services for beginners and do not require users to be qualified traders. Coinbase, for example, operates two separate platforms, one specifically for less experienced traders and Coinbase Pro for professionals and institutional clients.

Due to BTC's dominating market position amongst digital coins, most of DCEs offer BTC, with the full BTC trading accounting for around half of the trades in 2019[29]. The quoted fiat currency depends on the country in the exchange is operating, and according to a recent report, out of 97 analysed exchanges, 18% supported United States Dollar (USD) deposits; 18% and Euros (EUR) and around 6% supported Japanese Yen (JPY), South Korean

won (KRW), or Pounds Sterling (GBP) deposits[29]. This data can be a good indicator for client engagement and the preferred currencies. The number of trading pairs available varies between DCEs: while Binance lists around 800 pairs, Coinbase Pro offers approximately 60.

The distinction between a pure cryptocurrency exchange and a conventional crypto exchange, which offers crypto-fiat trading as well is extremely important from a regulatory perspective, especially in the EU. Crypto-crypto transactions are unregulated while the conversion of crypto to fiat is included in the fifth EU Anti-Money Laundering Directive (AMLD5), as outlined in the next chapters.

Not only the offered trading pairs and digital currencies differ amongst DCEs, but the served markets as well. The trading is concentrated on spot market, with only a marginal portion of derivatives offering. The derivatives market still counts as emerging, and only a couple of exchanges, such as BitMEX, OKEx, Huobi, Deribit and Binance have already started to offer futures on digital currencies.

Following the increasing market demand, new companies are constantly entering the market. Market operators are typically organizations specially tailored to the crypto environment, with engineering experiences in the blockchain area. Interestingly, even though the market is considered as inefficiently regulated, several highly regulated entities have expanded their portfolio offering with digital currencies. Such examples are in Europe the Stuttgart Stock Exchange Group or Gibraltar Stock Exchange and overseas the Bakkt (by ICE) and CME.

Along with the increasing popularity of DCEs, there has been a raising number of hacker activities as well. This issue was marked as the primary concern of traders[33]. These attacks gain an enormous public attention, result in reputation loss, may eventually lead to a colossal failure of exchanges. Just last year, Binance has suffered from a hacking attack, loosing around 7000 BTC[34], which had to be covered by own funds. The exchange had to suspend trading and conduct investigation on the security breach. Exchanges can take various safety measures and decrease the exposure to such attacks by having appropriate insurance or by keeping the keys stored in cold wallets.

The estimation of the true market size has proved to be difficult due to the wash trading phenomena, which is another typical unique feature of the crypto exchanges due to the lack of reporting standards. Many unregistered and private exchanges are not obliged to conduct auditing or publish

company information. Therefore, their own declared trading volume can implicate much higher volumes than in reality. Unfortunately, there exist platforms which publish and use their reported trading volumes without conducting necessary data validation and background checks. Such an example would be Coinmarketcap, which is widely used as a data source. Even the European Parliament or the New York Times use the website as a source, just to name a few[35]. It is a complicate process to discover such market manipulation, but not impossible and there are many signs in the trading data which can suggest wash trading. Some organizations (like Bitwise Asset Management, Alameda Research) have been researching this topic and published their findings. The reports examine and eliminate the fake volume from the real and publish the findings. Moreover, crypto exchanges passing a certain level of reliable reporting are whitelabeled. The reported trading volumes deviate significantly from other publications not taking into account the fake volumes. Suspicious exchanges mislead the market in order to achieve better rankings on popular sites and therefore attract more users to their platforms. This issue, as many others, could be solved by stricter regulating crypto markets and forcing exchanges to enable regulatory oversight from authorities.

2.1.3 Wallet providers

Every system based on cryptography possesses a special feature in order to encrypt information. In blockchain's database each of the block has a public key for the identification of transactions. Users have their private keys for authentication and encryption purposes. If private keys are stolen or lost, the ownership of the cryptocurrencies is comprised and cannot be restored. It is therefore essential to securely storage private key information. Wallet providers has been established for this reason as they offer custodian services and have therefore direct control of the client's cryptocurrencies. The storage takes place either in hot or cold wallets. Hot wallets can be accessed through the Web, so they are more vulnerable for hacks. Cold wallets on the other hand are completely offline.

Many exchanges provide custodianship over cryptocurrencies, either with in house developed solutions or outsourced to other companies. Cryptocurrency exchanges and wallet providers are often regulated together due to their similar features.

3 Regulatory frameworks

3.1 Overview on regulatory items

The broad applications of the blockchain technology and the speed of which the crypto industry is evolving are making lawmakers' task extremely difficult. Creating a transparent and fair legal framework which enables innovation is time-consuming and includes a lot of different aspects to be taken into consideration. Most of the regulators highlight that while cryptocurrencies do need to be regulated, the blockchain technology needs to be separately evaluated. Regulatory items vary between legislations and can include ICOs, mining and tax aspects. In addition, they mostly incorporate cryptocurrencies themselves and cryptocurrency service providers, such as exchanges or wallet providers.

Even though cryptocurrencies represent monetary value in digital form, they are not meeting the necessary requirements to be recognised as a legal tender. This raises the questions: if cryptocurrencies are not perceived as legal tender, in what kind of asset class should they be included. The possible cases can vary in a wide range, such as commodity, financial instrument, or token. A big challenge is to differentiate between the types of cryptocurrencies, either based on the underlying technology or the purpose of their usage. Due to their unique structure, instead of forcing cryptocurrencies into the existing legal frameworks, a creation of a new asset class could propose a solution to this issue. Japanese lawmakers followed this approach and defined the term "virtual currency"[18].

Without a central governing body, the target of law enforcement for satisfying any claims remains obsolete. Even in case of an ICO, the question of the regulated entity brings many complications. Lawmakers therefore are regulating other market participants, like service providers. Since the services they offer show some similarities to the traditional financial products, the pillar of the new regulation is already present.

3.2 Regulatory ambitions and their impacts

Finding the right balance between strict regulations and loose law enforcement is a major challenge lawmakers face and significantly impacts the market behaviour. While a solid legal framework could contribute to market

stability, the choice of not heavily regulating crypto markets could attract international investors and boost the economy.

Several regulatory aspects have to be taken into consideration cause of the market's special features. The following table summarizes a few special features in the market and possible solutions, based on supranational task forces' recommendations.

Issue	Possible regulatory response
High volatility causing risk to financial and economic stability	No clear solution was found until yet
Hacks	Mandatory risk management, and IT standards
Anonymity benefitting financial crimes	Due diligence, transaction monitoring, reporting suspicious activities
Consumers not aware of risks	Investor protection measures: ban of advertising, limited access to margin trading and lending
Consument misleading (f.e. wash trading)	Mandatory auditing and record keeping, whitelabeling and publication of blacklists
Regulatory arbitrage	Supranational collaboration

Table 1: Typical issues in the cryptocurrency market and proposed solutions

3.3 Common regulatory practices

Usually, when a new technology arises, criminals are the first adopters taking advantage of the unknown system and lawmakers firstly start targeting these issues. By the time that one component gets regulated, the market has been already moved forward and developed new products. Therefore it is essential to constantly monitor and evaluate market trends.

The first step of the regulatory progress is usually a public announcement from the government related to cryptocurrencies. The warnings mention topics like market and security risks and the risk of loss of the whole investment amount from the investors' perspectve.

Another form of the consumer warnings is the publication of blacklists. These lists include entities operating without required authorisation or companies suspected in committing fraud or other crimes. Authorities can also whitelabel companies as approved, which have been examined and passed a certain minimum criteria.

Members of certain supranational organizations (for example EU) are required to make national laws follow the recommendations given by the higher authorities. Countries with more advanced approach already are ahead and extended the scope of EU Directives. Such an example would be the UK where legislators adjusted the AMDL5 to include pure cryptocurrency exchanges.

Furthermore, a certain supranational collaboration is typical amongst more progressed countries. Advisory intergovernmental bodies, such as the Financial Action Task Force (FATF) provide standards on several topics which can be implemented by jurisdictions. There exist several blockchain associations advising governments and the G20 is currently working on an analysis of stablecoins[5]. France and Germany addressed the issue of regulatory discrepancies and requested the G20 to establish a supranational framework on cryptocurrencies[8].

Supervisory authorities usually collect feedback from stakeholders before a new legislation will come into force. It occurs either in an open round, so everyone can disclose their opinions on the matter, or only a study group is involved. Participants can take part in the discussion on the draft version of the legislation and lawmakers decide afterwards if they take on the advices.

Establishing a self-regulatory organization in the crypto sector is also a sign of welcoming approach towards cryptocurrencies. These entities specialize in the advisory on regulatory topics and work closely with the supervisory authorities together in order to enforce predefined standards in the crypto market.

Another common procedure is the establishment of a regulatory sandbox. The term indicates the creation of a controlled environment where private firms can test innovations[6]. The UK's Financial Conduct Authority (FCA) has conducted such testing and allowed some blockchain companies to use its regulatory sandbox[7].

Probably the most advanced step is the creation of new legal framework specially tailored to cryptocurrencies. There are not many examples for this progress, but Japanese lawmakers already incorporated virtual currency related regulations into the national law[18].

3.4 Examples outside of EU

In order to get a better understanding on the general governmental attitudes towards cryptocurrencies and service providers, it is valuable to take a look at some individual regulation concepts.

Generally, governments and organizations tend to follow individual strategies for the regulation of the crypto space. It is very interesting to observe how national authorities are working on the adaption of common standards in a different way, although they mostly have the same goal: keep financial markets safe.

Despite the fact that on a global level, regulation is highly fragmented, regulators have consensus on one matter: cryptocurrencies are not recognised as legal tender. What is more interesting is that there is even a high discrepancy between global leaders: China and India are more hostile towards cryptocurrency trading while the U.S enables trading and even implemented legislation for corporations based in New York and the European Union is also planning to regulate the crypto market in the upcoming years.

People's Republic of China has been known for its strong control forces and opposing policies towards many foreign companies. The restrictive measures have reached the cryptocurrency market as well: what first started with a governmental warning notice on the usage of cryptocurrencies turned slowly in a complete ban of cryptoexchanges, ICOs and trading in 2017. This action has resulted in a 6% instant decline of the BTC price[16]. Currently, only the holding of digital coins is allowed in China, but even financial institutions are prohibited from that. Regarding crypto exchanges, these are effectively banned in the country, with the exception of those which have their servers outside China and transactions are conducted on a P2P basis. Binance, for instance, offers P2P trading for BTC, ETH and Tether (USDT) against the Chinese yuan (CNY).

At present, Japan's regulatory approach towards cryptocurrencies can considered to be quite advanced. The Financial Services Agency has been closely working together with a study group specialised on crypto-related topics. This cooperation resulted in the successful plans of future implementation of virtual currencies into the Act on Prevention of Transfer of Criminal Proceeds[18]. Furthermore, main developments include the amendment of the term "crypto asset" to "virtual currency", the strengthening of regulation of crypto asset custody and exchange services. Additionally, lawmakers limited the level of margin trading up to maximum 4%, and regulated

margin call rules as well[20]. What is more, under the Payment Services Act, the law specifies which business operators may operate cryptocurrency exchanges. The requirements include mandatory registration, Know your customer (KYC) processes, minimum financial base, and IT system risk management as well[21]. The country's proactive method has not discouraged business owners, as of March 2019 there have been around 23 licensed cryptoexchanges in Japan[22]. The list includes some industry leaders, such as Liquid, Quoine, Huobi and bitFlyer, however, the latter had to face serious consequences due to its lack of minimum requirements in their KYC process. The exchange had to freeze the procedure of taking on new users for almost 1 year[23]. This is a great example of the possible disadvantages that crypto exchanges might face due to stricter regulation.

While the Royal Bank of India issued a general ban prohibiting banks, lenders and other regulated financial institutions from dealing with virtual currencies[19],this verdict has been recently lifted due to India's Supreme Court ruling. Many exchange operators welcomed the court's decision. Binance made a major move into Indian's crypto market in 2019, by acquiring the biggest local crypto exchange WazirX.

In the United States, states have disparate laws affecting cryptocurrencies. Some states eased the regulation and excluded cryptocurrencies from various laws such as securities laws[24] and others chose to accept BTC as legal payment option for tax purposes. The most strict rule comes from the state of New York, where the so called Bitlicense is mandatory for any corporations involving New York state or residents from New York operating various activities associated with virtual currencies[25]. Many leading exchanges have been granted a Bitlicense, such as Coinbase, bitFlyer and Bitstamp.

3.5 Regulation in the European Union

Existing laws are not yet tailored to the new asset class cryptocurrencies might require. Many legal bodies are involved in the law-making procedures, such as the European Parliament, Council of the European Union, European Commission. The Commission proposes new laws, which the Parliament and Council adopt then. Afterwards, the Commission ensures that member countries properly incorporated the new legislation in their national regulatory framework.

Cryptocurrencies caught legislators' attention due to their usage as a payment option for crime purposes. In the research paper "Cryptocurrencies and blockchain" published by the European Parliament, the basic interpretation around cryptocurrencies, blockchain, and market players were introduced. The EU, such as many organizations worldwide face the challenge of categorising cryptocurrencies into an asset class as they do not quite fit into the category of financial instruments. This means that exchange platforms and wallet providers are thus excluded from the Markets in Financial Instruments Directive (MiFID) licensing obligation.

The key issue surrounding the nature of cryptocurrencies lies in the anonymity which can be exploited for money laundering, terrorist financing and tax evasion[28]. The recent mandatory transmission of the AMLD5 addresses this issue, by broadening the scope of the AMLD4 and brings custodian wallet providers as well as virtual currency exchanges (defined as "an entity that provides services to safeguard private cryptographic keys on behalf of their customers, to hold, store and transfer virtual currencies" and "providers engaged in exchange services between virtual currencies and fiat currencies", respectively) under the same regulation. Service providers are obliged to conduct customer due diligence controls, when exchanging virtual for fiat currencies, ending the anonymity associated with such service providers, and report suspicious transactions to the competent financial authorities. In addition, mandatory registration was also presented in the legislation, both for exchange platforms and custodian wallet providers. Prior to the amendment of this legislative, service providers were not forced to conduct KYC processes.

Nevertheless, as highlighted in the paper, existing laws are failing to achieve predefined goals and leaving blank spaces in the regulatory framework. This fact also applies to the current AMLD5 regulation since only entities dealing with crypto-fiat transactions are regulated while pure cryptocurrency exchanges are left out of the regulation. Moreover, if these exchanges do not provide custodian wallet services, they are completely excluded of the scope of 5AMLD.

The recently released paper written by the same authors explores more regulatory concerns regarding crypto assets. The paper addresses cryptoassets and not cryptocurrencies as in the previous publication. It raises many topics and give recommendations to lawmakers such as to align on a supranational level on regulating stablecoins, research central bank currencies, and strengthen AML procedures of exchanges. Furthermore, the need of intro-

ducing standards for cybersecurity measures for custodian service providers is also mentioned in the paper. These advices are all aligned with the European Commission Work Programme for 2020. As seen in that plan, the Commission is aiming to make "Europe fit for the digital age", with plans for introducing new legislatives and recommendation on regulating cryptoassets[27]. The reason behind the planned regulation remained the same, that is due to the high usage of cryptocurrencies for illegal purposes.

3.5.1 How crypto exchanges reacted to regulatory changes

The implications of the recent regulatory changes are yet to come, since member countries only introduced the 5AMLD recently. Crypto exchanges had to act accordingly and adjust to the new legal environment. Some have chosen to escape the force of the legislation, such as Deribit, which left the Netherlands to relocate to Panama[39]. Others were already prepared and had set up a registered company before the regulation came into force.

Regulatory arbitrage is a well-known practice in the crypto industry. Service providers can take advantage of regulatory discrepancies with setting up a company in a less regulated jurisdiction and still serve global customer base through their platform. Since the servers of crypto exchanges is operated in the cloud and cryptocurrencies are accessible through permissionless digital networks, exchanges and wallet providers can be relocated much easier than traditional companies.

Without a new category, crypto service providers usually register as a payment institute or E-money business. Payment institutions are allowed to conduct many financial services such as funding, transferring fiat currencies and issuing or acquiring payment instruments, money remittances, foreign exchange services[40]. On the other hand, the E-Money license enables companies additionally to issue electronic money[41].

Another major topic causing service providers to rethink their strategy is the Brexit and its impact on businesses. Exchanges staying in the UK would give up the freedom of passporting (the right to do business in any of the European Economic Area (EAA) states once a firm is registered in the EEA, without the need for further authorization from each country). The response from the crypto community was as expected: Coinbase successfully applied for and was granted the E-money license in Ireland[42] while Binance launched its new exchange in Jersey[43]. Both of the exchanges are rumoured

to set up new subsidiaries in Germany.

3.6 National regulations

Members need to follow the European Union's recommendation on introducing new legislation and translate the laws the into their existing legal framework, just as it was in the case of AMDL5. Authorities can choose different approaches and take various types of actions to address relevant issues. Lack of international standards result in regulatory gaps and these differences can be derived from the different market conditions and the attitude of the government towards digital innovation. The following countries were selected based on the top crypto exchange's location, as can be seen in the following chapters.

3.6.1 UK

Lawmakers in the UK have been closely working together with national and international associations in order to create transparency in the regulatory environment. The FCA supports recommendations given by the FATF, and it involves in the decision-making process the Bank of England and the UK Treasury as well. A cryptoasset taskforce was formed in 2018 to assess the potential impact of cryptoassets and Distributed Ledger Technology (DLT) in the UK and to consider appropriate policy responses. Even though the FCA does not regulate cryptocurrencies yet, the taskforce issued a report in October 2018 on its findings, describing common uses of cryptocurrency and whether or not the use falls under the existing regulatory frameworks. Nowadays, derivatives with crypto-related underlying are categorized as financial instruments, bringing entities dealing with such financial products under MiFID II[47]. However, the FCA along with the cryptoasset taskforce is considering a ban on the derivatives sales to retail consumers for investor protection purposes[48]. In addition, as part of the investor protection programme, the FCA gives warnings on unregistered crypto companies conducting business in the UK. The other active regulation incorporating crypocurrencies is the obligatory amendment of the AMLD5 into UK's law. The regulation was adopted in a broader range: it also included pure cryptocurrency exchanges, P2P exchanges, and bitcoin ATMs.

UK's decision on leaving the EU causes high uncertainty in the markets, but the FCA stated the goal to continue to engage with the future EU agenda. The process includes amongst many other aspects, the future regulation of crypto assets as well [49].

3.6.2 Malta

Malte is known as an offshore financial centre due to its favourable tax rates and is therefore a popular choice for newly established companies. The country successfully attracted investors from the crypto market as well. The Malta Financial Services Authority (MFSA) started to work on the regulatory frameworks with a series of acts. The Virtual Financial Assets Act regulates virtual financial asset exchanges amongst others, forcing exchanges to obtain a license before they can officially operate in the country[50].

The MFSA recently published a list of entities which have not applied for the mandatory authorisation. Interestingly, majority of the service providers failed to comply with the new laws[51].

3.6.3 Luxembourg

Luxembourg, as many other EU members, has not yet created a special legal framework around cryptocurrencies. However, following the revision of European Directive AMDL5, any entity providing services related to virtual assets is obliged to obtain a payment institutions license from responsible local authorities. The Financial Sector Monitoring Commission (CSSF) of Luxembourg also issued a warning to investors about the risk of cryptocurrencies. Additionally to the amendment of AMLD5, the government is planning to follow the FATF's recommendations and tighten the rules regarding AML and Combating the Financing of Terrorism (CFT) supervision of virtual asset service providers.[31]. Furthermore, entities dealing with the exchange between one or more virtual assets will be also included in the regulation.

Crypto exchanges are drawn to the country probably owing to Luxembourg's strong position as a financial centre in the EU.

3.6.4 Gibraltar

Gibraltar's regulators have followed a progressive approach towards firms carrying out blockchain projects. The country started a precedent by not only amending the existing law to the new asset class, but creating an entire legislation tailored to cryptocurrencies. Moreover, the Digital Ledger Technology Regulatory Framework came into force in 2018, and regulated KYC and AML processes 2 years before other EU members. The framework addresses topics, like honesty and integrity, customer care, resources, risk management, protection of client assets, corporate governance, systems and securities access, financial crime, resilience[61].

Service providers are also regulated under this law, and are obligated to obtain a license from the Gibraltar Financial Services Commission (GFSC) as a DLT Provider in order to conduct business in or from Gibraltar. Licensed exchanges include well-known Huobi and the Global Blockchain Exchange (GBX), which is a subsidiary from the country's only regulated stock exchange, the Gibraltar Stock Exchange. However, GBX currently relocated to Estonia.

3.6.5 Germany

Being part of the EU, Germany introduced the amendment of AMLD5 into the national law in January 2020. The legislation also obliges crypto custodian business to apply for an appropriate license by the authorities, even if they are approved for other crypto-related businesses. Additionally, the offering of custodian services requires the separation of legal entities. Not only companies based in Germany, but any business with active targeting of the german market requires written authorisation from the Federal Financial Supervisory Authority (BaFin). In addition, german banks are allowed to conduct business with digital assets, allowing them to buy, hold and sell digital assets in the same way as with traditional assets. The regulation resulted in already more than 40 applications[52], as this procedure also requires licensing. European passporting cannot be applied for custodian services since these are not recognised as financial services. This means that any entity wishing to enter the german crypto market needs to setup a subsidiary in Germany. In this way, lawmakers are trying to protect markets from regulatory arbitrage and this legilsatin might explain some exchanges' plans on opening a subsidiary in Germany.

As for the asset classification, cryptocurrencies are brought under the regulation, defined as units of account and qualified as financial instruments under the German Banking Act (KWG).

Lawmakers are actively working together with market participants in order to better understand their needs. They might follow the UK's example on a possible ban on derivates with crypto underlying for retail consumers, also justifying this decision as investor protection. In the future, BaFin plans to continue supporting international concepts, which are aiming to create uniform regulations on a supranational level, inclusive the regulation of stablecoins.

3.6.6 Estonia

Estonia incorporated the Anti Money Laundering and Terrorism Finance Act into its national law in 2017. The legislation not only came into force earlier than the AMLD5 Directive from the EU but also takes a broader set of activities into scope. The regulation introduced two different kinds of obligatory licensing: the Virtual Currency Exchange Service License, and the Virtual Currency Wallet Service License. In addition, the law has been amended in January 2020 and virtual currency service providers will be treated equally to financial institutions. Under the new version of the Act, the services of pure cryptocurrency exchanges have been brought under the law as well[53]. Similar to Germany, a certain local presence became mandatory for virtual currency service providers.

4 Research on the top crypto exchanges

4.1 Methodology on the selection of exchanges

Due to the immature and unregulated nature of the crypto market, reliable datasources are not easily accessible. The determination of the leading exchanges requires the establishment of a certain criteria list.

The procedure of the selection of the analysed exchanges was the following:

1. Selection of reports and reliable rankings on the top exchanges

2. Identification of exchanges with active business in the EU

3. Eliminate exchanges reporting fake volumes based on reports, online sources and existing partnerships

4. Further analysis of selected exchanges.

There exist various research papers with rankings on the top exchanges. These rankings have to be carefully selected, aggregated and their methodology was reviewed instead of rashly accepting the facts they are stating. The following table summarizes some of the top exchanges from different rankings, which created the base of the further research:

	Statista	Cryptocompare	Coingecko	Coinmarketcap	Nomics	Tokeninsight
1	BKEX	itBit	Binance	BKEX	Binance	Binance
2	Coinsbit	Gemini	Coinbase Pro	MXC	Bitmex	Coinbase Pro
3	BiKi	Coinbase	Huobi Global	P2PB2B	bitFlyer	Huobi Global
4	Lbank	Kraken	Kraken	Fatbtc	Bybit	OKEX
5	BitForex	Bitstamp	Bithumb	BitForex	FTX	Kraken
6	Hcoin	Liquid	Bitfinex	EtherFlyer	Bequant	Liquid
7	Coineal	Bitfinex	Bitstamp	Bilaxy	Coinbase Pro	Bitstamp
8	Hotbit	OKEX	FTX	Coinsbit	Deribit	Kucoin
9	P2PB2B	bitFlyer	bitFlyer	CoinBene	Kraken	Bitflyer
10	Fatbtc	OKCoin	KuCoin	Hotbit	Liquid	Bitfinex

Table 2: Rankings of the top crypto exchanges

It is important to highlight that these resources do not follow the same ranking methodology. The most popular ranking methodology is based on the trading volume, however, as some of the rankings are not controlling the reported volumes, these have been disregarded. Other rankings, such as CryptoCompare and TokenInsight have their self-developed methodology based on a coherent procedure and includes important aspects, such as liquidity, geography, legal/regulatory, investment, team/company, data provision, trade surveillance, market quality and a penalty factor for negative events. These rankings are more trustworthy and are the foundation of the further analysis. As the legal element is incorporated in CryptoCompare's ranking, that report has had less impact on the analysis in order to eliminate a biased conclusion. CME's and Bakkt's lists do not count as rankings, but are merely aggregations of their current active partnerships with crypto exchanges. Bakkt does not publish from which exchanges they collect data

for the derivatives, however, its parent company, the ICE published a list of cryptocurrencies which will be listed in the data provision segment[54]. The list includes alongside the most popular coins the USDC stablecoin developed partly of Coinbase. Other coins from the analysed cryptoexchanges (such as Binance Coin, Kraken Coin) are excluded, regardless their popularity. The listed coins reveal ICE's viewpoint on trustable and valuable coins. The other major institutional participant, CME, lists BTC and ETH futures and options. To calculate the derivatives, following crypto exchanges are taken as pricing sources: Bitstamp, Coinbase, itBit, Kraken, Gemini [55]. Unfortunately, the admission criteria for the exchanges is not publicly available, but a long-established regulated stock exchange's opinion should be taken into consideration as a good indicator for the top exchanges.

The final selection also takes into account social media presence, recent news, and user numbers as well. In addition, exchanges with a possible expansion within the European Union were favoured, since the choice of their strategic allocation is a good indicator on their approach of regulation. In addition, the few exchanges backed up by a traditional stock exchange were also included in the list.

4.2 Analysed crypto exchanges

Following crypto exchanges were further analysed from a strategic and regulative perspective and taken as representative set:

Exchange	HQ	EU Location	EU Regulated
Börse Stuttgart	Germany	Germany	Yes
Digital Asset Exchange	Gibraltar → Estonia	Gibraltar → Estonia	Yes
Binance	Unconfirmed	Jersey → Germany	No
Kraken	US	UK	Only for Futures
Coinbase	US	UK → Germany	E-Money License
Bitstamp	Luxembourg	Luxembourg	Payment institution
bitflyer	Japan	Luxembourg	Payment institution
Bitfinex	Hong Kong	British Virgin Islands	Unconfirmed
Bittrex	US	Lichtenstein	Limited company

Table 3: Analysed exchanges, their locations and regulatory statuses

4.2.1 Regulated entities offering cryptocurrency products

Traditional stock exchanges in Europe usually do not offer cryptocurrency trading, however, there are a few exceptions. The Deutsche Börse is considering to develop BTC, ETH, and XRP contracts[36], while the Gibraltar Stock Exchange and Börse Stuttgart already launched some products.

Börse Stuttgart counts as a first mover in the regulated crypto environment, with the development of BISON and Börse Stuttgart Digital Exchange (BSDEX). The initial implementation of their digital strategy resulted in the creation of BISON, the first mobile application specialised in digital assets. It is important to highlight that BISON is merely the trading partner in the transactions, and is not a regulated or supervised exchange trading. Clients can buy and sell BTC, ETH, Litecoins and Ripple (XRP) via Smartphone[37]. The application is accessible for EEA citizens and citizens of Switzerland.

Germany's first regulated trading venue for digital assets was also established by Börse Stuttgart. BSDEX meets the regulatory requirements in accordance with the German Banking Act (Kreditwesengesetz) and is op-

erated as a multilateral trading facility. The platform enables the trading of BTC against EUR through an open order book. Several order types are available, such as limit and market orders. Contrary to BISON, reliable trading on BSDEX is ensured through a market surveillance system. Custody services are managed by the same subsidiary as for BISON. As of future plans, Börse Stuttgart intends to expand its digital offering to other coins, more order types as well as other markets.

The Digital Asset Exchange is powered by the Gibraltar Stock Exchange and provides a trading platform, and fiat/crypto gateway for professional and institutional clients.The exchange launched its own coins, GATE and STACS. Recently, the company decided to relocate its headquarter to Estonia with the explanation of Estonia being an appealing country that takes a progressive approach to DLT. GBX surrendered its DLT Provider's license and will no longer be regulated by the Gibraltar Financial Services Commission since it is now licensed by the Estonian Financial Intelligence Unit (FIU) as a virtual currency against fiat currency exchange service provider and virtual currency wallet service provider under the Estonian Money Laundering and Terrorist Financing Prevention Act[38].

4.2.2 Binance

Binance appears in almost every ranking and is considered to be one of the most popular exchanges in the crypto market. Besides the P2P trading platform facilitating, it offers a wide range of services through its subsidiaries, including custodian services and lending. It covers spot and derivatives markets (with futures, options and the availability of margin trading) and it operates both a decentralized and a decentralized exchange. Recently, it also took over the crypto data provider, Coinmarketcap. Binance lists an outstanding amount of trading pairs, with more than 600 on their platform.

Most of the volume comes from crypto-crypto pairs, since the exchange has been more focused on its pure crypto trading, only slowly entering the fiat market. The explanation behind this decision lies in the long-established product strategy of the exchange, set by the founder of Binance, Changpeng Zhao. He is famous of his view on regulatory topics, mentioning in some interviews that dealing with fiat currencies would draw a lot of attention and regulatory complication[44]. This approach is reflected in the constant change of their location. Binance was firstly set up in China, but when regu-

lators introduced the ban on ICOs, the company decided to move to Japan. The relocation did not last long, as Japanese laws have been tightened shortly afterwards. Ever since then, there has been a global confusion of Binance's location. The unclarity was caused by the exchange itself as it was continuously refusing to publish this information. The mystery surrounding the official location of Binance has not been cleared yet. Majority of the crypto community mention Binance as Malta-based. However, the MFSA officially declined the allegations[45]. The company still has presence in Asia, since the platform is still accessible for Chinese investors, offering Chinese yen and crypto pairs. The Singaporean subsidiary was granted an exception from the licensing obligation for some time due to the new legislation coming to force. However, it has to apply for a license to be able to continue providing digital payment token services. The company was also rumoured to have offices in offshore islands, such as the Seychelles and Bermuda as well. Their only confirmed registration in Europe is in Jersey. Jersey is said to be a leading jurisdiction for asset management and crypto-related services. Binance Jersey allows users the trading of fiat-to-crypto in GBP and EUR with BTC and ETH, in addition to asset management services to users.

After a failed partnership in Lichtenstein, Binance moved on and is exploring the expansion to Germany, however, following its approach to the legal frameworks, it will be interesting to see how the company is compiling with the laws.

4.2.3 Kraken

Kraken was established in San Fransisco and serves clients in over 190 countries, offering more than 20 digital assets and 70+ currency pairs. The platform facilitates many services, such as OTC desk, dark pool and margin trading. Currently, it has registered business in the US and Canada, both as Money Services Business. New York citizens are not allowed for trading on the platform, as Kraken does not have the required Bitlicense, justifying its decision as a cost-saving measure. Alongside with Binance, Kraken also left Japan stating that the costs running the operations were too high[46], referring to the mandatory license process and strengthened oversight from the JFSA.

Kraken is trusted by both retail and institutional clients. Its UK-based subsidiary, CryptoFacilities, which was acquired in 2019, is providing CME

with data for its index calculation. Being the only registered subsidiary in Europe, the business is responsible for facilitating derivatives trading. The company license enabled Kraken to expand its services and introduce the possibility of fiat Forex (FX) trading on its platform, strengthening its position as a first mover in the industry.

After India's Supreme Court recent decision to ease the bans on crypto firms, the company is exploiting its enter into the market as well.

4.2.4 Coinbase

The services of Coinbase cover the entire transaction process chain, starting with venture capital services, in-house developed custodian services, and data platform (both for beginners and professionals). In 2018, it earned a $1 billion 'unicorn' valuation from investors[56] as the first US cryptocurrency startup and it has been later valued at $8 billion[57]. Its investor base includes the NYSE as well.

Coinbase lists more than 40 digital coins, and carries out Initial Exchange Offerings (IEOs) often. Alongside with Circle, their jointly developed stablecoin USDC is currently the second most popular and has around $ 700 million market capitalization[58].

The primary office is in San Fransisco, and a company in Ireland was set up recently to handle all non US transactions. Coinbase is considered to be a quiet regulated company. It holds the Bitlicense in New York, is currently in the process of obtaining the required licences in Japan and Singapore and the UK subsidiary has E-Money License.

4.2.5 Bitstamp

Bitstamp entered the market in 2011, and earned with that move the title of "world's longest-standing crypto exchange". The company was firstly established in Slovenia then moved to London. Bitstamp is said to be the first to implement KYC requirements across its user base and as a truly EU-based exchange, it was the first digital currency exchange in the EU to register as a payment institution. The license was granted in 2016 in Luxembourg. Bitstamp also holds the Bitlicense in New York.

The exchange only offers two fiat currencies and a few cryptocurrencies, but it has earned the trust of many institutional companies, such as Swis-

squote or Silvergate.

4.2.6 BitFlyer

BitFlyer was established in 2014, in Tokyo, where the company is still headquartered. The exchange facilitates spot, FX and futures trading and supports many blockchain based projects. Since bitFlyer is considered to be the most used virtual currency exchange in Japan, most of the volume (around 95%) is dominated by JPY, followed by USD and EUR.

After its expansion to the US and Europe, bitFlyer has earned the title as the only virtual currency exchange licensed to operate in all of the 3 jurisdictions. The exchange has a license as a Virtual Currency Exchange Service Provider in Japan, operates in 47 states in the US as Money Transmitter and holds the Bitlicense in NY. Its European subsidiary was set up as a payment institution in Luxembourg, similar to Bitstamp.

4.2.7 Bitfinex

Bitfinex was founded in 2012 and has become famous for its highly liquid markets mainly directed to captivate professional traders preferences with its advanced features. These services include margin trading due to the availability of P2P lending directly through Bitfinex, OTC market, various order types, offering of derivatives products (such as perpetuals contracts and multi-pair indices). The platforms enables users to trade 4 fiat currencies (EUR, USD, GBP, JPY) and many cryptocurrencies.

The headquarter is in Hong Kong and the exchange itself is registered in the British Virgin Islands. Some level of regulatory compliance is reflected in the fact that US residents are prohibited from the usage of the trading platform, but other information is hardly to be found.

Bitfinex was hacked in 2016, suffering a loss of 119,756 bitcoins. The importance of the exchange is reflected in the fact that after the hack attack the BTC price dropped about 20%[59]. What is more, the exchange has been prosecuted in New York due to allegations of having hidden $850 million of client funds[60].

The exchange does not reveal its regulatory state and the government of British Virgin Islands (as many other offshore locations) does not publish this kind of data unrestrained.

4.2.8 Bittrex

Even though Bittrex is not mentioned in all of the rankings, due to its somehow lower trading volumes, it passes all of the different wash trading reports with excellent results. Opposite to the above mentioned crypto exchanges, it merely lists 2 fiat currencies, USD and EUR.

Bittrex was founded in 2014 and was up until recently an US based exchange. It was only operated from the US while the headquarter have been moved to Lichtenstein[62]. The reason for its relocation may be derived from lawmakers' decision to toughen regulation in Malta, where the exchange was previously located[63]. This was not the first occasion where the exchange had issues with regulators: Bittrex' application for a Bitlicense in NY was denied[64].

The exchange is currently registered as a private limited company, but the framework, within it is regulated ("The Blockchain Act"), has not been officially approved yet.

5 Conclusion

After conducting the analysis on the strategies of the top crypto exchanges with an active EU market, several conclusions can be drawn.

In the early days of the adoption of cryptocurrencies the market was completely unregulated. Thus, exchanges could freely decide if a legal entity was vital to be set up for operations. In order to quickly react to the thriving client demand, most of the exchanges were run in an unregulated environment, and many of them failed to survive due to low security systems or the lack of liquidity.

In the present, cryptoexchanges face more regulatory challenges, but the lack of homogeneous EU legislations still enables them to take advantage of regulatory arbitrage. Many different strategies can be observed in the market. Most of the top exchanges have some kind of license and have setup a legal entity in order to conduct business legally. This step attracts institutional clients and partnerships granting additional revenues, even though it is still an emerging part of the market. Nevertheless, stricter regulation also might cause KYC processes to take longer, and a lower anonymity might result in a declining number of clients. Since regulatory costs are reflected in the financial statements, which are not always publicly available, the fur-

ther comparison of the exchanges is based on the trading volume and client numbers, which are defined as key success factors and can be seen in Table 4 below.

Exchange	Users	24h Trading volume*
Börse Stuttgart	no publicly available data	no publicly available data
Digital Asset Exchange	no publicly available data	no publicly available data
Binance	15 M	$ 2 B
Kraken	no official data	$ 239 M
Coinbase	30 M	$ 370 M
Bitstamp	3 M	$ 248 M
BitFlyer	2 M	$ 73 M
Bitfinex	1.6 M	$ 157 M
Bittrex	no official data	$ 33 M

Table 4: User number and trading volumes of the selected exchanges
*as of 21.05.2020[65]

The most regulated exchanges like Bitstamp, bitFlyer and Coinbase have strict listing rules and offer therefore fewer cryptocurrencies. Bittrex, and Binance on the other hand are targeting aggressive traders with a quick listing procedure and a broad product line. Kraken and Bitfinex provide a mix of security regulatory adherence and access to several cryptocurrencies.

The data on trading volumes in Table 4 clearly indicates that Binance dominates the market. It successfully created an excellent market targeting with serving private users in need of low KYC requirements as well as a lot of crypto pairs. Binance's evasion of authoritarian supervision has resulted in slightly slip off in the rankings, where the legal aspect was taken into account, but neither this fact nor the hacking attacks could damage its reputation or trading volume. However, in the number of registered users, Coinbase comes out as a winner with around double as much clients as Binance.

Traditional exchanges offering cryptocurrency products fail to keep up with the highly competitive market. Interestingly, one could expect that they are the most transparent exchanges due to their highly regulated structure. However, neither Börse Stuttgart nor the Digital Asset Exchange publish information on their user numbers and their trading volume is so marginal

that popular data sites won't even take the volumes into account. It seems that they cannot attract enough clients and their product offering is quite narrow as well. A reasonable explanation for the low success can be that cryptocurrency traders are not the usual customers of traditional exchanges. The crypto market is probably not ready for the institutional adoption and it might take several years to change that.

To summarize, it is clear that regulation significantly impacts the success of crypto exchanges. These days it is hardly inevitable to have some kind of regulatory compliance, especially when serving global clients. Binance and Coinbase count as the most successful exchanges and they follow very deviant strategies regarding regulation. It seems like the evasion of regulation is still a possible approach to earn significant revenues, however, the constant relocation comes with high cost. As for the future, it will be interesting to observe how Binance can keep its leading position when a supranational regulatory framework will develop and more legislations will come into force. Coinbase and other regulated exchanges are already ahead and are prepared for the upcoming regulatory frameworks.

Regulators are turning more and more often to supranational organizations for recommendations on the legislations, and an increasing number of countries are starting to regulate cryptocurrencies and service providers. A clear and transparent regulatory framework could contribute greatly in the establishment of a safe and transparent trading environment, from which all market participants could benefit in the long-term. Due to the fast development of the market environment, it will be fascinating to observe how the landscape will shape financial markets and how crypto exchanges will answer to the stricter regulation, as well as to examine if the EU can keep its competitive advantage in the crypto space.

6 Acknowledgments

I would like to thank my supervisor, Afonso Eça, for his guidance and support through my questions. I would like to thank for the support that I received at Eurex Frankfurt, where I completed my internship. My time at the company was more than valuable and helped me with the development of this work project. I am grateful that I was part of the Eurex Crypto Project and I appreciate all the chances I received to gain an insight in this project. I

would like to especially thank Christian Schulte, Gerriet Scholle, Maximilian Trossbach, Fabian Schaum, Beate Fisior and Thomas Koivu. Furthermore, I would like to thank for Raquel Chaves for her contribution in the delivery of the work project as well.

References

[1] Zoe Clark, 2018: *bitFlyer Launches in Europe and Becomes the World's First Bitcoin Exchange to Be Regulated in Japan, the US and Europe*
https://bitflyer.com/pub/announce-payment-institution-license-and-europe-launch-en.pdf

[2] Satoshi Nakamoto, 2008: *Bitcoin: A Peer-to-Peer Electronic Cash System*
https://bitcoin.org/bitcoin.pdf

[3] Chris Burniske, Jack Tatar, 2018: *Cryptoassets: The Innovative Investor's Guide to Bitcoin and Beyond*

[4] Michael del Castillo, 2020: *Forbes Blockchain 50*
https://www.forbes.com/sites/michaeldelcastillo/2020/02/19/blockchain-50/#36486f407553

[5] Andrey Shevchenko, 2020: *World Governments at G20 Are Concerned About All Stablecoins, Not Just Libra*
https://cointelegraph.com/news/world-governments-at-g20-are-concerned-about-all-stablecoins-not-just-libra

[6] Jake Frankenfield, 2018: *Crypto Regulatory Sandbox*
https://www.investopedia.com/terms/c/crypto-regulatory-sandbox.asp

[7] FCA, 2019: *Regulator sandbox - cohort 5*
https://www.fca.org.uk/firms/regulatory-sandbox/cohort-5

[8] Nicholas Megaw, 2018: *France and Germany join calls for global bitcoin clampdown*
https://www.ft.com/content/03511abe-0d86-11e8-839d-41ca06376bf2

[9] CoinMarketCap, 2020: *Top 100 Cryptocurrencies by Market Capitalization*
https://coinmarketcap.com/

[10] Mike Orcutt, 2020: *Sweden is now testing its digital version of cash, the e-krona*
https://www.technologyreview.com/2020/02/20/906146/sweden-riksbank-ekrona-blockchain/

[11] Shaura Malwa, 2018: *Estonia Scales Back Plans of Ambitious State Cryptocurrency 'Estcoin'*
https://www.ccn.com/estonia-scales-back-plans-of-ambitious-state-cryptocurrency-estcoin/

[12] Thomas Simms, 2019: *Major Swiss Stock Exchange SIX Developing Stablecoin Pegged to the Franc*
https://cointelegraph.com/news/major-swiss-stock-exchange-six-developing-stablecoin-pegged-to-the-franc

[13] Julia Magas, 2020: *Top Facts on China's Crypto Yuan and Related Blockchain Projects*
https://cointelegraph.com/news/top-facts-on-chinas-crypto-yuan-and-related-blockchain-projects

[14] Prof. Dr. Robby Houben, Alexander Snyers, 2020: *Crypto-assets: Key developments, regulatory concerns and responses*
Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg
https://www.europarl.europa.eu/RegData/etudes/STUD/2020/648779/IPOL_STU(2020)648779_EN.pdf

[15] Samuel Haig, 2020: *Halving Hype Drives Second-Strongest Spot Volume on Record*
https://cointelegraph.com/news/halving-hype-drives-second-strongest-spot-volume-on-record

[16] Shobhit Seth, 2019: *Is Bitcoin Banned in China?*
https://www.investopedia.com/news/bitcoin-banned-china/

[17] Robyn Mak, Pete Sweeney, 2019: *China's e-yuan will be more cryptic than crypto*

https://www.reuters.com/article/us-china-crypto-breakingviews/breakingviews-chinas-e-yuan-will-be-more-cryptic-than-crypto-idUSKBN1YR0DC

[18] Ken Kawai, Akihito Miyake, Shunsuke Aoki, Tomoyuki Tanaka, Takeshi Nagase, Keisuke Hayashi, 2019: *Revisions to Payment Services Act Provisions, etc. on Crypto Assets*
https://www.amt-law.com/asset/pdf/bulletins2_pdf/190523.pdf

[19] Library of Congress, 2019: *Regulation of Cryptocurrency Around the World*
https://www.loc.gov/law/help/cryptocurrency/world-survey.php

[20] Ana Alexandre, 2019: *Japan Introduces New Regulations for Cryptocurrency Margin Trading*
https://cointelegraph.com/news/japan-introduces-new-regulations-for-cryptocurrency-margin-trading

[21] Press Release, Financial Services Agency, 2017: *Details of Screening for New Registration Application as Virtual Currency Exchange Service Provider*
https://www.fsa.go.jp/en/news/2017/20170930-1/02.pdf

[22] Kevin Helms, 2020: *23 Approved Cryptocurrency Exchanges in Japan — Number Rises Despite Pandemic*
https://news.bitcoin.com/cryptocurrency-exchanges-japan/

[23] Daniel Kuhn, 2019: *BitFlyer to Resume Opening New Accounts After One Year Voluntary Suspension*
https://www.coindesk.com/bitflyer-to-resume-opening-new-accounts-after-one-year-voluntary-suspension

[24] Joe Dewey, 2019: *Blockhain & Cryptocurrency Regulation 2020*
https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/usa

[25] New York State, Department of Financial Services, 2020: *Virtual Currency Business Activity (Bitlicense)*
https://www.dfs.ny.gov/apps_and_licensing/virtual_currency_businesses

[26] Nathan DiCamillo, Nikhilesh De, 2019: *New York Regulator Details Changes to Contentious BitLicense*
https://www.coindesk.com/new-york-regulator-details-changes-to-contentious-bitlicense

[27] European Commission Secretariat, 2020: *European Commission Work Programme for 2020*
https://eur-lex.europa.eu/resource.html?uri=cellar%3A7ae642ea-4340-11ea-b81b-01aa75ed71a1.0002.02/DOC_1&format=PDF

[28] Prof. Dr. Robby Houben, Alexander Snyers, 2020: *Cryptocurrencies and blockchain - Legal context and implications for financial crime, money laundering and tax evasion*
Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg
https://www.europarl.europa.eu/cmsdata/150761/TAX3%20Study%20on%20cryptocurrencies%20and%20blockchain.pdf

[29] Amber Song, Julio Wu, 2020: *2019 Cryptocurrency Spot Exchange Industry Annual Report*
https://image.tokeninsight.com/upload/levelPdf/2019-Cryptocurrency-Spot-Exchange-Industry-Annual-Report.pdf

[30] Song Bingyao, Wang Jinhua, 2019: *2019 2nd Issue Cryptocurrency Futures Exchange Industry Research Report*
https://image.tokeninsight.com/upload/levelPdf/2019-11-Cryptocurrency-Futures-Exchange-Industry-Research-Report.pdf

[31] Comission de Surveillance du Secteur Financier, 2020: *Communiqué on virtual assets and virtual asset service providers*, https://www.cssf.lu/en/2020/01/communique-on-virtual-assets-and-virtual-asset-service-providers/

[32] Binance Blog, 2019: *Binance DEX Launches on Binance Chain, Invites Further Community Development*
https://www.binance.com/en/blog/327334696200323072/Binance-DEX-Launches-on-Binance-Chain-Invites-Further-Community-Development

[33] M. Szmigiera, 2019: *Largest problems of cryptoexchanges according to traders 2018*
https://www.binance.com/en/blog/327334696200323072/Binance-DEX-Launches-on-Binance-Chain-Invites-Further-Community-Development

[34] Changpeng Zhao, 2019: *Binance Security Breach Update*
https://binance.zendesk.com/hc/en-us/articles/360028031711-Binance-Security-Breach-Update

[35] Bitwise Asset Management, 2019: *Presentation to the U.S. Securities and Exchange Commission*
https://www.sec.gov/comments/sr-nysearca-2019-01/srnysearca201901-5164833-183434.pdf

[36] Bitwise Asset Management, 2020: *Institutional Adoption of Digital Asset Trading*
https://www.acuiti.io/wp-content/uploads/2020/03/Institutional-Adoption-of-Digital-Asset-Trading.pdf?utm_source=linkedin&utm_medium=post&utm_campaign=acuiti

[37] Börse Stuttgart, 2020: *Bison app*
https://bisonapp.com/en/

[38] Official Announcement of GBX, 2020: *GBX Moves to Estonia amid GSX Group Global Expansion*
https://exchange.gbx.global/cms/noticeContent/article?title=Announcements&articleSeqNo=1657695467285831682

[39] Benjamin Pirus, Cointelegraph, 2020: *Crypto Derivatives Exchange Leaves EU for Panama, Expands KYC*
https://cointelegraph.com/news/crypto-derivatives-exchange-leaves-eu-for-panama-expands-kyc

[40] Official Journal of the European Union, 2015: *Directive (EU) 2015/2366 of the European Parliament and if the council of 25 November 2015*
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366&from=EN

[41] Official Journal of the European Union, 2009: *Directive 2009/110/EC of the European Parliament and of the council of 16 September 2009*
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0110

[42] Coinbase Blog, 2019: *The next step on our European journey: Coinbase is granted an e-money licence in Ireland*
https://blog.coinbase.com/next-step-on-our-european-journey-coinbase-is-granted-an-e-money-licence-in-ireland-f2881b5fef73

[43] Binance Blog, 2019: *Binance Expands to European Markets, Launches Binance Jersey*
https://www.binance.com/en/blog/292174235499782144/Binance-Expands-to-European-Markets-Launches-Binance-Jersey

[44] Eva Xiao , 2017: *Three months after launch, this unbanked crypto exchange made $7.5m in profit*
https://www.techinasia.com/cryptocurrency-exchange-binance

[45] MFSA , 2020: *Public statement on February 21, 2020*
https://www.mfsa.mt/news-item/public-statement-2020/

[46] Rakessh Sharma, Investopedia, 2020: *Why Did Kraken Suspend Operations In Japan?*
https://www.investopedia.com/news/why-did-kraken-suspend-operations-japan/

[47] FCA, 2018: *Cryptocurrency derivatives*
https://www.fca.org.uk/news/statements/cryptocurrency-derivatives

[48] FCA, 2019: *FCA proposes ban on sale of crypto-derivatives to retail consumers*
https://www.fca.org.uk/news/press-releases/fca-proposes-ban-sale-crypto-derivatives-retail-consumers

[49] FCA, 2019: *The future of financial services regulation in the UK*
https://www.fca.org.uk/news/speeches/future-financial-services-regulation-uk

[50] Malcolm Fazon, Alexia Valenzia, 2020: *Blockchain & Cryptocurrency Regulation 2020 Malta*
https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/malta

[51] Jeffrey Gogo, 2020: *Malta's 'Blockchain Island' Dream Deferred as 70% Entities Shun Licensing*
https://news.bitcoin.com/malta-blockchain-island-deferred-licensing/

[52] Jake Simmons, 2020: *40 applications: German banks want to custody Bitcoin, Ethereum, Ripple*
https://www.crypto-news-flash.com/40-applications-german-banks-want-to-custody-bitcoin-ethereum-ripple/

[53] Consolidated text of English translations of Estonian legislation, 2020: *Money Laundering and Terrorist Financing Prevention Act*
https://www.riigiteataja.ee/en/eli/517112017003/consolide

[54] ICE Cryptocurrency Data Feed, 2020: *CME CF Cryptocurrency Pricing Products*
https://www.cryptofacilities.com/cms/storage/resources/cme-cf-constituent-exchange-list.pdf

[55] CME, 2020: *CME CF Cryptocurrency Pricing Products*
https://www.theice.com/market-data/connectivity-and-feeds/consolidated-feed/coverage-list/cryptocurrencies

[56] Adam Samson, 2018: *Crypto exchange Coinbase valued at $8bn*
https://www.ft.com/content/2dc519cc-dc3d-11e8-9f04-38d397e6661c

[57] Daniel Palmer, 2018: *Coinbase Hits $8 Billion Valuation After $300 Million Raise*
https://www.coindesk.com/coinbase-hits-8-billion-valuation-after-300-million-funding-round

[58] Cryptoslate, 2020: *Stablecoin Cryptocurrencies*
https://cryptoslate.com/cryptos/stablecoin/

[59] Jordan Tuwiner, 2020: *What was the Bitfinex Hack?*
https://www.buybitcoinworldwide.com/bitfinex-hack/

[60] Coline Emmel, François Pilet, 2019: *The dark side of Zug's Crypto Valley*
https://www.swissinfo.ch/eng/bitfinex-scandal-_the-dark-side-of-zug-s-crypto-valley/45090064

[61] Gibraltar Financial Services Commission, 2020: *Distributed Ledger Technology Regulatory Framework (DLT framework)*
http://www.gfsc.gi/dlt

[62] Bittrex, 2019: *Bittrex Global Terms of Service*
https://bittrexglobal.zendesk.com/hc/en-us/articles/360009624760

[63] Stephen O'Neal, 2020: *As Malta Delays Regulatory Clarity, Fewer Firms Remain on 'Blockchain Island'*
https://cointelegraph.com/news/as-malta-delays-regulatory-clarity-fewer-firms-remain-on-blockchain-island

[64] Nikhilesh De, 2019: *New York Rejects Bittrex Exchange's BitLicense Application*
https://www.coindesk.com/new-york-rejects-bittrex-exchanges-bitlicense-application

[65] CryptoCompare, 2020: *Exchange overview*
https://www.cryptocompare.com/exchanges/#/overview