

**Economic and Social Council**

Distr.: General
17 February 2020

Original: English

Economic Commission for Europe**Conference of European Statisticians****Group of Experts on National Accounts****Nineteenth session**

Geneva, 27-30 April 2020

Item 5 of the provisional agenda

Digitalization**The recording of crypto assets in the System of National Accounts – An update**

Prepared by Organisation for Economic Co-operation and Development¹

Summary

The last few years have seen a significant proliferation in the number and types of crypto assets. As guidance on how to record crypto assets in the System of National Accounts (SNA) was largely absent, the International Monetary Fund and the Organisation for Economic Co-operation and Development (OECD) started to explore their statistical measurement in 2018. After consultation of the Advisory Expert Group on National Accounts (AEG), this has led to first interim guidance. This note provides an update of the earlier OECD paper, presenting an updated breakdown of crypto assets and discussing their recording in the SNA. Furthermore, the paper discusses in more detail how the creation of crypto assets without a corresponding liability should be accounted for in the accounts.

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I. Introduction

1. The introduction of Bitcoin in 2009 and its open-source protocol has precipitated a significant proliferation in cryptocurrencies as well as other types of crypto assets in recent years. However, guidance on how to record these crypto assets in the System of National Accounts (SNA) is still largely absent, related to the fact that these instruments simply did not exist at the time of the drafting of the 2008 SNA.
2. In response to the lack of international guidance, in 2018 the International Monetary fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) started to explore the statistical measurement of crypto assets. The IMF drafted a paper for the 2018 meeting of the Committee on Balance of Payments Statistics (BOPCOM) describing the various types of crypto assets and coming up with a proposal on how to record them in macroeconomic statistics². The OECD prepared a paper for the 2018 meeting of the Working Party on Financial Statistics (WPFS) examining whether cryptocurrencies meet the asset boundary and, if so, what type of assets they reflect³. Both papers were discussed at the meeting of the Advisory Expert Group (AEG) on National Accounts in 2018 which was followed by a written consultation.
3. The consultation provided first interim guidance on how to deal with crypto assets in the system of national accounts. This has already been reflected in an update of the IMF paper (see IMF (2019)). However, the consultation also stressed the need for more specific definitions for the various types of crypto assets and the need to continue monitoring developments in the crypto asset market to assess whether updates of the guidance may be necessary. With regard to the latter, new types of crypto assets have emerged over the last half year that may indeed require a re-assessment of the interim guidance.
4. This paper provides an update of the earlier OECD paper, presenting an updated breakdown of crypto assets with accompanying definitions and discussing their recording in the national accounts, taking into account recent developments in the crypto asset market. In relation to the latter, it sometimes differs slightly from the guidance as included in the updated IMF paper. Furthermore, the paper discusses in more detail how the creation of crypto assets without a corresponding liability should be accounted for in the accounts. The AEG is asked to reflect on these proposals and to provide their feedback. On the basis of that, the IMF and the OECD will draft a joint paper providing up-to-date guidance on how to deal with the recording of crypto assets in macroeconomic statistics.
5. The paper is structured as follows. Section II provides a general overview and an updated description of crypto assets. On the basis of that, Section III discusses relevant criteria for distinguishing between various types of crypto assets to be recorded in the system of national accounts and presents an updated classification. It also discusses, using the results from the AEG consultation as a starting point, how these various types of crypto assets should be classified. Section IV summarises some of the evident challenges in the statistical measurement of these assets, mainly focusing on the identification of data sources. The paper finalises with main conclusions in Section V.

II. General overview of crypto assets

6. Crypto assets are a relatively recent phenomenon. Facilitated by fast technical innovation, they have been developed over the last decade, mainly to serve as alternatives to traditional financial instruments. Their main characteristics are that they are exchanged via peer-to-peer architecture⁴, which enables two parties to directly transact with each other

² https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12_3e_Cryptocurrencies_IMF.pdf

³ https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12_3e_Cryptocurrencies_OECD.pdf

⁴ A peer to peer network can be defined as a network of computers that are connected, where each computer plays the role of both client and server. In a peer-to-peer architecture, each computer stores

without the need for trusted intermediaries, and that they rely on cryptography. This is a method of storing and transmitting data in a particular form (encrypted) so that only those for whom it is intended can read it by possessing a secret key. An example of such cryptography is the blockchain technology that was invented to support the launch of the Bitcoin. Blockchain is a form of distributed ledger technology that records all transactions of a system at regular time intervals. On the basis of this technology, Bitcoin uses a peer-to-peer distributed timestamp server to generate computational proof of the chronological order of transactions, preventing double spending of the same unit by the same holder (see for more information Box 2.1)⁵.

7. The main motivation for the creation and use of crypto assets is the possibility to transact without the intervention of a third party and the creation of alternatives to traditional financial instruments. On the other hand, as the crypto asset market is generally not regulated by a central authority, there is no clear legal protection or monitoring of the market. Furthermore, it lacks transparency and it is liable to money laundering, insider trading, fraud, price manipulation and market abuse.

Box 2.1. Blockchain technology

The blockchain technology can be defined as a distributed account receivables ledger (or distributed database) recording all transactions of a system at regular time intervals. The distributed ledger is based on a chain of connected information blocks in which each new transaction is recorded in a block of information which is added to previous blocks in order to update the ledger. Each new transaction should first be validated by the members of the system which is done on the basis of a consensus mechanism. Blockchains employ cryptographic and algorithmic methods to record and synchronize data across the network in an irreversible manner. With the blockchain technology, the double spending issue is solved as transactions are timestamped, keeping track of all transactions in a chronological way. In addition, the propagation rule in the network enables harmonisation of the information in the blockchain and reinforces protection against possible double spending.

8. There are various types of crypto assets. The first type concerns cryptocurrencies which are crypto assets designed to work as a medium of exchange. They do not exist in physical form and are usually issued and controlled by its developers, and in practice they are most often used and accepted among the members of a specific virtual community. The main motivation for the creation and use of cryptocurrencies is, as stated before, the possibility to transact without the intervention of a third party (which may provide more independence to economic actors) and the creation of an alternative means of payment to official currencies (which may be particularly relevant if an official currency is suffering from lack of confidence, e.g. in times of high inflation or large exchange rate fluctuations). However, cryptocurrencies may also be created by monetary authorities themselves. Whereas some cryptocurrencies are being accepted as a legitimate source of funds by an increasing number of merchants, this is currently not the case for most of them. In addition to the intended role as medium of exchange, the last couple of years have seen a large increase in the use of cryptocurrencies for investment and speculation purposes. Most cryptocurrencies can be bought with and directly converted into fiat currency on a wide array of cryptocurrency exchanges.

9. The creation of most types of cryptocurrencies takes place via a process called “mining”. This mining process involves verifying and confirming (i.e. ‘validating’) transactions via solving computationally difficult puzzles (also known as ‘proof of work’). The participant who first solves the puzzle gets to place the next block on the blockchain and

part of the data belonging to the network and requests other data from the other computers in the network. By nature, peer-to-peer networks are decentralised as data is stored across the various computers constituting the network.

⁵ The Bitcoin white paper provides more technical details, see <https://bitcoin.org/bitcoin.pdf>.

claims the rewards. The rewards consist of both the transaction fees associated with the transactions compiled in the block and a newly released coin. An alternative form of creating new currencies is via validating transactions in the form of ‘proof of stake’. In that case, the creator of the next block in the network, who will claim the rewards, is chosen on the basis of various combinations of random selection and the amount of coins a person holds (i.e. the stake).

10. Bitcoin was the first cryptocurrency and since its introduction in 2009, several other cryptocurrencies have been created, commonly referred to as ‘altcoins’. The term Bitcoin-like crypto assets (BLCAs) is also sometimes used to label the latter types of crypto assets⁶. The number of cryptocurrencies available over the internet as of the end of July 2019 was almost 2,300 with a total market capitalisation of 240 billion Euros (CoinMarketCap).

11. A recent development in the field of cryptocurrencies is the emergence of so-called ‘stablecoins’. These are a form of crypto assets designed to act as a medium of exchange, but set up in a different way than traditional cryptocurrencies, in order to minimize the volatility of their value. This is done by fixing it to one or more commodities (such as another cryptocurrency, fiat money or precious metals) and by being redeemable for such (more or less) on demand (i.e. backed stablecoins), or by utilizing specific algorithms to control the stablecoin’s money supply (seignorage-based stablecoins). In case of the backed stablecoins, a company or central entity issues fiat-backed tokens in exchange for an equal value of collateral and guarantees the possibility to redeem at any moment. The seignorage-style stablecoins are not backed by any asset, but use an algorithm for controlling the money supply in order to arrive at a stable value of the coin.

12. In addition to cryptocurrencies (including stablecoins), other types of digital assets have been created that also rely on cryptography. These are transferable units based on cryptography to track their ownership, which are created for different purposes than cryptocurrencies such as providing access to services or raising money, for example by start-up companies. These crypto assets are usually created on a platform that allows for their creation and transfer, and they are only accepted in the context of their applications. This distinguishes them from cryptocurrencies as described above, which are intended as broad medium of exchange. Whereas traditional cryptocurrencies rely on their own separate blockchains, these other types of crypto assets, as well as stablecoins, usually reside on top of another blockchain that facilitates the creation of decentralized applications. These types of crypto assets are usually referred to as tokens (i.e. a unit value that has been created on an existing blockchain).

13. Crypto tokens are currently broken down into payment tokens, utility tokens, asset-tokens and hybrid tokens (see IMF (2019)). However, it has to be borne in mind that new types may easily emerge. Payment tokens are tokens that can be used to exchange goods or services among participants within a certain framework. They are often classified together with cryptocurrencies as they basically share the same characteristics (i.e. act as unit of account, store of value and means of payment), but in some cases are explicitly distinguished, highlighting that these tokens are not convertible into a legal currency or cryptocurrencies, and that they can only be used within a specific platform⁷. Utility tokens are designed to

⁶ This terminology is also used in the BOPCOM paper (IMF, 2019). However, the AEG consultation revealed that there was some concern regarding this term as it would imply the use of a brand name to characterize a group of crypto assets. Furthermore, the term may not provide proper insight in the coverage of this category. A question may for example arise in relation to the treatment of asset-backed cryptocurrencies (i.e. stablecoins). Whereas they may be regarded as similar to Bitcoin (in being a cryptocurrency), they may need to be treated differently (being backed by an asset).

⁷ Please note that this definition differs from the one used in the BOPCOM paper (IMF, 2019) which defines payment tokens as “those intended to become BLCAs and to be used universally (i.e., not restricted to a specific platform) as units of account, store of value, and means of payment (e.g., Litecoin)”. In the classification used in this paper, these instruments would qualify as cryptocurrencies, given their intended role. Consequently, the coverage of payment tokens in this

provide the holders future access to goods or services by means of a cryptography-based application. Examples are tokens for file storage and social messaging. They are providing access to a function provided directly by the issuer and in that sense provide a specific obligation to the issuer. Payment tokens share a lot of similarities with these utility tokens, but whereas payment tokens can be used to exchange goods and services amongst participants, utility tokens only relate to the issuer. Asset tokens (also called investment tokens or security tokens) represent debt or equity claims on the issuer. They generate interest to the holder or promise a share in the future earnings of the company, respectively. In that sense, they are similar to securities, but exchanged via peer-to-peer networks using cryptography. They are usually issued via initial coin offerings (ICOs) or security token offering (STO)⁸. Finally, tokens can also come in hybrid form, for example combining aspects of utility and investment tokens. These are known as hybrid tokens. Furthermore, as mentioned above, it has to be borne in mind that this breakdown is not fixed, as new types of crypto assets may be created in the near future and as their characteristics (e.g. in terms of use, regulation and creation) may change over time.

III. Linking crypto assets to the System of National Accounts

14. This section considers a classification of crypto assets that should assist in properly recording them in the national accounts. In that regard, it has to be borne in mind that the main aim is not to come up with a taxonomy of crypto assets as such (as was the goal of the classification included in the BOPCOM paper (IMF, 2019), but to provide more specific guidance on how the different types should be classified, bearing in mind current SNA guidance. On the basis of this classification, which is discussed in Subsection A, the section then explores the appropriate recording. This is done by first focusing on whether the various types of crypto assets meet the asset boundary (in Subsection B) and, if so, by subsequently exploring which asset category they should go under (in Subsection C). The latter is done by taking into account the outcome of the AEG consultation which already provided initial guidance on the classification of some crypto assets, and by exploring criteria that may be relevant for the new asset categories. Finally, this section also explores how to account for the creation of crypto assets that do not have a corresponding liability, in response to comments made by various AEG members.

A. Types of crypto assets

15. Crypto assets can be defined as digital representations of value that are exchanged via peer-to-peer architecture based on cryptography, which is a method of storing and transmitting the data in an encrypted form so that only those for whom it is intended can read it by possessing a secret key. This means that all digital assets that are not exchanged via peer-to-peer based on cryptography are not considered as crypto assets, which may include several digital assets that have similar functionality as crypto assets. For example, several platforms may use forms of credit to provide future access to goods or services, similar to utility tokens as described in the previous section. However, if they are not exchanged peer-to-peer based on cryptography, they are not regarded as crypto asset. The latter obviously

paper is limited to those tokens that are only intended to be used as medium of exchange within a platform.

⁸ Recently, a specific type of instrument has been created in response to criticism that asset tokens did not comply with securities regulations. These instruments are called Simple Agreements for Future Tokens (SAFT) and provide the investors with the right to a certain number of tokens in exchange for an up-front investment. It is a new and simple way for new ventures to raise funds in a legally compliant way. Whereas they have been created in relation to tokens, they do not represent tokens themselves, but are simply a form of investment contracts.

does not imply that they should not be recorded in the national accounts; for these, a similar assessment has to be made as is done in this paper, probably on the basis of similar criteria).

16. In the consultation, based on information available at the end of 2018, the AEG suggested to break down crypto assets into cryptocurrencies⁹ (with a further breakdown into those that have been issued by a monetary authority and other cryptocurrencies) and crypto assets other than cryptocurrencies (further broken down into payment and utility tokens, asset tokens, and hybrid tokens), in line with the classification as used in the BOPCOM paper (IMF, 2019). However, taking into account new types of crypto assets that have emerged in the recent period and on the basis of further exploring relevant criteria to classify crypto assets, it is proposed to further refine this classification.

17. As explained in the previous section, there are several types of crypto assets, with different characteristics that may require a different recording in the SNA. Furthermore, there may be an interest for users to make a distinction between the various types of crypto assets. For that reason, it is important to develop a sufficiently granular classification and to come up with clear definitions. Such a classification is also important for the anticipation of new crypto assets that may be expected to be developed in the near future

18. To arrive at a proper classification, it is important to assess the relevant criteria for distinguishing between different types of crypto assets. These may relate to existing SNA guidance for distinguishing between specific types of assets, but also to user demands.

19. When looking at possible distinctive criteria, the following can be listed¹⁰:

- The role of the asset: Crypto assets may serve different roles which may be relevant for their classification, bearing in mind that many existing asset categories in the SNA are (partially) determined on the basis of their role. On the basis of the examples as described in the previous section and taking into account the comments provided by AEG members in the consultation, one can distinguish the following roles:
 - acting as a general medium of exchange;
 - acting as a medium of exchange within a platform/network;
 - providing a financial claim on the issuer (including future access to goods or services); and
 - acting as a store of value.

Other roles can be envisaged in the near future.

With regard to this criterion, it is also important to decide whether, for the classification, one should look at the intended or the actual role of the asset, as this may sometimes differ. For example, most cryptocurrencies are not yet regarded as a well-accepted means of payment, whereas this may be their intended role according to the issuer. When looking at the comments provided by AEG members in the

⁹ Please note that the term Bitcoin-like crypto asset is used in the BOPCOM paper (IMF, 2019). However, as the AEG consultation revealed some concerns regarding this term, it is proposed to opt for a different term. The concerns mainly related to the use of a brand name to characterize a group of crypto assets and the term not providing specific insight in the coverage of the category (i.e. what characteristics of the Bitcoin would qualify for recording in this category?). The term 'altcoin' does not seem to work either, as it is referring to all cryptocurrencies 'alternative to bitcoin' and therefore would exclude the Bitcoin. For that reason, the term 'cryptocurrency' is still used here, although this term also still meets some opposition as people feel that these instruments cannot be put on a par with traditional currencies.

¹⁰ Please note that other criteria are sometimes also mentioned such as 'form' (i.e. physical versus digital), 'negotiability' (i.e. tradable versus non-tradable) and 'the exchange of the asset' (i.e. centralized versus decentralized). However, as these are similar for all crypto assets by definition (i.e. all crypto assets are digital, tradable assets that are exchanged peer-to-peer (decentralized)) this has not been taken into account here as criteria to distinguish between types of crypto assets.

consultation, it looks like there is a preference to focus on the actual role over the intended role¹¹.

- The existence of a corresponding liability: In some cases, the creation of a crypto asset may lead to the creation of a corresponding liability, whereas in other cases this may not. Security tokens as described in the previous section, for example, create a claim on the issuer, whereas this is not the case by traditional cryptocurrencies. As the existence of a liability is an important feature of most financial assets as defined in the SNA, this is deemed to be an important criterion.
- The issuer of the asset: It may be relevant who issues a specific asset. Looking at the current SNA guidance this is for example relevant with regard to monetary gold, SDRs and currency. This criterion may be of importance for some specific types of crypto assets, most likely cryptocurrencies.
- The supply of and control over the asset: The supply and control may be decentralised, e.g. left to the community, or may be controlled by a centralised party. Looking at current SNA guidance, this does not seem to be an important distinction, but may be of interest for users.
- The technique underlying the asset: All crypto assets rely on cryptography, but some use their own, while others may be built on top of existing cryptography. For their classification in the SNA, this does not seem to be an important distinction.
- The creation of the asset: Crypto assets that do not have a corresponding liability may be created via various protocols, such as proof of work and proof of stake. Although the underlying technique itself may not be relevant for their classification in the SNA, it may affect the assessment of the question whether the asset should be regarded as the result of a production process or not. The latter may have an impact on the classification of the asset according to the SNA. However, when it does not affect the outcome of this question, this criterion is expected to be of less importance.

20. Not all criteria as listed above will be relevant for the asset classification in the SNA. Particularly the last three criteria do not seem to be of direct relevance for this purpose. However, the role of the asset and the existence of a corresponding liability of the asset are expected to be of considerable relevance. The criterion of the issuer may be relevant when looking at specific instruments as distinguished in the SNA – particularly regarding currencies – but is deemed of lesser importance for most of them, as this information will normally already be captured by properly assigning the holder and issuer according to institutional sector.

21. On the basis of the above and the current known examples of crypto assets, this leads to the following proposal for categorisation of the various types of assets (which, as mentioned before, slightly differs from the BOPCOM classification (IMF, 2019):

- Crypto assets acting as a general means of payment: This would include the cryptocurrencies that are regarded as a well-accepted means of payment. At the moment, this is not the case for most of them, but this may change over time. When

¹¹ The AEG consultation showed diverging views on this issue. Some felt that the intended role should be leading in their classification, arguing that the fact that some may not fully fulfil this role yet will be reflected in their market value (e.g. non-performing loans are also still regarded as loans, but with a market value that reflects their actual value). Furthermore, the issue was raised that not recording crypto assets according to their intended role may create recording issues when the asset is still fulfilling this role to a certain extent (e.g. it may lead to barter trade in case some cryptocurrencies are to a limited extent used for purchasing goods and services). However, most AEG members argued that the practical role is more important in this regard, e.g. explaining that the lack of general acceptance as medium of exchange and a lack of counterpart liability should prevent cryptocurrencies to be recorded as financial asset.

they are not acting as a well-accepted means of payment most of them mainly act as store of value and should be categorized accordingly.

For their recording in the SNA, it is important to further distinguish between those:

- with a corresponding liability: This would cover any cryptocurrency issued by a monetary authority, as well as backed stablecoins if they indeed imply a claim on the issuer (or any third party). As the specific recording may be dependent on the issuer, a further breakdown may be needed into those:
 - issued by a monetary authority
 - not issued by a monetary authority
- without a corresponding liability: This would include most of the well-known cryptocurrencies.
- Furthermore, if the focus is indeed on the actual role instead of the intended role, criteria will have to be developed when a crypto asset can be regarded as acting as general means of payment. When the focus is on the intended role, all cryptocurrencies can most likely be recorded in the same category.
- Payment tokens: This category will include all crypto assets that only act as a medium of exchange within a platform or network.

For their recording in the SNA, it is important to further distinguish between those:

- with a corresponding liability: If there is a corresponding liability, this will imply that the tokens are redeemable with the issuer (i.e. convertible into a legal currency or another financial asset with the issuer). However, it is expected that most payment tokens will not be redeemable.
- without a corresponding liability: These may for example be bought or obtained as a reward within the platform, acting as a means of payment within the platform, but not convertible into a legal currency or another financial asset).
- Security crypto assets: This includes all crypto assets that provide a financial claim on the issuer. Dependent on the type of claim, it can be further broken down into:
 - Debt security crypto assets: These include crypto assets that serve as evidence of debt. This would also include utility tokens that provide the holders future access to goods or services. These assets always imply a financial claim on the issuer (or another third party), and as they are regarded as crypto assets, are negotiable by definition. Given their specific role, dependent on user demands, it may be relevant to separately distinguish them from other types of debt security crypto assets.
 - Equity crypto asset: These include crypto assets that provide the holder with a residual claim on the assets of the institutional unit that issued the instrument.
 - Derivative crypto asset: These include crypto assets that provide the holder with the right to buy (or sell) a particular financial (traditional or crypto) instrument or commodity at a predetermined price within a given time span or at a given date, or to settle a specific transaction at a specified date. It does not include derivatives that are derived on the basis of crypto assets, but are not themselves exchanged via peer-to-peer architecture based on cryptography. It also does not include SAFTs, which should be regarded as investment contracts that provide the investors with the right to a certain number of tokens in the future.
- Crypto assets acting as a store of value: This includes all crypto assets whose main role is to act as a store of value. This may also include crypto assets that from a

theoretical point of view have been created for a different purpose, but that in practice may mainly be used as store of value.

For their recording in the SNA, it is important to further distinguish between:

- with a corresponding liability: This may include a lot of stablecoins that are not yet regarded as well-accepted as means of payment.
- Without a corresponding liability: This may include a lot of cryptocurrencies that are not yet regarded as being well-accepted as means of payment.

As mentioned earlier, the coverage of this group may very much depend on whether the focus is on the actual role or on the intended role of crypto assets. If the focus is on the actual role, more specific criteria will be needed to properly determine the actual role.

22. In this classification no separate category has been created for hybrid tokens¹². In line with how the SNA deals with other instruments that serve multiple roles, they have to be classified in one of the other categories on the basis of their main characteristics.

23. It is expected that this classification will help in developing guidance on how to deal with the various types of crypto assets. It is not intended as new or additional classification to be included in the SNA, but simply to help assigning them to the correct existing (sub)categories in the SNA. Only in case a specific category cannot be matched to an existing category or in case there is a specific (user) interest for separate information on a specific category, it may lead to the creation of a new (sub)category. Furthermore, it has to be understood that this should not be regarded as an exhaustive classification, as new types of crypto assets may emerge in the future. In that case, the classification may need to be expanded, depending on the specific role and characteristics of new assets.

B. Asset boundary

24. To decide on the classification of crypto assets, a first question that needs to be answered is whether they meet the characteristics of an asset. To that end, they should be owned by some unit and the owner should be able to derive economic benefits by holding them over a period of time (see §1.46 of the 2008 SNA).

25. Ownership is well defined for crypto assets. Whoever possesses the private keys associated with a given crypto asset account has the ability to use them much as they would use cash or other (financial) assets. Furthermore, ownership can easily be verified via the blockchain which records the ownership of crypto assets and transactions upon it¹³.

26. The second consideration that a given entity must provide economic benefits to the holder also holds for most crypto assets as they allow for carrying forward value between accounting periods (see §10.8 of the 2008 SNA). The valuation of a given crypto asset depends on the market's expectations regarding its future benefits. In that respect, as noted by Berentsen and Schär (2018), a purchase order for a unit of a digital coin conveys an expectation that its dollar valuation will at least remain at the same price over the period of

¹² Please note that this differs from the BOPCOM paper (IMF, 2019) that recognizes hybrid tokens as a separate subcategory. However, in line with SNA guidance, the BOPCOM paper recommends to classify the hybrid tokens according to their main characteristics, which is also the recommended approach followed in this paper.

¹³ In this regard, it should be noted that ownership can be established for digital coins, but generally not for the underlying blockchain technology as it is usually publicly owned. Only in the case that a blockchain is private or 'permissioned' (users may be granted various interaction rights) it may be possible to establish an economic owner. See for more information: <https://developer.ibm.com/code/2018/05/07/who-owns-the-blockchain/>.

which it is to be held (although the market is, for now, characterised by significant volatility). For other crypto assets, this will also be related to their specific economic function. The only exception to this rule may be the payment tokens without a corresponding liability. They may carry forward some value between accounting periods within the platform, but as they are not convertible into a legal currency or other financial asset, it is doubtful whether they would qualify as assets according to the SNA. In that regard, it may be expected that a lot of digital tokens that are not regarded as crypto assets may currently not be treated as an asset.

27. The consultation showed that all AEG members agree that crypto assets are within the asset boundary of the SNA, as they are owned by an economic agent, and the owner is able to derive economic benefits by holding them over a period of time. However, when having a closer look at the characteristics of payment tokens without a corresponding liability, as explained above, this paper raises the question whether they should be excluded. The AEG is asked to reflect on that.

C. Recording of crypto assets

28. After concluding that most crypto assets indeed meet the asset boundary, the next question is how they should be classified. Are they financial or non-financial assets and in the case of the latter, should they be regarded as produced or non-produced? Furthermore, what specific asset categories should be included in and/or is there a need to create new (sub)categories?

29. Regarding the question whether crypto assets should be regarded as financial or non-financial, the SNA explains that an asset is, in general, regarded as financial when there is a corresponding claim on another institutional unit and when it entitles the holder to receive an agreed sum at an agreed date (see §11.5-11.8 of the 2008 SNA). This also covers shares and other equity that provide the holder with a claim on the residual value of a corporation or quasi-corporation. There is one important exception to this general rule, which is monetary gold that is currently the only financial asset for which no corresponding liability is recorded in the accounts.

30. Regarding the question whether crypto assets, in case they are regarded as non-financial assets, should be considered as produced or non-produced assets, it is important to assess whether their creation meets the production boundary. In this regard, the SNA states that “economic production may be defined as an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods and services” (see §6.24 of the 2008 SNA). However, “activities undertaken by households that produce services for their own use are excluded [...] except for services provided by owner-occupied dwellings and services produced by employing paid domestic staff” (see §6.26 of the 2008 SNA).

31. For each type of crypto assets, the above questions need to be assessed to derive their appropriate recording. This subsection discusses the classification for the various types.

1. Crypto assets acting as a general means of payment

With a corresponding liability, issued by a monetary authority

32. As explained above, the SNA classifies an asset as financial when there is a corresponding claim on another institutional unit and when it entitles the holder to receive an agreed sum at an agreed date. This means that any crypto asset with a corresponding liability is in scope to be recorded as a financial instrument. This will be the case for cryptocurrencies issued or authorized by central banks or a government. In line with fiat currency issued by monetary authorities, they have a corresponding liability and should therefore be recorded as financial instruments. Although this type of issuance is not common practice yet, it can be envisaged that central banks or governments will start issuing their own versions of cryptocurrencies for use as a supplement to cash. Indeed, a number of central banks have

already began exploring the possibilities of doing so¹⁴. In order for an electronic representation of money to be considered as a cryptocurrency issued by a central bank, it would necessitate the use of cryptography to allow for decentralised transfers. This would distinguish this form of currency from other electronic liabilities already issued by central banks such as reserve balances. In these cases households could hold these state-issued cryptocurrencies as liabilities of the central bank in the same way as cash and the relevant amounts could be included in the currency category as defined in the SNA. Cryptocurrencies issued by a monetary authority could then be classified similar to traditional fiat currency, in category ‘Currency’ (AF.21) or in a separate subcategory under AF.2 to acknowledge their different form.

With a corresponding liability, not issued by a monetary authority

33. As explained above, any crypto asset with a corresponding liability is in scope to be recorded as a financial instrument. This means that also crypto assets that act as a means of payment that have not been issued by a monetary authority, but still have a corresponding liability, should be regarded as financial instruments. This would apply to backed stablecoins (not issued by a monetary authority) that indeed act as a general means of payment. This is currently not the case (at least for most of them), but this may change in the future. Once that is the case, it may make sense to classify them in the category ‘currency and deposits’ (AF.2), but possibly in its own separate subcategory to distinguish them from fiat currency (included in AF.21) and (transferable or other) deposits (AF.22 and AF.29 respectively). This separate classification will also be necessary, because they do not meet the current SNA definitions of these existing categories. Furthermore, as they may be backed by different types of assets, it may also make sense to differentiate for that (e.g. distinguishing between stablecoins backed by fiat currency, cryptocurrency, and precious metals). As long as backed stablecoins (not issued by a monetary authority) are not regarded as well-accepted medium of exchange, it would make sense to regard them as crypto asset acting as a store of value with a corresponding liability (see later on in this section).

Without a corresponding liability

34. The traditional cryptocurrencies usually do not have a corresponding liability, which could be used as an argument not to classify them as financial instrument¹⁵. However – although this is currently not the case for at least most of them – they may start acting as a general means of payment over time and in that case become quite similar to fiat currencies. In that regard, it has to be borne in mind that whereas fiat currency constitutes a contractual obligation for an economic actor to provide a payment or series of payments upon the redemption of a given coin unit (see §11.52 of the 2008 SNA), this claim is often more a matter of convention, as for most currencies it will not be possible to obtain any underlying value by redeeming the currency¹⁶. Nevertheless, as an accounting convention, the currency

¹⁴ The government of Venezuela for example issued a cryptocurrency in 2018, the Petro. As this was said to be backed by Venezuela’s oil reserves, this could be regarded as a commodity-backed stablecoin. However, it looks like the currency is no longer regarded as a valid cryptocurrency.

¹⁵ Indeed, several AEG members used this argument in favour of classifying cryptocurrencies as non-financial assets. However, some others explained that the existence of a liability should not be leading. In their opinion, the leading criterion should be whether or not the instrument is acting as a widely accepted means of payment. As the latter is currently not the case for most of them, the BOPCOM paper (IMF, 2019) included interim guidance that all cryptocurrencies should for now be classified as valuables under the heading of non-financial assets.

¹⁶ Whereas fiat currencies were traditionally backed by gold and silver, over time most countries abandoned the possibility for holders to exchange currencies for these underlying metals (the gold and silver standards). Furthermore, whereas the issuance of new currency is sometimes accompanied by corresponding changes in other financial instruments that back the newly created liabilities (e.g. by providing more credit to banks or via open market operations), this need not always be the case. For example, in case of directly distributing cash to households (i.e. helicopter money) or in case of covering specific expenses by issuing new money, the newly created currency will not be backed by any assets.

will still show up in the system of national accounts as an asset for the holder and a liability for the monetary authority. This raises the question as to whether crypto assets that act as a general medium of exchange would merit a different treatment. It could be argued that they should be recorded in the category ‘currency and deposits’ (AF.2), but possibly in a separate subcategory to distinguish them from fiat currency (included in AF.21) and (transferable or other) deposits (AF.22 and AF.29), as well as from other crypto assets that are not issued by a monetary authority acting as general medium of exchange but with a corresponding liability as described in the previous section.

2. Payment tokens

With a corresponding liability

35. Crypto assets acting as a medium of exchange within a platform or network may have a corresponding liability, which means that they are redeemable with the issuer (i.e. convertible into a legal currency or other financial asset). As all crypto assets are negotiable instruments, this would imply that these types of crypto assets are negotiable instruments serving as an evidence of debt, which would qualify them as debt securities (AF.3) as defined in the 2008 SNA (see § 11.64 of the 2008 SNA). However, because they are quite different from traditional debt securities, it may also make sense to create a separate subcategory for payment tokens with a corresponding liability. It should be noted here that, if such a token is not negotiable (which would imply it would not qualify as a crypto asset), it should be classified in the category ‘trade credit and advances’ under other accounts receivable or payable (AF.8).

Without a corresponding liability

36. It is expected that most payment tokens will not have a corresponding liability, but only act as a medium of exchange within the platform/network, not redeemable for any other currency or financial instrument. As explained in Subsection B, it may be considered not to treat them as an asset according to the SNA. This would deviate from the interim guidance as included in the BOPCOM paper (IMF, 2019), which recommends classifying them as a valuable under non-financial assets. Please note in this regard that the coverage of payment tokens in the BOPCOM paper also differs from the one used in this paper.

3. Security tokens

Debt security tokens

37. Debt security tokens (also including utility tokens that provide the holders future access to goods and services) are negotiable instruments serving as evidence of debt. For that reason, they qualify as financial instrument and should be recorded under debt securities (AF.3). However, as explained in Subsection B, it may be considered to classify (at least) the utility tokens in a separate subcategory.

Equity tokens

38. Equity tokens provide the holder with a residual claim on the assets of the institutional unit that issued the instrument. For that reason, they should be classified under equity and investment fund shares and units (AF.5).

Derivative tokens

39. Derivative tokens provide the holder with the right to buy (or sell) a particular financial (traditional or crypto) instrument or commodity at a predetermined price within a given time span or at a given date, or to settle a specific transaction at a specified date. For that reason, they should be classified under financial derivatives and employee stock options (AF.7).

4. Crypto assets acting as a store of value

40. Several crypto assets, particularly a lot of cryptocurrencies, will mainly serve as a store of value, possibly anticipating a future role as general medium of exchange or another role that was initially intended by the issuer. This may require a specific recording, also depending on whether there is a corresponding liability.

With a corresponding liability

41. Some crypto assets with a corresponding liability, such as backed stablecoins, may be intended to serve as a general means of payment, but cannot yet be regarded as such. In that case, their main economic function is serving as a store of value. As there is a corresponding liability, they qualify as financial instrument. However, as they are not (yet) regarded as general medium of exchange, they cannot be classified as currency and deposits (AF.2). They act like negotiable instruments serving as evidence of debt, looking a lot like asset-backed securities. In that regard, it would make most sense to classify them as debt securities (AF.3), although there are no payments of interest and the value of the asset-backed instrument may be very dependent on the type of underlying collateral. In that regard, it could also be considered to record them under equity and investment fund shares (AF.5), but as they do not provide a claim on any residual value, this does not seem preferable.

Without a corresponding liability

42. A lot of cryptocurrencies that are not (yet) regarded as general means of payment will have no corresponding liability. In that case, they will not qualify as financial asset, but should be recorded as a non-financial asset. The question then is whether they qualify as produced assets or as non-produced assets. On the one hand, their creation via mining activities could be considered as an act of production that requires both the input of labour and capital, similar to the mining of gold or the extraction of energy resources^{17 18}. On the other hand, it could be argued that although the miners engage in production activities, they are not actually producing cryptocurrencies, but mining services for which they are rewarded via already existing cryptocurrencies.

43. In case the crypto asset is regarded as produced non-financial asset, it would make most sense to record it as a valuable, i.e. as items that are held as an alternative form of investment such as precious metals or art objects (see §10.149 of the 2008 SNA). Investors may choose to buy these valuables rather than a financial asset “when the prices of financial assets [are] behaving in a volatile matter”. Although cryptocurrencies currently also suffer from high volatility, they indeed serve as an alternative form of investment and are expected to maintain some value over time. In the case the crypto assets are regarded as non-produced assets, it would make most sense to record them as contracts and leases, looking at the activities of miners as validating the transactions recorded in the distributed ledgers, designed to ensure the value of the cryptocurrency and to govern the amount of the currencies in circulation.

44. In the consultation, most AEG members assessed the recording of cryptocurrencies under the assumption that they cannot be regarded (yet) as well-accepted means of payment, but mainly as a store of value. Most AEG members were of the opinion that they should therefore be recorded as valuables under produced non-financial assets. However, it was recommended to record them under a specific subcategory, because of their specific characteristics. This recording should apply as long as crypto assets mainly act as store of value and not yet function according to their intended role. When this actual role changes,

¹⁷ However, one could argue that the act of creating cryptocurrencies is very different from traditional mining activities, which typically relate to the mining of resources which are already existing in the soil or subsoil.

¹⁸ It has to be borne in mind that also the creation of a lot of fiat currency involves a production process that is captured within the production boundary (on the basis of a sum of cost approach), albeit that the relevant value typically does not reflect the value of the currency produced.

this may require a reclassification of the asset. This interim guidance has also been adopted in the BOPCOM paper (IMF, 2019).

D. Recording of the creation of crypto assets

45. The creation of a crypto asset with a corresponding liability is the result of a financial transaction, in which a corresponding liability is created at the same time. However, for crypto assets without a corresponding liability, the creation is less straightforward. This will mainly depend on how the activity of mining is regarded. In this respect, it is also important to assess how to classify their activities in terms of industry classification and how to record their output in terms of product classification. These issues are discussed in this section.

46. Most of the crypto assets without a corresponding liability involve the development of software that allows for their existence to be realised. This is the work of ‘miners’ whose activities in most cases require the use of both intellectual property for developing algorithmic solutions to the cryptographic puzzles as well as the use of computing equipment needed to scale the process¹⁹. Furthermore, miners usually spend a lot of time in solving these puzzles and ‘creating’, or rather ‘discovering’, new coins. For that reason, the AEG expressed to be in favour of recording cryptocurrencies that are not (yet) regarded as general means of payment as produced non-financial assets. Alternative to the proof of work, new crypto assets can also be created via proof of stake. Whereas this does not involve solving a cryptographic puzzle, it still requires the input of computing equipment, and in that regard can also be regarded as a process of production.

47. A next issue is then how to determine the output value of these activities. Taking the view that the mining in and of itself unearths or creates the cryptocurrency, in the same way that mining may unearth gold and silver, one approach is to record the value of the activity as being equal to the sum of the fee and the value of the newly released coin (which would make it significantly different to the approach used for fiat currencies). In case of successful mining²⁰, the production process then leads to the output of ‘cryptocurrencies’ valued at market prices²¹. An alternative is to record it in line with the production of fiat currency, i.e. on the basis of the sum of cost approach²². This would be a more suitable approach when the view would be taken that the ‘miners’ are not engaged in ‘creating’ coins but rather in ‘discovering’ already existing coins, but this approach may also be applied in case the currency is regarded as result of the mining process. The two approaches will normally lead to quite different output values, thus also having a different impact on gross domestic product (GDP)²³. The consultation showed that most AEG members are in favour of valuing the

¹⁹ The computing equipment along with the software used to perform the mining would be evidently classified under ‘other machinery and equipment’ and computer software respectively.

²⁰ Non-successful mining would have an output value of zero.

²¹ These would show up in the capital account (as gross fixed capital formation) in case the crypto asset is recorded as valuable, or in the financial account (as creation of a financial asset) in case the crypto asset is recorded as a financial asset.

²² In the sum of cost approach, the output value would be derived upon the costs related to the use of computing equipment and other inputs needed in the mining process as well as a compensation for the time spent on mining. As this value will usually fall short of the market value of the new asset, this would require an additional entry in the other changes in assets account to account for the full value that will appear in the balance sheet. This is both the case for when it is regarded as a financial asset and when it is regarded as a non-financial asset.

²³ The valuation of the output on the basis of the market price of the cryptocurrency will almost certainly lead to a (significantly) higher value added than valuing the output at the sum of costs. Furthermore, value added in the former case may be expected to show more fluctuation over time, at least in current prices, particularly when market prices continue to be very volatile. The impact in constant prices, on the other hand, may be much smaller, depending on the deflation method. When assessing the possible impact on GDP, it is also important to decide how to deal with (the costs of) unsuccessful mining activities, as these may significantly lower the value added of these activities. In

output of mining crypto assets as the sum of transaction fees and the value of newly mined crypto assets.

48. Another issue is in which industry to record the mining activities and in what product class to classify the output. If drawing a parallel with other mining activities, a recording of the activities in International Standard Industrial Classification (ISIC) Section B (mining and quarrying), division 07 (mining of metal ores) or 08 (other mining and quarrying) may make sense, leading to the output of ‘ores and minerals’ (included in Central Product Classification (CPC) Section 1) or metal products (included in CPC Section 4). However, as crypto assets will have a different form (i.e. digital) than all other mining outputs (which will all be in physical form), this may not be the best solution. Furthermore, the activity of mining crypto assets is rather different from mining physical products²⁴. Looking at the large IT component, it may therefore also be an option to classify the activities as computer programming activities (Division 62) or information service activities (Division 63) in ISIC Section J (information and communication). Alternatively, when looking at the (intended and practical) role of crypto assets, it may also be a possibility to record the activities in a specific (new) subsection under ISIC Section K (financial service activities). The classification may also have an impact on the recording of the output, as a good or a service. It seems quite problematic to record the output as a service, in the case of the crypto asset being classified as a valuable. The AEG is requested to further explore this issue and to come up with a recommendation.

IV. Statistical measurement of cryptocurrencies under incomplete data sources

49. Perhaps the most evident challenge in adequately monitoring the phenomenon of crypto assets is the general anonymity of transactions. If national statistical authorities deem that the size of crypto assets are sufficiently large to warrant incorporation into their compilation procedures, this will require the identification of reliable data sources where there is transparency regarding the identity and location of transactions. The fact that new developments and uses of crypto assets can emerge quickly highlights the need for timely and accurate information.

50. The underlying blockchain of a given crypto asset would be an evident starting point in the collection of data on stocks and transactions. While this would provide the primary information on all the transactions that have taken place and the amount of crypto assets holdings at specific points in time, discerning more detailed information such as linking a wallet to a resident or non-resident institutional unit may be more difficult to achieve or impossible by design. It may be possible to supplement this raw information by requesting information from major exchange platforms, however it appears that there would be significant reluctance in disclosing this type of information voluntarily. Alternatively, looking to existing administrative sources of information may in many cases present a more viable option. It is evident that national tax authorities also have an interest in determining the identity of crypto asset owners and have already made progress on this front. As a notable example, the United States Internal Revenue Service obtained a court order obliging Coinbase, a major trading platform to disclose this information²⁵.

51. Most of the AEG members responded that they do not already include transactions and/or stocks of crypto assets in their accounts, because there are no specific data sources

any case, an example for Georgia shows that the impact may be significant. An IMF issues paper prepared for BOPCOM showed that mining companies in Georgia receive an estimated amount in fees and newly mined Bitcoins which is around 5% of GDP (IMF, 2018).

²⁴ See also foot-note 16.

²⁵ <https://www.nytimes.com/2018/01/22/opinion/irs-bitcoin-fear.html> highlights some further accounting issues of cryptocurrencies for tax purposes.

available. However, to the extent that these assets are used to make specific purchases or used in specific transactions, they are probably reflected in the accounts. Most AEG members were also not aware of specific data sources that may provide detailed information on who is owning specific types of crypto assets. However, publicly available data sources such as used for pricing, trading and initial coin offerings were mentioned as a useful starting point. Furthermore, several expressed the expectation that more detailed information might become available from fiscal and legal authorities in case certain types of crypto assets increase in importance over time.

V. Conclusions

52. This paper provided an updated breakdown of the various types of crypto assets to be distinguished in order to properly record these assets in the system of national accounts, and discussed how these should be recorded in the accounts. This has led to the following proposal:

- Crypto assets acting as a general means of payment
 - with a corresponding liability
 - i. issued by a monetary authority – *Currency (AF.21)*
 - ii. not issued by a monetary authority – *Separate subcategory within Currency and deposits (AF.2)*
 - without a corresponding liability - *Separate subcategory within Currency and deposits (AF.2)*
- Payment tokens
 - with a corresponding liability – *Debt securities (AF.3)*
 - without a corresponding liability – *No asset*
- Security crypto assets
 - Debt security crypto assets – *Debt securities (AF.3)*
 - Equity crypto asset – *Equity and investment fund shares (AF.5)*
 - Derivative crypto asset – *Financial derivatives and employee stock options (AF.7)*
- Crypto assets acting as a store of value
 - with a corresponding liability – *Debt securities (AF.3)*
 - without a corresponding liability – *Valuables (AN.13)*

53. The AEG is asked to reflect on the criteria used to classify crypto assets, including the proposed classifications and definitions. Furthermore, the AEG is asked to reflect on the proposal for recording the various types of crypto assets.

54. The paper also discussed in more detail the creation of crypto assets that do not have a corresponding liability and explores possible industries to classify the activities of the miners and possible product categories to record their output. The AEG is also asked to reflect on these suggestions.

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