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Issues in reflecting digital assets in the Flow of Funds Accounts[1]

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[1] This presentation was prepared for the conference. The views expressed are those of the author and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the event.

Issues in reflecting digital assets in the Flow of Funds Accounts[1]

Yoshiko Sato[2]

Abstract

This paper proposes an idea of how digital assets could be included in the Flow of Funds Accounts. Digital assets which are used as a means of payment, including CBDCs, stablecoins, and other types of crypto-assets, can have a potential impact on the financial system and are therefore expected to be reflected in an appropriate, feasible and consistent manner within the existing statistical framework of the Flow of Funds Accounts. Reviewing international discussions on the statistical treatment of these digital assets, this paper looks at the issues regarding the definition and classification of these instruments and explains difficulties in the collection of source data.

Keywords: System of National Accounts, Flow of Funds Accounts, digital assets, crypto-assets, stablecoins, CBDCs

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Contents

1. Digital assets in the context of the Flow of Funds Accounts

Recent years have been an evolutional age for digital assets. There is significant attention on digital assets, including crypto-assets—particularly on how they behave, who participate in transactions, and where they are actually held. However, with no common definition of digital assets, no consensus has been made on what should or should not be included in statistics. Against this backdrop, international organizations are working together with national compilers of macroeconomic statistics to update the system of national accounts (SNA) —towards the 2025 SNA— on how to include digital assets in macroeconomic statistics.

The Flow of Funds Accounts are compiled based on the SNA and serve as essential source data for compiling financial accounts in the SNA. Digital assets which are used as a means of payment, including CBDCs, stablecoins, and other types of crypto-assets, can have a potential impact on the financial system and are therefore expected to be reflected in an appropriate, feasible and consistent manner within the existing statistical framework of the Flow of Funds Accounts. Focusing on the Flow of Funds Accounts, this paper discusses the issues regarding the definition and classification of these instruments and explains difficulties in the collection of source data. Following a quick overview of digital assets, the first section introduces the international discussions about the statistical treatment of these digital assets and proposes an appropriate classification. The second section presents an idea of how digital assets could be recorded in the Flow of Funds Account. The last section explains difficulties in the collection of source data.

1.1 Introduction

While there is no common definition of the word of digital assets, this paper looks at a broad scope of digital assets, rather than focusing only on newer products such as crypto-assets. This approach has the advantage of enabling classification by clarifying the differences to and similarities of new products with the existing digital assets.

Before considering how to classify digital assets in the Flow of Funds Accounts, it is worthwhile looking at the common attributes of digital assets, and then reviewing the statistical standard on the treatment of financial assets.

Several common attributes are observed (Table 1). Some digital assets have an issuer (while others do not). They may be account-based or token-based in representing value and ownership. Some digital assets are exchanged on platforms using distributed ledger technology (DLT) and others are exchanged on platforms without DLT. Some digital assets are to be redeemed at a fixed rate of a certain asset (typically fiat currency) and others are variable at the time of redemption. Some may be used as a means of payment and others may not.

In the operation, some may not have any governing entity and/or transactions are conducted without permission (distributed); others may have a governing entity and/or permission is required in transactions (centralized). One of the novel features is the cryptographic validation technique. It is closely related to the above mentioned attributes such as DLT usage and governance/operation. Sometimes, the digital assets are classified in terms of whether the assets are issued by public or private

entities or, in a slightly different sense, whether the redemption is partially or fully guaranteed by the government.

Common attributes of digital assets Table 1

Attributes	Examples
Issuer	Existence or absence of issuer. Liability of the issuer corresponding to the asset.
Type	Claim-based or object-based. Account-based or token-based.
DLT usage	Use of Distributed Ledger Technology (DLT).
Value	Redemption value is guaranteed by the issuer at a fixed rate of a certain asset (typically fiat currency), or variable at the time of redemption.
Mean of payment	Playing as a means of payment.
Governance / operation	Centralized or distributed. Permissioned or permission-less.
Cryptography	Use of cryptographic validation technique.
Public / private	The issuer is public or private entity. The redemption is partially or fully guaranteed by the government.

Sources: Adrian and Mancini-Griffoli (2021), CPMI-MC (2018), G7 Working Group on Stablecoins (2019)

1.2 Criteria for financial assets

What are the attributes that matter in the compilation of the Flow of Funds Accounts? In other words, what kind of digital assets should be regarded as financial assets? Some of the crypto-assets seem to be used as a medium of exchange and as such one may want to classify them into financial assets. However, the question is not straightforward.

Financial assets in the SNA, in principle, should have a counterpart liability. The 2008SNA, the current version of the SNA, defines an asset as a store of value representing a benefit or series of benefits (¶3.5). Benefits are exchanged by means of payments. From this, a financial claim, and hence a liability, can be defined (¶3.32). A liability is established when one unit (the debtor) is obliged, under specific circumstances, to provide a payment or series of payments to another unit (the creditor) (¶11.5). … Whenever either of these types of liability exists, there is a corresponding financial claim that the creditor has against the debtor. A financial claim is the payment or series of payments due to the creditor by the debtor under the terms of a liability (¶11.7). This means that in recording the Flow of Funds Accounts, which are based on the current SNA, all financial assets (the creditors) entail corresponding liabilities (the debtors), with an exception of monetary gold.

Recognizing this current SNA criteria for financial assets, all digital assets which seem to act as a means of payment will not necessarily be categorized in financial assets. Among the attributes mentioned above, special attention should be paid to the existence of issuer (liability).

1.3 Guidance note

As part of the updating process from the current 2008SNA towards 2025SNA, guidance notes for prioritized issues have been developed by the Intersecretariat Working Group on National Accounts (ISWGNA), receiving its mandate from the

United Nations Statistical Commission (UNSC). One of the issues included in the guidance notes is the recording of crypto-assets in macroeconomic statistics and this note calls for global consultation on this point. The guidance note proposes grouping crypto-assets into three broad categories, to discuss the criteria of classifying them into financial or non-financial assets. [3]

- Crypto-assets designed to act as a general medium of exchange
  - with a corresponding liability:
    - issued by a monetary authority (e.g., central bank digital currencies (CBDCs) that qualify as crypto-assets)
    - not issued by a monetary authority (e.g., stablecoins with a claim on the issuer)
  - without a corresponding liability (CAWLM) (e.g., crypto-assets such as Bitcoin)
- Crypto-assets that only act as a medium of exchange within a platform or network (i.e., payment tokens)
  - with a corresponding liability
  - without a corresponding liability (CAWLP)
- Security tokens (which always have a counterpart liability)
  - Debt security crypto-assets (e.g., Bond-i issued by the World Bank); this also includes utility tokens that provide the holders future access to goods or services.
  - Equity crypto-assets
  - Derivative crypto-assets (i.e., derivative contracts that rely on cryptography and that can be exchanged peer-to-peer even if the underlying asset is not a crypto-asset).

Firstly, it is important to point out that the CBDCs are not "crypto-assets" (G7 (2021)). Recent literature defines cryptocurrencies or crypto-assets, which are used interchangeably, as "private digital assets with their own currency unit of account, such as Bitcoin and Ethereum. Cryptocurrencies do not represent a claim on a central bank, which makes them different from CBDCs" (Kosse and Mattei (2022)). Since CBDCs are not crypto-assets, it is appropriate to use a wider terminology of "digital assets" instead of "crypto-assets."

Secondly, the above categories in the guidance note puts the highest priority on whether the digital assets act as a medium of exchange. If they act as a medium of exchange, then the scope of the exchange is needed: do they only act within a specific platform or are they used more generally? How they are used "generally" depends on the technologies available at the time of evaluation. In fact, there may be digital assets developed in future that can be exchangeable across platforms. Therefore, it is appropriate to avoid setting statistical classifications based on a medium of exchange,

[3] Foreseeing diverse opinions on the treatment of crypto-assets, the guidance note presents three recording options; treating crypto-assets without a corresponding liability (CAWLM) as any one of "financial", "non-financial", or "hybrid" assets. In the hybrid case, they are recorded in the newly created hybrid account. As a current status, these recording options have not yet reached a consensus. Discussions are still ongoing for international agreement.

considering the possibility of future technologies enabling a variety of other types of crypto-assets to emerge.

Finally, as closely related to the above, given the volatile value of crypto-assets, they will not act as a unit of account even if they act as a medium of exchange or a store of value. It lends support to the view that the medium of exchange attribute should not be the highest priority in deciding the assets as financial assets.

1.4 Proposed classification

This paper proposes a classification of digital assets which align with the current SNA (Chart 1).[4] The proposed criteria that the digital assets are classified as financial or non-financial depends on whether there is a corresponding liability, irrespective of whether and how generally they act as a means of payment. Among the digital assets with a corresponding liability, there may be those issued by public sector and others by private sector. Crypto-assets are different from CBDCs but both of them are digital assets.

Stablecoins: There are a variety of so called stablecoins observed in the market but they have no robust definition. The common feature is that they are designed to achieve stable value (G7WG(2019)) or aim to maintain stable value (FSB(2022)). For statistical purposes, this paper defines stablecoins as only those with a corresponding liability. This treatment is in line with the definition of Boar and Wehrli (2021) which requires stablecoins to have an identifiable issuer as key criterion.

The methodologies to maintain stable value are either (1) backed (collateralized) or (2) unbacked (uncollateralized) but algorithmically controlled. In case of (1), collaterals may be a specific asset or a basket of assets. Furthermore, collaterals may be in some cases held on the issuers' balance sheet, and in other cases segregated from the issuers' balance sheet and administered, for instance, in trust accounts[5]. In case of (2), only those which have a corresponding liability should be treated as financial assets.

Other types of crypto-assets used as a means of payment with a corresponding liability: This category contains crypto-assets which are not called stablecoins but have a corresponding liability and are used as a means of payment. As a means of payment, the value of the assets is expected, to a certain extent, to have low volatility. For that reason, at this moment, although this category is conceptually possible, there may not be many digital assets classified to it.

Prepaid payment instruments: Prepaid payment instruments are the digital assets that already exist, typically as prepaid card or e-money. Some countries have reflected them in their statistics. They are currently issued based on traditional techniques but if they could be issued in the form of crypto-assets, they would become close to the above category of other types of crypto-assets used as a means of payment with a corresponding liability.

[4] The classification is based on currently existing digital assets and may vary according to the future market development.

[5] It is important to recognize that tying the value to underlying assets does not always mean collateralizing the underlying assets. Moreover, collateralizing is not the same as assuring legal claim of the holders to the underlying assets.

Bank deposits: Bank deposits are in a broad sense one forms of digital assets. [6]

Central bank digital currency (CBDCs): As is described in CPMI-MC (2018), CBDC is a digital form of central bank money that is different from balances in traditional reserve or settlement accounts. Since CBDCs are liabilities of central banks, they are not crypto-assets.

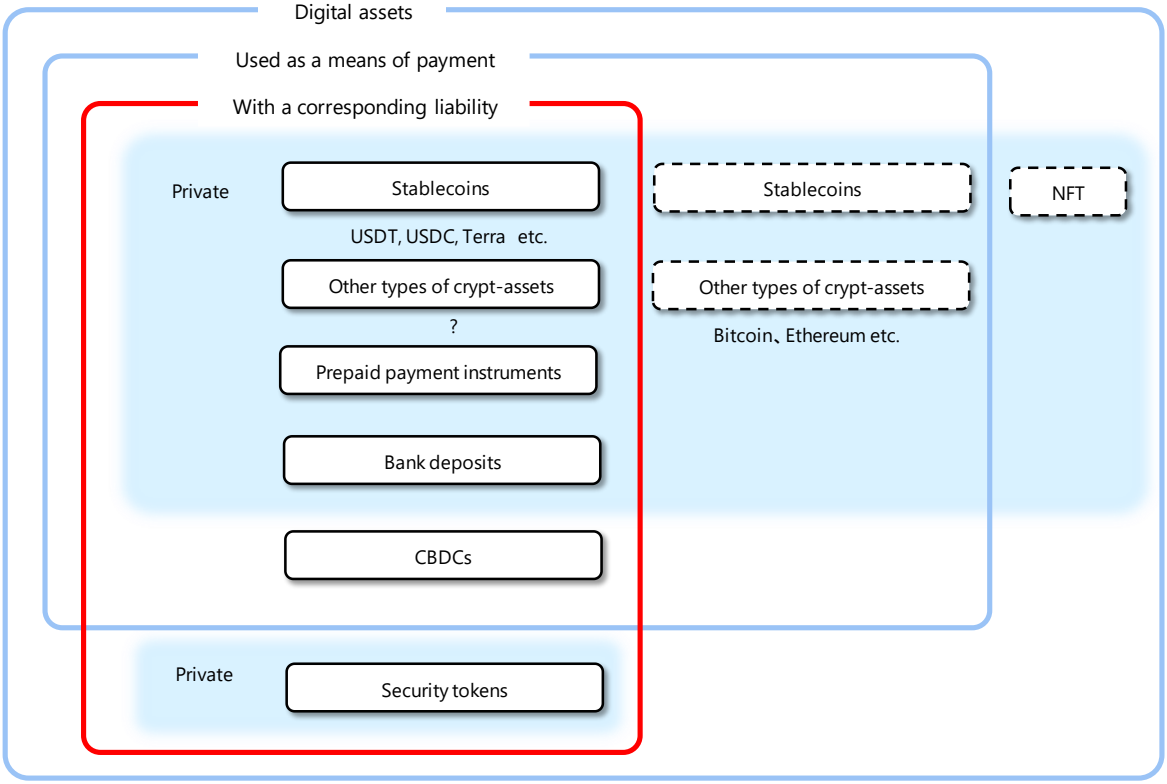
Security tokens: Security tokens are digital assets that represent negotiable financial claim on the issuer such as debt securities, equity, and derivatives. In most cases, they are issued or managed using DLT. Given these roles, they will not be expected to act as a means of payment.

Digital assets without a corresponding liability: These are assets which according to our proposed classification—which prioritizes existence or non-existence of corresponding liability—are not to be classified as financial assets. Further research is not provided in this paper. Bitcoin and Ethereum might be possible examples of other types of crypto-assets used as a means of payment without a corresponding liability. Non fungible tokens (NFT) also might be an example of digital assets without a corresponding liability.

[6] In this classification, Bank deposits are particularly indicated in light of its role for payment instruments. Securities in book entry transfer system may also be digital assets in the same breadth of digital assets definition.

Proposed digital assets classification

Chart 1



[1] USDT: Tether, USDC: USD Coin, Terra: UST(Terra), NFT: Non-fungible tokens

Stablecoin definitions in the literature

Table 2

Sources	Description
G7WG(2019)	Stablecoins are digital tokens that typically transact on a distributed ledger and rely on cryptographic validation techniques to be transacted, with the goal of achieving stable value relative to fiat currencies.
G30(2020)	A stablecoin is a digital currency. The entity issuing a stablecoin attempts to reduce its price volatility by pegging its value to some external asset or basket of assets like fiat money or exchange-traded commodities.
Boar, C and A Wehrli (2021)	Private digital tokens that have an identifiable issuer or represent a claim and/or underlying assets.
FSB(2022)	Stablecoins are a category of crypto-assets that aim to maintain a stable value with reference to a specified asset (typically US dollars), or basket of assets, and provide perceived stability when compared to the high volatility of unbacked crypto-assets.

2. Reflecting digital assets in the Flow of Funds Accounts

This chapter presents an idea of how digital assets could be recorded in the Flow of Funds Accounts based on the abovementioned proposed classification of digital assets[7]. Though not exhaustive, some numerical examples are given for stablecoins, CBDCs, and security tokens (Table 3-5).

2.1 Stablecoins

Stablecoins are defined as having a corresponding liability (Table 3). It is assumed that the stablecoins are issued by Financial corporations (FC). Households or Non-financial corporations (HH・NFC) initially hold currency and purchase stablecoins in exchange for their currency. Here, the transaction of stablecoins is by convention to be recorded under the instrument name of Deposits money. If they are backed by collaterals, the underlying assets may be a single asset or a basket of assets. If the collaterals are financial assets, i.e., Currency, Deposits, and CP, they are recorded in the balance sheets. On the other hand, if the collaterals include crypto-assets without a corresponding liability, these crypto-assets do not appear in the Flow of Funds Accounts.

The underlying assets may either be held by the FC on its balance sheet, or by the third party in the trust account (TC) segregated from the issuer's balance sheet. [8]The financial claim of the FC on this TC is by convention represented as Trust beneficiary certificates.

The recording of algorithmically controlled stablecoins having issuers but without specific collaterals lacks sufficient information to elaborate. [9] Further research is necessary on the mechanism and relationship of players involved.

2.2 CBDCs

The CBDC example (Table 4) draws on the accounting framework employed by the flow of funds representation of CPMI-MC (2018). The HH・NFC initially hold currency and deposits, with a counterpart liability of the central bank (CB) and the depository corporation (DC) respectively. Along with this, the DC holds reserve balances with CB, represented under the name of Deposit with CB.

At the time of issuance, the CB issues CBDC to the DC against the Deposit with CB. When HH・NFC purchases CBDC, there are two options, either to exchange it with an equivalent amount of currency, or to withdraw their deposit. In the former case, the currency returned to the DC is simultaneously deposited to the CB. In the latter case, the deposit withdrawn from the DC are, other things being equal, not

[7] All described here are conceptual sketch, completely independent of any statistical and policy decision.

[8] Stablecoins may not be redeemable if the issuer goes bankrupt. Depending on the legal arrangement, HH・FC may directly claim ownership of the underlying assets in trust account (bankruptcy remote).

[9] Table 3 illustrates an algorithm type UST(Terra) issued by the FC (Terra) in the center column and the native token Luna issued by the FC in the left, assuming the two FCs are different. Exact information is required.

replenished automatically. The resulting size of the DC's balance sheet differs between the two cases, by the amount of CBDC issued.

2.3 Security tokens

Security tokens have issuers and take on the same characteristics of the existing financial instruments (Table 5). They will be unarguably recorded under respective transaction names such as Debt securities, Equity, and Derivatives, according to characteristics of each token.

The example assumes the issuers to be FC, and HH・NFC purchase the debt security tokens, equity security tokens, and derivatives security tokens issued by the issuer in exchange for their holding currency.

Stablecoins

With collateral on the issuers' balance sheet — Table 3

	FC		HH・NFC	
Initial holding			Currency 1,000	
After purchase (single asset)	Currency 1,000	Deposits money 1,000	Deposits money 1,000	
After purchase (a basket)	Currency 400 Deposits 300 CP 300	Deposits money 1,000	Deposits money 1,000	

With collateral segregated from the issuers' balance sheet

	Trust		FC		HH・NFC	
After purchase (a basket)	Currency 400 Deposits 300 CP 300	Trust beneficiary certificates 1,000	Trust beneficiary certificates 1,000	Deposits money 1,000	Deposits money 1,000	

Without collateral (algorithm type) - Provisional idea -

	FC		FC		HH・NFC	
After purchase		Deposits money 1,000	Deposits money 1,000	Deposits money 1,000	Deposits money 1,000	

[1] The table illustrates the case in which only financial corporations (FC) are allowed to issue stablecoins. This is not always the case, for example, there are cases when non-financial corporations are allowed to issue stablecoins.
[2] Assets (left hand side) and liability (right hand side) are shown in each sector.
Source: Author

CBDCs

Table 4

	CB		DC		HH・NFC	
Initial holding	Currency 700				Currency 700	
				Deposits 1,000	Deposits 1,000	
	Deposit with CB 500	Deposit with CB 500				
Issuance	Currency 700				Currency 700	
				Deposits 1,000	Deposits 1,000	
	Deposit with CB 300	Deposit with CB 300				
	CBDC 200	CBDC 200				
Withdrawal (against currency)	Currency 500				Currency 500	
				Deposits 1,000	Deposits 1,000	
	Deposit with CB 500	Deposit with CB 500				
	CBDC 200				CBDC 200	
Withdrawal (against deposits)	Currency 700				Currency 700	
				Deposits 800	Deposits 800	
	Deposit with CB 300	Deposit with CB 300				
	CBDC 200				CBDC 200	

[1] Assets (left hand side) and liability (right hand side) are shown in each sector.
Source: Author, drawing on the accounting framework employed by the flow of funds representation CPMI-MC (2018).

Security tokens

Table 5

	FC		HH・NFC	
Initial holding			Currency 1,000	
After purchase	Currency 1,000	Debt securities 500	Debt securities 500	
		Equity 300	Equity 300	
		Derivatives 200	Derivatives 200	

[1] Assets (left hand side) and liability (right hand side) are shown in each sector.
Source: Author

3. Difficulties in the collection of source data

The previous chapters discuss the issues regarding the definition and classification of digital assets and propose a classification which aligns with the context of the SNA. It should be noted that even if the appropriate classification is applied in the statistical standard, the compilation of the Flow of Funds Accounts will face difficulties in the collection of source data.

One of the difficulties is the identification of the holders' sector. In any financial asset, the Flow of Funds Accounts records the amount issued in one sector and simultaneously the same amount purchased in the counterpart sectors. The difficulty is particularly relevant to crypto-assets. Since most crypto-assets work on the public DLT platforms, transactional data are publicly available. Nevertheless, because of their anonymous nature, identification of holders is impossible by design. Moreover, transactions occur between addresses. It is difficult to aggregate addresses even at the sectoral level[10].

Consequently, if the holders' sector remains unknown, the Flow of Funds Accounts will rely on estimation. Some academic research sheds light on the ownership of crypto-assets. Makarov and Schoar (2021) showed that by clustering addresses, individual investors collectively control 8.5 million bitcoins, almost half the bitcoins in circulation by the end of 2020, while the balances held by intermediaries comprise only 5.5 million bitcoins, about one-third of Bitcoin in circulation. Currently though, the result of the research is too far from being utilized as a reference in the estimation of the Flow of Funds Accounts. More detailed information on the ownership structure of crypto-assets is required in future studies.

Another stream related to this issue is the use of private big data in the statistics. As is well known, official statistics around the world are increasingly likely to use private big data through recent digitalization developments. Against this backdrop, some academic research focuses on developing methodologies to make use of big data while assuring anonymity. The statistics in which these studies have interest are basically population estimates, different types of statistics to the SNA, but the aim is the same—safely protecting confidentiality in data sources. The stream of using big data from private and public data sources may provide a hint in compiling holders' sector.

Taking into account the rapidly proliferating nature of crypto-assets, another pragmatic difficulty for compilers is to consider what crypto-assets should be reflected in the statistics. Key questions here should include: are they of relative importance, widely used and expected to stay in the position for a reasonably long period of time? Are they measurable in the first place?

In summary, given the specific nature of crypto-assets, compilers might have to confront making a more pragmatic decision to allow for implementation, by striking a balance between feasibility and ideal coverage in the statistics.

[10] The Financial Stability Board (2022) indicates, "it is difficult to aggregate and analyse such data, especially as many transactions occur 'off-chain', rather than on the DLT ledger, and at entities that do not report off-chain data, or through complex protocols and smart contracts".

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Issues in reflecting digital assets in the Flow of Funds Accounts

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Motivation

- No consensus on what digital assets should or should not be included in statistics.
- A guidance note (GN) on the recording of crypto-assets in macroeconomic statistics has been developed, as an updating process towards the 2025 SNA.
- The Flow of Funds Accounts (FOF) — as the essential source data for financial accounts in the SNA — needs to reflect digital assets in an appropriate, feasible and consistent manner.
- This paper presents an idea for the classification of digital assets used as a means of payment (CBDCs, stablecoins, and other types of crypto-assets), with some numerical examples for discussion.

Attributes that matter in the classification of financial assets

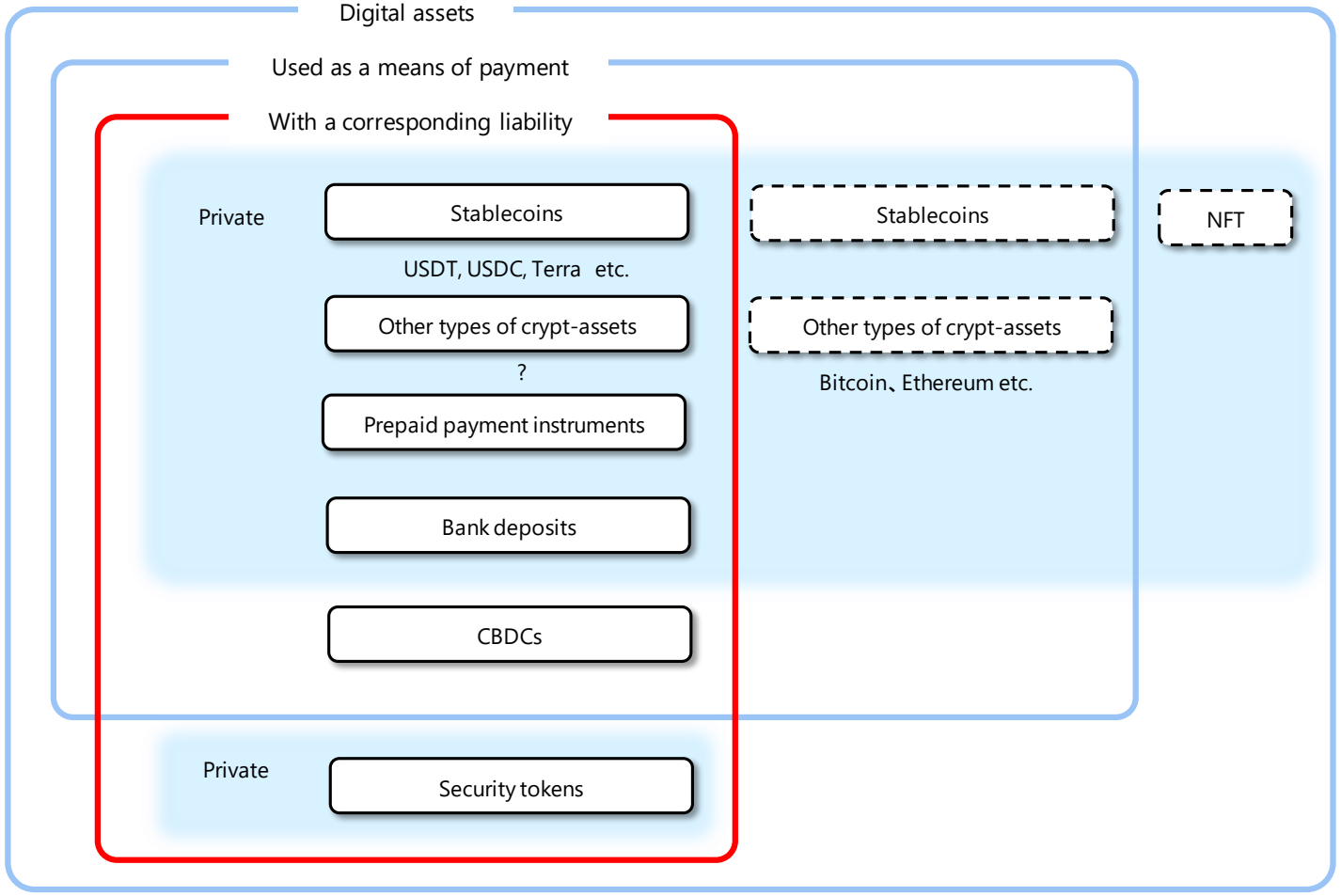
- Several common attributes of digital assets are observed in literature from academia and international organizations.

Attributes	Examples
Issuer	Existence or absence of issuer. Liability of the issuer corresponding to the asset.
Type	Claim -based or object -based. Account -based or token -based.
DLT usage	Use of Distributed Ledger Technology (DLT).
Value	Redemption value is guaranteed by the issuer at a fixed rate of a certain asset (typically fiat currency), or variable at the time of redemption.
Mean of payment	Playing as a means of payment.
Governance / operation	Centralized or distributed. Permissioned or permission -less.
Cryptography	Use of cryptographic validation technique.
Public / private	The issuer is public or private entity. The redemption is partially or fully guaranteed by the government.

Sources: Adrian and Mancini-Griffoli (2021), CPMI-MC (2018), G7 Working Group on Stablecoins (2019)

- Financial assets in the SNA, in principle, should have a counterpart liability (¶11.5, ¶11.7).
- Recognizing this current SNA criteria for financial assets, all digital assets which seem to act as a means of payment will not necessarily be categorized in financial assets. Among the attributes, special attention should be paid to the existence of liability.

Proposed digital assets classification



USDT: Tether, USDC: USD Coin, Terra: UST(Terra), NFT: Non-fungible tokens

Digital assets with a corresponding liability are to be treated as financial assets.

The GN's options:
Crypto-assets without a corresponding liability, designed to act as a general medium of exchange (e.g., Bitcoin) are

- "Financial" assets?
- "Non-financial" assets?
- "Hybrid" assets – to be recorded in the newly created hybrid account?

...Discussions are still ongoing.

Reflecting digital assets in the Flow of Funds Accounts: **Stablecoins**

- An idea of recording -

Initial holding

FC		HH・NFC	
		Currency 1,000	

With collateral on the issuers' balance sheet

After purchase

FC		HH・NFC	
Currency 400	Deposits money 1,000	Deposits money 1,000	
Deposits 300			
CP 300			

With collateral segregated from the issuers' balance sheet

After purchase

TC		FC		HH・NFC	
Currency 400	Trust beneficiary certificates 1,000	Trust beneficiary certificates 1,000	Deposits money 1,000	Deposits money 1,000	
Deposits 300					
CP 300					

Without collateral (algorithm type) - provisional idea -

After purchase

FC		FC		HH・NFC	
	Deposits money 1,000	Deposits money 1,000	Deposits money 1,000	Deposits money 1,000	

There are a variety of so-called stablecoins.

With a corresponding liability: appear in the FOF
Without a corresponding liability: not appear in the FOF

- Represented in “Deposits money” by convention
- Assumed to be issued by FC

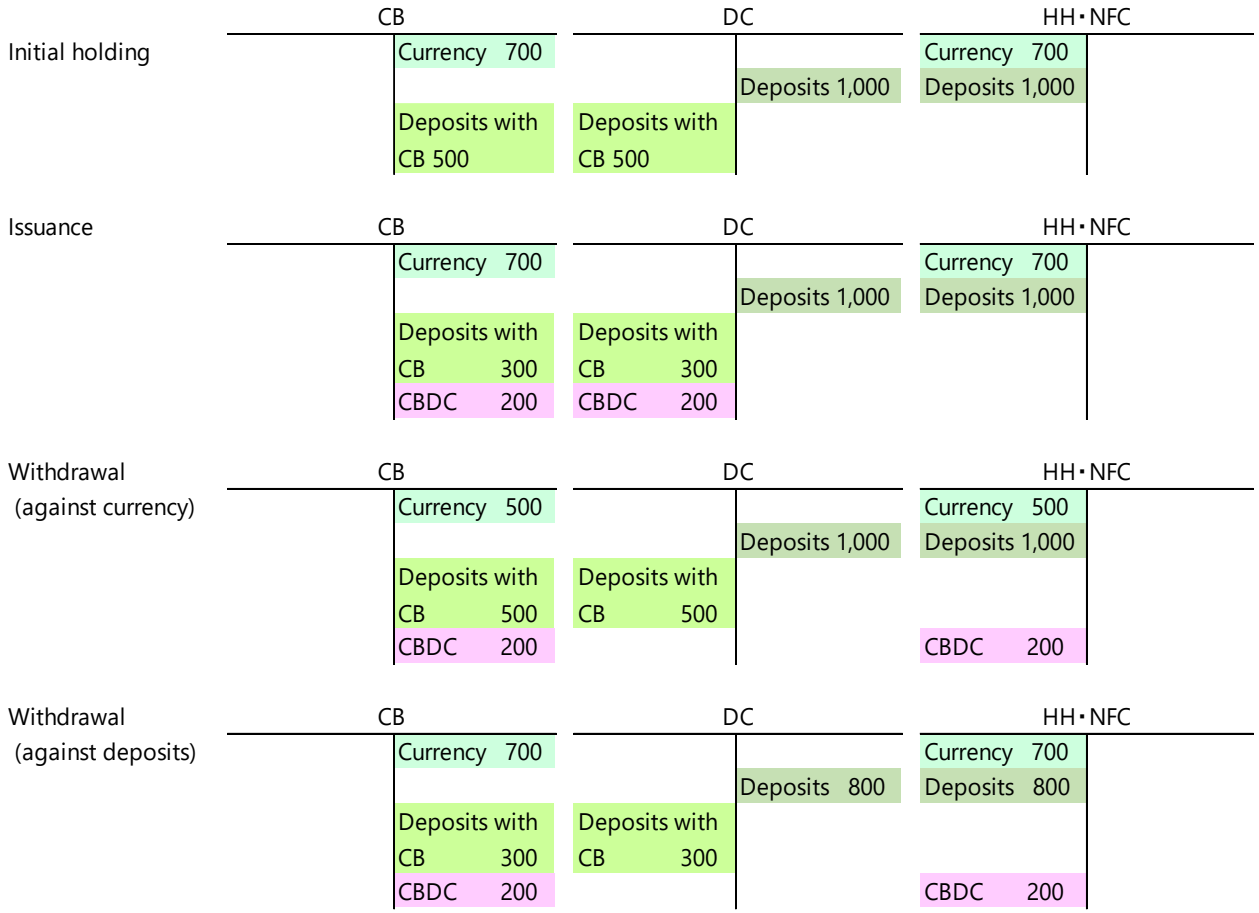
Different ways of recordings, depending on the methodologies used to maintain stable value.

- With/without collateral
- On/off issuers’ balance sheet
- Algorithmically controlled

HH・NFC: Households or Non-financial corporations, FC: Financial corporations, TC: Trust account

Reflecting digital assets in the Flow of Funds Accounts: **CBDCs**

- An idea of recording -



CB: Central bank, DC: Depository corporations

Currently, only a very limited number of countries have introduced CBDCs.

A case of retail CBDCs is described.

There are two options for HH・NFC to withdraw CBDCs against:

- currency
- deposits

Difficulties in the collection of source data

- Identification of holders' sector.
  - Particularly relevant to crypto-assets. Since most crypto-assets work on the public DLT platforms, transactional data are publicly available. Nevertheless, because of their anonymous nature, identification of holders is impossible by design.
  - The Flow of Funds Account could rely on estimation. Although some academic research has shed light on the ownership of crypto-assets, more detailed information is required.
  - Experiences of using big data safely while protecting confidentiality may provide a hint.
- Striking a balance between feasibility and ideal coverage in the statistics.
  - With lack of source data, compilers might ask themselves "what crypto-assets should actually be reflected?"

Thank you for your attention

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