14th Meeting of the Advisory Expert Group on National Accounts,
5-9 October 2020, Virtual Meeting

Agenda item: 5.4

The recording of crypto assets

Introduction

Recent years have seen a significant proliferation in the number and types of crypto assets. As guidance on how to record crypto assets in macroeconomic statistics was largely absent, the IMF and the OECD started to explore the statistical measurement of crypto assets in 2018. Discussions took place at meetings of the Balance of Payments Committee (BOPCOM), the OECD Working Party on Financial Statistics (WPFS), and the Advisory Expert Group (AEG) on National Accounts in 2018 and 2019, feeding into interim guidance on the recording of crypto assets in macroeconomic statistics. All of this has been reflected in an IMF paper that was published in 2019 and in an updated OECD paper in 2020. The latter paper also contains updated guidance on crypto assets that emerged over the last year and addresses feedback received from the 2019 AEG meeting regarding the need for more specific definitions and classification of crypto assets. It has been attached to this cover note as background information.

Whereas there is broad consensus on the recording of most types of crypto assets, discussion still remains regarding one specific subcategory, i.e. the classification of cryptocurrencies without a corresponding liability that do not yet act as a general medium of exchange. Important questions regarding this specific type of crypto asset are whether they concern financial or non-financial assets and how to account for their creation. The issues note attached to this cover note addresses these questions and presents updated proposals for their recording in the SNA. The note argues that it would be better to, in contrast to the interim guidance, also record cryptocurrencies without a corresponding liability that are not yet regarded as general medium of exchange as financial assets. Although they do not have a counterpart liability, it is explained that this is not a necessary condition to qualify as financial assets. Furthermore, they do not derive their value from benefits that can be obtained from their use in production activities like most non-financial assets. They are also quite different from valuables, which are the only type of non-financial assets not used in production. In line with monetary gold and fiat currency they derive their value from their 'financial' role (i.e. acting as an alternative to traditional financial instruments) and the trust that people put in them to serve as such. For that reason, a recording as financial instrument would seem to make most sense.

The note further explains that in case all cryptocurrencies are regarded as financial assets, it may be best to cluster them all (possibly with the exception of those created by a monetary authority, as these would resemble traditional fiat currency) in one new financial asset class in an updated SNA, possibly further distinguishing between different types of cryptocurrencies (e.g. between those with and without a corresponding liability) within this class. This would have the benefit that users that are looking for specific information on cryptocurrencies can easily find this information in the accounts. Furthermore, it would do justice to the fact that cryptocurrencies have their own characteristics, making them different from traditional asset classes.

Regarding the creation of cryptocurrencies, the note explains that they are not produced by miners, as suggested in the interim guidance, but that they simply come into existence as laid down in the protocol set up by the creator of the cryptocurrency. Following this line of reasoning, miners are

involved in producing validation services, for which they may be rewarded in the form of fees and in the form of new coins (the Block reward). The Block reward leads to lower explicit fees that need to be paid in return for the validation. It is recommended to record the activities of validators (including miners) in a specific (new) subsection under ISIC Section K (financial service activities), distinguishing them from more traditional types of financial services, and to record the output of validators (including miners) under financial and related services (CPC 71) as validation services of cryptocurrency transactions.

The note also explains that in case new coins are released in exchange for validation services, it would make most sense to regard the community (consisting of the entities possessing existing coins) as the initial owners of 'new' coins that are being 'released' by the system, and that they indirectly distribute them to the new owners. In terms of underlying institutional sectors, the relevant amounts may be assigned to domestic sectors and the rest-of-the-world on the basis of share of existing cryptocurrency holdings. Alternative may be to regard the community as a notional unit and to record the transactions with this entity separate from the domestic sectors and the transactions vis-à-vis the rest-of-the world. This decision may heavily depend on the information that may become available on the various cryptocurrencies and may need to be a specific part of the testing of the guidance.

The AEG is asked to reflect upon the specific issues raised in the issues note regarding the recording of cryptocurrencies without a corresponding liability. On the basis of the feedback of the AEG, the working paper that is attached as background information will be updated to present definitive guidance by the end of 2020.

Documentation

- Issues note on "The recording of cryptocurrencies without a corresponding liability in the System of National Accounts" (September 2020).
- Working paper on "The recording of crypto assets in the System of National Accounts – Interim guidance" (June 2020)

Main issues to be discussed

The AEG is requested to reflect on the following questions:

- Do you agree that all cryptocurrencies (including those without a corresponding liability that do not yet act as general medium of exchange) should be regarded as financial assets?
- Do you agree that, in that case, it would be best to cluster them together in a new asset class, with a possible distinction between those with and those without a corresponding liability?
- Do you agree that miners are not producing cryptocurrencies but validation services for which they may be rewarded in the form of a new cryptocurrency coin?
- Do you agree that the activity of validators (including miners) should be recorded in a specific (new) subsection under ISIC Section K (financial service activities) and their output as validation services of cryptocurrency transactions under financial and related services (CPC 71)?
- How should the consumption of validation services that is paid for by the Block reward best be accounted for in the SNA?
- Do you have any other comments with regard to the recording of crypto assets in the SNA?

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Issues note on the recording of cryptocurrencies without a corresponding liability in the System of National Accounts[1]

22 September 2020

[1] This note was prepared by Jorrit Zwijnenburg (OECD). The author would like to thank Nadim Ahmad, John Mitchell and Peter van de Ven for their valuable input.

1. Introduction

1. Recent years have seen a significant proliferation in the number and types of crypto assets. As guidance on how to record crypto assets in macroeconomic statistics is largely absent, the IMF and the OECD started to develop interim guidance to fill this gap (see International Monetary Fund (2019) and Zwijnenburg, De Queljoe and Ynesta (2020)).

2. Whilst, for most types of crypto assets, there is now broad consensus on their recording, deliberations continue on the recording of cryptocurrencies without a corresponding liability that do not yet act as a general medium of exchange.

3. An important question regarding this specific type of crypto asset is how to account for their creation. The interim guidance regards them as being produced by miners but an alternative is to view the miners as being remunerated with already existing coins in exchange for the provision of validation services. Related questions that remain unresolved are how to value the output of miners and how to account for the consumption of their output, especially when they are considered as providing validation services. Another important question concerns the interim guidance to classify them as non-financial instruments when they are de facto intended to serve as a medium of exchange and appear to have characteristics more in common with financial than with non-financial instruments.

4. This issues note further considers these questions, taking into account the interim guidance for other types of cryptocurrencies, as input to the forthcoming meeting of the Advisory Expert Group on National Accounts in October 2020, after which a final paper with recommendations will be produced.

2. Background

5. As explained in Zwijnenburg, De Queljoe and Ynesta (2020), crypto assets are instruments that are exchanged via peer-to-peer architecture and rely on cryptography. They have mainly been developed to serve as alternatives to traditional financial instruments.

6. There are various types of crypto assets. A specific type concerns cryptocurrencies, which are designed to work as a medium of exchange. They do not exist in physical form and are usually issued and controlled by their 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 the possibility to transact without the intervention of a third party and to serve as an alternative means of payment to official currencies, which may help in lowering transaction costs and increasing the speed of transferring money. Of relevance for the deliberations on the treatment of cryptocurrencies is that despite the growth in the number of merchants accepting some of them as a legitimate source of funds, this is not currently the case for most, which may raise questions about whether they can be treated as comparable to fiat currencies. An additional consideration concerns the increase in the use of cryptocurrencies for investment and speculative purposes and the fact that most cryptocurrencies can be bought with and directly converted into fiat currency on a wide array of dedicated cryptocurrency exchanges. This may raise questions whether they may have more in common with financial than with non-financial assets.

7. Because of the decentralized nature of the peer-to-peer architecture, cryptocurrencies heavily rely on the work of validators (including 'miners') to validate the transactions and positions within the system. This validation can be done in a couple of ways. The most well-known is 'proof-of-work', which involves verifying and confirming transactions, and solving computationally difficult puzzles in order to obtain the right to place the next block (including the validated transactions) on the Blockchain. The complexity of the puzzle is often regulated by the developer of the system, which for some cryptocurrencies, also ensures a relatively constant rate of return. For example, for Bitcoin the complexity is automatically adjusted roughly every two weeks in order to keep the rates of mining constant[2]. As the rewards may be significant, the puzzles will often be very complex, requiring significant resources to solve them, in the form of specialized high-performance machines and, by extension, energy consumption. Consequently, in practice, the proof-of-work validation is mainly performed by dedicated companies and 'mining' pools, although it is important to note that this is not uniquely the case. An alternative form of validation is in the form of 'proof of stake', whereby the creator of the next block in the network validating the transactions is determined at random with chances proportional to the amount of coins an entity puts at stake (i.e. the stake). This means that the more and the longer someone possesses coins of a certain cryptocurrency, the more likely he/she is to be allowed to validate the next block of transactions. Other cryptocurrencies (such as XRP (Ripple)) rely on a network of approved validators to validate transactions in the system. This is known as 'proof-of-authority'. There are also various other forms of consensus algorithms, such a proof-of-provenance, proof-of-burn and proof-of-elapsed-time. They are not further explained here. It is only relevant to bear in mind that there are several alternatives to the 'proof-of-work' validation.

[2] The larger the number of validators that are competing for a solution, the more difficult the problem will be made, whereas in the case the computational power on the network decreases, the level of difficulty will be adjusted downward to make the mining easier.

8. Validators may receive two kinds of remunerations. The first concerns the fees associated with the transactions they verify, paid by the entities whose transaction is validated. In addition, a validator may be rewarded in the form of a newly released coin (also known as the Block reward). This is a way to keep transaction fees (relatively) low (particularly when the cryptocurrency is relatively new and the number of transactions is still relatively low), and is also a common way to bring new cryptocurrencies into circulation. For example, successful miners in Bitcoin will receive amounts of Bitcoin in addition to the transaction fees whenever they add a new block to the Blockchain. For Blockchain, the procedure is set up in such a way that new blocks are added on a regular basis (e.g. roughly every 10 minutes), which means that 'new' Bitcoins come into circulation on a regular and frequent basis.

9. Cryptocurrencies that rely on 'proof-of-work' validation and that reward their validators in the form of new currency are referred to as 'mineable' cryptocurrencies, i.e. validators can be seen as searching (or 'mining') for 'new' coins. These validators are usually referred to as 'miners'. All other cryptocurrencies are known as non-mineable cryptocurrencies. This may concern currencies that have already been 'pre-mined' (i.e. all coins have already been released) or currencies for which coins are brought into circulation in a different way then via mining (e.g. via 'proof-of-stake' or 'proof-of-authority'). All cryptocurrencies with a corresponding liability are non-mineable by definition. It is important to note that some mineable currencies may turn into non-mineable after a maximum number of coins has been mined. For example, Bitcoin is halving the Block rewards every so many transactions. It is expected that this will continue until around 2140. At that point, miners will only be rewarded with fees for processing transactions.

10. Bitcoin was the first cryptocurrency and since its introduction in 2009, several other cryptocurrencies have been created, commonly referred to as 'Altcoins'. A recent development in the field of cryptocurrencies is the emergence of '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 them to one or more asset categories (such as another cryptocurrency, fiat currency 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.

11. When looking at the different types of cryptocurrencies, this has led to the following classification as included in the interim guidance (see Zwijnenburg, De Queljoe and Ynesta (2020)), based on: differences in their role; the existence of a corresponding liability; and the issuer of the cryptocurrency:

- Crypto assets acting as a general means of payment: This includes those 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 might change over time.
    - with a corresponding liability: This covers 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).
        - issued by a monetary authority
        - not issued by a monetary authority
    - without a corresponding liability: This would include most of the well-known cryptocurrencies and the relevant seignorage-style stablecoins.

- 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.
    - with a corresponding liability: This may include a lot of stablecoins that are not yet regarded as a well-accepted means of payment.
    - without a corresponding liability: This would include a lot of cryptocurrencies and seignorage-style stablecoins that are not yet regarded as a well-accepted means of payment.

12. In this breakdown, the main focus is on the actual role, instead of the intended role, of the cryptocurrency. The AEG consultation showed diverging views on this issue. Some felt that the intended role should be leading in determining their classification, arguing that the lack of fulfilment of the intended role will be reflected in their market value (e.g. non-performing loans are 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 partially fulfilling this role (e.g. it may lead to barter trade when cryptocurrencies are to a limited extent used for purchasing goods and services). In the end, there was a slight preference to focus on the actual role. Maintaining this decision would imply that criteria will have to be developed to distinguish between currencies that are regarded as a well-accepted means of payment and those that are not. Furthermore, it will need to be tested whether it would be possible for countries to apply this distinction in practice, especially given the complications that may arise when the actual role changes over time.

3. Financial or non-financial assets?

13. The first issue for discussion is whether cryptocurrencies should be regarded as financial or non-financial assets. For this purpose, it is important to look at how the SNA defines and distinguishes between these two types of assets.

14. 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.

15. One important exception to this general rule is monetary gold, which is currently the only financial asset for which no corresponding liability is recorded in the accounts. Fiat currency could be considered as another exception. Although fiat currency constitutes a contractual obligation for an economic actor to provide a payment or series of payments upon the redemption of a given unit of fiat currency (see §11.52 of the 2008 SNA), the 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 currency. Nevertheless, as an accounting convention, the currency will still show up in the system of national accounts as an asset for the holder and a liability for the monetary authority that issues the fiat currency.

16. Looking at these two exceptions, it can be concluded that having a counterpart liability is not a necessary condition to qualify as financial asset. Furthermore, the SNA does not contain any further explicit conditions to qualify as financial asset. In this regard, it is important to note that the two current exceptions of assets with a counterpart liability both derive their value from their role in enabling economic transactions and facilitating financial markets. Monetary gold is held as a reserve asset by monetary authorities and plays an important role in "meeting balance of payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes (such as maintaining confidence in the currency and the economy, and serving as a basis for foreign borrowing)" (see para. 6.64 of the BPM6)[3]. Fiat currency plays a vital role in facilitating economic transactions. For both items, this can be seen as the main reason why they are still regarded as financial assets, i.e. they mainly derive their value from their 'financial' role and the trust that people put in them to serve as such. As the distinction between financial and non-financial assets is currently not clearly defined in the SNA, it may be good to explicitly acknowledge assets as financial, if their main role is to enable economic transactions and facilitate financial markets.

17. Focusing on non-financial assets, the SNA does not contain a clear definition either. However, it can be observed that most non-financial assets derive their value from benefits that can be obtained from their (direct or indirect) use in production activities. This is for example the case for produced non-financial assets such as dwellings, machines, and intellectual property products, as well as for non-produced non-financial assets such as natural resources, and contracts, leases and licences. However, valuables (such as paintings and jewellery) are an exception to the general rule concerning produced assets and their use in production. They mainly derive their value from being a store of value, carrying forward value from one period to another on the basis of specific value that people attach to them.

[3] Furthermore, the Public Sector Debt Statistics Guide explains that monetary gold in the form of bullion is by convention treated as a financial asset, as it "provide[s] economic benefits by serving as a store of value and can be used as a means of payment to settle financial claims and finance other types of transactions (see para. 3.12 of the PSDS).

18. Looking at the above, it makes sense that the interim guidance already recognised cryptocurrencies without a corresponding liability that are widely accepted as a medium of exchange as financial assets. They have a lot of similarities with fiat currency, even if there is no explicit counterparty with a liability. Like fiat currencies, they also rely on the trust that users put in them to act as general means of payment. Furthermore, not recording them as a financial asset would imply that any purchase of goods and services using cryptocurrencies should be recorded as barter trade. The interim guidance recommends to record cryptocurrencies without a corresponding liability that act as a general means of payment as financial assets, in a separate subcategory within 'currency and deposits' (AF.2).

19. The guidance for those that are not (yet) regarded as medium of exchange may be less straightforward. It is indeed the case that they lack a corresponding liability, but as explained above, this is not a decisive criterion to not record them as financial assets. There are already known exceptions and the interim guidance also accepts that cryptocurrencies without a liability can be treated as financial assets if they are widely accepted as mediums of exchange. In that sense, it is clear that the desire to avoid creating further exceptions to the range of assets that can be treated as financial despite having no liability has its limits. In view of the lack of clear definitions on what makes an asset financial or non-financial, it may be better to look at some of the other characteristics. In that regard, cryptocurrencies (and crypto assets in general) do not seem to derive their value from benefits that can be obtained from their use in production activities. Looking at possible parallels with valuables (the only exception of a non-financial asset that is not used in production), it can indeed be argued that cryptocurrencies are used as a store of value, which was also the main underlying rationale to treat (a selection of) cryptocurrencies as valuables. However, reassessing this interim guidance, it is important to note that there are significant differences between cryptocurrencies and valuables. As stated in paragraph 9.57 of the SNA "valuables are expensive durable goods that do not deteriorate over time, are not used up in consumption or production, and are acquired primarily as stores of value". The first concern is that cryptocurrencies cannot be regarded as durable goods. The second concern is that valuables are normally goods with significant values that were typically produced in a much earlier accounting period which is clearly not the case for crypto assets. The third issue relates to the qualification of 'expensive'. Whilst there is no debate on whether crypto assets have value, it is not always the case that they are necessarily of significant (expensive) value in the sense that was intended for valuables. For these reasons, it may be good to reassess the interim guidance.

20. Having another look at possible similarities with financial assets, it is clear that cryptocurrencies (and crypto assets in general) derive their value from acting as an alternative to traditional financial instruments. This may be as an alternative to traditional fiat currency (i.e. the cryptocurrency already acting as such or people anticipating that it will take this role in the future), or – in the case the latter has not yet materialised – as an alternative to financial investments, such as debt securities, equity or investment fund shares. Despite the fact that they do not have counterpart liabilities, people may still trust them to act like traditional financial instruments, and for that reason put a certain value to them. In this respect, it would make more sense to record cryptocurrencies without a corresponding liability that do not yet act as general means of payment as financial assets, in line with those that already do so, and in line with crypto assets with a corresponding liability.

21. In addition to the conceptual argumentation above, there are also some practical arguments to classify them as financial assets. It has already become clear that not a lot of data is currently available on the possession and the use of crypto assets. For that reason, it may be complicated for compilers to develop estimates and this may become more challenging in case specific distinctions are being targeted, particularly in case this

is based on the actual role of an asset. As mentioned earlier, this would require criteria to distinguish between currencies that are regarded as a well-accepted means of payment and those that are not. And it would require that compilers are able to apply these criteria in practice, also being able to process any changes in case the role of a specific currency changes. This may not be necessary if cryptocurrencies are all regarded as financial asset. There may still be demand for a specific subcategorization, but in case this does not turn out to be feasible, countries would then still be able to provide information on the aggregates.

4. The creation of cryptocurrencies

22. Another important question in relation to the recording of cryptocurrencies is how to account for their creation. This is relatively easy for those with a corresponding liability, i.e. their creation is the result of a financial transaction, in which a corresponding liability is created at the same time. However, for cryptocurrencies without a corresponding liability, the assessment of their creation is less straightforward.

23. As described earlier, there are a couple of ways via which cryptocurrencies without a corresponding liability may come into circulation. Mineable currencies come into circulation via the work of miners that develop software to solve cryptographic puzzles (proof-of-work). The work of these 'miners' in most cases requires the use of both intellectual property for developing algorithmic solutions to the cryptographic puzzles as well as the use of computing equipment and considerable amounts of energy to scale the process. Furthermore, 'miners' usually spend a lot of time in 'solving' these puzzles. Non-mineable coins may come into circulation in two different ways. They may be brought into circulation via an explicit sale (for example in the form of an initial coin offering) or by providing them to validators that validate transactions in different ways than via proof-of-work (e.g. via proof of stake or proof of authority).

24. In the interim guidance, the AEG expressed - albeit with a very small majority – a preference for treating the creation of cryptocurrencies without a corresponding liability as output of miners. However, at that time, the main focus was on mineable cryptocurrencies and how to deal with the activity of the miners. It was argued that – as the activity of miners requires both the input of intermediate goods and services, labour and capital – it should be regarded as production and that they are in that case actually producing new coins. However, re-assessing this interim guidance, it is important to note that the recognition that these miners are engaged in productive activities does not automatically imply that the cryptocurrencies necessarily have to be treated as produced (i.e. that the miners are actually engaged in the production of the assets themselves)[4]. This may need another reflection.

25. It is important to note that the treatment of the miners as being engaged in the production of cryptocurrencies assets only, creates a dual form of distinction, and implicit inconsistency, between the way that output is recorded for those miners engaged in 'validation services' for which they are 'only' rewarded via a fee (in case that all coins have already been mined or are distributed in a different way) and those that are instead rewarded via a fee and a new coin (the Block reward). In this regard, the Block reward just seems like an additional means to attract miners to validate transactions, i.e. lowering the transaction costs for users when the number of coins and transactions is still relatively low, and of a way to bring new currency into circulation.

26. When also taking into account the other ways via which cryptocurrencies without a corresponding liability may be brought into circulation, it seems that they are actually 'created' by the developer and then brought into circulation in a way depending on the specific setup of the cryptocurrency as chosen by the developer. For example, validators that are involved in the validation of transactions in the form of proof-of-stake or proof-of-authority may also be rewarded in the form of a new coin, whereas they do not engage in mining (i.e. solving cryptographic puzzles). Also the fact that most mineable currencies come into circulation at a pace that is determined by the developer implies that the underlying protocol is controlling the release and that this is not influenced by the miners. In that sense, it would make more sense to regard the activity

[4] Underwater treasure seekers also for example engage in significant production activities but do not of course produce the goods they find, even if the value of their remuneration matches the value of the goods they find.

of miners as providing validation services for which they are remunerated in the form of fees and existing coins, rather than looking upon them as producing the coins.

27. The fact that miners often have to make significant costs to solve the cryptographic puzzles, may raise the question whether this should still be regarded as costs in providing validation services. However, it has to be borne in mind that solving the cryptographic puzzle is a means to gain the right to add the next block to the Blockchain and to validate the relevant transactions within. Furthermore, the Block reward leads to lower explicit fees that need to be paid in return for the validation services. In that sense, the sum of both the fee and the Block reward need to cover all the costs borne by the miners made to validate the various transactions[5].

28. The validators involved in other forms of validation (e.g., proof-of-stake and proof-of-authority) can also be regarded as producing validation services. Just as with proof-of-work validation, they may be rewarded in the form of fees only or in the form of both fees and a Block reward, the latter reducing the fees that users have to pay to have their transactions validated.

29. Looking at the industry classification of the validators (including miners), it could be argued – as suggested in the interim guidance – that the activities of the validators should be regarded as computer programming activities (Division 62) in ISIC Section J (information and communication), given the large amount of IT that may be involved in the validation of transactions. However, looking at the specific role of the validators in facilitating and strengthening the use of cryptocurrencies (and the fact that the IT component in case of validating transactions of non-mineable currencies is much lower), it may be better to record the activities in a specific (new) subsection under ISIC Section K (financial service activities), distinguishing them from more traditional types of financial services. In this case, it would also make more sense to record the output of validators (including miners) under financial and related services (CPC 71) as validation services of cryptocurrency transactions.

30. When taking the viewpoint that the coins are in fact 'created' by the developer, a question still remains how to account for this creation and at what point in time the coins are actually created. Another question is to whom to assign the ownership of the coins, i.e. where do they first show up and who is distributing them (e.g. as a Block reward) within the community?

31. It may be argued that the currency should appear on the balance sheet of the developer who is then distributing it. This may make a lot of sense in case the currency is brought into circulation via explicit purchases. However, it may make less sense if the coin is brought into circulation in different ways, such as via remuneration for 'proof-of-work' or in the form of rewarding specific entities via 'proof-of stake' or 'proof of authority'. In this case, the developer may have decided on the way to bring the coins into circulation, but cannot really influence the allocation anymore after the launch of the coin. The system automatically creates the new coins and allocates it to the relevant entities according to the underlying algorithms and protocol embedded in the system. In that sense, it seems to make more sense to regard the community (consisting of the entities possessing existing coins) as the initial owners of 'new' coins that are being 'released' by the system, and that they (indirectly) distribute them to the new owners[6]. Explicit fees are paid by the entities whose transactions are validated in the block, while the 'new' coins can be regarded as being paid by the community as a

[5] It has to be borne in mind that a higher Block reward will usually also lead to higher costs involved in the mining, as a higher reward will usually attract more miners, after which the complexity of the puzzle will normally be increased to ensure that new coins will still be released at a more or less fixed pace. This means that the output value of proof-of-work validation may be higher than certain other forms of validation, but that the value added may be expected to be more similar.

[6] The entry of more coins into circulation can in this view also be seen as adding to the size and importance of the community.

whole. Both types of use can be regarded as (final or intermediate) consumption (including imports and exports).

32. While in the case of fiat currency, the creation of the coin is recorded as a simultaneous appearance of an asset and a liability in the form of a financial transaction, in the case of a cryptocurrency without a corresponding liability, the appearance has to be accounted for in a different way. It seems to make most sense to do so in the form of an 'other change in the volume of assets'. This should be done at the time a new coin is brought into circulation. It then appears on the balance sheet of the community and is then distributed to the relevant entities involved in the 'proof-of-work', 'proof-of-stake', 'proof-of authority' or an alternative form that may be used to obtain new coins.

33. A specific challenge in this recording, is to determine the entities constituting the 'community'. When the viewpoint is taken that this consists of the owners of the existing coins, the underlying entities may be several institutional units that may partially concern resident entities, whereas in most cases a lot of the entities will concern non-residents. The relevant amounts (i.e. appearance of the new coins and the payment of the Block reward) may then be assigned to domestic sectors and the rest-of-the-world on the basis of share of currency holdings. Alternative may be to regard the community as a notional unit and to record the transactions with this entity separate from the domestic sector and the transactions vis-à-vis the rest-of-the world. This decision may heavily depend on the information that is available on the various cryptocurrencies. This could be further explored in the testing of the guidance.

5. Recommendations

34. This Issues note reassessed the interim guidance on the recording of cryptocurrencies without a corresponding liability that do not yet act as a general medium of exchange, as there was still a lot of discussion on their recording.

35. A first question concerned whether these cryptocurrencies should be regarded as financial or non-financial assets. The note explained that, in contrast to the interim guidance, it would make most sense to record them as financial assets. Although they do not have a counterpart liability, it was explained that this is not a necessary condition to qualify as financial assets. Furthermore, they do not derive their value from benefits that can be obtained from their use in production activities like most non-financial assets and they are also quite different from valuables, which are the only type of non-financial assets not used in production. In line with monetary gold and fiat currency they derive their value from their 'financial' role (i.e. acting as alternative to traditional instruments) and the trust that people put in them to serve as such. For that reason, a recording as financial instrument would seem to make most sense.

36. If all cryptocurrencies would be regarded as financial assets, the next question is how to classify them. In the interim guidance, it was recommended that the ones that already act as general means of payment should be recorded within 'currency and deposits' (AF.2), in two separate subcategories (the ones with versus the ones without a counterpart liability), to distinguish them from fiat currency (included in AF.21) and (transferable or other) deposits (AF.22 and AF.29). Furthermore, it was recommended that the ones with a corresponding liability, but not yet acting as general means of payment, should be recorded as debt securities or investment fund shares, depending on how the coin is backed[7].

37. Although one could stick with the above interim guidance, and determine a specific category for cryptocurrencies without a corresponding liability not yet acting as general means of payment, it could also be opted to combine all cryptocurrencies (possibly with the exception of those created by a monetary authority as they would resemble traditional fiat currency[8]) in one new financial asset class. This would have the benefit that users that are looking for specific information on cryptocurrencies can easily find this in the accounts. Furthermore, it would do justice to the fact that cryptocurrencies have their own characteristics, making them different from traditional asset classes. Finally, it may be easier for compilers to compile and publish relevant results as it may enable them to only do so at more aggregated levels, particularly when only limited information is available on different types of cryptocurrencies.

38. As there are different types of cryptocurrencies, it would make sense to distinguish subcategories in such a new financial asset class dedicated to cryptocurrencies. As a minimum, one should distinguish those with and without a corresponding liability. Those without a corresponding liability will only appear on the asset side of the balance sheet, similar to monetary gold, whereas those with a corresponding liability will appear on both the asset and the liability side of the balance sheet. The latter category could possibly be further broken down by type of underlying

[7] "As they resemble negotiable instruments serving as evidence of debt, looking a lot like asset-backed securities, it makes 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. Alternative would be 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" (see Zwijnenburg, De Queljoe and Ynesta (2020)). However, one should note that in practice the latter condition is also not applicable for investment fund shares.

[8] It would indeed make most sense to treat them as fiat currency released by the monetary authority, and to record them in AF.21.

collateral. The categories with and without a corresponding liability could also be further broken down into those cryptocurrencies already acting as general means of payments and those that are not. Theoretically, a distinction may also be envisaged into mineable and non-mineable currencies, although it is questionable whether this would add much value from a users' and/or from a compilers' perspective.

39. Another question regarding this specific type of crypto assets was how to account for their creation. Whereas the interim guidance regarded them as being produced by miners, the note explained that it makes more sense to regard them as being 'created' by the developer. In this regard, it has to be borne in mind that several cryptocurrencies do not come into circulation via mining and that the pace via which they are released is usually determined by the underlying protocol and not by the miner. Whereas miners are involved in productive activities, they are actually producing validation services, for which they may be rewarded in the form of fees and in the form of new coins (the Block reward). The Block reward leads to lower explicit fees that need to be paid in return for the validation. It is recommended to record the activities of validators (including miners) in a specific (new) subsection under ISIC Section K (financial service activities), distinguishing them from more traditional types of financial services, and to record the output of validators (including miners) under financial and related services (CPC 71) as validation services of cryptocurrency transactions.

40. Regarding the appearance of new cryptocurrencies, the paper explained that in case they are released in exchange for validation services, it would make most sense to regard the community (consisting of the entities possessing existing coins) as the initial owners of 'new' coins that are being 'released' by the system, and that they indirectly distribute them to the new owners. It seems to make most sense to record their appearance in the form of an 'other change in the volume of assets' for the community at the time a new coin is brought into circulation. It is then distributed to the relevant entities involved in the 'proof-of-work', 'proof-of-stake' or 'proof-of authority' (or an alternative form that may be used to obtain new coins) in exchange for their validation services. In terms of underlying institutional sectors, the relevant amounts may be assigned to domestic sectors and the rest-of-the-world on the basis of share of existing cryptocurrency holdings. Alternative may be to regard the community as a notional unit and to record the transactions with this entity separate from the domestic sector and the transactions vis-à-vis the rest-of-the world. This decision may heavily depend on the information that may become available on the various cryptocurrencies and may need to be a specific part of the testing of the guidance.

6. References

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The recording of crypto assets in the System of National Accounts – Interim guidance[9]

June 2020

[9] This paper was prepared by Jorrit Zwijnenburg, Matthew De Queljoe and Isabelle Ynesta (OECD). The authors would like to thank Nadim Ahmad, John Mitchell and Peter van de Ven for their valuable input.

1. 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, the IMF and the OECD started to explore the statistical measurement of crypto assets in 2018. Discussions took place at the meetings of the IMF Committee on Balance of Payments Statistics (BOPCOM)[10], the OECD Working Party on Financial Statistics (WPFS)[11] and the Advisory Expert Group (AEG) on National Accounts, feeding into interim guidance on the recording of crypto assets in macroeconomic statistics[12]. This has been reflected in an IMF paper that was published in 2019. At the same time, the various constituencies stressed the need to continue exploring this issue, to arrive at more specific definitions for the various types of crypto assets and to assess whether updates of the guidance may be needed in relation to further developments in the crypto asset market.

3. This paper provides updated guidance on the recording of crypto assets, taking into account new types of crypto assets that have emerged over the last year as well as feedback received from the 2019 AEG meeting regarding the need for more specific definitions and classification of crypto assets. The paper presents an overview of the various types of crypto assets and discusses their recording in the national accounts. Furthermore, the paper discusses how the creation of crypto assets without a corresponding liability should be accounted for in the accounts. As there are still some remaining issues that need further reflection, the guidance included in this paper should still be considered as interim. An updated version of this paper will be made available towards the end of 2020, after consultation of the Advisory Expert Group on National Accounts on these issues.

4. The paper is structured as follows. Section 2 provides a general overview and a description of crypto assets. On the basis of that, Section 3 discusses relevant criteria for distinguishing between various types of crypto assets to be recorded in the system of national accounts and presents a classification. It also discusses how these various types of crypto assets could be classified. Section 4 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 5.

2. General overview of crypto assets

5. 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 architecture[13], which enables two parties to directly transact with each other 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

[10] https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12_3e_Cryptocurrencies_IMF.pdf
[11] https://unstats.un.org/unsd/nationalaccount/aeg/2018/M12_3e_Cryptocurrencies_OECD.pdf
[12] https://www.imf.org/external/pubs/ft/bop/2019/pdf/Clarification0422.pdf
[13] 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 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.

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)[14].

6. 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.

7. 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.

8. Most types of cryptocurrencies come into circulation via a process called "mining". This mining process involves verifying and confirming (i.e. 'validating') transactions, and 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 claims the rewards. This consists of both the transaction fees associated

[14] The Bitcoin white paper provides more technical details, see https://bitcoin.org/bitcoin.pdf.

with the transactions included in that block and a newly released coin (the Block reward)[15]. New blocks are added to the blockchain on a regular basis (e.g. roughly every 10 minutes for Bitcoin). This form of mining requires a lot of resources (in the form of specialized high-performance machines and energy consumption) and for that reason is mainly performed by dedicated companies and mining pools[16]. 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 an entity holds (i.e. the stake).

9. 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 assets[17]. 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).

10. 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.

11. 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).

12. As described in IMF (2019) crypto tokens can currently be broken down into payment tokens, utility tokens, asset-tokens and hybrid tokens. 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.

[15] The Block reward can be stable over time (in the case of inflationary cryptocurrencies) with no maximum amount, or may decrease every certain number of blocks (in the case of deflationary cryptocurrencies) with a maximum limit to the amount of crypto currencies brought into circulation. The latter is for example the case for Bitcoin. When reaching the limit, miners will only be rewarded with fees for validating and processing transactions. These fees ensure that miners still have an incentive to mine and to keep the network going.

[16] A mining pool is a group of miners who combine their computing power and split the block reward between the participants.

[17] This terminology was also used in the IMF paper (2019), but raised some concern 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. For example, a question may arise in relation to the treatment of asset-backed cryptocurrencies (i.e. stablecoins), i.e. whereas they may be regarded as being similar to Bitcoin (in being a cryptocurrency), they may need to be treated differently as they are backed by an asset.

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 platform[18]. Utility tokens are designed to 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)[19]. 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.

3. Linking crypto assets to the System of National Accounts

13. 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, but to provide more specific guidance on how the different types should be classified according to the System of National Accounts. On the basis of this classification, which is discussed in Subsection 3.1, the section explores the appropriate recording. This is done by first focusing on whether the various types of crypto assets meet the asset boundary (in Subsection 3.2) and, if so, by subsequently exploring which asset category they should go under (in Subsection 3.3). The latter is done by exploring criteria that may be relevant for the new asset categories. Finally, this section explores how to account for the creation of crypto assets that do not have a corresponding liability.

3.1. Types of crypto assets

14. 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

[18] Please note that this definition differs from the IMF paper (2019) that 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 paper is limited to those tokens that are only intended to be used as medium of exchange within a platform.

[19] 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.

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 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.

15. 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

16. 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.

17. When looking at possible distinctive criteria, the following can be listed[20]:

- 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. The following roles can currently be distinguished:
    - 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 to emerge in the future in case new types of crypto assets are created.

  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. The AEG consultation showed some preference for focusing on the actual role over the intended role[21], although it was also acknowledged that this may be difficult to determine in practice. More guidance might be needed in this regard[22].

[20] 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.

[21] The AEG consultation showed diverging views. 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 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 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 most cryptocurrencies from being recorded as financial asset.

[22] When looking at cryptocurrencies – anticipating that the actual number that might be regarded as well-accepted means in practice will be limited – a list could be maintained that shows the ones that meet the criteria. On the other hand, it may be

- 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 for 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 way the asset comes into circulation: Crypto assets that do not have a corresponding liability may come into circulation 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.

18. 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, as noted in the above, 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.

19. On the basis of the above and the current known examples of crypto assets, this leads to the following conceptual categorisation of the various types of assets[23]:

- Crypto assets acting as a general means of payment: This includes those 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 might change over time. When 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 covers 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

questionable whether it will be feasible for compilers to make such a distinction in practice and to compile results accordingly. In that case, it may also be decided to group them together in one category for practical considerations.

[23] Please note that this slightly differs from the classification described in IMF (2019).

recording may be dependent on the issuer, a further breakdown could be envisaged 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.

As a distinction is made between those currencies that are regarded as a well-accepted means of payment and those that are not, criteria will have to be developed to assess when a crypto asset should be regarded as acting as general means of payment[24] [25]. It is expected that currently no or only very few cryptocurrencies may meet the criteria, which means that the vast majority will be regarded as stores of value.

- Payment tokens: This category includes 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. Debt security tokens always imply a financial claim on the issuer (or another third party), and as they are regarded as crypto assets, they are considered as negotiable (i.e. they can be exchanged and transferred) 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 instrument (traditional or crypto) 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 based on crypto

[24] It could be envisaged that a list is maintained that shows the crypto assets that meet the criteria, particularly when the number is relatively small.

[25] It also needs to be assessed whether making this distinction is feasible in practice. When it turns out not to be feasible for compilers to compile results accordingly, it may need to be decided to group all cryptocurrencies without a corresponding liability together in one category for practical considerations, according to the role that is applicable to most of them.

assets, but are not themselves exchanged via peer-to-peer architecture relying 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 means of payment.

    without a corresponding liability: This would include a lot of cryptocurrencies that are not yet regarded as well-accepted means of payment.

20. In this classification no separate category has been created for hybrid tokens. 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.

21. It is important to stress here that this classification is not intended as new or additional classification to be included in the SNA, but simply assists in assigning them to the correct (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, a new (sub)category may need to be created. Furthermore, it 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.

3.2. Asset boundary

22. 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 from them by holding them over a period of time (see §1.46 of the 2008 SNA).

23. 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 in a way which is very similar to the use of cash or other (financial) assets. Furthermore, ownership can easily be verified via the blockchain which records the ownership of crypto assets and transactions upon it[26].

24. 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 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 are the payment

[26] 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/.

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, and are usually not regarded as a form of investment, they do not qualify as assets according to the SNA.

3.3. Recording of crypto assets

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

26. 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.

27. 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).

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

3.3.1. Crypto assets acting as a general means of payment

With a corresponding liability, issued by a monetary authority

29. 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 has already began exploring the possibilities of doing so[27]. 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

[27] 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.

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 should be included in the currency category as defined in the SNA. Cryptocurrencies issued by a monetary authority should then be classified similar to traditional fiat currency, in category 'Currency' (AF.21).

With a corresponding liability, not issued by a monetary authority

30. 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 might change in the future. Once that is the case, it makes sense to classify them in the category 'currency and deposits' (AF.2), but in a 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[28]. 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).

31. Criteria will have to be developed to assess when a crypto asset should be regarded as acting as general means of payment. As the number will most likely be relatively small, a list could be maintained that shows the ones that meet the criteria. It also needs to be assessed whether making such a distinction would be feasible to apply in practice. When it turns out not to be feasible for compilers to compile results accordingly, it may need to be decided to group all cryptocurrencies with a corresponding liability, not issued by a monetary authority, together in one category for practical considerations, according to the role that is applicable to most of them.

Without a corresponding liability

32. The traditional cryptocurrencies usually do not have a corresponding liability, which could be used as an argument not to classify them as financial instrument[29]. However – although this is currently not the case for at least most of them – they might 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 currency[30]. Nevertheless, as an accounting convention, the currency will still show up in the system of national

[28] Furthermore, as they may be backed by different types of assets, it may make sense to differentiate for that (e.g. distinguishing between stablecoins backed by fiat currency, cryptocurrency, and precious metals), also depending on the size and the user demand for this type of information.

[29] For this reason, the IMF paper (2019) included interim guidance that all cryptocurrencies should for now be classified as valuables under the heading of non-financial assets.

[30] 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.

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 also has to be borne in mind that not recording them as financial asset may create issues in case some of them may actually be used to purchase goods and services. Not acknowledging them as financial instruments would in that case lead to the recording of these transactions as 'barter trade'. For these reasons, it is preferable to record those that are accepted as general medium of exchange (even if it is only a few) in the category 'currency and deposits' (AF.2), 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. It has to be borne in mind that these cryptocurrencies will only appear on the asset side of the balance sheet, without a corresponding liability, similar to monetary gold.

33. As mentioned above, criteria will have to be developed to assess when a crypto asset should be regarded as acting as general means of payment and whether it is feasible to make such a distinction in practice. If this is not the case, it may be decided to group all cryptocurrencies without a corresponding liability together in one category for practical considerations, according to the role that is applicable to most of them.

3.3.2. Payment tokens

With a corresponding liability

34. 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 qualifies them as debt securities (AF.3) as defined in the 2008 SNA (see § 11.64 of the 2008 SNA) [31]. However, because they are quite different from traditional debt securities, it may make sense to create a separate subcategory for payment tokens with a corresponding liability.

Without a corresponding liability

35. 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 Section 3.2, these tokens do not qualify as assets according to the SNA[32].

3.3.3. Security tokens

Debt security tokens

36. 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 Section 3.2, it may be considered to classify (at least) the utility tokens in a separate subcategory.

[31] 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).

[32] This differs from the interim guidance as included in the IMF paper (2019) that recommended classifying them as a valuable under non-financial assets. Please note in this regard that the coverage of payment tokens in the IMF paper differs from the one used in this paper.

Equity tokens

37. 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

38. 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).

3.3.4. Crypto assets acting as a store of value

39. 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

40. 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). As they resemble negotiable instruments serving as evidence of debt, looking a lot like asset-backed securities, it makes 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[33] [34].

Without a corresponding liability

41. A lot of cryptocurrencies that are not (yet) regarded as general means of payment will have no corresponding liability. In that case, it may make more sense to record them as a non-financial asset. The question then is whether they qualify as produced assets or as non-produced assets. On the one hand, the fact that they come into circulation as a result of "mining" activities that requires both the input of intermediate goods and services, labour and capital could lead to the conclusion that they result from an act of production[35]. On the other hand, it could be argued that although the "miners" engage in production activities, they are not actually producing cryptocurrencies, but provide "mining services" for which they are rewarded via already existing cryptocurrencies.

42. 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

[33] Alternative would have been to record them under equity and investment fund shares (AF.5), but as they do not provide a claim on any residual value, this was not deemed preferable.

[34] As mentioned before, criteria will have to be developed to assess when a crypto asset should be regarded as acting as general means of payment. It should also be assessed whether such criteria may be applicable in practice. If this is not the case, it may be decided to group all cryptocurrencies with a corresponding liability, not issued by a monetary authority together in one category for practical considerations, according to the role that is applicable to most of them.

[35] 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.

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 may make 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.

43. The Advisory Expert Group (AEG) on National Accounts extensively discussed the proper classification of this type of crypto assets, but did not yet arrive at a final conclusion. As intermediate guidance, it was decided to record these crypto assets as valuables (AN.13) under the category produced non-financial assets (see also 3.4), under a separate subcategory, because of their specific characteristics. This recording should then 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, this would lead to a reclassification of the asset[36]. It was also decided that further reflection is needed to arrive at a final proposal.

3.4. Recording of the creation of crypto assets

44. 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 amongst others depends on how the activity of "mining" is regarded. In this respect, it is also important to assess the classification of their activities and how to record their output in terms of product classification. These issues are discussed in this section.

45. Most of the crypto assets without a corresponding liability come into circulation as a result of the work of miners that develop software to solve cryptographic puzzles. The work of these "miners" 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 process[37]. Furthermore, "miners" usually spend a lot of time in 'solving' these puzzles. For that reason, the AEG expressed to be in favour of interim guidance to record 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.

46. 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 "mining"[38], the production process then leads to an output value in line with the fee and the market value of the mined 'cryptocurrencies'[39].

[36] As explained before, criteria will have to be developed to assess when a crypto asset should be regarded as acting as general means of payment. It should also be assessed whether such criteria may be applicable in practice. If this is not the case, it may be decided to group all cryptocurrencies without a corresponding liability together in one category for practical considerations, according to the role that is applicable to most of them.

[37] 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.

[38] Non-successful mining would have an output value of zero.

[39] 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.

This would also reflect that mining is a market activity that attracts a lot of actors because of the large possible returns on the creation of crypto assets, also involving a certain amount of risk (i.e. a lot of "mining" activities may turn out to be unsuccessful). An alternative is to record it in line with the production of fiat currency, i.e. on the basis of the sum of cost approach[40]. 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, although this approach may still 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 GDP[41]. A consultation of the AEG showed that most members are in favour of valuing the output of mining crypto assets as the sum of transaction fees and the value of newly mined crypto assets.

47. Another issue is in which industry to record the mining activities and in what product class to classify the output. Looking at the large IT component, the AEG expressed a preference for classifying the activities as computer programming activities (Division 62) in ISIC Section J (information and communication), possibly in a separate subcategory 'crypto asset miners'. An alternative would have been to record the activities in a specific (new) subsection under ISIC Section K (financial service activities), looking at the (intended and practical) role of crypto assets, but as the creation of crypto assets does not directly relate to (supporting) financial intermediation, this was deemed less appropriate. For the same reason, it was deemed not very sensible to record the output under financial and related services (CPC 71). In line with the industry classification, it makes most sense to classify the output within the product category professional, technical and business services (except research, development, legal and accounting services) (CP 83), possibly as a specific subcategory 'crypto asset services' within information technology (IT) design and development services (CP8314). Whereas this category concerns services, it has to be borne in mind that these may also lead to the creation of produced (intangible) assets, like in the case of research and development. However, in an update of the SNA, it may need to be explicitly acknowledged that valuables may also include intangible assets.

4. Statistical measurement of cryptocurrencies under incomplete data sources

48. 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.

[40] 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 the volume of 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.

[41] 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 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).

49. 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 information[42]. In this sense, more detailed information may become available from fiscal and legal authorities in case certain types of crypto assets increase in importance over time. Furthermore, publicly available data sources such as used for pricing, trading and initial coin offerings may provide a useful starting point.

5. Conclusions

50. This paper presented a breakdown of crypto assets in order to properly record them in the system of national accounts. It also discussed how these should be recorded in the accounts, leading to the following proposal for interim guidance:

- Crypto assets acting as a general means of payment
  - with a corresponding liability
    - issued by a monetary authority – *Currency (AF.21)*
    - not issued by a monetary authority – *New subcategory within Currency and deposits (AF.2)*
  - without a corresponding liability – *New 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 – *As a new subcategory under Valuables (AN.13)*

51. Regarding the distinction between crypto assets that act as a general means of payment and as a store of value, criteria will need be developed and it will need to be assessed whether this distinction would be feasible in practice. When this is not the case, it may be better to group cryptocurrencies together according to their other characteristics and classify them according to the role that is applicable to most of them.

52. The paper also discussed in more detail the creation of crypto assets that do not have a corresponding liability. It is proposed to record their creation as output of 'crypto

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

asset services' for now as a specific subcategory within information technology (IT) design and development services (CP8314). The "miners" should be classified in computer programming activities (Division 62) in ISIC Section J (information and communication), as a separate subcategory 'crypto asset miners'. The output should be valued as the sum of transaction fees and the value of newly mined crypto assets.

53. Whereas there is broad consensus on the recording of most types of crypto assets, discussion still remains on the classification of cryptocurrencies without a corresponding liability that do not yet act as a general medium of exchange. Their classification still need further reflection to arrive at definitive guidance. For that reason, the guidance as included in this paper should be considered as interim. An updated version of this paper with definitive guidance will be made available towards the end of 2020, after consultation of the Advisory Expert Group on National Accounts on the remaining issues.

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