INTERNATIONAL MONETARY FUND

Statistics Department

Treatment of Crypto Assets in Macroeconomic Statistics

List of Acronyms

ASBJ	Accounting Standard Board of Japan
AASB	Australian Accounting Standards Board
BLCA	Bitcoin-like crypto asset
DAO	decentralized autonomous organization
DLT	distributed ledger technology
ICOs	initial coin offerings
IPPs	intellectual property products
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
MFSMCG	*Monetary and Financial Statistics Manual and Compilation Guide*
PoS	proof of stake
PoW	proof of work
SEC	U.S. Securities and Exchange Commission
FINMA	Swiss Financial Market Supervisory Authority

Treatment of Crypto Assets in Macroeconomic Statistics[1]

Despite compilers' increasing need for advice, there has been no formal guidance on the statistical treatment of crypto assets. Neither accounting nor regulatory standards provide clear guidance either. At present, Bitcoin-like crypto assets do not meet the definition of a financial asset—and hence currency—in macroeconomic statistics. This paper presents an overview of crypto assets and provides guidance on the classification for their treatment in macroeconomic statistics based on the current statistical standards and classifications. Bitcoin-like crypto assets and digital tokens without counterpart liabilities should be classified as produced nonfinancial assets as a distinct sub-category under valuables. Other crypto assets with characteristics similar to those of more standard financial instruments should be classified according to current guidelines. While this guidance for dealing with crypto assets is consistent with the current statistical standards, the development and use of crypto assets need to continue being closely monitored and these recommendations may need to be revisited if conditions substantially change in the future.

I. INTRODUCTION

A. Overview

1.   **A digital revolution has taken place in the past decade, especially concerning the provision of financial services supported by advances in technology and computing power.** At the leading edge of this digital innovation is the advent of crypto assets such as Bitcoin that are designed to be used as a medium of exchange and other crypto assets often called "digital tokens" used to raise money by startup companies. Although the impact at the global level is not significant yet, cross-border transactions in crypto assets are material at least for a few countries.

2.   **Because of their unique characteristics, this paper provides guidance on the treatment of crypto assets in macroeconomic statistics.** Crypto assets did not exist when the latest revision of the macroeconomic statistical manuals took place, consequently no international guidelines are available, except a reference in the *Monetary and Financial Statistics Manual and Compilation Guide* (*MFSMCG*) clarifying that Bitcoin like crypto assets are nonfinancial assets. Crypto assets combine properties of currencies, commodities, and intangible assets. This should guide their classification in macroeconomic statistics.

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[1] Prepared by Marcelo Dinenzon, Venkat Josyula, Jose Carlos Moreno-Ramirez, Robert Dippelsman, and Tamara Razin (under the supervision of Carlos Sánchez-Muñoz). A previous version of this paper was presented at and agreed via written procedure after the thirty-first meeting of the IMF Committee on Balance of Payments Statistics (the Committee) (see BOPCOM 18/11 at https://www.imf.org/external/pubs/ft/bop/2018/31.htm). The revised paper incorporating the suggestions of the Committee was submitted for comments to the Inter Secretariat Working Group / Advisory Expert Group on National Accounts before posting the clarification paper. The ISWGNA/AEG overall agreed with the recommendations in the paper and emphasized that, given that the recommendations still retain some challenges, the development and the use of crypto assets need to continue being closely monitored and the recommendations may need to be revisited if conditions substantially change in the future.

3.   **This paper provides guidance on the categories of crypto assets and recommends a specific statistical treatment.** The paper explains the process of "mining" crypto assets (such as Bitcoin) and provides guidance on how to measure the output of the mining activity. Additionally, guidance on the statistical recording of cross-border transactions associated with Bitcoin-like crypto assets (BLCAs) is presented.

4.   **The classification of crypto assets recommended in this paper may need to be revisited based on how they evolve in the future.** Crypto assets are at their initial phase of development and undergoing fast changes. It is difficult to predict at this stage how these assets and underlying technologies will change in the coming years. Moreover, at the time of finalizing this paper the accounting treatment of these assets is not yet decided by the International Accounting Standards Board (IASB).

5.   **The rest of this paper is organized as follows.** Section I.B introduces key concepts to understand crypto assets. A glossary of important terms is provided in Annex 1 to further elaborate on these concepts. Section II classifies crypto assets into categories and briefly explores the applicable international accounting standards; Section III discusses the recommended classification of crypto assets in macroeconomic statistics and offers guidance on measuring the output of mining; Section IV deals with practical considerations; and Section V concludes.

B. Understanding Crypto Assets

6.   **Crypto assets are digital representations of value, made possible by advances in cryptography[2] and distributed ledger technology (DLT).** The blockchain technology allows using distributed ledgers for generating and keeping records without the need for a central party (for example, a central bank) to administer the system. Crypto assets are denominated in their own units of account and can be transferred peer-to-peer without an intermediary.[3] Box 1 presents the key differences between centralized and distributed ledger systems.[4]
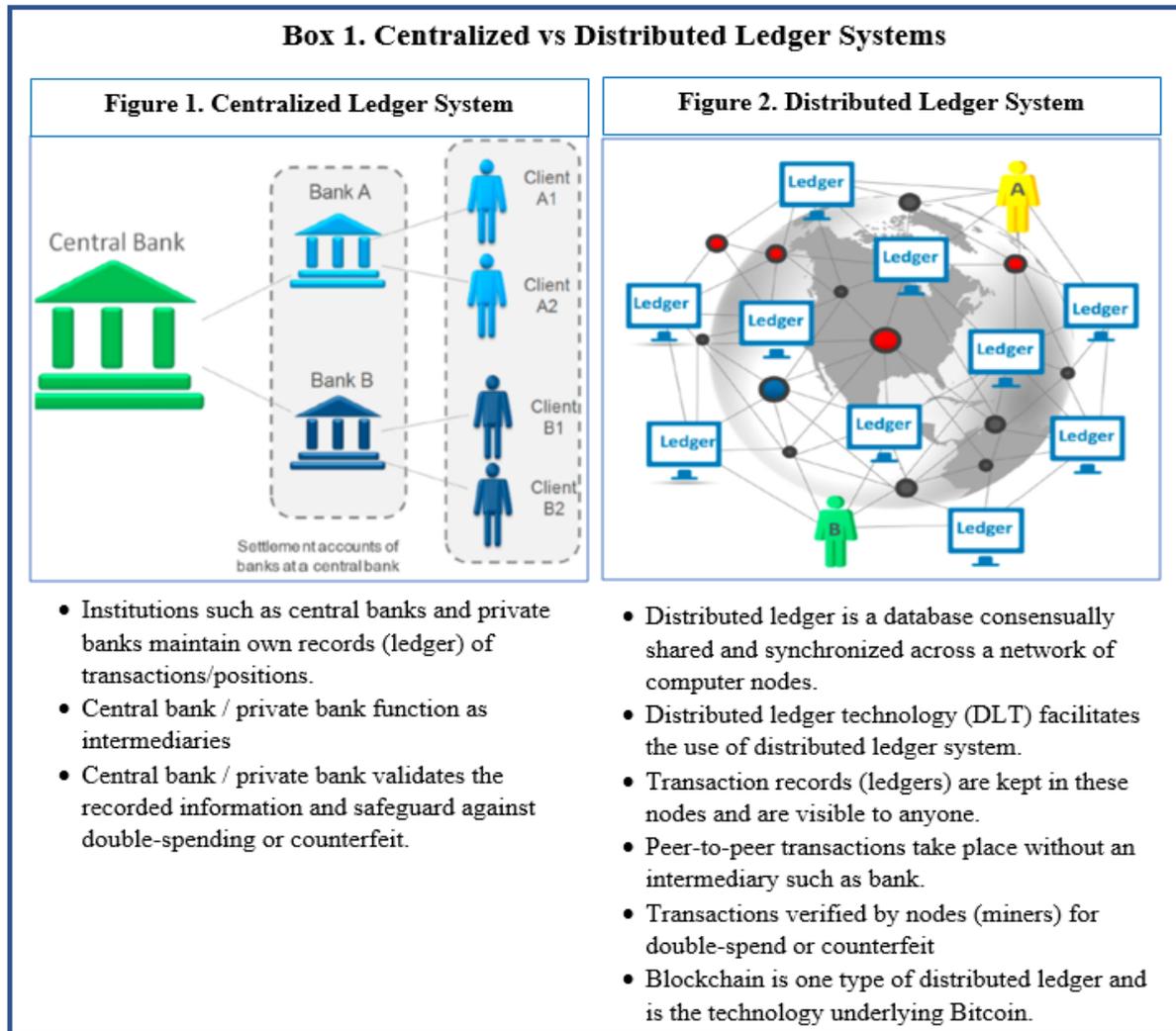
7.   **BLCAs are one type of crypto assets.** They are digital assets based on DLT and designed to work as a medium of exchange. Examples of BLCAs are: Bitcoin, Ether, Ripple (XRP), Bitcoin Cash, EOS, Stellar, and Litecoin. BLCA is often used in reference to all crypto assets. However, in this paper, it is used specifically to mean those crypto assets that are designed to serve as a general-purpose medium of exchange for peer-to-peer payments, with no issuer and no counterpart liability. In a peer-to-peer system, the central party is

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[2] Cryptography is the conversion of data into a secret code for transmission over a public network. Refer to Annex 1 for additional details.

[3] He, 2018

[4] Images in Box 1 were taken from the IMF staff discussion note on "Virtual Currencies and Beyond: Initial Considerations" (January 2016).

replaced by a framework of internal protocols that govern the operation of the system and allow the verification of transactions to be performed by the system participants themselves.

Box 1. Centralized vs Distributed Ledger Systems

Figure 1. Centralized Ledger System

- Institutions such as central banks and private banks maintain own records (ledger) of transactions/positions.
- Central bank / private bank function as intermediaries
- Central bank / private bank validates the recorded information and safeguard against double-spending or counterfeit.

Figure 2. Distributed Ledger System

- Distributed ledger is a database consensually shared and synchronized across a network of computer nodes.
- Distributed ledger technology (DLT) facilitates the use of distributed ledger system.
- Transaction records (ledgers) are kept in these nodes and are visible to anyone.
- Peer-to-peer transactions take place without an intermediary such as bank.
- Transactions verified by nodes (miners) for double-spend or counterfeit
- Blockchain is one type of distributed ledger and is the technology underlying Bitcoin.

8.   **Whereas some BLCAs are put into circulation as a result of so-called "mining" (e.g., Bitcoin, Bitcoin Cash, Ether,[5] etc.), others were issued at the launch of the project.** At the time of drafting this paper, there were more than 1600 BLCAs with a total market capitalization of around USD 228 billion, and Bitcoin accounted for almost half of this value.[6]
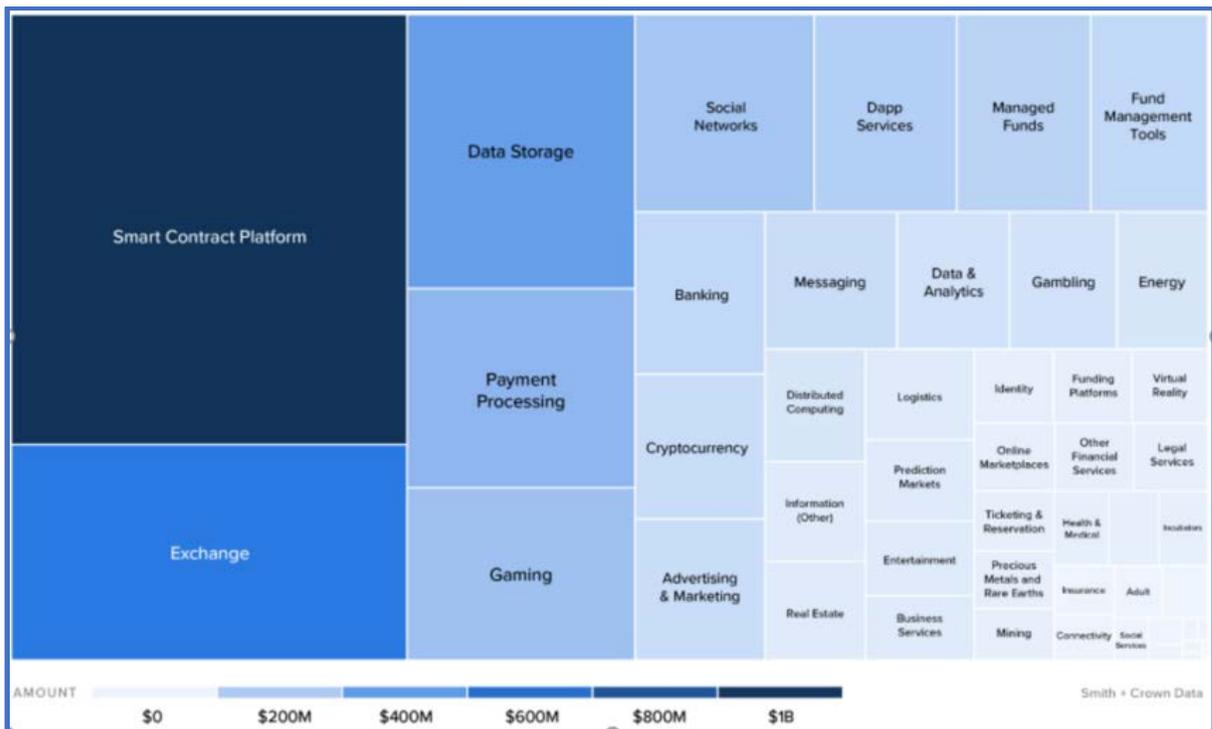
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[5] Ether was sold through an ICO in 2014. In addition, similar to Bitcoin, Ether can be mined as part of verification of transactions undertaken in Ether.

[6] BLCAs use decentralized control based on DLT. Bitcoin and Ether are highly decentralized. There are around 12,000 nodes on the Bitcoin network and over 26,000 on Ethereum network verifying transactions (see https://news.bitcoin.com/most-cryptocurrencies-are-more-centralized-than-you-think/). No one has central control over the protocol. While most of these BLCAs are fully decentralized (e.g., Bitcoin and Ether), some important BLCAs such as Ripple's XRP use a trusted network of validators which limits somewhat the decentralized character of this BLCA, as the network is controlled by Ripple labs.

9.   **The activity of mining refers to verifying and confirming transactions in BLCAs** by including transactions in a block following the proof of work (PoW)[7] consensus mechanism, typically using high-end computers. For participating in such verification process, miners[8] receive transaction fees[9] and/or newly mined crypto assets (such as Bitcoin).

10.   **A significant number of crypto assets other than BLCAs called "tokens" or "digital tokens" are being issued using initial coin offerings (ICOs).** Digital tokens are defined as transferable units generated within a distributed network that tracks ownership of the units through the application of blockchain technology.[10] Through ICOs digital tokens are issued to raise money to fund new DLT-related projects. These projects are described in "white paper" documents and involve businesses as diverse as smart contract platforms, exchanges, data storage, etc. Figure 3 shows the most important ICOs by type of business in 2017–18.

Figure 3. Amounts Raised Through ICOs by Type of Business (2017–18)

Source: Smith & Crown (https://www.smithandcrown.com/introducing-smith-crown-industry-classifications/)

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[7] The PoW consensus mechanism requires the network participants to solve a cryptographic puzzle to allow them to add new blocks to the blockchain. Refer to Annex 1 for further details.

[8] Institutional units that undertake mining of BLCAs are called miners. Mining could be undertaken by miners individually (solo mining) or as part of a pool (pooled mining). Refer to Annex 1 for further details.

[9] It is the fees that spenders pay for the verification of a transaction in BLCA (e.g., purchase of goods) on top of the price of the goods. Refer to Annex 1 for further details.

[10] See the paper of the Chamber of Digital Commerce "Understanding Digital Tokens: Market Overviews and Proposed Guidelines for Policy Makers and Practitioners" at https://digitalchamber.org/token-alliance-paper/.

II. CRYPTO ASSETS CATEGORIES

11.   **The paper presents a decision tree (see Annex 2) to assist compilers in identifying the crypto assets in the broader context of digital assets.** It draws on a set of key characteristics of crypto assets (issuer and transfer mechanism) using the money flower presentation discussed in a Bank of International Settlements' paper (Morten and Rodney, 2017). The green boxes in Annex 2 represent crypto assets and are the focus of this paper.

12.   **In this paper, crypto assets are categorized into two types:** (i) BLCAs and (ii) crypto assets other than BLCAs (digital tokens).

13.   **Digital tokens can be classified into four types depending on their underlying economic function, as follows:**[11]

a) **Payment tokens:** 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).

b) **Utility tokens:** those designed to provide the holders future access to services by means of a DLT-based application. Examples of such applications are those for file storage, social messaging, and trading (e.g., Ether, Binance coin, and Filecoin[12])

c) **Asset tokens:** those representing 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.

d) **Hybrid tokens:** those that are part utility and part asset or payment token.

14.   **Digital currencies issued by central banks where a liability is recognized are classified as financial assets.** Some central banks may issue a digital version of their fiat currencies that may or may not be DLT-based.[13] Those digital currencies are considered electronic money and are classified similar to other forms of digital money such as bank deposits irrespective of the underlying transfer technology. Along the same lines, securities issued by institutional units where a liability is recognized are treated as financial assets irrespective of the transfer technology.[14]

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[11] This classification follows recommendations from International Financial Reporting Standards (IFRS) experts (EY 2018) and securities regulators (Swiss FINMA and Singapore MAS).

[12] For instance, Filecoin provides decentralized cloud storage service that will take advantage of unused computer hard drive space. It raised $257 million through ICOs.

[13] Please, refer to the IMF Staff Discussion Note "Casting Light on Central Bank Digital Currency" at https://www.imf.org/~/media/Files/Publications/SDN/2018/SDN1808.ashx.

[14] For example, the bond-i issued by the World Bank in August 2018 is the first blockchain operated new bond instrument and should be classified as a debt security.

Crypto Assets in Accounting Standards

15.   **The accounting treatment of crypto assets has been under consideration of the International Accounting Standards Board (IASB).** The current available guidance among the international accounting community suggest that BLCAs should not be classified as financial assets. Nonetheless, no general conclusion is reached on their classification (i.e., a specific type of nonfinancial asset or a new category of asset). As a result, there are differing reporting practices applied in accounting for holdings of BLCAs. Annex 3 provides further details on the developments related to crypto assets in the international accounting standards.

III. CLASSIFICATION OF CRYPTO ASSETS IN MACROECONOMIC STATISTICS

16.   **The recommended classification of crypto assets draws on the key characteristics of the different categories of these assets as well as on the principles for classification of economic assets presented in macroeconomic statistical manuals.**[15] Under the current macroeconomic statistics guidelines, each economic asset needs to be classified as either a financial or a nonfinancial asset.

Are crypto assets economic assets?

17.   **Crypto assets are considered economic assets** because the institutional units holding them can be identified and they derive economic benefits to the holder in terms of holding gains/losses and other benefits. They have monetary value and their price is determined by the market in which they trade.

Are crypto assets financial assets?

18.   **Only those crypto assets that give rise to a claim on an issuer can be classified as financial assets.** The key criterion for identifying whether a crypto asset is financial or not is the existence of a counterpart liability attributed to an issuer. In macroeconomic statistics, financial assets consist of claims that give rise to an economic asset with a counterpart liability of a debtor.[16] Currencies issued by central banks constitute financial assets as they are legal tender in the domestic economy and represent claims on the issuer. Those crypto assets, including BLCAs, which do not give raise to a claim on an issuer do not qualify as financial assets given that no counterpart liability is recognized.

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[15] The *System of National Accounts 2008*, *BPM6*, and *MFSMCG*.

[16] The only exception is the gold bullion included in monetary gold which is a financial asset in physical form. Gold in physical form not held as reserve assets and other precious metals (e.g., silver or platinum) do not have a counterpart liability, are universally accessible, and peer-to-peer validated. They are/may be used as means of payments or store of value and are classified as valuables—produced nonfinancial assets.

A. Bitcoin-like Crypto Assets

Are BLCAs financial or non-financial assets?

19.   **Based on the considerations in the paragraphs above, this paper recommends that BLCAs should be classified as nonfinancial assets.** Nonfinancial assets can be used in an economic activity and can serve as store of value. Unlike financial assets,[17] BLCAs have no counterpart liability, and are not issued or authorized by a central bank, government or any other institutional unit. This is emphasized in paragraph 4.40 of the *MFSMCG* in respect of Bitcoin-like assets as follows:

> "*Internet-based currency such as Bitcoins is not electronic money because it does not meet the definition of currency, as it is not issued or authorized by a central bank or government, and additionally it is not widely accepted as a medium of exchange. Bitcoins are classified as nonfinancial assets.*"

20.   **Further, the IMF Staff Report on *Measuring the Digital Economy*[18] endorsed this view and clarified that BLCAs do not qualify as money in the current monetary and financial statistics framework.** Nevertheless, the report notes that "if and when digital currencies become widely accepted as a medium of exchange, consideration will be given to their inclusion in a broader measure of liquidity."

Are BLCAs produced or nonproduced nonfinancial assets?

21.   **This paper recommends that BLCAs should be classified as produced nonfinancial assets.** These assets come into existence as outputs of a production process (i.e., through mining and/or project development) under the control, responsibility, and management of a specific institutional unit using inputs of labor, capital, goods, and services. The resulting output is owned by an institutional unit and can be transferred from one institutional unit to another by engaging in transactions on markets. Further, asset holders do not have claims on other institutional units. These characteristics support the recommended classification of BLCAs as ***produced nonfinancial assets***.[19] Once classified as a produced nonfinancial asset, the classification by activity and product is necessary**.**

Under which category of produced non-financial assets should BLCAs be classified?

22.   **BLCAs should be classified under the subcategory of valuables.** BLCAs are also held as store of value, similar to valuables such as precious metals. They cannot be

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[17] Except gold bullion, as previously mentioned.

[18] See paragraphs 90–92 of the IMF Staff Report "Measuring the Digital Economy" at www.imf.org/~/media/Files/Publications/PP/.../022818MeasuringDigitalEconomy.ashx.

[19] Produced nonfinancial assets are those assets that have come into existence as outputs from production processes that fall within the production boundary of the SNA.

considered as fixed assets or inventories which are held by producers only for production purposes.[20] Further, BLCAs come into existence through mining, which is akin to mining of precious metals.[21] Currently, BLCAs are mostly held as stores of value like valuables. Hence, this paper is proposing to classify BLCAs as valuables and identify them as a distinct new subcategory called *digital valuables* that can be used as a store of value or in barter for purchase of goods and services.

23.   **BLCAs may not be classified as intellectual property products (IPPs).** Unlike IPPs (e.g., computer software, research and development), which are fixed assets and are used in the production process over a long period of time, BLCAs are used only as a store of value or a means of payment.

24.   **Separate identification of BLCAs as a distinct subcategory under valuables (general merchandise in balance of payments) is recommended** to allow the possibility of separately observing the impact of BLCAs transactions on macroeconomic statistics. For analytical purposes, separate identification of these transactions will help monitor their level and impact on the current account. The recommended treatment implies that for any cross-border transaction using BLCAs, an export/import of BLCAs needs to be recorded. Example 1 in Annex 4 presents the recording of the recommended classification in the balance of payments.

25.   **For completeness, Annex 5 presents other alternative statistical classifications of BLCAs** which are not recommended in this paper.

How to measure the output of mining?

26.   **The output of mining BLCAs should be measured as the sum of the transaction fee and newly mined BLCAs.** Service fees and newly mined BLCAs should be differentiated, among others because the former has an identified counterpart, while the latter has no counterpart. Reward of BLCAs through decentralized issuance is embedded in the network protocol and integral to the process of mining activity. Transaction fees and newly mined BLCA incentivize miners to make their computing power available to validate the transactions. The first part of the output (transaction fee) can be seen as a payment for transaction-verification services, while the second part (newly mined BLCAs) can be considered as a produced asset resulting from mining. If the payer of the transaction fees is a nonresident, the miner is exporting transaction-verification services to a nonresident. Example 2 in Annex 4 presents relevant balance of payments entries to illustrate this treatment.

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[20] Paragraph 10.10 of *2008 SNA* clarifies the following "there are three main types of produced assets: fixed assets, inventories and valuables. Both fixed assets and inventories are assets that are held only by producers for purposes of production. Valuables may be held by any institutional unit and are primarily held as stores of value."

[21] The production of BLCAs is also constrained to an upper ceiling, like the limited reserves of precious metals.

27.   **For economies with significant mining/production activity of BLCAs and cross-border trading in them (e.g., Georgia—see box below), the recommended classification of BLCAs (produced nonfinancial assets/valuables) will impact the measurement of GDP and the current account.** More specifically, the goods and services account of balance of payments and supply and use framework of goods and services will be impacted.

Box 2. Bitcoin Mining in Georgia

Currently, 80 percent of global Bitcoin mining is undertaken in four countries: China, Georgia, Sweden, and the US. In terms of impact on the domestic economy, Georgia's case stands out, as its share in the global mining stands at around 15 percent. At the current market price of Bitcoins (as of August 2018), mining companies in Georgia are receiving an estimated amount of USD 700 million annually on account of newly mined Bitcoins and transaction fees—about 5 percent of GDP or 10 percent of exports of goods and services. Even though the impact of the mining activity is significant, corresponding transactions are currently not fully captured in the Georgian national accounts and balance of payments.

B. Crypto Assets Other Than BLCAs (Digital Tokens)

28.   **Classification of digital tokens in macroeconomic statistics depends on the token category.** As with BLCAs, for a token to be classified as a financial asset, a counterpart liability should be identified, and a creditor/debtor relationship established. Payment and utility tokens in most cases follow the classification of BLCAs as nonfinancial assets/valuables (except when there is an issuer that recognizes a liability for the future service to be provided), while asset tokens should be classified as financial assets. Most payment and utility tokens are generated by a decentralized autonomous organization (DAO) (not issued by a corporation or identified individuals). DAOs may not be legal entities with a separate set of accounts and may not be considered institutional units to which claims can be enforced.[22]

29.   **This paper recommends the following statistical classification for different categories of digital tokens:**

a) *Payment and utility tokens* should be classified as nonfinancial assets/valuables if these tokens represent no claim on any institutional unit (i.e., there is no counterpart liability, similar to BLCAs). For this reason, they should be classified as *nonfinancial assets/valuables* just like BLCAs. Some utility tokens may be financial assets if the issuer recognizes a liability at the time of issuance for the future service

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[22] ICO tokens may be issued by a virtual organization (a DAO) or other capital raising entity. A virtual organization is an organization embodied in computer code and executed on a distributed ledger or blockchain. The code, often called a "smart contract," serves to automate certain functions of the organization, which may include the issuance of certain virtual coins or tokens (Source: SEC – Investor bulletin on initial coin offerings).

to be provided. This treatment is similar to ***trade credit and advances***, when there is recognition of a pre-payment for a service. However, if tradable, the utility tokens should be classified as ***debt securities***.

b) ***Asset tokens*** should be classified as debt or equity securities to the extent that they represent a debt or equity claim on the issuer.[23]

c) ***Hybrid tokens*** can be classified as debt or equity securities if they share the characteristics of asset tokens. For example, if the hybrid instrument generates interest for the holder, it should be classified as debt securities.

30.   Annex 6 provides a summary of the classification of crypto assets recommended in this paper—BLCAs and crypto assets other than BLCAs.

IV. PRACTICAL CONSIDERATIONS

31.   **Integrating crypto assets in the macroeconomic statistical framework is subject to many challenges such as:**

- Crypto assets are a new type of assets that do not exactly fit into existing categories of assets;

- Crypto assets may be generated by DAOs that may not be institutional units;

- Currently, there are no international accounting standards and no harmonized regulations;

- The fast-evolving nature of the crypto assets and underlying technologies; and

- Complex data collection.

32.   **Absence of harmonized regulation across countries may have implications in implementing the recommended treatment.** Financial regulators may treat crypto assets as securities based on regulatory considerations (i.e., not based on macroeconomic statistical principles), on a case-by-case basis. For instance, the U.S. Securities and Exchange Commission applies the Howey Test to determine if a transaction represents an investment contract for its classification as security—a transaction would represent an investment contract if a person invests his money in a common enterprise and is led to expect profits solely from the efforts of the promoter or a third party. The Swiss Financial Market Supervisory Authority (FINMA) may treat utility tokens as securities only if the token has an investment purpose at the point of issue in addition to conferring digital access rights to an application or service.

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[23] At this stage, given the absence of harmonized regulation across countries for asset tokens issuances, it is not clear whether these debt or equity securities have a security identifier. On the other hand, the recently issued World Bank bond-i using blockchain technology in the regulated market has an ISIN—AU0000020612.

33. **For surveillance purposes, comprehensive data on transactions and positions of crypto assets may be relevant.** While the recommended treatment would provide cross-border transactions on all types of crypto assets (e.g., BLCAs and digital tokens) via the balance of payments, position data would be covered in the IIP only for those considered as financial assets. For crypto assets classified as nonfinancial assets (valuables), stock data should ideally be recorded separately in the national accounts for monitoring purposes.

34. **The most critical challenge is the data collection for crypto assets transactions and positions.** Crypto assets data collection would require international cooperation as these assets are traded peer-to-peer globally. While the crypto assets eco system involves many players as shown in Figure 4, data collection from crypto assets exchanges[24] and wallet providers[25] could be the most efficient and accurate way to track transactions (exchanges) and positions (wallet providers) in crypto assets, respectively. The economies in which these exchanges and wallet providers are located should collect information on the country of residency of the counterparts in transactions (from exchanges) and on positions in different types of crypto assets (from wallet providers). Such information should ideally be provided to compilers in the respective countries through some kind of international exchange.

Figure 4. Possible Data Sources on Crypto Assets
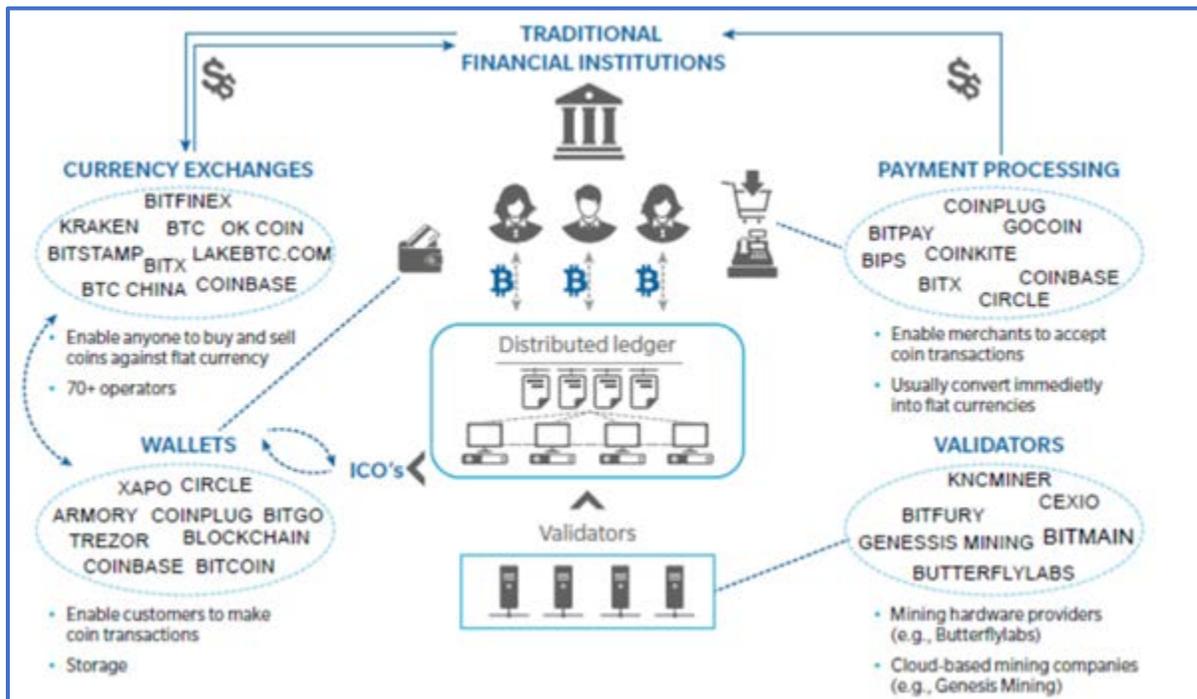
Source: Oliver Wyman "Cryptocurrencies: Head in the sand is not an option" (April 2018)

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[24] Businesses that provide exchange services to BLCA users, usually for a certain fee. Refer to Annex 1 for additional details.

[25] Entities that provide BLCA users digital wallets or e-wallets that are used for holding, storing, and transferring BLCAs. Refer to Annex 1 for additional details.

V. CONCLUSIONS

35.   This paper discusses the classification of crypto assets in the context of macroeconomic statistics and recommends the following treatment:

- *Crypto assets* **should be classified into two categories:** BLCAs and digital tokens.

- *BLCAs* should be classified as *produced nonfinancial assets* as a separate distinct sub-category under valuables.

- *Digital tokens* should be classified depending on the token category: (i) payment and utility tokens should be classified as *nonfinancial assets/valuables* except when there is an issuer that recognizes a liability for the future service to be provided; (ii) *asset tokens* should be classified as *debt or equity securities* to the extent that they represent a debt or equity claim on the issuer; and (iii) hybrid tokens can be classified as *debt or equity securities* if they share the characteristics of asset tokens.

- *The output of mining* should be measured as the sum of transaction fee and newly mined BLCAs. The *transaction fee* should be classified as *services*.

- While the above guidance for dealing with crypto assets is consistent with the current statistical standards, **the development and use of** *crypto assets* **need to continue being closely monitored** and these recommendations may need to be revisited if conditions substantially change in the future.

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Annex 1. Glossary of Important Terms

Altcoins: BLCAs other than Bitcoin. There are hundreds of altcoins (See https://www.investopedia.com/terms/a/altcoin.asp).

Crypto Assets Exchanges: Businesses that provide exchange services to BLCA users, usually for a certain fee. They allow users to sell their crypto assets for fiat currencies (or altcoins) or buy new crypto assets with fiat currency (or altcoins) (see https://www.investopedia.com/terms/b/bitcoin-exchange.asp). Coinbase, Coinmama, Bitpanda are examples of such exchanges.

Cryptography: It is a technique for the conversion of data into a secret code for transmission over a public network. Today, most cryptography is digital, and the original text ("plaintext") is turned into a coded equivalent called "ciphertext" via an encryption algorithm. The ciphertext is decrypted at the receiving end and turned back into plaintext (see https://www.pcmag.com/encyclopedia/term/40522/cryptography).

Decentralized Autonomous Organization (DAO): Organization embodied in computer code and executed on a distributed ledger or blockchain. The code, often called a "smart contract," serves to automate certain functions of the organization, which may include the issuance of certain virtual coins or tokens (Source: SEC – Investor bulleting initial coin offerings). (see https://en.wikipedia.org/wiki/Decentralized_autonomous_organization).

Distributed Ledger, Distributed Ledger Technology (DLT) and Blockchain: A distributed ledger is a database that is consensually shared and synchronized by a network spread across multiple sites, institutions or geographies. The participant at each node of the **network** can access the database records and can own an identical copy of it. Any changes or additions made to the ledger are reflected and copied to all participants in a short lapse of time. Transactions are verified and confirmed by some network participants (the so-called miners) via a Proof of Work (see definitions below). This system is facilitated by the so-called distributed ledger technology. Blockchain, the technology that underlies Bitcoin, is an example of DLT.
(see https://www.investopedia.com/terms/d/distributed-ledgers.asp and https://www.worldbank.org/en/topic/financialsector/brief/blockchain-dlt).

Initial Coin Offering (ICO): An ICO is the BLCA space's rough equivalent to an IPO in the mainstream investment world. ICOs act as fundraisers: a company looking to create a new coin, app, or service launches an ICO. Next, interested investors buy in to the offering, either with fiat currency or with preexisting BLCA like ether. In exchange for their support, investors receive a new digital token specific to the ICO. (see https://www.investopedia.com/terms/i/initial-coin-offering-ico.asp).

Miners: Institutional units that validate and confirm the BLCA transactions. We can consider miners as bookkeepers / distributed ledger updaters. A transaction can only be

considered secure and complete once it is included in a block. Mining could be undertaken by miners individually (solo mining) or as part of a pool (pooled mining).

Proof of Stake (PoS): In a PoS system, a transaction validator (a network node) must prove ownership of a certain asset (or in the case of BLCAs, a certain amount of coins) in order to participate in the validation of transactions. This act of validating transactions is called "forging" instead of "mining". For example, in the case of BLCAs, a transaction validator will have to prove his "stake" (i.e., his share) of all coins in existence to be allowed to validate a transaction. Depending on how many coins he holds, he will have a higher chance of being the one that validates the next block (because of greater network seniority earning him a more trusted position). The transaction validator is paid a transaction fee for his services by the transacting parties. Neo and Ada are examples of BLCAs that use PoS system.

Proof of Work (PoW): In a PoW system, network participants have to solve cryptographic puzzles in order to add new blocks to the blockchain. The first miner to successfully produce the PoW is rewarded with newly mined BLCAs. Bitcoin is based on PoW consensus mechanism. Other BLCAs that use PoW include Litecoin, Bitcoin cash, Monero, etc.
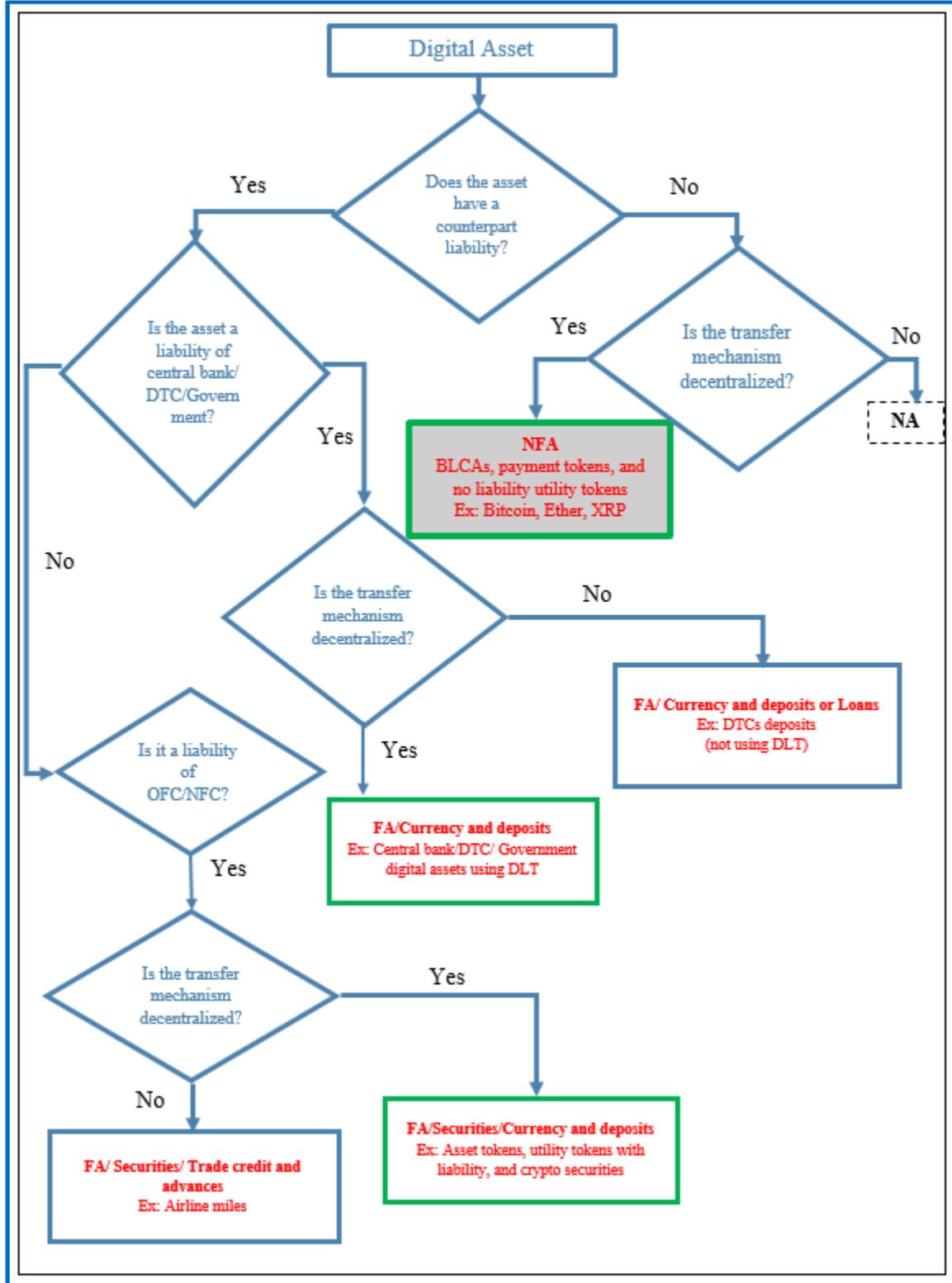
ausSolo and pooled mining: Solo mining is when a miner performs the mining operations individually. All mined blocks are generated to the miner's credit. Pooled mining pools all the resources of the clients to generate the solution to a given block. Therefore, rewards generated by that block's solution are split and distributed between the pool participants. Pool miners agree to share block rewards in proportion to their contributed mining power. Currently, around 80 percent of the Bitcoins are mined by six/seven large mining pools such as BTC.com, Antpool, BTC.Top, ViaBTC, Slushpool, F2pool. (see https://www.blockchain.com/pools?timespan=4days).

Transaction fee and block reward: For the service provided by miners, they are rewarded with transaction fees and newly-created BLCAs. The transaction fee is the amount that spenders pay for the verification of a BLCA transaction (e.g., purchase of goods) on top of the price of the goods. The fee is collected by the miner who includes the transaction in a block (See https://en.bitcoin.it/wiki/Transaction_fees). In some cases, adding a fee to the BLCA transaction may be voluntary, but help get preference as miners tend to verify first transactions attaching a fee (See transaction fee statistics of Bitcoin at: https://www.blockchain.com/stats?). In the case of Bitcoin, at each ten-minute confirmation, all the transactions fees included in a block, along with the block reward, go to the miner whose computer solve the cryptographic puzzle.

Wallet and Wallet Providers: A BLCA (e.g., Bitcoin) wallet is a software program where BLCAs are stored. There is a private key (secret number) for every BLCA address that is saved in the BLCA wallet of the person who owns the balance. These wallets facilitate sending and receiving BLCAs and gives ownership of the BLCAs balance to the user. Loss

of the wallet would imply losing ownership of the BLCA. These wallets come in many forms; desktop, mobile, web, and hardware are the four main types of wallets. (see https://www.investopedia.com/terms/b/bitcoin-wallet.asp). Wallet providers are entities that provide BLCA users digital wallets or e-wallets that are used for holding, storing, and transferring BLCAs. Coinbase is a prominent wallet provider and facilitates online custody of a user's BLCA.

Annex 2. Crypto Assets in the Framework of Digital Assets

Digital Asset

Does the asset have a counterpart liability?

Yes → Is the asset a liability of central bank/DTC/Government?

No → Is the transfer mechanism decentralized?

No → NA

Yes (counterpart liability) →
NFA
BLCAs, payment tokens, and no liability utility tokens
Ex: Bitcoin, Ether, XRP

Is the asset a liability of central bank/DTC/Government?
- **Yes** → Is the transfer mechanism decentralized?
- **No** → Is it a liability of OFC/NFC?

Is the transfer mechanism decentralized?
- **No** → **FA/ Currency and deposits or Loans** Ex: DTCs deposits (not using DLT)
- **Yes** → **FA/Currency and deposits** Ex: Central bank/DTC/ Government digital assets using DLT

Is it a liability of OFC/NFC?
- **Yes** → Is the transfer mechanism decentralized?

Is the transfer mechanism decentralized?
- **No** → **FA/ Securities/ Trade credit and advances** Ex: Airline miles
- **Yes** → **FA/Securities/Currency and deposits** Ex: Asset tokens, utility tokens with liability, and crypto securities

DTC-deposit-taking corporations; OFC-other financial corporations; NFC-nonfinancial corporations; FA-financial assets; NFA-nonfinancial assets

Annex 3. International Accounting Standards

1.   The accounting treatment of crypto assets has been under consideration of the International Accounting Standards Board (IASB) and some national accounting boards for some time. The Australian Accounting Standards Board (AASB) in its paper presented to the Accounting Standards Advisory Forum of IASB in December 2016 suggested that BLCAs should not be considered as cash or cash equivalents under *IAS 7 Statement of Cash Flows*. In addition, BLCAs are not considered financial instruments as defined under *IAS 32 Financial Instruments: Presentation*, due to the lack of contractual relationship that results in a financial asset for one party and a liability for another. It is further noted that given the lack of guidance in the IFRS on BLCAs, they could be accounted under IAS 2 *Inventory* or IAS 38 *Intangible Assets* depending on underlying characteristics and should not be included under financial assets. While some countries are working toward developing accounting standards for crypto assets, the Accounting Standard Board of Japan (ASBJ) has recently issued an accounting standard on BLCAs. The ASBJ's new standard clarifies that BLCAs do not fit into any of the existing accounting categories (financial assets or nonfinancial such as inventories held for trading or intangible assets) and should be considered as an independent category of assets. The guidance from international accounting consultants (e.g., PricewaterhouseCoopers and Ernest & Young) suggest that BLCAs should be treated as nonfinancial assets.

2.   The IASB has discussed a staff paper on crypto assets at its July 2018 meeting. The paper noted that there are differing reporting practices applied in accounting for holdings of BLCAs in the absence of guidance in the IFRS. Out of the 26 IFRS reporters from seven countries (Australia, Bermuda, Canada, Isle of Man, Japan, Switzerland, and United Kingdom), 15 entities accounted for the holdings as financial asset and the remaining applied either IAS 38 *Intangible Assets* or IAS 2 *Inventory.* Regarding digital tokens issued through ICOs, it is mentioned that the nature of ICOs can vary from one transaction to another, and thus the rights and obligations of the entity raising finance through an ICO can also vary from one transaction to another. The IASB decided to request the IFRS Interpretations Committee to provide clarification on how an entity should apply existing IFRS requirements to holdings of BLCAs, mining, and ICOs.

Annex 4. Numerical Examples

Example 1

Country B purchases 100 units of BLCAs from country A for US$100. Next, Country B imports goods (machinery) of US$80 from Country A and pays with BLCA.

Example 2

A miner in Country A provides BLCA verification services for a transaction originated in Country B. The Country B consumer using a BLCA in the transaction pays a transaction fee of 20 in BLCA to the miner of Country A. In addition, Country A miner receives 80 in BLCA as reward (through decentralized issuance from the network protocol or "DAO"). The service provided by miners is measured as transaction fee received, and treated as export of country A to Country B.

BLCAs are considered as a new type of produced nonfinancial asset (valuables) (recommended treatment)

Example 1

Recording of BLCA Transactions

Country A			Country B		
First transaction					
Current account/Goods: +100			**Current account/Goods: -100**		
	Credit	Debit		Credit	Debit
Export of BLCAs	100		Import of BLCAs		100
Financial account: +100			**Financial account: -100**		
	Net acquisition of financial assets (NAFA)	Net incurrence of liabilities (NIL)		Net Acquisition of Financial Assets (NAFA)	Net Incurrence of Liabilities (NIL)
Currency and deposits	+100		Currency and deposits	-100	

Country A			Country B		
Second transaction					
Current account/Goods: 0			**Current account/Goods: 0**		
	Credit	Debit		Credit	Debit
Export of machinery	80		Import of machinery		80
Import of BLCAs		80	Export of BLCAs	80	

For Country A, this recording implies that total export of goods is 180 (of which "export of BLCAs" is 100) and import is 80 (of which "import of BLCAs" is 80).

Example 2

Recording of BLCA Transactions

Country A			Country B		
Current account/goods and services: 0			**Current account/goods and services: 0**		
	Credit	Debit		Credit	Debit
Import of BLCAs		20	Export of BLCAs	20	
Export of services	20		Import of services		20

Annex 5. Alternative Classifications of BLCAs

1.   For completeness, this Annex discusses the following two alternatives for the classification of BLCAs, which are not recommended by this paper: (i) financial assets, and (ii) nonproduced nonfinancial assets (permits). See Annex 4, Example 1 and 2 (options B and C) of BOPCOM 18/11 (at https://www.imf.org/external/pubs/ft/bop/2018/31.htm) for the impact of the above options on balance of payments.

2.   BLCAs may be considered as financial assets by convention, similar to monetary gold. Under this approach, there will be a limited impact on the current account, as most flows will affect the financial account. This option may be considered in the future, if and when BLCAs will be widely used as means of payment with a relatively stable value.

3.   BLCAs may be considered as nonproduced assets. In this case, the rewards to miners in the form of newly created BLCAs are meant to put them in circulation and not seen as outputs of production.

4.   Under nonproduced assets, BLCAs seem to fit most closely (but not exactly) into the category of contracts, leases, and licenses, specifically permits to undertake specific activities. Transactions in BLCAs would then be seen as buying and selling permits, which allows the holder to use them as a means of payments. The permit holders are limited in number and get monopoly gains/losses that do not arise from the use of permit itself. They can sell permits to third party. Further, considering them as nonproduced nonfinancial assets means that the value added of entities involved in mining will be negative.

5.   Under the current macroeconomic statistics guidelines, each economic asset is classified either as a financial or nonfinancial asset. There is wide consensus not to grant BLCAs the status of financial assets at this stage, as they have no backstop and their value depends entirely on self-fulfilling expectations. They appear to have characteristics of a hybrid asset (e.g., features of financial assets), but not meeting the statistical definition.

Annex 6. Classification of Crypto Assets

Crypto Assets

- **Bitcoin Type Crypto Assets (BTCA)** → *NFA (Valuables)*
- **Crypto Assets Other Than BTCAs (Digital Tokens)**
  - **Payment Tokens** → *NFA (Valuables)*
  - **Asset (security) Tokens**
    - *Debt securities* (If issuer recognizes liability and pay interest)
    - *Equity securities* (If issuer recognizes liability and holder have property rights)
  - **Utility Tokens**
    - *Trade credit and advances/ debt securities* (If issuer recognizes liability for future service)
    - *NFA* (If issuer does not recognize liability)
  - **Hybrid Tokens** → *Same as Asset Tokens* (To the extent that characteristics are shared)

NFA: nonfinancial assets