

The economic potential and risks of crypto assets: is a regulatory framework needed?

Maria Demertzis & Guntram B. Wolff

Executive summary

MARIA DEMERTZIS (maria.demertzis@bruegel.org) is Deputy Director of Bruegel

GUNTRAM B. WOLFF (guntram.wolff@bruegel.org) is the Director of Bruegel

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WE ANALYSE AND assess the economic potential and risk of crypto assets and discuss key regulatory questions that European Union policymakers need to confront. Crypto assets can be broadly classified as cryptocurrencies – a private means of payment – and initial coin offerings (ICOs), typically used to fund new activities against the promise of future utilities (utility tokens) or financial returns (securities tokens). Crypto exchanges and wallets provide services such as exchanging crypto assets into central bank currencies and brokerage services.

THE UNDERLYING TECHNOLOGIES – record keeping in distributed ledgers and blockchain – facilitate peer-to-peer interactions without intermediaries and are still experimental. They have been praised as offering benefits for many applications beyond finance, but there is also significant scepticism.

THE CRYPTO ASSET market has seen huge variation in its market valuation. After a peak of above \$800 billion (January 2018), it fell to around US\$200 billion (August 2018). Cryptocurrencies such as bitcoin have dropped markedly in value. The amount of funds raised through ICOs has also declined substantially since its March 2018 peak.

REGULATORS AND SUPERVISORS have taken great interest in these new markets. Different regulators in Europe classify and treat cryptocurrencies differently. Some classify cryptocurrency as a unit of account while others reject it as a financial instrument. Several regulators take the view that case-by-case assessments of ICOs are necessary. There seems to be convergence on the view that crypto exchanges and wallet providers should require authorisation to operate.

CRYPTO ASSETS RAISE six major public policy questions: how great is the potential of crypto assets in advanced financial systems? What is the best way to combat illegal activity such as money laundering and terrorism finance? How can consumer and investor protection be ensured? What about financial stability? How might crypto assets be taxed? And how can blockchain applications be embedded into the existing legal framework?

EUROPEAN POLICYMAKERS MUST first decide whether crypto assets should be isolated, regulated or integrated. We argue that at this point regulation is the right approach. Second, global cooperation in the managing risks of the new technology should be ensured while reaping the opportunities it undoubtedly provides. The G20 and the Financial Stability Board should set regulatory norms that address the six policy questions. Standard-setting organisations such as the International Organisation for Standardization should also play a role. Third, EU policymakers need to agree on the right moment to move supervision of crypto assets from the national level to the EU level. In a single market for capital, diverging supervisory practices can come with significant downsides and this is particularly true for highly mobile crypto assets. However, different supervisory practices can allow experimentation with different approaches to a fast-changing technology.

1 Introduction

Crypto technologies and decentralised record keeping on distributed ledgers (eg blockchain) have facilitated secure peer-to-peer (P2P) interactions and allowed for the creation of so-called crypto assets. Such assets were initially created as private digital money (eg bitcoin). More recently, they have been employed as a way to raise funding, for example with initial coin offerings (ICOs). The technology has been used for applications other than finance, such as machine-to-machine exchanges in the internet of things, supply chains, digital identity management and healthcare record management (Casey *et al*, 2018).

The technology eliminates the role of the middleman in transactions. In the traditional financial system, for any form of non-cash transaction, there is a need for at least one ‘trusted middleman’. In distributed ledger technology (DLT), the process of verification and record-keeping is done by everyone who engages in the system in a decentralised, open and transparent way. At the same time, the technology provides a credible solution to the double-spending problem, ie money transacted digitally is not spent twice (Lee, 2018).

The promise of the new technology is based on decentralised record-keeping, enabling the decentralisation of trust. Instead of a centralised ledger deposited at a trusted institution, information is recorded on a distributed ledger, in other words, the same information is saved simultaneously on a large number of computers. This enables the decentralisation of trust. However, the secure record-keeping needs to be governed by costly governance mechanisms, usually in the form of difficult computational tasks¹.

Two features constitute this technology’s real added value. First, the log of transactions recorded cannot be tampered with. This implies that historical records are definitive, a feature that is invaluable to any business that relies on data tracking. Second, the principle of consensus-building (namely, the verification process) in a decentralised ledger has built-in incentives for participants to report truthfully. A DLT, therefore, has in-built structures to achieve a good equilibrium in which correct information is revealed by itself. These are all powerful innovations that can advance the way we track and update information.

The technology has the potential to provide innovative solutions to many areas including finance, but it is still at an experimental stage. The true scale of the technology’s potential, in finance and in other areas, is heavily debated. Major banks, start-ups and venture capitalists invest significantly in these technologies². Techno-enthusiasts claim that the technology will change everything. But increasingly, players in the market recognise that reaping the technology’s benefits might be harder than initially thought. For example, it is now widely recognised that the transaction verification process in decentralised and *permission-less* ledgers such as bitcoins demands high levels of energy, with significant environmental costs³. There are also serious concerns about data-storage and eventually internet bandwidth as the files become larger. Moreover, it is too time-consuming to constitute an effective real-time payment system. This has led the latest generation of crypto technology to ‘return’ to more centralised systems, in which only a few nodes are given permission to verify transactions, known as

1 In contrast, the accuracy of information in a centralised ledger depends on the central entity managing the ledger. Dynamic incentives and elaborate checks and balances aim to reduce the potential to abuse the power of centralisation of record keeping. The central entity does have an incentive to be accurate as inaccuracy will result in a loss of trust and thereby reduce the value of the central ledger. But as a central ledger, it is possible to extract rents and benefit from the record keeping – in other words, central record keeping comes with a concentration of power that could be abused. See for example Abadi and Brunnermeier (2018).

2 For example, Santander announced that it plans to utilise blockchain and other new technologies within its capital markets business to change how securities are issued, traded and settled. See: https://www.santander.com/csgs/Satellite/CFWCSancomQP01/en_GB/Corporate/Press-room/Santander-News/2018/07/11/Santander-Corporate-Investment-Banking-appoints-John-Whelan-as-head-of-new-Digital-Investment-Banking-unit.html.

3 The global industry accounts for 0.17 percent of global electricity consumption, more than 161 individual countries, according to *Digiconomist*, a website that tracks the industry. See: <https://digiconomist.net/bitcoin-energy-consumption>

permissioned ledgers. The original idea of full decentralisation has been shown to become less effective as the networks increased in popularity. It is also recognised that entries into ledgers still depend on the accuracy of the entered information. Whether distributed ledgers can really improve data keeping for cattle or mango supply chains is therefore debatable⁴.

Permissioned networks aim to combine the advantages of the centralised and decentralised approaches to record keeping. In particular, trust is based on the verification processes of new entries to the database carried out by a small group of trusted insiders but participation is wider than only the trusted insiders. Examples of permissioned networks are Alastria and Utility Settlement Coins⁵. Banks are exploring the usage of such permissioned networks in, for example, trade finance or for clearing and settlement of financial assets, which currently still takes several days, in contrast to payment systems that are almost instantaneous. However, the smaller the permissioned network, the larger the risk of abuse of market power (Abadi and Brunnermeier, 2018).

Crypto assets can, in principle, be divided into those that do not represent any real-world asset and those that are a representation of real-world assets or have the backing of an institution. In practice the world of crypto assets is fluid with hundreds of innovations every month, with new products combining different features of crypto technology and distributed ledgers. Nevertheless, we think that one can roughly classify the world of crypto assets into those assets that most resemble currencies (cryptocurrencies) and those that represent promises of institutions or networks on future services or pay outs (ICOs). Finally, there are service providers in the form of crypto exchanges, via which crypto assets can be exchanged against each other and against real currencies, and wallet providers that offer brokerage services and simple services such as the holding of crypto keys. **This distinction has significant implications for regulation and supervision.**

Cryptocurrencies, such as bitcoin, derive their value from scarcity and the network of users. They can therefore be thought of as a way to monetise network effects. **In contrast, many tokens and ICOs can be best thought of as representations of assets controlled by a cryptographic key.** Their attraction results from a possible reduction in transaction costs and their greater tradability. This could allow a wider spread and greater access to finance, as well as significant reductions in trading costs. But these crypto assets are otherwise not dissimilar to equities, securities or even gift cards.

Whether it is necessary to regulate crypto assets, and how one should go about it has been the subject of major recent debates. The Financial Stability Board has been tasked by the G20 to report on its overall work on crypto assets. In its findings (FSB, 2018) the FSB reported that there is currently no financial stability risk but continuous monitoring is necessary. The European Commission discussed crypto assets in its March 2018 fintech action plan⁶, stressed their economic potential and pointed to the fact that the EU's anti-money laundering directive addresses concerns on money laundering and terrorist financing. Landau and Genais (2018) studied the crypto assets markets at the request of the French finance ministry and argued that it is probably too early to systematically regulate crypto assets. Instead, they suggested that exposure of standard financial intermediaries to crypto assets should be limited. The German government coalition intends to set out a strategy to limit abuse of blockchain and create a legal framework for cryptocurrencies and tokens at international and European levels⁷.

4 *Financial Times*, 'Wyoming's pioneering crypto cowboys beef up the supply chain', 1 July 2018. See: <https://www.ft.com/content/da69a410-6972-11e8-b6eb-4acfcfb08c11>. For a critical appraisal of 'smart mangoes' and the benefits of blockchain more generally, see: <https://hackernoon.com/ten-years-in-nobody-has-come-up-with-a-use-case-for-blockchain-ee98c180100>.

5 See: <https://alastria.io/> and <https://ftalphaville.ft.com/2017/09/18/2193542/what-is-utility-settlement-coin-really/>.

6 See: https://ec.europa.eu/info/publications/180308-action-plan-fintech_en.

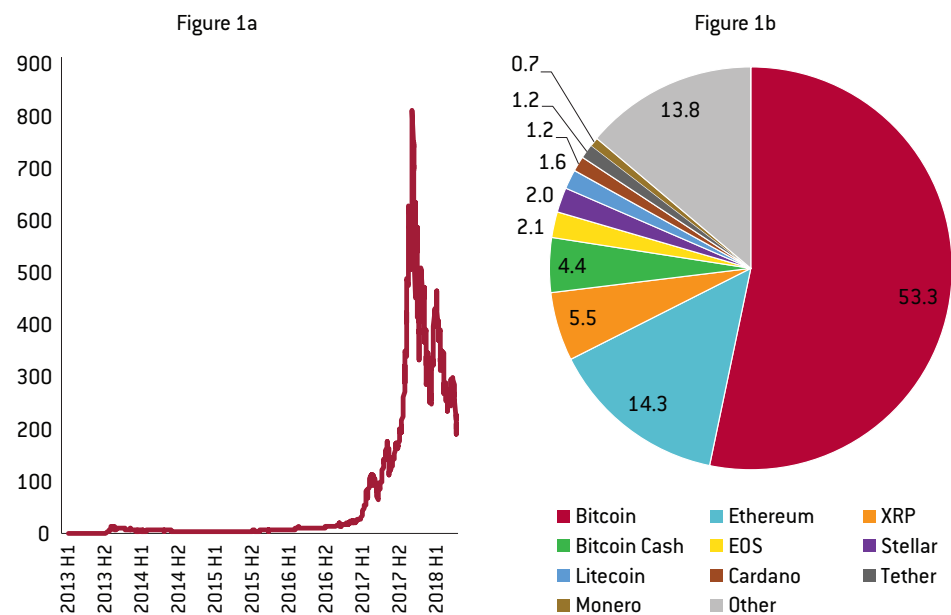
7 The coalition agreement sets out the political programme of the governing parties in Germany. See: https://www.cdu.de/system/tdf/media/dokumente/koalitionsvertrag_2018.pdf?file=1.

2 Crypto assets and infrastructure: size and economic assessment

2.1 Cryptocurrencies

Market capitalisation of crypto assets after a peak of more than \$800 billion has fallen substantially during 2018 and to approximately \$200 billion. The market capitalisation of crypto assets increased strongly until 7 January 2018, reaching a peak of \$836 billion. Since then, it has fallen substantially to reach \$207 billion on 16 August 2018 (Figure 1). The greatest part of crypto assets are cryptocurrencies, with bitcoin playing the largest role. Most of the movement of market capitalisation of crypto assets is down to cryptocurrencies and bitcoin in particular. Bitcoin has a high level of price volatility with daily changes often in the hundreds of dollars (Figure A1 in the online annex).

Figure 1: Market capitalisation and shares (\$ billions and % shares)



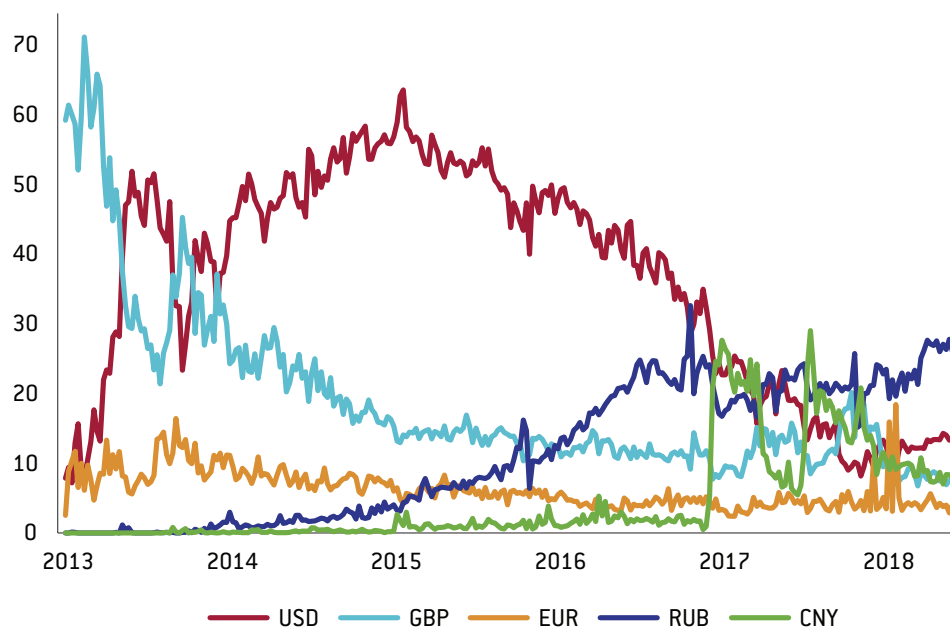
Source: coinmarketcap.com. Note: Last observation is for 15 August 2018 (Figure 1a). Data for 16 August 2018 (Figure 1b).

The share of cryptocurrencies in global payment transactions is tiny. According to the European Central Bank, on a daily basis, there are around 284,000 bitcoin transactions globally, compared with 330 million retail payments in the euro area⁸.

Exchanges between bitcoin and government-backed currencies were initially dominated by the British pound and are now more broadly spread across currencies. The geographic localisation of bitcoins is difficult to determine because bitcoins live in the internet. However, one can measure into which currencies bitcoin is traded on prominent P2P bitcoin exchanges. Figure 2 shows that as of 11 August 2018, on localbitcoins.com, the shares divided as follows: Russian rubble, 27.9 percent share; US dollar, 12.1 percent; British pound, 7.3 percent; Chinese yuan, 7.2 percent; and the euro, 3.1 percent.

⁸ See: <https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180208.en.html>. A January 2018 bitcoin conference stopped receiving payment in bitcoin because of the cost and time involved in processing the payments (see <https://news.bitcoin.com/miami-bitcoin-conference-stops-accepting-bitcoin-due-to-fees-and-congestion/>).

Figure 2: Currency market shares in bitcoin exchange transactions (% shares)



Source: Bruegel based on localbitcoins.com and coin.dance. Note: Figures based on weekly bitcoin volumes on the Finnish exchange localbitcoins.com. Last observation is for 11 August 2018.

Revenues from mining new cryptocurrencies have increased substantially in the last five years. Cryptocurrencies create incentives for companies and groups of individuals to participate in the mining process. Since the end of April 2013, average daily revenues from mining went from \$0.7 million to \$33 million as of 18 July 2018 (Figure A2 in the online annex). Daily revenues in 2018 have averaged over \$44 million, and more than 1.6 million unique users participate in transactions each day (against 119,000 in 2013).

Regulators, supervisors and multilateral institutions have difficulties agreeing how to classify, treat and regulate crypto assets. A large number of views have been expressed and a number of institutions have adopted contradictory or at least differing views on the nature of crypto assets. The differences in views concern cryptocurrencies, ICOs/tokens and exchanges.

As regards cryptocurrencies, there are strong differences on their classification, including within the EU. The European Supervisory Authorities (ESAs) recently issued a joint warning on the risks of virtual currencies for consumers⁹. The European Banking Authority (EBA) argues that virtual currencies should remain outside the scope of the payment services directive as technology related risks make them distinct from conventional fiat currencies, and rejects the use of the term ‘currency’¹⁰. The ECB makes it clear that it does not consider cryptocurrencies or virtual currencies to be money¹¹. But the ECB also recognises that the nature of virtual currencies could change in the future and should therefore be monitored. The ECB also points to the fact that current payment systems are by far superior to what DLT can achieve (Coeuré, 2018). The Bank of England equally rejects the view that cryptocur-

9 See: <https://www.eba.europa.eu/documents/10180/2139750/Joint+ESAs+Warning+on+Virtual+Currencies.pdf>.

10 See: <https://www.eba.europa.eu/documents/10180/1547217/EBA+Opinion+on+the+Commission%E2%80%99s+proposal+to+bring+virtual+currency+entities+into+the+scope+of+4AMLD>.

11 ECB executive Board member Yves Mersch argues that they are not in foreseeable future money as they lack official recognition and have a small market share. He also argues that they poorly function as medium of exchange, are not a valid unit of account and cannot well store value due to their high price volatility. <https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180514.en.html>.

rencies are money¹². Central banks therefore do not consider them a unit of account. In contrast, the German Federal Financial Supervisory Authority (BaFin) classifies bitcoin as a unit of account comparable to foreign exchange with the difference that they do not refer to a legal tender (see Table A2 in the online annex, which details different EU countries' approaches). Bitcoin is thus a sort of private means of payment and falls under German law (Kreditwesengesetz) with implications for all those trading in bitcoin. The French supervisor AMF, in turn, argues that virtual currencies are not subject to the regulatory framework on means of payment and cannot be considered a financial instrument. Italian authorities consider it a means of exchange while the Spanish note that virtual currencies have not been registered, authorised or verified in Spain and a case-by-case approach should be taken. China restricts the bitcoin mining industry out of environmental and financial stability concerns¹³.

In our assessment, cryptocurrencies cannot currently be considered as money. We agree with the ECB that they are neither a useful unit of account, nor a well-usable medium of exchange, and least of all a store of value because of their extraordinary price volatility (see also Claeys *et al*, 2018). Currently, cryptocurrencies probably best resemble speculative assets.

2.2 Initial coin offerings

Financing via ICOs gained momentum, reaching more than \$7 billion in March 2018, before decreasing drastically in July to \$926 million (Figure 3). According to icowatchlist.com (retrieved on 16 August 2018), most of the fundraising is operated through the Ethereum blockchain and is located in five countries: Russia (\$1.0bn), the US (\$0.9bn), Switzerland (\$0.5bn), Singapore (\$0.3bn), and China (\$0.2bn).

The EU market constitutes about 30 percent of the global market in terms of the number of projects¹⁴ and is concentrated in a few countries and industries. Within the EU, the UK and Estonia host more than 46 percent of ICO-funded projects, followed by Lithuania, Germany, France and Spain. More than 71 percent of all projects are located in these six countries. In terms of industry, most ICO-based funds are raised in network/communications, followed by blockchain platform and finance (Figure 4).

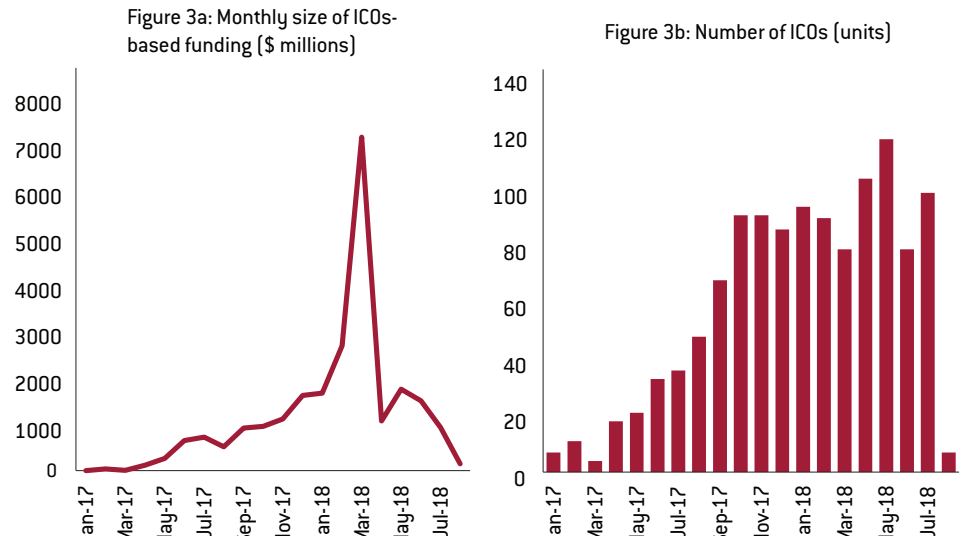
Several regulators take the view that a case-by-case consideration and assessment needs to be applied to ICOs. The European Commission is still in the process of assessing whether the current EU regulatory framework is adequate with regard to ICOs (see Table A2 in the online annex). The current practice at institutions such as BaFin and AMF is to look at every application for a new ICO separately. And while some take the view that some general guidelines are needed, it is also acknowledged that one has to primarily assess whether an ICO is a securities ICO or a utility ICO. For ICOs that are essentially securities living on a blockchain, relevant securities law applies. In Europe, for example Mifid II would be applied. But according to the information provided by our interview partners, the predominant form of ICOs is utility tokens, where future services are promised in exchange for a current payment. The US Securities and Exchange Commission (SEC), in turn, because of the wider definition of what a security is (Howey), calls most ICOs securities and applies the respective US law.

12 Mark Carney argues that they fail to be a good store of value, an efficient medium of exchange and a proper unit of account <https://www.bankofengland.co.uk/speech/2018/mark-carney-speech-to-the-inaugural-scottish-economics-conference>.

13 <https://www.ft.com/content/adfe7858-f4f9-11e7-88f7-5465a6ce1a00>.

14 Source: icowatchlist.com.

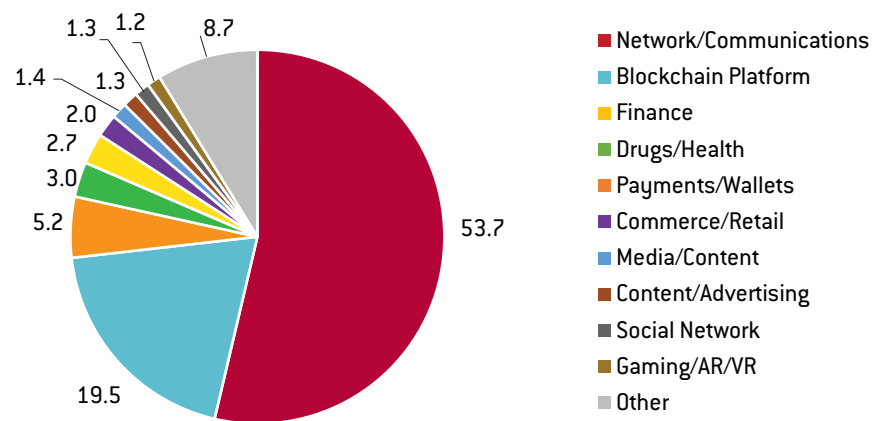
Figure 3: Monthly size of ICOs-based funding (\$ millions) and Number of ICOs (units)



Source: medium.com based on tokendata.io, icodrops.com, icodata.io, coinschedule.com, cryptocompare.com, smithandcrown.com. Note: August 2018 data up to 5 August. As medium.com notes, information on funds collected is not available for all ICOs (information for last week is tentative and may be adjusted). ICOs that collected less than \$100,000 were not considered. More than 1,000 ICOs were performed in 2017. However, the data for the 514 largest and most popular ICOs, the data of which can be processed, were considered when calculating the total amount of funds collected during 2017. Data include the TON Pre-ICO-1,2 (\$1.7 billion) and the Petro ICO (\$5 billion). According to the data from the official website of the Petro ICO, Petro sales equalled more than \$5 billion, which is equivalent to more than €4 billion or 31 billion yuan (<http://www.elpetro.gov.ve/#about>). However, the data on the amount collected by El Petro from some other sources differs. For example, according to criptomoeadasfacil.com, the amount of funds collected cannot exceed \$2.3 billion taking into account discounts, the project White Paper indicates \$4.387 billion, and other sources mention \$3 billion. Not including EOS, which collected \$4 billion or 7.12 million ETH over the year from 26 June 2017 to 1 June 2018.

In our assessment, ICOs are indeed new forms of financing companies, usually young companies. In that respect they are similar to crowdfunding. Unlike crowdfunding however, they are globally available, they are transferable (marketable) and investors are expecting to earn a return. Crowdfunding by contrast is more localised and typically made as donations.

Figure 4: Industry shares of ICO-funded projects (% shares)



Source: icowatchlist.com. Note: Shares out of raised funds. Data for 16 August 2018.

It is for this reason that investors consider crowdfunding a more limited way of raising money¹⁵. As such, ICOs are akin to securities but since most of them only promise future services, they can best be thought of as tradable future services, for example access to computer games, or gift cards or tradeable frequent flyer miles.

ICOs raise questions for the functioning of the economy. If companies increasingly create company-specific money that is a promise of a future utility only delivered by the specific company, such funding can create significant new transaction costs¹⁶. ICOs also raise important regulatory questions and we concur with the view that every ICO in Europe should be assessed by the relevant regulator as to whether it is a security or a utility token and the relevant regulation should be applied correspondingly.

2.3 Crypto exchanges

Crypto exchanges are digital platforms that allow users to exchange tokens for other tokens or possibly for central bank money. They have experienced a similar path to that of crypto assets: a meteoric rise in late 2017/early 2018, followed by a moderation. On 17 August, 215 exchanges were reported in the market, with a total trading volume of approximately \$19.1 billion, down from a high of more than \$50 billion in January 2018 (Figure 5). These figures exclude retail bitcoin dealers and focus on market-makers.

The market seems less concentrated than that for crypto assets, as the share of trading volumes of smaller participants is higher, even though the picture changes significantly depending on which type of volumes we are considering (Figure 6 reports market shares based on adjusted and reported 24-hours volumes). Moreover, data from crypto exchanges is usually released without scrutiny, which suggests that these figures should be examined with caution.

Nevertheless, crypto exchanges have gained millions of customers in a short period of time and are reportedly very profitable, perhaps because of the largely unregulated nature of the market (Casey *et al*, 2018). In fact, while some Asian governments are introducing regulations, some crypto exchanges have decided to move their operations elsewhere; for example, Binance has reportedly decided to relocate to Malta¹⁷, while Huobi went to Singapore¹⁸. These are two of the biggest exchanges, whose moves might suggest that there is scope for regulatory arbitrage. The three largest crypto exchanges in terms of 24-hour adjusted trading volumes (OKEx, Binance, and Huobi) are all located in Asia, and average almost 12 million users each (Table A1 in the online annex). Binance reported profits of \$300 million for the first half of 2018 and expects its 2018 profits to be between \$500 million and \$1 billion¹⁹. In general, it is very difficult to retrieve or estimate profit or revenue figures for crypto exchanges. We provide a (rough) estimate of 30 days revenues based on reported fees and volumes, obtained by multiplying trading volumes by the percentage due in fees. While results might not be exact (because of insufficient data on actual applied pricing schedules), the order of magnitude for OKEx and Huobi is between \$20.5 million and \$40 million in revenues. Huobi Group also reports approximately \$150 billion cumulative turnover in 2018 up to April.

EU-based crypto exchanges trail market leaders in terms of scale. Based on the 24-hours reported volumes on 13 August 2018, the largest EU exchanges seem to be only a fraction of the biggest global ones. Table A1 in the online annex also reports information for a collection

15 See: <https://medium.com/@EnergyPremier/ico-vs-crowdfunding-whats-different-bc54f13ede79>.

16 Suppose you hold a token promising that you will be able to play a certain online game by company x but then your preference changes and you want to play a game provided by company y. You would need to exchange the token from one company with a token of another company. This creates transaction costs and the tokens will probably trade at a discount.

17 See: https://medium.com/@Elysian_Ely/binance-relocates-to-malta-293fa03acb44.

18 See: <https://www.techinasia.com/singapores-huobi-putting-itself-blockchain>.

19 See: <https://www.bloomberg.com/news/articles/2018-07-06/world-s-largest-crypto-exchange-eyes-1-billion-profit-amid-rout>.

of major EU exchanges. They seem to operate on fewer markets, while the 30 days estimated revenues fall in a range from \$0.7 million to \$5.5 million.

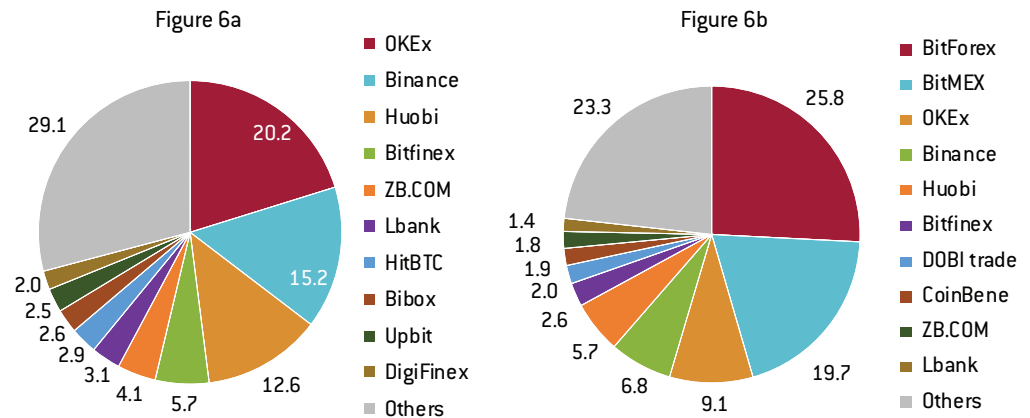
Figure 5: Reported exchange volumes (billion USD)



Source: coinmetrics.io. Note: Figures based on daily volumes for 64 major crypto assets (accounting for more than 83 percent of the market). Data on OTC exchanges are not included. Last observation is 18 July 2018.

Regulatory approaches seem to converge across EU countries. Crypto exchanges and custodial wallet providers fall under the EU’s anti-money laundering directive. The ECB argues that virtual currency exchanges need to be held “to the same rigorous standards as the rest of the financial system”²⁰. National regulators all require authorisation for a virtual currency exchange to be established (Table A2 in the online annex). However, it is more difficult to establish how strict the regulation of these exchanges is.

Figure 6: Crypto exchanges market share based on prior 24 hours adjusted and reported volumes



Source: coimarketcap.com. Note: Data for 17 August 2018. Adjusted volume is from spot markets, without markets with no fees and transaction mining.

20 See: <https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180514.en.html>.

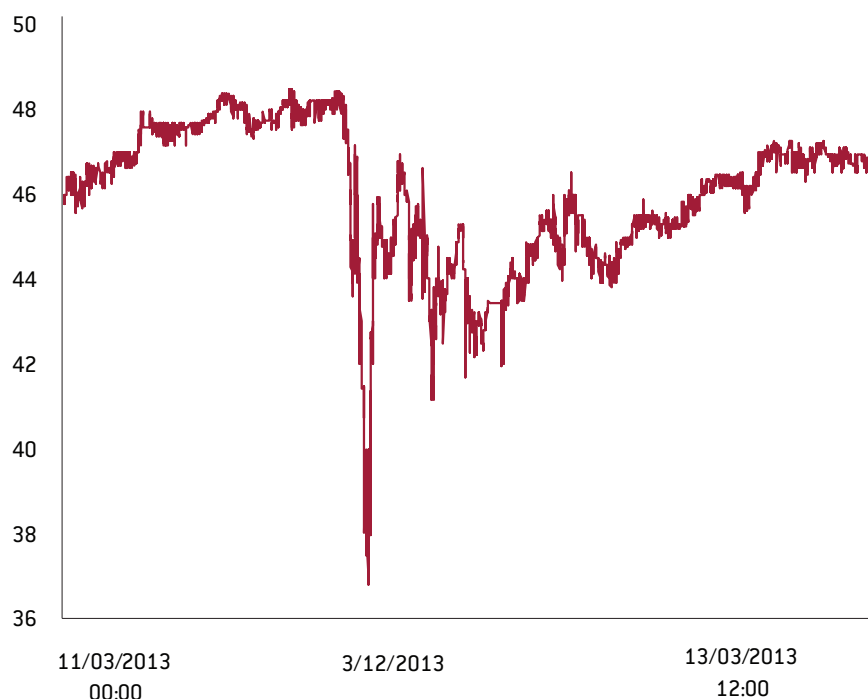
3 Policy concerns

The public policy debate on how to regulate crypto assets needs to consider six major concerns.

First, to what extent does the new technology allow for innovative sources of financing that would reduce the cost of financing? Currently, crypto assets such as ICOs play only a marginal role in financing the European economy. But permissioned blockchain solutions might eventually reduce the transaction costs of financial intermediation by broadening the access to finance for smaller companies and smaller projects. It is too early to say how significant the benefits will be as the technology and governance is still in its infancy. An important argument is certainly that public authorities should not stifle further innovation in this space.

Second, cryptocurrencies have been and are used for illegal activities²¹. As transactions in cryptocurrencies can be done anonymously, they can be misused. The strong market reaction to the value of bitcoin after the shutdown of Silk Road, a major digital market for illicit drugs, suggests that illegal activity is indeed an important feature of cryptocurrencies (see Figure 7 and BIS, 2018). As is the case for cash, where many measures are in place to limit its abuse, careful policy action is needed to limit and prevent illegal activity in cryptocurrencies. The EU's anti-money laundering directive has been amended to deal with this²².

Figure 7: Bitcoin price (\$) on the day of the Silk Road shutdown



Source: Bruegel based on coindesk.com. Note: Intraday data.

Third, consumer and investor protection issues need to be carefully considered. The digital nature of crypto assets makes them directly accessible to the general public, provided people are digitally savvy. Broad access is desirable but also exposes vulnerable groups. For

21 G20 Communiqué 19-20 March 2018. See: https://g20.org/sites/default/files/media/communique_-_fmcbg_march_2018.pdf.

22 In February 2018, Europol, the European Union Agency for Law Enforcement Cooperation, estimated that about 3-4 percent of illicit proceeds in Europe are laundered through cryptocurrencies. See: <https://www.bbc.co.uk/news/technology-43025787>.

example, the March 2018 US *Student Loan Report*²³ quotes the results of a survey, in which about a fifth of all participating students had used financial aid money to invest in cryptocurrencies, like bitcoin. The three ESAs have issued warnings about the riskiness of crypto assets. By their nature, many ICOs are investments in risky start-ups – which, in the regular financial system would typically be done by venture capitalists who know about and price the risks appropriately.

Beyond the regular possibility of default and losses when investing in ICOs and cryptocurrencies, there have also been incidents of fraud. These incidents have varied from the exploration of vulnerabilities in the code to actual instances of the system being beaten. Notably, a group of hackers known as ‘51 Crew’, took control of more than 51 percent of the computer network of two blockchain clones, Shift and Krypton. The group effectively took over the verification process and enabled an online theft of \$65 million in bitcoin²⁴. Hacks and frauds have also concerned services providers such as wallets, who hold cryptographic keys on behalf of consumers and investors. The MIT Technology Review reported in May 2018²⁵ that the Wall Street Journal investigated the documents of 1,450 ICOs and found that 271 raised serious doubts about their authenticity. As they increase in popularity, ensuring investor protection becomes even more important.

Fourth, there is the question of financial stability. The high price volatility in the market could cause financial stability problems. This is not a real threat at the moment as the market is still very small and largely separated from the traditional financial system. The FSB therefore agreed that crypto assets do not currently pose a material risk to global financial stability, but supported vigilant monitoring in light of the speed of developments and data gaps.

Fifth, there are important questions about how crypto assets should be taxed. One issue is how profits from speculation with crypto assets are taxed. A natural way would be to tax those profits in the same way as other profits resulting from speculation in, for example, stocks. A second question is how the proceeds from ICOs for companies should be treated. For companies issuing securities tokens, the normal taxation of companies can apply. More complicated is the taxation of utility tokens which, at the time of issuance, are exchanged for cash and oblige the company to spend resources in order to be eventually able to deliver the services. This requires some clarification on the necessary tax accountability. For the one buying the utility token, there is also a question of whether and how the valuation gain should be taxed (suppose you buy a token for €100 in the hope to have access to a computer game worth €200 in two years, should the €100 gain be taxed? What if the value of the token then increases to €250?).

Finally, blockchain solutions raise important legal questions in both financial and non-financial applications. For example, blockchain solutions could substantially simplify the process of clearing and settling. Yet the participants in such a solution would need legal safeguards that any settlement on a blockchain has the same legal status as in previous solutions. Similarly, experiments with blockchain solutions in trade finance suggest that a substantial reduction in transaction costs is possible. Yet, currently most experiments duplicate the blockchain solution with standard exchanges of the respective legal documents. For it to fully work, the transfer of the property of say a container on the blockchain would need to be legally recognised and binding. Otherwise, severe legal uncertainty prevails.

23 Available at: <https://studentloans.net/financial-aid-funding-cryptocurrency-investments/>.

24 See: https://www.huffingtonpost.in/raja-raman/blockchain-can-transform-the-world-but-is-it-fool-proof_a_21660586/.

25 See: <https://www.technologyreview.com/the-download/611170/surprise-hundreds-of-icos-are-probably-scams/>.

4 Three considerations that should frame the EU's debate on crypto assets

There is broad consensus among the crypto experts and policymakers (IMF, 2018; BIS, 2018) that the technology behind crypto assets is interesting and promising. However, it is also thought that the technology is still very much in flux and as different applications emerge we are only starting to understand how it can be adapted for different uses. Currently, the total value of crypto assets is small, as we have shown, and is therefore not perceived to pose a visible risk to financial stability (IMF, 2018) or, indeed, to other sectors.

The approach to regulation has to be adapted to the technical nature of crypto assets, especially when they are based on fully decentralised systems. A number of these crypto assets, for example bitcoin, are not issued by entities that are known (legal entities or otherwise). Nowhere in this process is the identity of the issuer revealed. It is therefore not possible to regulate bitcoin as such as it is just a software code that exists on the internet. Instead, one can regulate all those entities that operate with cryptocurrencies: for example, as done in China, mining farms can be forbidden. Exchanges can also be regulated. Buying and selling can be prohibited on exchanges operating in Europe. So the approach to regulation needs to be adapted to the technology.

In our view, the European policy discussion on crypto assets should focus on three key questions.

First, should crypto assets be isolated, regulated or integrated? This question was first asked by Mark Carney²⁶. Landau and Genais (2018) argued that it might be premature to regulate crypto assets in general ways, as regulation could hamper or prevent innovation. Regulation would oblige definition and classification of crypto assets. As a result, innovation could be hampered or even be directed at regulatory evasion. Instead, Landau and Genais (2018) proposed to focus the regulatory effort on the interface between crypto assets and the regular financial system. A further important argument against a generalised regulation is that it could prematurely provide legitimacy to the regulated entity. The fact that something is regulated and supervised is a stamp of quality that can be used vis-à-vis retail and professional customers.

Yet, the proposal to basically isolate crypto assets by focusing their regulation on the interface and limiting the ability of banks or funds to invest in crypto assets has significant drawbacks. First, this intervention in itself might limit the development of crypto assets much more significantly than direct regulation of the assets. In particular, without gaining access to investment and savings funds, it might be impossible for the market to grow. Innovation would then be mostly directed at fringe uses. Moreover, consumer and investor protection questions are already significant and crypto asset exchanges could already be held to high standards given their strong growth and profitability. Mark Carney supports the view that crypto assets should be regulated now, but should not be isolated from the regular financial system. Others, for example the US SEC, are still considering whether to approve a bitcoin ETF, that would allow for a deeper integration of bitcoin in the financial system²⁷.

We concur with Jean-Pierre Landau that limiting the exposure of financial institutions to cryptocurrencies is sensible. Not only do cryptocurrencies provide little societal value (at least in advanced economies with well-functioning and accountable central banks) but they are also high-risk assets and as they grow can create financial stability risks. The question, how-

26 See: <https://www.bankofengland.co.uk/speech/2018/mark-carney-speech-to-the-inaugural-scottish-economics-conference>.

27 The US SEC announced that it would delay its decision on a bitcoin exchange traded fund (ETF). Disapproving the bitcoin ETF would be a step in the direction of isolating bitcoin from the traditional financial system. See: <https://www.ft.com/content/53311902-9ad1-11e8-ab77-f854c65a4465> and <https://www.sec.gov/rules/sro/cboe-zx/2018/34-83792.pdf?ios-app-redirect=true>.

ever, is whether this would not be best achieved by treating and regulating them as highly risky assets. The argument can be made stronger with exchanges. Is it not time for citizens in the EU to be provided with comparable levels of disclosure when buying a crypto asset on an exchange than when buying a risky derivative on a regular exchange?

If one accepts the need to regulate, then the question is how. Our understanding is that much can be subsumed under existing regulation with case-by-case evaluations by the relevant supervisors. The central argument for this is that despite the great innovation and new technology, at its core much of the crypto asset world is 'old wine in new bottles'. In other words, the features of the technology do not transform the fundamental nature of the financial intermediation that requires regulation. Moreover, a case-by-case approach would allow the new technology to develop freely and for regulation to be technology-neutral.

Second, the public policy approach to crypto assets requires global coordination on key regulatory questions. Limiting money laundering and terrorism finance or preventing tax evasion requires international cooperation, and even more so in the world of crypto assets. But since access to crypto exchanges essentially only requires access to the internet, also consumer and investor protection for crypto exchanges would benefit from a global approach. We therefore consider the FSB and the G20 as the best-placed institutions to discuss these matters. Beyond finance, we have pointed to the need for international standards and compatibility with various legal systems. A global standard for blockchain trade finance solutions would for example be of great use. Standard-setting organisations such as ISO can play a role in this regard.

Third, there is the question of which supervisor/institution should apply regulation. As we have documented, currently a variety of national and EU-level supervisors apply the existing regulatory framework, sometimes in different ways. In a single market in which consumers, investors and firms can operate their digital business from any EU country, it is sensible to empower one supervisor to eventually be in charge of the entire crypto asset world. This is in our view the right approach for capital markets union in general (Sapir, Véron and Wolff, 2018) and holds even truer for crypto assets provided digitally. However, at which point that should happen can still be debated. Currently it might be useful to sustain different practices across EU countries for some time as a way to experiment and learn about the best approaches to this fast-developing technology. But it also implies that regulatory arbitrage within the EU would have to be tolerated for some time. This might currently be acceptable given the small size of the market but creates facts on the ground and makes eventual switching to European Securities and Markets Authority supervision more difficult from an economic and political economy point of view. So policymakers should not debate whether but when is the right moment to move to a single supervisory approach in the EU²⁸.

Finally, we would like to point to the issue of accountability. Crypto-asset systems should be resistant to error, fraud or ill intent. But even the most robust system can fail and therefore should have in-built processes for resolving conflict and disputes when things go wrong. Peer review of software code might not be sufficient for robustness. Purely decentralised systems such as bitcoin lack the individual/institution that could be held accountable in case of error. Ultimately, this might result in unstable systems. The promise of the technology as a stand-alone mechanism might therefore be limited. Instead, we predict that if it is integrated with systems that have strong ultimate accountability, the technology will provide tangible benefits.

28 See also Demertzis *et al* (2018) on the need for coordinated action in fintech at the European level.

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