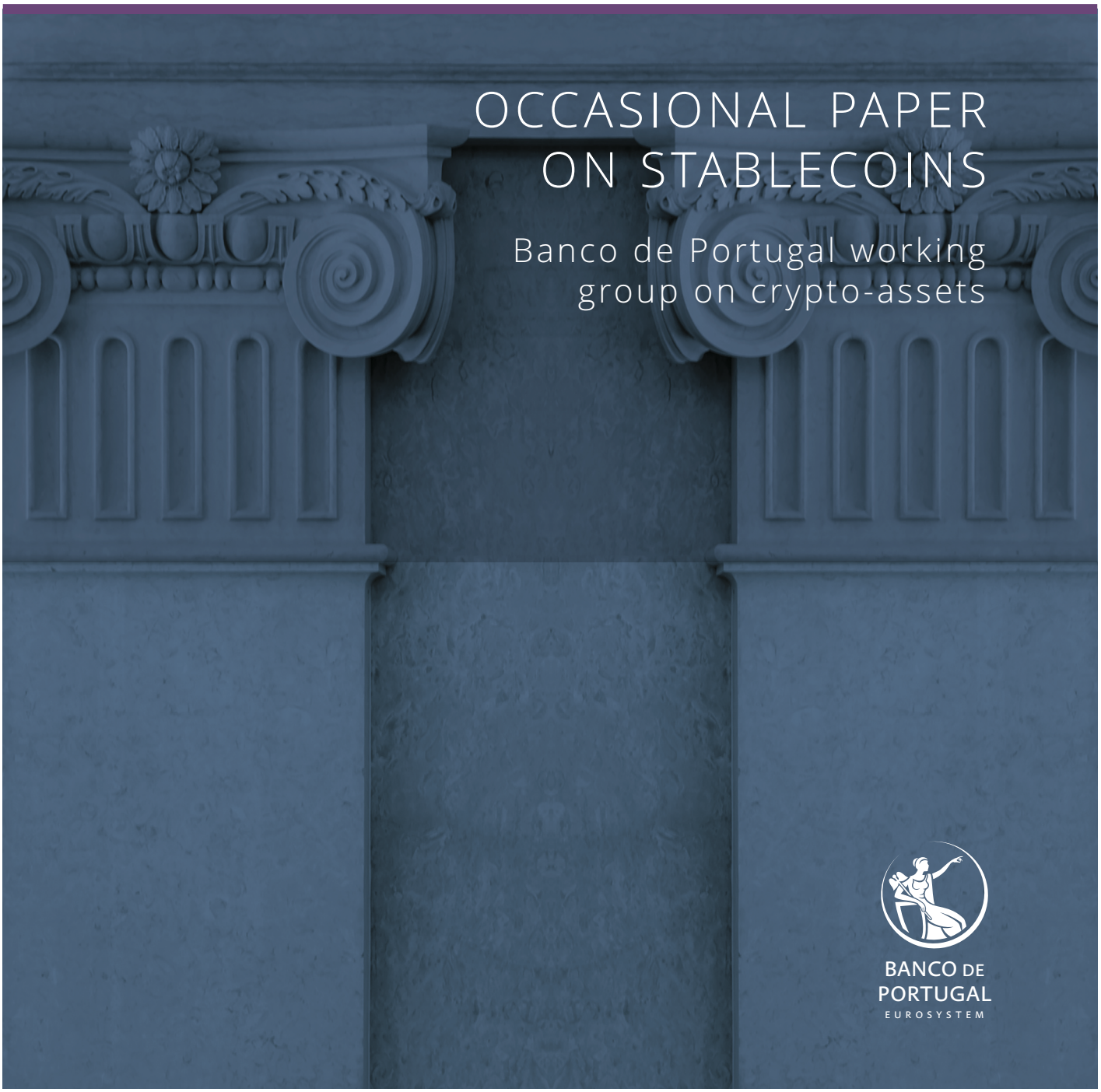
01

OCCASIONAL PAPERS 2023



OCCASIONAL PAPER ON STABLECOINS

Banco de Portugal working group on crypto-assets

BANCO DE PORTUGAL
EUROSYSTEM

01

OCCASIONAL PAPERS 2023

OCCASIONAL PAPER ON STABLECOINS

Banco de Portugal working group on crypto-assets

JANUARY 2023

Please address correspondence to
Banco de Portugal
Rua do Comércio 148, 1100-150 Lisboa, Portugal
Tel.: +351 213 130 000, email: info@bportugal.pt

BANCO DE PORTUGAL
EUROSYSTEM

Lisboa, 2023 • www.bportugal.pt

Occasional Papers | Lisboa 2023 • **Banco de Portugal** Rua do Comércio, 148 | 1100-150 Lisboa • www.bportugal.pt •
Edition Banco de Portugal • **ISBN (online)** 978-989-678-856-8 • **ISSN (online)** 2182-1798

Occasional paper on Stablecoins

Banco de Portugal working group on crypto-assets

January 2023

Abstract
Although the terminology used to define stablecoins is currently ambiguous, they can be broadly defined as a specific type of crypto-asset that aims to maintain a stable value relative to a specified currency, asset, or pool of currencies/assets. This paper characterises different types of stablecoins according to the stabilisation mechanism used and analyses the current stablecoins' market. It also describes the regulatory framework applicable to stablecoins in a few selected jurisdictions. The main focus of the paper is the identification of the main risks associated with stablecoins, particularly the so-called global stablecoins, i.e., those stablecoins with a potential to be adopted across different jurisdictions and achieve a substantial volume. Finally, the paper concludes that continuous monitoring of the stablecoins' market should be pursued, given their increasing relevance and potential impact on the financial sector.

JEL: E42, E51, E58, F31, G21, G23, G28, L50, O32, O33

Keywords: central banks, crypto-assets, global stablecoins, regulatory framework, stablecoins, stablecoins characterisation, stablecoins' market, stablecoins' risks.

Acknowledgements: This paper summarises part of the findings and reflections of a Banco de Portugal expert team set up. The authors of the paper are: Agostinho da Silva, Ana Isabel Cerqueira, André Leal, António Jorge Silva, Carla Almeida Ferreira, Carla Marques, Carlos Martins, Dina Teixeira, Fernando Silva, Gisela Fonseca, Joel Alves, José Nobre, Madalena Borges, Maria Bettencourt, Patrícia Casaca, Pedro Tomé, Sara Pereira e Silva, Sónia Correia, Susana Cortes, Tiago Moreira Silva and Vera Cardoso. The authors would like to thank the valuable inputs and insights from the heads of Departments, Divisions and Units involved and from the participants at Banco de Portugal meetings in which the conclusions of the paper were presented. The analyses, opinions and findings of this paper represent the views of the authors, which are not necessarily those of Banco de Portugal or the Eurosystem.

E-mail: mmbettencourt@bportugal.pt

Introduction

Technological innovation is shaping the payments landscape and the provision of payment services at an incredibly fast pace. New payment methods, platforms and interfaces are announced every day.

In the payments sphere, crypto-assets have been advertised as a way to overcome some of the challenges that exist in the provision of payment services, namely some inefficiencies in cross-border payments. However, the high volatility of crypto-assets' value jeopardises their widespread use as a means of payment. As stated by Bindseil *et al.* (2022), referring to the most popular crypto-asset, "while Bitcoin raised the attention for the potential of distributed ledger technology (DLT), it fails to deliver on its promises but comes at high costs. It is unfitted and inefficient as a means of payment but used extensively for illicit activities. It is unsuitable as an investment asset and neither empowers, nor relieves the sovereign individual from the state".

In this context, so-called stablecoins gained popularity as, given their potential to maintain a stable value, they are better suited to be used as a medium of payment or as a store of value than other crypto-assets. The increasing popularity and expansion of crypto-assets, including stablecoins, are (among others) one of the reasons motivating central banks to develop projects on central bank digital currencies (CBDC). According to Fabio Panetta, Member of the Executive Board of the European Central Bank (ECB), "(. . .) the expansion of crypto-assets reveal a growing demand for immediacy and digitalisation. (. . .). For this reason, countries around the world are currently exploring the issuance of a central bank digital currency".[1]

Stablecoins are a crypto-asset that aims to maintain a stable value relative to a specified currency or asset or a pool or basket of currencies or assets. A stablecoin that has the potential to be adopted across multiple jurisdictions and to achieve substantial volume can be considered a global stablecoin (GSC).

In this paper, we first explore the different definitions of stablecoins according to major international bodies and to the Proposal for a Regulation on Markets in Crypto-assets (MiCA Proposal).[2] Then, we analyse different types of stablecoins in terms of the stabilisation mechanism used and define the concept of GSC.

We also examine the national and international regulatory frameworks applicable to stablecoins. At the national level, there is currently no legal framework specifically applicable to stablecoins. However, Law No. 83/2017,[3] which transposes the European Union (EU) Anti Money Laundering Directive (4AMLD),[4] and in

1. "Public money for the digital era: towards a digital euro", Fabio Panetta, Member of the Executive Board of the ECB, 16 May 2022.

2. In this document, all references to the MiCA Proposal refer to the Draft overall compromise package agreed by the Permanent Representatives' Committee, approved on 5 October 2022.

3. Law n.º 83/2017, August 18.

4. Directive (EU) 2015/849 of the European Parliament and of the Council, of 20 May 2015.

broader terms establishes the Portuguese Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) legal regime, includes virtual asset service providers (VASP) as obliged entities subject to AML/CFT rules and supervision. At the international level, we analyse the current state of regulatory framework in various jurisdictions relevant to the stablecoins' market, namely the European Union, the United Kingdom, the United States, Japan, Switzerland and China.

An overview of the stablecoins' market shows that, as of 30 June 2022, this market had a market capitalisation of 158 billion USD, representing 18% of the total crypto-assets' market capitalisation of 901 billion USD. Furthermore, the Top 4 stablecoins represent 92% of the whole stablecoins' market, with Tether representing 42%.

This paper concludes with an analysis of the risks and challenges presented by stablecoins focusing firstly on those inherent to any stablecoin initiative, irrespectively of the scale of their reach and, secondly, on the risks more associated with GSC, namely those related to monetary policy, financial stability and fair competition. Moreover, the possible impact of a GSC on the usage of euro banknotes and the euro's international role is also explored.

The main conclusion from the risk analysis presented is that continuous monitoring of the related risks must be pursued since the impact of stablecoins on the financial sector may increase in the future.

This paper is structured as follows: Section 1 starts by defining the concept of stablecoin; Section 2 presents the underlying regulatory framework, which includes the analysis of the applicable legal and regulatory regimes both at national and international levels; Section 3 analyses the current stablecoins' market; Section 4 revisits the main risks associated with stablecoins; and Section 5 presents the conclusions.

1. The concept of stablecoins

1.1. Definition

Given the relative novelty of the phenomenon, stablecoins still lack a widely accepted definition. In this paper, Banco de Portugal follows the Financial Stability Board (FSB) definition: "a crypto-asset that aims to maintain a stable value relative to a specified asset, or a pool or basket of assets" (FSB (2020)). This definition is also used as a reference by the Bank for International Settlements (BIS) in its 2022 report on stablecoins (BIS (2022a)) and is in line with the definition contained in the MiCA Proposal.[5]

5. The MiCA Proposal, for which a draft overall compromise package was agreed in 5 October 2022 by the Permanent Representatives' Committee, was presented in September 2020 by the European Commission as part of the Digital Finance Package. It sets the requirements in Europe for issuers of crypto-assets and crypto-asset service providers. Its main purpose is to contribute to

As stablecoins, crypto-assets also lack a common taxonomy. However, according to the MiCA Proposal,[6] the latter can be defined as a digital representation of a value or a right which may be transferred and stored electronically, using distributed ledger technology (DLT) or similar technology. On this topic, Banco de Portugal recently published an Occasional Paper on Crypto-Assets (Banco de Portugal working group on crypto-assets (2020)) where a similar definition was used.

Stablecoins share many features of other crypto-assets. They benefit from the same potential of the underlying technology (DLT or similar) with the advantage of aiming to maintain a stable value.

Definitions of stablecoins presented in major international bodies' reports over the last years mainly differ in respect to the references used for the value of the stablecoin. While some consider only a reference to fiat currencies (ECB (2020a) and G7 Working Group on stablecoins (2019)), others include a wider range of references (FSB (2020) and BIS (2022a)).

The G7 Working Group on stablecoins (2019), for instance, defines stablecoin initiatives as "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". Along the same line, the ECB (2020a) defines stablecoins as "digital units of value that differ from existing forms of currencies (e.g. deposits, e-money, etc.) and rely on a set of stabilisation tools to minimise fluctuations in their price against a currency, or basket thereof".

1.2. Types of stablecoins

The stabilisation mechanisms used to maintain the value of a stablecoin may vary, giving rise to different types of stablecoins.

Stablecoin arrangements can be characterised according to three main dimensions (ECB (2019b)): (i) the existence or not of an accountable issuer; (ii) the centralisation or decentralisation of responsibilities over the stablecoin initiative; and (iii) what supports the value of the stablecoin and its stability. The way these dimensions are combined in a given stablecoin arrangement determines the type of the stablecoin (Table 1).

Stablecoins can be grouped into four different types (ECB (2020a)):

---

a more competitive EU financial sector and give consumers access to innovative financial products, while ensuring end-user protection and financial stability.

6. The MiCA Proposal defines two categories of crypto-assets, based on the use of DLT or similar technology, that intend to capture the concept of stablecoins, namely: (i) "electronic money token" (EMT), defined as "a type of crypto-asset that purports to maintain a stable value by referencing to the value of one official currency"; and (ii) "asset-referenced token" (ART), defined as "a type of crypto-asset that is not an electronic money token and that purports to maintain a stable value by referencing to any other value or right or a combination thereof, including one or more official currencies".

Tokenised funds are the least innovative stablecoin initiative but have the highest probability to be used in payments. They can be described as simple digital representations (tokens) issued on the receipt of funds (i.e. cash, deposits or electronic money) that use DLT or similar technology to register the respective claim. The tokens are collateralised either by funds or close substitutes (secure, low risk, liquid assets) which are then safeguarded by traditional custodians. The tokens can be redeemed at the market value of the collateral at the time of redemption or at face value. One example of a tokenised fund is USDCoin,[7] a stablecoin pegged to the US Dollar that claims to be fully backed by secure and low-risk liquid assets.

Off-chain collateralised stablecoins are in almost all aspects similar to tokenised funds. However, their issuance and collateralisation are based on a distinct category of assets held through an accountable entity (e.g. securities, commodities, or crypto-assets). Moreover, since the price of the assets backing the stablecoin may fluctuate over time, the users may be requested to post further assets (margin calls). This ensures that the value of the stablecoin remains (at least) at par with the currency of reference. Examples of offchain collateralised stablecoins are Tether USD and Binance USD,[8] which are in the Top 4 stablecoins with the highest market capitalisation in the crypto-assets market (section 3). These stablecoins are pegged to the US Dollar (like the USDCoin), however their collateral includes other assets beyond secure and low-risk liquid assets, such as US treasury bonds (not necessarily short term) and commercial paper, corporate bonds or secured loans.

On-chain collateralised stablecoins are issued on receipt of crypto-assets registered directly on the DLT or similar technology in custody of the network participant without the need of intervention of any party. These arrangements can be fully operated by smart contracts,[9] without the intervention of any entity or, although not common, can have an accountable issuer overseeing the smart contract rules and liquidating collateral on request. These tokens are backed by crypto-assets, which in turn, as in off-chain collateralised stablecoins, may be adjusted through margin calls to guarantee the price stability of the stablecoin. Two examples are DAI and Reserve stablecoins. They are both designed to maintain one-to-one parity to the USD through a system of smart contracts on the Ethereum blockchain.

Algorithmic stablecoins have their price set by a mechanism based on smart contracts that adjust demand and supply to maintain parity between the value of the stablecoin and the reference currency, or basket of currencies. They do not require any asset as collateral nor have an accountable entity behind them. One example is TerraUSD, a stablecoin that collapsed in May 2022 due to its inability to maintain its peg to the USD.

---

7. USD Coin Token (USDC) – Reserve Accounts Report, April 2022.

8. Binance USD Token (BUSD) – Reserve Accounts Report, April 2022.

9. A smart contract is a computer protocol that can execute, verify, and constrain the performance of an action involving either units or representations of assets recorded in a distributed ledger (ECB (2019b)).

Table 1. Types of stablecoin arrangements

		Tokenised funds	Off-chain collateralised stablecoin	On-chain collateralised stablecoin	Algorithmic stablecoins
Characteristics/Dimensions	**"Collateralised" by:**	Funds and/or close substitutes (i.e. secure and low-risk liquid assets, such as cash, deposits, e- money or short term treasury bonds)	Assets held through an accountable entity (e.g. securities, commodities, or crypto-assets in custody with an intermediary)	Crypto-assets held directly on the DLT ledger	No collateral (i.e., the value of the stablecoin is based purely on the expectation of its future market value)
	Redeemable at:	Market value of the collateral at the time of redemption or face value of the stablecoin	Market value of the collateral at the time of redemption	Market value of the collateral at the time of redemption	Not redeemable
	Accountability of the issuer	Accountable issuer	Accountable Issuer	Possible to have an accountable issuer, or not	No accountable issuer
	Responsibilities	Centralised	Centralised	Decentralised	Decentralised
	Examples	USD Coin (USDC), Euro Coin (EUROC)	Tether (USDT), Binance USD (BUSD), Paxos USD (USDP), Pax Gold (PAXG)	DAI, Reserve (RSV)	TerraUSD (UST), Frax

If we consider the MiCA Proposal's scope and try to make an analogy with the types of stablecoin arrangements characterised in this section we can conclude that some types of stablecoins will probably not be subject to all, or at least some, MiCA requirements.[10]

10. For instance, while tokenised funds and off-chain collateralised stablecoins will most probably be subject to the MiCA Proposal as they can be captured by the concept of EMT (in case of tokenised funds referring to the value of a single currency) or ART (in case of tokenised funds referring to the value of more than a single currency and in case of off-chain collateralised stablecoins), the other two types of stablecoins described (on-chain collateralised stablecoins and algorithmic stablecoins), may not fall under MiCA requirements applicable to issuers, especially in cases where they don't have an accountable issuer.

The analysis carried out in this paper will not focus on algorithmic stablecoins as their ability to maintain a stable value over the medium term is arguable (G7 Working Group on stablecoins (2019)).

One additional aspect worth mentioning in respect of stablecoins categorisation is the distinction between **retail stablecoins**, that can be accessible to consumers and businesses, and **wholesale stablecoins**, that have restricted access, usually to financial institutions (G7 Working Group on stablecoins (2019)).

Finally, another possible arrangement suggested by some stablecoin proposals has been commonly designated as "Synthetic CBDC", despite of not being a real CBDC (BIS (2020)) (Box 1).

Box 1

Synthetic CBDC

A CBDC is a new form of digital money, denominated in the national unit of account, which is a direct liability of the central bank. CBDC can be designed for use either among e.g. payment service providers only (wholesale CBDC), or by all citizens and businesses (retail CBDC)(BIS (2021a)).

A "Synthetic CBDC" is an alternative payments framework that would involve central banks in the emergence of crypto-assets. Under this arrangement, payment service providers would issue liabilities matched by the correspondent funds deposited at a central bank.

In this model, users would have units of digital currency for which it would be assured by a contract with a payment service provider that the exact same amount would be placed in an account held with the central bank. However, since this digital currency is a liability of the payment service provider and not the central bank, it cannot be considered a CBDC.

1.3. Global stablecoins

A GSC is "a stablecoin with a potential reach and adoption across multiple jurisdictions and the potential to achieve substantial volume" (FSB (2020)). These stablecoins may originate new risks and/or amplify some of the existing risks inherent to stablecoin arrangements with a smaller reach.

To classify a stablecoin as a GSC several criteria should be taken into account (FSB (2020)), such as: the value of stablecoins in circulation; the number and value of transactions; the number of users; the market share in cross-border payments and the number of jurisdictions where they are used; the market share in payments; and the interconnectedness with other financial actors, services and systems.

The concept of GSC is also considered in the MiCA Proposal based on similar criteria as listed above.[11] These criteria are essential elements to evaluate the importance of a GSC in terms of the impact that its failure or disruption can have on the financial system as a whole. This global assessment requires relevant authorities of different jurisdictions to cooperate closely when monitoring GSC arrangements.

2. Legal framework

2.1. National legal framework

Over the past few years, there have been notable developments around the globe with regard to legislative and regulatory initiatives concerning crypto-assets in general and stablecoins in particular. In Portugal, there is still no specific national legislation governing stablecoins.

Nevertheless, it might be tempting to associate stablecoins with electronic money (e-money) and subject stablecoins to the rules set forth in the Portuguese legal framework for payment services and e-money,[12], hereinafter RJSPME.

Some stablecoins may indeed have some of the features of e-money, such as being considered an electronically stored monetary value, which is issued after receipt of banknotes, coins or scriptural currency to make payment transactions, accepted by entities other than the issuer and representing a claim on the issuer. However, due to the complex design characteristics of most stablecoin arrangements and the wide scope of the current stablecoin concept, they cannot be, in principle, subject to the legal regime applicable to e-money.[13]

In addition, most stablecoins seem to fulfil the essential requirement of e-money, which is to be redeemable.[14] However, while in the case of e-money redemption at any time at par value is a requirement, in the case of stablecoin arrangements, due to the lack of a legal framework, redeemability is instead a possibility, not a guarantee for the stablecoin user.

In this regard, there may be cases where, based on the specific characteristics of the stablecoin evaluated, the asset could in theory qualify as 'electronic money'

11. The MiCA Proposal defines more stringent requirements for GSC; i.e. significant ARTs and EMTs that could represent higher risks for financial stability, monetary policy transmission or monetary sovereignty.

12. Approved as an annex to the Decree-Law no. 91/2018 which transposes Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market (PSD2) into national law.

13. For instance, not all stablecoin arrangements have an accountable issuer (e.g. algorithmic stablecoins), and some can be issued at the receipt of commodities or crypto-assets (e.g. off-chain and on-chain collateralised stablecoins).

14. With the exception of algorithmic stablecoins which are not redeemable and other stablecoin arrangements that might be created without redemption rights.

and could therefore fall within the scope of the EMD2.[15] In such cases, carrying out these specific type of activities pursuant to Title II of the EMD2 would only be allowed to authorised entities.[16]

However, since there is still a margin of discretion in the assessment of the legal nature of such assets entailing a risk of regulatory arbitrage, it is important to provide clarity at the EU level about how the EU financial services regulatory framework applies to such assets.

Although there is currently no national legal framework specifically applicable to stablecoins, Law No. 83/2017,[17] which transposes the EU Anti Money Laundering Directive (4AMLD)[18] and, in broader terms, establishes the Portuguese AML/CFT legal regime, includes VASP[19] as obliged entities subject to AML/CFT rules and supervision.

In this Law, Portugal adopted a definition of VASP closer to the Financial Action Task Force (FATF) Recommendations[20] than the definition provided in the 4AMLD (i.e. the definition is based on a functional approach, identifying a set of relevant activities). As such, for national legislation, a VASP is considered a natural or legal person that conducts one or more of the following activities or operations, when performed in the name, or on behalf of, a customer: (i) exchange between crypto-assets and fiat currencies; (ii) exchange between one or more forms of crypto-assets; (iii) transfer of crypto-assets; and (iv) safekeeping and/or administration of crypto-assets or instruments enabling control over crypto-assets, including private cryptographic keys.

Currently, the Portuguese AML/CFT legal regime determines that activities with crypto-assets can only be carried out, in Portuguese territory, by an entity that obtains its prior registration with Banco de Portugal. The requirements to initiate the registration procedure are established by article 112A of Law No. 83/2017 and Banco de Portugal's Notice no. 3/2021.[21]

2.2. International legal framework

This section of the paper analyses the current state of regulatory framework existent in a non-exhaustive list of jurisdictions relevant to the stablecoins' market.

15. Second Electronic Money Directive (Directive 2009/110/EC) (EMD2).

16. Unless a limited network exemption applies in accordance with Article 9 of that Directive.

17. Law nº 83/2017, August 18.

18. Directive (EU) 2015/849 of the European Parliament and of the Council, of 20 May 2015.

19. For this paper, "VASP" means an entity that carries out activities with virtual assets, in the terms set by articles 2(1)ll and 2(1)(mm), both from Law no. 83/2017, when performed in the name, or on behalf of, a customer.

20. The FATF recommendations.

21. Aviso do Banco de Portugal no. 3/2021, of 13 April 2021.

European Union

The Permanent Representatives' Committee approved, on 5 October 2022, a draft overall compromise package for the the MiCA Proposal, which intends to regulate the crypto-assets landscape in Europe, including stablecoins arrangements. This proposal establishes three categories of crypto-assets, two of them referring to crypto-assets that purport to maintain a stable value and could, therefore, be considered stablecoins, defined as "asset-referenced token" and "electronic money token", and another one classified as "crypto-assets, other than asset-referenced tokens or e-money tokens", in which "utility tokens"[22] are included.

The MiCA Proposal also includes requirements applicable to the issuers of crypto-assets/stablecoins and seems to encompass in its current definition three different roles for them: (i) issuance; (ii) offering to the public; and (iii) admission to trading. In addition, crypto-asset service providers, including wallet providers and operators of trading platforms and exchanges, are regulated under the MiCA Proposal.

Finally, the MiCA Proposal empowers national competent authorities with supervision of the three categories of crypto-assets, when they are non-significant, and the European Banking Authority (EBA) with the supervision of significant asset-referenced tokens and significant e-money tokens.[23] Regarding crypto-asset service providers, they will be supervised by national competent authorities (both significant and non-significant).

United Kingdom

Currently, in the UK, there is still no regulatory proposal applicable to crypto-assets, particularly stablecoins. The UK government is conducting a phased approach to regulation, which started with the work initially carried out in 2018 by a cross-authority taskforce whose mandate was to explore the impact of crypto-assets, analyse related risks and benefits and advise on the adequate regulatory solution.

In 2021, the HM Treasury issued a consultation and call for evidence, seeking views from the industry, consumers and regulators on how to approach crypto-assets in terms of categorisation, policy approach and treatment when used for payments

22. The MiCA Proposal defines "utility token" as "a type of crypto-asset which is only intended to provide access to a good or a service supplied by the issuer of that token".

23. However, the supervision model applicable to asset-referenced tokens and e-money tokens will be different. While the first will be subject to harmonised EBA supervision, the second will be subject to dual supervision by the EBA together with the national competent authority. This supervisory model, and its possible shortcomings, is analysed by the ECB in the Opinion of the European Central Bank of 19 February 2021 on a proposal for a Regulation on markets in crypto-assets, and amending Directive (EU) 2019/1937 (CON/2021/4)).

or investment. The UK Government's goal with this risk-led approach is to "ensure its regulatory framework is equipped to harness the benefits of new technologies, supporting innovation and competition, while mitigating risks to consumers and stability" (HM Treasury (2021)).

According to the consultation response, issued on April 2022, the plan is to create a regulatory regime for stablecoins that are used as a means of payment (HM Treasury (2022)). In fact, on this point, the government's proposed regulatory approach will provide the FCA with appropriate powers over stablecoin issuers and other entities, including wallet providers, and determinate FCA guidance and rules that will set out in detail the requirements that apply to specific activities.

In May 2022, while the Treasury is pressing ahead with plans to legalise stablecoins as a form of payment in Britain,[24] the U.K. government proposed amending existing rules to manage the failure of stablecoin firms that may pose a systemic risk.[25]

United States

The United States is one of the jurisdictions where stablecoins are most used (mostly to facilitate trading, lending or borrowing of other crypto-assets), therefore increasing the chance of becoming widely used by households and businesses as a means of payment.

Since there is still no specific legislation applicable to stablecoins in the United States, in November 2021, the President's Working Group on Financial Markets (PWG), along with the Federal Deposit Insurance Corporation (FDIC) and the Office of the Comptroller of the Currency (OCC) (hereinafter, "the agencies") published a report recommending that "Congress act promptly to enact legislation to ensure that payment stablecoins and payment stablecoin arrangements are subject to a federal prudential framework on a consistent and comprehensive basis" (President's Working Group on Financial Markets (2021)).[26]

The plans to continue the discussion of interagency work on stablecoins were announced by the US Secretary of the Treasury Janet L. Yellen in July 2021,[27] which led to the publication of the above-mentioned report. This report discusses the potential benefits and risks posed by stablecoins and analyses the current US

24. Rishi Sunak to legalise 'stablecoins' despite cryptocurrency crash (telegraph.co.uk).

25. Britain proposes safety net against failing stablecoins | Reuters.

26. Prior to the publication of this report, the work developed by PWG was built on a statement issued on 23 December 2020 about regulatory and supervisory considerations for participants in stablecoin arrangements (President's Working Group on Financial Markets (2020)). In addition, the OCC issued interpretive letters in July 2020 (Interpretive Letter nº 1170), September 2020 (Interpretive Letter nº 1172), and January 2021 (Interpretive Letter nº 1174). Nevertheless, the OCC is currently reviewing these interpretive letters and may issue additional guidance.

27. According to US Department of Treasury, Secretary of the Treasury Janet L. Yellen to Convene a Meeting of the President's Working Group on Financial Markets to Discuss Stablecoins, July 2021.

regulatory framework, providing recommendations to address potential regulatory gaps.

The agencies believe that a Congress act is urgently needed to address the prudential risks of payment stablecoin arrangements. Such Congress act should establish an appropriate federal prudential framework for these arrangements and should, especially regarding stablecoin issuers, "provide for supervision on a consolidated basis; prudential standards; and, potentially, access to appropriate components of the federal safety net" (President's Working Group on Financial Markets (2021)).

Additionally, the agencies recommend future legislation to restrict the issuance of stablecoins, redemption activities and management of reserve assets to entities that are insured depository institutions. Furthermore, the agencies believe that legislation can give supervisors the authority to implement interoperability standards on stablecoins.

Moreover, according to the OCC, in order to ensure that stablecoins are open and inclusive, a standard-setting initiative must be established, with representatives from crypto firms, academics and government. In the beginning of 2022, the Fed published a paper that discusses reserve-backed stablecoins' impact on bank balance sheets and credit intermediation (Liao and Caramichael (2022)). Additionally, later in the year, the White House released a framework on the plans for the future US regulation on crypto-assets, after an executive order issued by the President Joe Biden requesting federal agencies to analyse the risks and benefits of crypto-assets.[28]

Japan

The rapid growth of stablecoins has gained attention from Japanese authorities. Although there is no specific regulation governing stablecoins, crypto-assets are governed by the Payment Services Act (the "PSA"). In practical terms, a stablecoin in Japan will likely be classified either as a crypto-asset or a means of payment in fund remittance transactions, depending on whether such stablecoin is redeemable in fiat currency (Nagas *et al.* (2021)).

Recent developments show that Japan is looking to increase its efforts to regulate crypto-assets. For example, in July 2021, the Japan Financial Services Agency ("FSA") created a division to supervise the regulation of crypto-assets, establishing the Digital and Decentralised Finance Planning Office, in charge of examining the specific framework and regulation of fiat-backed stablecoins.

In early June 2022, Japan became one of the first major economies to introduce a legal framework around stablecoins, with the approval by parliament of a stablecoin law. The new legal framework will be implemented in a year and

28. White House Releases First-Ever Comprehensive Framework for Responsible Development of Digital Assets, September 2022.

clarifies the legal status of stablecoins as digital money, giving protection to crypto investors.[29]

Switzerland

Although it is considered one of the most crypto-assets "friendly" jurisdictions, mainly due to the key role played by the Swiss Financial Market Supervisory Authority (FINMA) in shaping the crypto-assets legal environment, there is currently no specific regulation for stablecoins in Switzerland nor a definition of the terms "crypto-asset" or "stablecoin" in Swiss law.

In relation to stablecoins, regarding initial coin offerings, market participants need to take into account the FINMA Guidelines on initial coin offerings.[30]

Moreover, as an answer to the increasing number of stablecoin projects submitted to FINMA since 2018, on 11 September 2019, FINMA published a supplement to the FINMA ICO Guidelines informing market participants on how stablecoins will be assessed under Swiss supervisory law.[31]

The Swiss financial markets regulation follows a principle-based and technology-neutral approach. As such, FINMA's supervisory classification of stablecoins follows the principles of "substance over form", "same risk, same rules", and "case-by-case analysis taking into account the specific circumstances of the individual case". This means that, depending on the specific features of each project, stablecoins must be analysed on a case-by-case basis to determine the different financial market laws that can apply.[32]

China

Despite being one of the world's largest crypto-asset markets, on 24 September 2021, China's central bank announced that all transactions of crypto-assets were illegal, effectively banning digital tokens such as Bitcoin, as well as a nationwide ban on crypto-asset mining.[33]

In recent years, the government agencies in China have shown distress about how the crypto-assets speculation could disturb the country's economic and

29. According to Coin Desk, Japan Passes Landmark Stablecoin Bill For Investor Protection: Report , June 2022.

30. FINMA, Guidelines for enquiries regarding the regulatory framework for initial coin offerings (ICOs).

31. FINMA, Supplement to the guidelines for enquiries regarding the regulatory framework for initial coin offerings (ICOs).

32. The FINMA Supplement to the guidelines for enquiries regarding the regulatory framework for initial coin offerings (ICOs) provides an "indicative" categorisation for supervising various stablecoins and lists some of the regulations that might be relevant to stablecoins projects.

33. According to BBC, China declares all crypto-currency transactions illegal, September 2021.

financial order, as well as being a threat to its sovereign digital-yuan. As a result, since 2013, the Chinese government has manifested hostility towards crypto-assets.

In 2017, Chinese regulators banned initial coin offerings[34] and in 2019 trading crypto-assets was officially banned, although continuing online through foreign exchanges. Finally, in May 2021, China's State Council issued a warning, saying it was necessary to "crack down on Bitcoin mining and trading behavior, and resolutely prevent the transmission of individual risks to the social field".[35]

3. The stablecoins' market

3.1. Overview

As of 30 June 2022, the stablecoins' market had a market capitalisation of 158 billion USD, which accounted for 17% of the total crypto-assets' market capitalisation of 901 billion USD. This is a modest share when compared with Bitcoin, the leading crypto-asset, with 43% of total market capitalisation (see Figure 1).

Tether, the stablecoin with the highest market capitalisation (66 billion USD), has a 42% market share in the stablecoins' market and a 7% market share in the global crypto-assets' market, where it holds the 3rd position, after Bitcoin and Ethereum. Even though several stablecoins are available in the market, there is a clear dominance by the Top 4 stablecoins, which represent 92% of the whole stablecoins' market capitalisation.

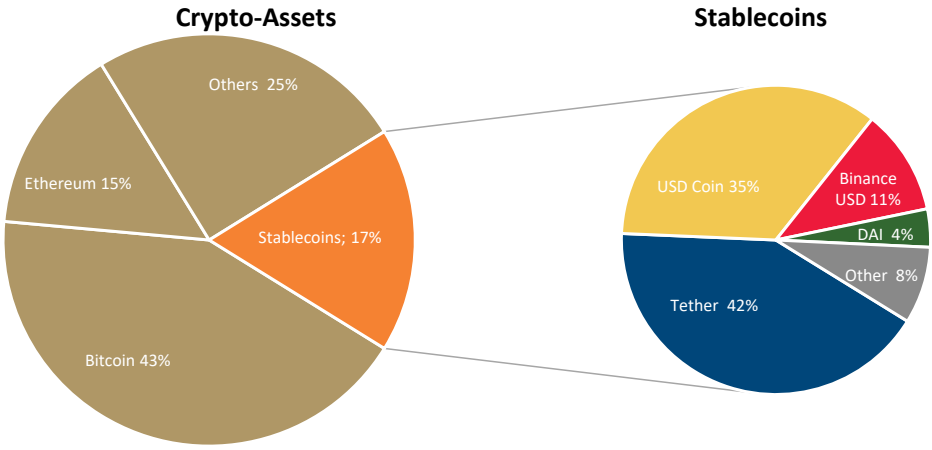
As shown in Figure 2, there is a considerable evolution in stablecoins' uptake, with the total market capitalisation growing more than 400% since 1 January 2021, from 30 billion USD to 158 billion USD as of 30 June 2022. This growth has been led mainly by USD pegged stablecoins which represent the majority of the stablecoins' market. The remaining share is covered by stablecoins pegged to other fiat currencies, commodities like gold or other crypto-assets.[36] EUR pegged stablecoins remain with a low representation on the total stablecoins' market (only 0.3% corresponding to a total market capitalisation of 450 million USD).

34. According to CoinDesk, China's ICO Ban: A Full Translation of Regulator Remarks, September 2017.

35. Also, in May 2021, according to a Forbes article, three financial groups issued a joint statement warning about the risks of crypto-assets speculation and against its use as a payment mode, since they would have no protection on trading crypto-assets online due to the increase of government's pressure.

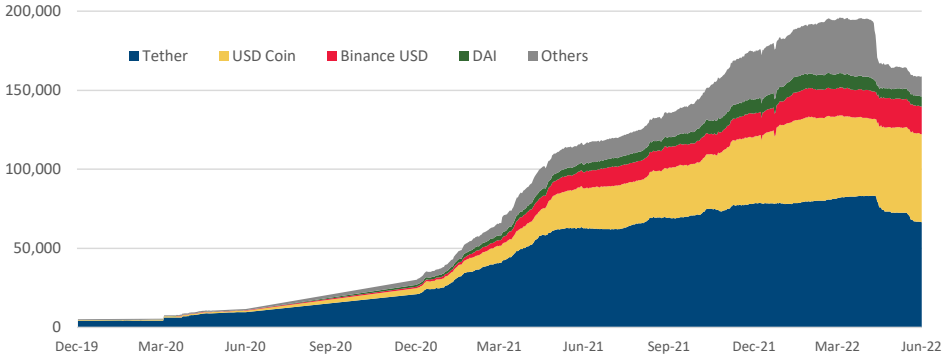
36. For instance, Pax Gold (PAXG) which is pegged to gold.

Figure 1: Crypto-assets and stablecoins' market share by market capitalisation



Source: CoinGecko. | Notes: Market capitalisation as of 30 June 2022. The "others" share in the crypto-assets graph include a wide variety of crypto-assets. The top 5 per market capitalisation are the following, as of 30 June 2022: 3.9% Binance Coin (BNB); 1.7% Ripple (XRP); 1.7% Cardano (ADA); 1.3% Solana (SOL); and 1.0% Dogecoin (DOGE).

Figure 2: Stablecoins'market capitalisation evolution since 1 January 2020 (Millions USD)



Source: CoinGecko.

Looking into the existing types of stablecoins, and taking section 1.2 of this paper as reference, the majority of existing arrangements are considered to be off-chain collateralised stablecoins, using securities, commodities and other off-chain assets as collateral (e.g., from the Top 4 stablecoins, both Tether and Binance USD

are off-chain stablecoins). Nevertheless, other types of stablecoins can be found in the market. For instance, DAI,[37] the 4th largest stablecoin in terms of market capitalisation, is an on-chain collateralised stablecoin backed by the crypto-asset Ethereum and the stablecoin USD Coin. As for algorithm stablecoins, perhaps due to their inherently more complex implementation, they are not as frequent as the remaining. Frax[38] for instance, is a recently arrived and well known algorithmic stablecoin even though its market capitalisation has a very low representability in the market (1.3 billion USD). In order to keep its price stable, Frax uses both algorithmic techniques and on-chain collateral. Finally, it is worth mentioning that tokenised funds, although the safest and most stable type of stablecoin due its low-risk collateral, are also not common in the market. USD Coin, the 2nd largest stablecoin in terms of market capitalisation, is one rare example of an existent tokenised fund.

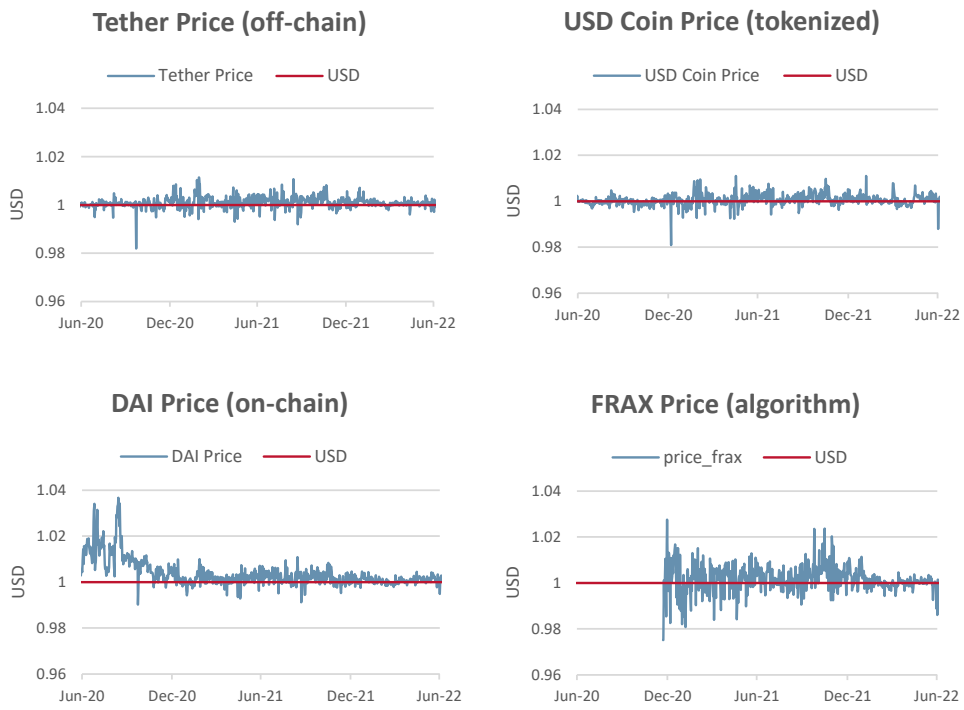
It is clear from Figure 3 that the off-chain and tokenised stablecoins have a more stable price than the on-chain and algorithmic stablecoins. For instance, Tether and USD Coin present volatility close to zero with occasional price fluctuations during its history.[39] In contrast, DAI and Frax prices are more volatile, reaching respectively a maximum of 1.04 USD and 1.03 USD since June 2020, this being probably the result of having other crypto-assets as collateral or using algorithmic techniques, which are inherently less stable. In May 2022, as an evidence of the lack of safety that most stablecoin projects can offer to users and investors, there was the collapse of Terra USD, an algorithmic stablecoin that used to be the 4th largest stablecoin in the market in terms of market capitalisation (this collapse is visible in Figure 2). Terra USD lost its peg to the USD reaching 0.01 USD at its lowest point due to a downturn in crypto-asset prices.

37. More information on DAI can be found at DAI's website.

38. More information on this algorithmic stablecoin can be found at: Frax Website.

39. Since October 2020 and up to June 2022 Tether price had never been lower than 0.98 USD or higher than 1.02 USD at its closure price. However, its intraday price temporarily declined to below 0.95 USD when Terra USD collapsed.

Figure 3: Price of Tether, USD Coin, DAI and Frax against USD



Source: CoinGecko. | Note: Data as of 30 June 2022.

Regarding stablecoins purpose, their use for payments remains limited (FSB (2022)). They are used for multiple functions, mainly for trading in the crypto space[40] but also as a "parking for savings"[41] (Box 2). For instance, Tether is mostly used to buy or sell other crypto-assets while only a minimum percentage is used to buy or sell other stablecoins or even to convert it into fiat currency (ECB (2020a)).

40. Data from September 2021 shows that 75% of all trading on crypto trading platforms involved a stablecoin (ECB (2021a)).

41. Stablecoins' users deposit stablecoins in centralised exchanges, where there have better yields comparing to traditional deposits.

Box 2

Stablecoins purpose: A view within the ecosystem

Nowadays, most stablecoin solutions are pegged to the dollar and the majority of people is using it to buy crypto-assets. For instance, since 2018, roughly 65% of all Bitcoin trades are done with Tether, while the remaining 35% are done with fiat currencies (mainly USD, EUR and JPY).[1]

The surge of decentralised finance (DeFi)[2] enabled the creation of financial services governed by software protocols known as 'Smart Contracts', which gave rise to a multiplication of possible applications of stablecoins. Some examples are summarised next:

Bridge – Fiat – Crypto: Stablecoins are used as bridges between fiat currencies and crypto-assets as they provide ample access to the crypto ecosystem (including diverse DeFi services) without the constraints of fiat currencies (which include, for example, the need to have multiple international accounts for cross border payments; less privacy due to the involvement of third party intermediaries and Know-Your-Costumer (KYC) due diligence, in the case of decentralised exchanges, as well as higher transfer time for transactions).

Parking for savings: Stablecoins are also deposited in centralised exchanges, where they have better yields when compared to traditional deposits. This appeals investors that intend protection from the volatility of crypto-assets and park their savings in a more stable solution.

Trading pairs: Given stablecoins' stability in value, most of them have a trading pair with other well established crypto-assets.

Borrowing and Lending: Stablecoins can also be used in peer-to-peer lending and borrowing DeFi services.

1. According to CryptoCompare website.

2. DeFi refers to an ecosystem in which financial transactions are performed in an open, decentralised, permissionless and autonomous way, through automated protocols on blockchains, without the need for intermediaries or centralised processes (OECD (2022)).

3.2. General and institutional adoption

According to a report published at the end of 2021 by Chainalysis (Chainalysis (2021)), between June 2020 and June 2021, Europe[42] accounted for 25% of the total value received in crypto-assets by all world economies, which represents a total of 1 trillion USD.

A breakdown of the total Europe's crypto-assets value received by country shows United Kingdom, France, Germany, Netherlands and Spain as the top 5 countries (in a total of 30 countries), receiving the highest share of value in crypto-assets (around 57% in total). Next to these countries, there is Switzerland, Italy, Belgium and Portugal, which occupies the 9th position in the rank, accounting for 3% of total value received in crypto-assets in Europe (around 30 million USD).

This report also shows that, in Portugal, the value received in crypto-assets is mainly sent through DeFi protocols (around 60%), whereas the remaining value is sent through centralised services.

In Europe, stablecoins account for around 25% to 30% of all transactions' volume in crypto-assets. In Portugal, this percentage drops to around 10% since the main crypto-asset transacted is Ethereum (around 70%).

In terms of banks' exposure to crypto-assets, a recent report from BIS (BIS (2022b)) shows that it has remained limited.[43] Based on the most recently available survey, relative to the end of 2020, only 7 banks, out of a total of 178 participant banks in the survey, reported having some kind of exposure to crypto-assets.[44] This amounted to a total exposure of 188 million USD (which represented, at the end of 2020, only 0.02% of total crypto-assets' market capitalisation).

The above mentioned survey revealed that 52.4% of the exposures are related to trading on client accounts, 24.4% are related to clearing of future contracts referencing crypto-assets and 5.8% are related to providing wallet and custody services.[45]

Although bank's exposure to crypto-assets is for now limited, its value in absolute terms is significant and expected to increase due to the rapid developments occurring in this market. For this reason, in December 2022, the BIS published its final standard for the prudential treatment of banks' crypto-asset exposures.[46]

---

42. In this section of the paper, data for Europe excludes Eastern Europe, which is analysed separately in the Chainalysis report.

43. According to BIS (2022b) "Exposure to the cryptocurrency ecosystem could arise from a multitude of direct and indirect interlinkages. These include activities such as direct issuance and ownership of cryptocurrencies, intermediation services for customers who seek exposure to this asset class, clearing of contracts that reference cryptocurrencies, or services for cryptocurrency issuers such as underwriting initial coin offerings".

44. This survey does not include data from jurisdictions that did not participate in the data collection exercise. Portugal is one of these jurisdictions and is therefore not contemplated by the results.

45. The remaining percentage (17.4%) is related to other activities, not specified in the survey.

46. Prudential treatment of crypto-asset exposures, BIS, December 2022.

4. Risks of stablecoins

A wide adoption of stablecoins as means of payment and/or store of value may pose several challenges and risks to consumers, financial markets and the economy in general. Without an appropriate regulatory, supervisory and oversight framework applicable to stablecoins, they are far behind what is required of a payment instrument used by the population in the real economy (ECB (2022a) and ECB (2022b)).

In this section, the risks considered more relevant from a central bank perspective are analysed taking into account the whole ecosystem of functions that can be associated with a specific stablecoin. This ecosystem can be called a stablecoin arrangement, characterised by BIS (2022a) as an "arrangement that combines a range of functions to provide an instrument that purports to be used as a means of payment and/or store of value".

A stablecoin arrangement usually involves three core functions: (i) issuance, redemption and stabilisation of value; (ii) transfer among users; and (iii) interaction with users, which involves a user interface (G7 Working Group on stablecoins (2019)).

The risks and challenges associated with stablecoins arrangements may vary depending on the structure and underlying design of such arrangements and also depending on the potential reach and adoption of a specific stablecoin. The risks listed in section 4.1 are associated with any stablecoin arrangement and they can be more or less amplified depending on the level of the stablecoin adoption and its impact in the economy. On the contrary, the risks listed in section 4.2 are risks that are more likely to emerge or become relevant in relation to stablecoins that turn global in its adoption (i.e. GSC).

4.1. General risks and challenges of stablecoins

4.1.1. Legal.

In recent years, regulators, supervisors and other authorities have adopted different approaches in relation to crypto-assets, and stablecoins in particular, and the regulation of related activities. Furthermore, the associated infrastructures, in contrast to traditional payment systems, are not regulated, lack an adequate legal structure, as well as a clear definition of the rights and obligations of the involved parties (i.e., issuers, holders, custodians of reserve assets, crypto-asset service providers), including key concepts of payment systems, such as settlement.

The legal uncertainty surrounding stablecoin arrangements - and crypto-assets in general - is a challenge for the authorities, which have made efforts to promote public awareness on the associated risks, namely by issuing warnings to consumers

to highlight that these are not subject to regulation nor supervision and therefore do not benefit from any public guarantee regarding their investment.[47]

There are three conceivable generic approaches in relation to this issue: isolate, integrate or regulate. The option to isolate, which advocates the exclusion of crypto-assets from the financial system, namely through their ban, may have the advantage of preventing any risk contamination to the traditional financial system and additionally preventing consumers and investors with a conservative risk profile from investing in these types of assets (European Parliament (2018)).

The approach that favours integration highlights the need to regulate the interface between stablecoins and the financial system. Finally, the approach to regulating faces the difficult task of determining what to regulate (the activity, the entity, or both), at what level (national, European, or international), and who should be the responsible supervisor. This last issue is particularly pressing in the EU, with the possibility that, in a Capital Markets Union, the assignment may be given to a single supervisory authority/mechanism.

The decision to regulate requires a stable and simultaneously evolving definition of the concept of stablecoin, in order to create legal certainty and security but, at the same time, not crystallise technological innovation.

It can be argued that the creation of a regulatory framework for crypto-assets, stablecoins in particular, is not desirable due to the heterogeneity and dynamic of this market which makes it difficult to regulate and supervise. However, regulating certain elements may be the answer to tackling illicit activities, promoting market integrity and safeguarding the financial system. To this end, Carney (2018) argues that the implemented ecosystem should be subject to the same standards of regulation and supervision that are applied to the financial system: "being part of the financial system brings enormous privileges, but with them great responsibilities". The European co-legislators appear to follow the same path with the MiCA Proposal.

According to ECB (2019a), "given the global dimension of the crypto-assets phenomenon, uncoordinated and/or inconsistent regulatory approaches undertaken at the country level may prove ineffective and create incentives for regulatory arbitrage. Whilst this need not pose an immediate threat to the financial system, it calls for vigilance at the level of the EU, to prevent a proliferation of national initiatives from triggering regulatory arbitrage and, ultimately, hampering the resilience of the financial system to crypto-asset market based shocks".

Taking into account the decentralised and cross-border dimension of these activities and to ensure that the players operate on a level playing field, the definition of a possible regulatory framework should be made, desirably, at least at the European level. To accomplish this objective, the European Commission

47. See, for instance, the joint European Supervisory Authorities warning on virtual currencies, followed by a similar warning by the Portuguese National Council of Financial Supervisors.

adopted in September 2020 the MiCA Proposal as part of the Digital Finance Package.

4.1.2. Governance.

The governance of a stablecoin arrangement is responsible for establishing and monitoring the set of rules that cover, among other issues, the entities involved in the arrangement, the protocol for validating transactions, the stabilisation mechanism of the stablecoin and the management of the reserve assets (FSB (2020)).

A stablecoin arrangement may involve a number of different entities with several different functions, interdependent among each other. The governance of all these entities and functions may vary in the degree of decentralisation and automation, depending on the design of the stablecoin arrangement. This makes the governance structure of stablecoin arrangements very complex and also very diverse.

For instance, the transfer function[48] in a stablecoin arrangement may be fully decentralised (i.e. based on a permissionless[49] DLT system) and fully automated[50] (i.e. set up as a smart contract). In this case, there is no legal entity responsible and accountable for the transfer, which can easily affect user's confidence, particularly in a crisis situation.

The governance of such arrangements may present several weaknesses materialised through, among other issues, lack of transparency, unclear definition of responsibilities, absence of monitoring mechanisms, excessive degree of automation and/or decentralisation and excessive reliance on third party providers. These fragilities may lead to the inability of the stablecoin arrangement to deal with unexpected events (e.g., a crisis situation), to manage and recover from operational incidents or to adapt to a changing environment (e.g. technological developments or changes in users' preferences).

Moreover, the existence of clear and transparent governance rules on key aspects of the stablecoin arrangement (such as the stability mechanism, the

48. The transfer function of a stablecoin arrangement "enables the transfer of coins between users and typically entails the operation of a system, a set of rules for the transfer of coins between or among participants, and a mechanism for validating transactions. The transfer function (...) is comparable to the transfer function performed by other types of financial market infrastructure (FMI)" (BIS (2022a)).

49. A permissionless DLT protocol implies that anyone can be a validator of transactions in the ledger; on the contrary, a permissioned DLT protocol only allows selected entities to be a validator of transactions (G7 Working Group on stablecoins (2019)).

50. The governance of some of the functions of a stablecoin arrangement can be implemented by technology protocols, not requiring human intervention. For instance, the management of the stability mechanism or the transfer of coins among users are both functions that can be governed by smart contracts. These contracts may determine, among other aspects, the validation mechanism of the transactions, the access policy of the stablecoin (namely, who has access and under which conditions), and the roles of each party (namely, which roles exist within the system and who can participate in each role).

investment policy applicable to the reserve assets or the policy applicable to the custody of assets) is a crucial aspect to maintain users' confidence in the stablecoin. However, and in practice, existing stablecoins arrangements offer only limited transparency on the composition and management of the reserve assets, exposing users and the system to risks related to their trustworthiness (OECD (2022)). For instance, the two major off-chain collateralised stablecoins (Tether and USD Coin), which together represent almost eighty per cent of the market, seem to fail in their governance, not ensuring compliance with standards that could robustly minimise liquidity and counterparty risks and maintain trust at all times (Box 3).

Ideally, the governance of a stablecoin arrangement should be sound and efficient, otherwise it may jeopardise the stability of the overall financial system, especially in the case of stablecoin arrangements that have the potential to become global. To achieve such goal it is essential to have a comprehensive governance framework, with clear and documented allocation of responsibilities and accountability. It is also critical to define how conflicts of interests should be managed among the different entities and jurisdictions involved in order to allow for an effective decision making process in crisis and emergencies.

Box 3

Spotlight on the management and custody of reserve assets in Tether and USD Coin

Major stablecoins usually proclaim redemption on a one to one basis for the US dollar. However, their reserves are not always fully composed of highly liquid assets easily and rapidly convertible to USD, auditability and reporting around those reserves still seem insufficient and the stability of the custodian of such reserves is not assured in any case.

In the course of 2021, various authorities in the US ruled that Tether made untrue or misleading statements and omissions of material facts regarding the backing of the stablecoin and questioned whether the reserve would undergo regular professional audits.[1] Tether occasionally overstated reserves, while claiming the stablecoin to be fully backed by US dollars at all times.[2] In May 2021, Tether finally released a report[3] with some breakdown of its reserve, showing it comprised only about 26% in cash, cash equivalents and other short-term deposits, about 50% in commercial paper and the remaining 24% in secured loans, bonds, funds, precious metals and other investments (including digital tokens). This kind of reserve composition could involve significant liquidity and counterpart risks. Moreover, this report still did not specify, for example, the issuers or the ratings of commercial paper or bonds included in the reserve, leaving the market further guessing about the assets' liquidity and creditworthiness. The reserves report was released with a so-called assurance opinion by an independent accountant, but without supervision by any regulatory authority. Recent releases of this report added some further disaggregation, namely regarding the rating and maturity of the commercial paper in the reserve, but information is still incomplete and not timely updated. Regarding the custody of assets, Tether reportedly has changed its banking relationship in several occasions, always with banks domiciled in jurisdictions other than the US. Despite the lack of public information generating doubts and conjectures about Tether's finances, this stablecoin has traded at one USD for almost all of its history.

1. According to the articles from New York Attorney General, February 2021, and the Commodity Futures Trading Commission, October 2021.

2. According to the Commodity Futures Trading Commission, October 2021: "Tether held sufficient fiat reserves in its accounts to back USDT tether tokens in circulation for only 27.6% of the days in a 26-month sample time period from 2016 through 2018".

3. Independent Accountant's Report, March, 2022.

Box 3 (Cont.)

The consortium that manages USD Coin used to claim that the stablecoin was backed one to one by US dollars in a bank account.[1] Up to July 2021 the consortium did not release the composition of its reserves account. At that time, it released a reserve account report "attested" by auditors[2] which revealed its reserves were composed of the following types of assets: 61% in risk-free assets like cash and equivalents; 12% in treasury bonds (which may be absent of default risk but are not as liquid as cash); and 27% in assets that could experience losses, such as commercial paper, corporate debt and certificates of deposit with foreign banks.[3] After some public scrutiny, the consortium announced in August a change in the composition of its reserves to include only cash and short duration US Treasuries, which was fully accomplished in September. Contrasting to Tether, the USD coin consortium claims that all the dollar-denominated assets backing the stablecoin are held in segregated accounts with US regulated financial institutions.

1. This consortium comprises Circle and Coinbase, which is a major exchange. Currently, in the Coinbase internet site, it can be found the following description: "USD Coin (USDC) is a stablecoin redeemable on a 1:1 basis for US dollars, backed by dollar denominated assets held in segregated accounts with US regulated financial institutions".

2. Independent accountant's report, by Grant Thornton LLP.

3. Until August, Coinbase's website misleadingly described USD Coin as backed completely by dollars "in a bank account".

4.1.3. Money laundering and financing of terrorism.

Stablecoins may be used as a tool for money laundering and terrorist financing (ML/TF) given (i) its ability to promote anonymity, (ii) the higher probability of mass adoption of this type of virtual asset,[51] and (iii) its potential for global reach.

Anonymity is related to the way the stablecoin ledger and user interface is designed. Decentralised ledgers with no central entity monitoring transactions, public ledgers blocking access to customer identification and also the possibility of making peer-to-peer transfers through unhosted wallets[52] are all aspects that allow for anonymity.

51. Exceptionally in this section of the paper it is used the term "virtual asset" instead of "crypto-asset" for consistency purposes with the Anti-Money Laundering Directive (Directive (EU) 2015/849 of the European Parliament and of the Council, of 20 May 2015).

52. Unhosted wallets are wallets which are not hosted by a third-party, such as a financial institution or other entity from the financial system.

The ML/TF risks related to anonymity in stablecoins were addressed by the FATF, on October 18th 2018, when it updated its Recommendations to clarify that they are applicable to virtual assets and VASP. Additionally, in June 2019, the FATF updated its Recommendations requiring countries to:[53] (i) assess and mitigate risks associated with virtual asset activities and service providers; (ii) license or register VASP and subject them to supervision or monitoring by competent national authorities; and (iii) implement sanctions and other enforcement measures when service providers fail to comply with their AML/CFT obligations. The FATF further determined that countries should adopt appropriate measures to ensure that VASP are able to assess and mitigate their ML/TF risks as well as implement the full range of AML/CFT preventive measures under the FATF Recommendations. Also in June 2019, FATF published Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers,[54] later updated in October 2021.[55]

Regarding anonymity, in a report published in June 2020, the FATF highlighted that "if unmediated peer-to-peer transactions become easier and more secure" than those performed through VASP "this could increase the number and value of payments not subject to AML/CFT controls and could present a material ML/TF vulnerability if mass-adopted" (FATF (2020)).

The Updated Guidance published by FATF highlights that stablecoins, unlike other virtual assets, have a higher probability of being mass adopted as a means of payment due to the fact that, as an inherent aspect of their nature, they are designed to overcome price volatility issues, thus further scaling the ML/TF risk associated to the use of virtual assets.[56]

The third most relevant factor regarding ML/TF risk is the global reach of a stablecoin. The easier a stablecoin can be transferred and exchanged over the internet and used to make cross-border payments, the more difficult it is to determine who is responsible for ensuring AML/CFT compliance and, above all, for supervising the different stakeholders involved.

In order to mitigate this risk, the FATF determined that countries should (FATF (2022)): (i) ensure that VASP obtain and hold required and accurate originator and

53. FATF Public Statement on Virtual Assets and Related Providers, June 2019.

54. Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers, June 2019.

55. FATF Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers, October 2021, which included, namely, guidance on how the FATF Standards apply to stablecoins and clarified that a range of entities involved in stablecoin arrangements could qualify as VASP under the FATF Standards.

56. According to FATF Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers, October 2021, "(. . .)Reduction of volatility could encourage their widespread use as a means of payment or transferring funds, particularly where they are sponsored by large technology, telecommunications or financial firms that could offer global payment arrangements(. . .)".

beneficiary information regarding crypto-asset transfers[57] and (ii) make it available to appropriate authorities.[58]

As stated by the FATF (2020) "the degree to which these risks materialise depends on the features of the specific so-called stablecoin, the extent to which jurisdictions have effectively implemented AML/CFT mitigating measures, and also, critically, on the extent to which there is mass-adoption of the so-called stablecoin".

As such, stablecoins, particularly those with potential for mass-adoption and that can be used for P2P (person-to-person) transactions[59] should be constantly monitored to ensure that the risks identified are mitigated through the adoption of concerted measures, before such arrangements are launched (with particular emphasis on those contained in the FATF Standards) and international cooperation between jurisdictions.

4.1.4. Payment systems.

Stablecoins, if widely used as means of payment and depending on its design features, can be characterised as a payment instrument,[60] a payment scheme[61] or a payment system.[62] As such, if not properly managed, stablecoins can cause disruptions in the economy and be a source of systemic risk that might threaten the conduct of monetary policy and the smooth operation of payment systems.[63]

Moreover, in its quality of settlement asset, stablecoins can also impact the efficiency and safety of overall payment systems if its credit and liquidity risk are not properly mitigated.

---

57. On this topic, last December 1st 2021, the European Council announced it will negotiate a proposal to require VASP to collect and make accessible full information that allows traceability of crypto-asset transfers.

58. Travel rule, foreseen on FATF Recommendation 16, which is also applicable to VASP (FATF - Targeted Update on Implementation of the FATF Standards on Virtual Assets and Virtual Assets Service Providers – June 2022).

59. FATF Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers, October 2021.

60. According to the Eurosystem oversight framework for electronic payment instruments, schemes and arrangements (PISA Framework), "an electronic payment instrument is a personalised device (or a set of devices), software and/or set of procedures agreed between the end user and the payment service provider to request the execution of an electronic transfer of value".

61. According to the Eurosystem oversight framework for electronic payment instruments, schemes and arrangements (PISA Framework) "a scheme is a set of formal, standardised and common rules enabling the transfer of value between end users by means of electronic payment instruments. It is managed by a governance body".

62. Regulation of the European Central Bank (EU) No 795/2014 of 3 July 2014 on oversight requirements for systemically important payment systems (SIPS Regulation), defines a payment system as "a formal arrangement between three or more participants, (. . .) with common rules and standardised arrangements for the execution of transfer orders between the participants".

63. Opinion of the European Central Bank of 19 February 2021 on a proposal for a regulation on Markets in Crypto-assets, and amending Directive (EU) 2019/1937.

As a payment system, a stablecoin arrangement based on decentralised technology will benefit from the advantages of having many parties involved (e.g., with reduced probability of experiencing a single point of failure). However, it will be a payment system that at the same time is potentially more exposed to cyber risk given that the attack surface increases with the increase in the number of entities involved.

Another important dimension that can become a source of systemic risk are interdependencies between stablecoin arrangements and the existing payment systems, payment schemes and payment service providers. For instance, the user interface of a stablecoin arrangement while providing end users with a point of access could have a high degree of interaction with the existing payment infrastructure and therefore risk contagion effects could occur.

To address the several risks that stablecoin arrangements may pose to the economy and maintain the safety and efficiency of payment systems, adequate regulatory and policy frameworks are essential. Nevertheless, they must be technology-neutral and not hinder innovation.

Overall, and alike payment systems, stablecoin arrangements should be designed and operated in a way to avoid disruptions in the financial system. For instance, a stablecoin arrangement without clear and transparent rights and obligations can easily be vulnerable to loss of confidence. This type of ambiguity and uncertainty is not allowed for any traditional payment system, especially if it has global reach, and should also not be acceptable in a stablecoin arrangement. In general, to avoid disruptions in the financial system, it is essential that a stablecoin arrangement has appropriate risk management frameworks and tools to mitigate possible sources of risk.

Although currently there is no specific legal framework applicable to stablecoins, in case a stablecoin qualifies as a payment instrument, scheme and/or system, based on the principle "same business, same risk, same rules", such stablecoin would be subject to the relevant Eurosystem oversight frameworks (i.e., the Eurosystem oversight framework for retail payment systems[64] and the Eurosystem oversight framework for electronic payment instruments, schemes and arrangements (PISA Framework)[65] and, in case it qualifies as a systemically important payment system, would also be subject to the ECB Regulation on oversight requirements for systemically important payment systems (i.e., SIPS Regulation).[66]

The Eurosystem oversight frameworks and the SIPS Regulation are based on the Principles for Financial Market Infrastructures (PFMIs) set up by the Committee on Payments and Market Infrastructures (CPMI) and the International Organization

64. Revised oversight framework for retail payment systems.

65. Eurosystem oversight framework for electronic payment instruments, schemes and arrangements (europa.eu).

66. Regulation of the European Central Bank (EU) No 795/2014 of 3 July 2014 on oversight requirements for systemically important payment systems.

of Securities Commissions (IOSCO), which are currently being reviewed to be applicable to systemically important stablecoin arrangements (BIS (2022a)).

Considering the risk that stablecoins may pose to the smooth operation of payment systems, the recently published Eurosystem Policy on the use of prefunding by ancillary systems[67] determines that the use of prefunding[68] by ancillary systems in the real-time gross settlement (RTGS) system owned and operated by the Eurosystem (TARGET2) is "expressly not permitted for use cases such as the issuance of stablecoins to the public".

A survey from BIS (BIS (2022c)) reveals that according to central banks available data, crypto-assets and stablecoins are not being used widely or significantly as a payment instrument both for domestic and cross-border payments. Instead, they have only trivial use or are used by niche groups. However, since stablecoins aim to be a payment solution that facilitates cross-border payments, with possible worldwide reach (associated with the huge customer base of technology companies), there is a high potential for interference with the central banks' key functions which justifies the increase in the analysis performed by central banks on the potential impact they can have on monetary policy and financial stability (BIS (2021b)).

4.1.5. Cybersecurity.

Stablecoins directly relate to the inherent weaknesses of their underlying digital systems to cyber-attacks, when compared with physical cash issuing. Additionally, one needs to take into account that in the last years, cyber incidents targeting crypto-asset platforms have been increasing and are still on the rise, resulting in significant losses to clients as well as in increasing risks of systemic impact.

Although not directly related, recent fraud based cyber-attack (e.g., to digital wallets), have uncovered the susceptibility of such systems and underlying infrastructures to cyber-attacks.

From that perspective, hacking as a whole might be considered as the primal cyber risk. There are today several examples of stablecoin issuers and operators that have been hacked. This usually leads to the crash of the tokens that represent the stablecoins. This risk becomes wider when considering that the systems in which the stablecoin is based on can have vulnerabilities which can be exploited. Other cyber risks, which are still unknown due to new technology paradigms, can rise and undermine the stability of stablecoins.

Finally, one can simply assume that the majority of the cyber-attacks and risks that are nowadays known can be applied to stablecoins. However, we should also

67. ECB - Policy on the use of prefunding by ancillary systems, January 2022.

68. For the purpose of the referred policy, "prefunding" is defined as a practice where an ancillary system participant places funds in central bank money under the control of the ancillary system for settlement purposes.

consider the possibility for these risks to be augmented due to the cyber-inherent risks related to the technical ecosystem that supports the stablecoin itself.

Public authorities, regulators or similar, should enforce strict operational and cyber risks mitigation controls for stablecoins. Such measures should be implemented to make sure stablecoin issuers use adequate and appropriate context-aware systems, policies and procedures. These represent the set of high-level controls that should address the aforementioned cyber risks.

Existing frameworks focused on cybersecurity should be widely adopted and evolved in the direction of reducing the probability of a successful cyber-attack. Standards issued by the International Organization for Standardization (ISO), the National Institute of Standards and Technology (NIST) and other entities, should be widely adopted and enforced.

4.1.6. Data protection.

Risks related to the treatment of personal data may arise in a stablecoin arrangement, especially when it is not clear to all parties involved how personal data is managed within the stablecoin ecosystem.

It is undisputed that stablecoin transfers stored within the network, inherent online identifiers provided by devices or public keys do in fact involve personal data within the meaning of the General Data Protection Regulation (GDPR) (Buocz *et al.* (2019)).

The GDPR aims to protect natural person's personal information and hold organisations accountable for any wrongdoing or misuse of personal information. The compliance assessment of stablecoins arrangements vis-a-vis the GDPR may require a case-by-case analysis due to the innovative and different types of technologies involved in each solution.

Stablecoin challenges associated to data protection are related to principles such as the right to erasure, the right to privacy, the minimisation of data, accountability and the limitation purpose, among others.

Considering that stablecoin arrangements are based on DLT, the right to erasure may be difficult to implement, since the DLT is an append-only data structure.[69] The minimisation principle may also be challenged since DLT networks achieve resilience through replication of the ledger's data in many nodes, guaranteeing that even if one or several nodes fail, the data remains unaffected. However, this technological design can be assessed by the Data protection authorities, conducting a risk analysis through a data protection impact assessment under guidance and opinion of the European Data Protection Board, on accepting the risks in privacy terms and increasing resilience of the solution.

69. "Cryptographic hash-chaining makes the log tamper-evident, which increases transparency and accountability. Indeed, because of the hash linking one block to another, changes in one block change the hash of that block, as well as of all subsequent blocks." (European Parliament (2019)).

In terms of accountability, stablecoin arrangements may also raise concerns, especially in totally decentralised ecosystems where there are no responsible entities to which GDPR could be applied.

Against this background, the European Data Protection Supervisor (EDPS) was consulted on the MiCA Proposal and issued an Opinion[70] recognising that a clear legal framework is paramount to mitigate the risks related to data protection in stablecoins.

For sure, and according to the GDPR, any project of stablecoin will require: (i) a data protection impact assessment, containing the identification of the associated risks, measures, safeguards and mechanisms envisaged for mitigating those risks; (ii) appropriate technical and organisational measures to ensure the security of the personal data; and (iii) a clear identification of the responsible entities involved.

4.1.7. Consumer/investor protection.

Different stablecoin types may entail different levels of risk to consumers and investors, depending on the specificities of each arrangement.[71] Considering that the aim of stablecoins is to minimise fluctuations in value, consumers and investors may be tempted to use it as store of value and means of payment.

The uncertainty regarding the regulatory treatment of stablecoins has a direct effect on consumers and investors, which may be unaware of their rights and obligations and, in some cases, completely legally unprotected. As there is no common taxonomy on stablecoins, a case-by-case analysis is frequently adopted. However, from a consumers/investors' perspective, this evaluation should be previous to the stablecoins' issuance.

The setting of a clear regulatory framework applicable before the stablecoins' issuance (in particular, determining rights and obligations, users' safeguards, liability regime applicable and supervisory regime) is an elementary condition to ensure protection and to raise confidence among users.

Another crucial element to protect users is to encourage the disclosure of information. This topic is a milestone of the MiCA Proposal, which has among its objectives to foster appropriate levels of consumer and investor protection. Also on this topic, the FSB has recently issued two relevant high-level recommendations.[72]

The FSB points out that GSC arrangements should provide users and relevant stakeholders with comprehensive and transparent information on a number of

70. EDPS Opinion on the Proposal for a Regulation on Markets in Crypto-assets, and amending Directive (EU) 2019/1937.

71. For instance, the level of volatility is variable across different types of arrangements. Tokenised funds, which are collateralised and can be redeemed (similar to e-money), will in principle be less volatile and represent less risks to consumers/investors than algorithmic stablecoins, which do not request a collateral and work on expectations, being subject to crisis of confidence.

72. FSB (2020), recommendations 8 and 9.

aspects necessary to understand the functioning of the arrangement.[73] This and other relevant information[74] should be presented timely and adequately to users, with certain elements being disclosed on a regular basis, in order to allow users to make an informed decision.

Finally, security and data protection risks are key concerns for users. The experimental stage (somehow unknown and untested) of the technology used, the variety of participants and the users' lack of digital skills are risk intensifiers. The robustness of systems and infrastructures should be ensured as well as a framework of measures to mitigate security incidents and to guarantee that consumers' data and funds are protected.

Overall, with a view to safeguarding consumer/investor protection it is crucial to implement a clear regulatory framework applicable to stablecoins setting up requirements that could mitigate existent risks. Additionally, due to the cross-border inherent characteristic of stablecoins it is key to ensure close cooperation and coordination at national and international level, promoting information sharing and joint supervision among authorities.

4.2. Additional risks and challenges for central banks

4.2.1. Monetary policy transmission.

The potential use of a GSC as a means of payment and as a store of value on a large scale can significantly affect the implementation of monetary policy. This impact will differ if a GSC is pegged to the official currency of the respective jurisdiction or if it is pegged to one currency or a basket of currencies of different jurisdictions. In the first case, important considerations relate to the demand for safe and liquid assets - that are crucial to the operation of monetary policy - or to the possibility of a decline on banks' deposits, with potential effects in financial intermediation. In the second case, the transmission of domestic monetary policy may eventually weaken and, ultimately, monetary sovereignty could be lost.

73. According to FSB (2020), GSC arrangements should at least be transparent on the following: (i) governance structure; (ii) allocation of roles and responsibilities assigned to operators or service providers; (iii) operation of the stabilisation mechanism; (iv) investment mandate for the reserve assets; (v) custody arrangement and applicable segregation of reserve assets; (vi) available complaints or redress procedures and dispute resolution mechanisms; (vii) information on risks relevant for users; and (viii) the nature and enforceability of redemption rights and the process of redemption.

74. Other relevant information to be disclosed should include: the amount and value of GSC in circulation, the composition of the assets in the reserve, a list of available exchange platforms and wallet providers, relevant modifications in the arrangement, etc.

GSC pegged to the official currency of the respective jurisdiction

In GSC pegged to the official currency of the respective jurisdiction, the funds delivered by agents for the acquisition of the GSC should be used in the constitution of a collateral reserve denominated in the currency of the same jurisdiction, potentially of a large dimension.

If the collateral reserve of the GSC is mainly constituted by high quality liquid assets (HQLA), which should be the case to minimise the credit and liquidity risks, the demand for HQLA would increase, possibly affecting the valuation of collateral for monetary policy operations, with potential implications in the volatility of interest rates in the repo markets and in the pass-through of monetary policy to prices (ECB (2020a)).[75] A possible reduction in the quantity of securities available in the market for monetary policy operations might also reduce the monetary policy space (for example, for purchases in quantitative easing programs or for collateral in credit facilities). Moreover, in case the GSC is backed by a very restricted basket of assets, the effects aforementioned would be exacerbated.[76]

Moreover, in a scenario of loss of confidence in a GSC, being of operational, financial or other nature, a significant and rapid increase in redemptions may occur, and, consequently, if the GSC is backed by HQLA the GSC issuer may be forced to quickly liquidate reserve assets, which may lead to losses in value (IMF (2021)). In an extreme scenario, monetary policy counterparties with a low over-collateralisation could face problems due to the devaluation of their collateral. Ultimately, if a run on a GSC happens and its issuer lacks a lender of last resort to meet liquidity needs, it may have a significant impact on financial stability as well as on monetary policy transmission.

Furthermore, the choice of the basket of assets backing the GSC may reduce commercial banks financing capacity while also impacting the central bank's balance sheet.

If funds delivered for the acquisition of the GSC would be invested in commercial banks' deposits, there would not be a significant change in the financing sources of the banking system (Lowe and Malloy (2021)). That would most likely entail a change in commercial banks' balance sheet composition, shifting from retail deposits to custody deposits of the GSC issuer.[77] As for the central bank's balance sheet, its dimension would remain unchanged.

75. A higher demand for HQLA could possibly affect the risk-free yield curve, the exchange rate and asset prices in general.

76. *E.g.* a basket containing solely a specific asset type which is also accepted in the Eurosystem's collateral framework.

77. One could also expect that the GSC issuer would opt for more established and less expensive solutions for the settlement of custodian services. Given that the most relevant players in that segment are currently in the US, euro area banks could probably face a partial elimination of its deposits funding base, while central bank's balance sheet could also shrink.

On the other hand, if funds delivered for the acquisition of the GSC are invested in short-term government securities or in other types of securities, commodities or crypto-assets, the impact in the financing sources of the banking system is difficult to anticipate, but most probably will be neutral to possibly negative (Liao and Caramichael (2022)). In particular, depending if the economic agents that sell those assets deposit or not in the domestic banking system the full amount of the funds received.[78] In case they do not, the central bank's balance sheet would contract, by a reduced demand for central bank monetary base.

Lastly, in a scenario where central banks would concede GSC issuers access to its deposit facilities, it could make matters worse for the banking system (Adrian and Mancini-Griffoli (2019)). This option can reduce the stability and increase the cost of banking institutions' market financing in a more significant way. In particular, competition for commercial banks' deposits may increase, with potential upside effects on their remuneration. In turn, the central bank's balance sheet dimension would remain broadly unchanged, at least at first, while its composition would shift from commercial banks reserves to deposits from GSC issuers.

In case of negative effects on the funding base of commercial banks, they may seek some additional financing through an increased use of monetary policy instruments, which could in turn trigger an increase in the central bank's balance sheet. In particular, when the GSC issuer is given access to deposit facilities in the central bank, it may even involve a central bank's balance sheet larger than without the GSC.

Finally, a GSC pegged to the official currency of the respective jurisdiction may strengthen the role of that currency in international payments and other financial flows. This can be seen as an alternative against the potential competition of other digital instruments referring to foreign currencies, either from private or other central banks initiative.[79] This reinforcement of the international use of such currency might bring substantial benefits for monetary policy in the respective jurisdiction, namely strengthening the policy transmission and autonomy or smoothing the effect of exchange rate shocks on consumer prices. On the other hand, it might lead to higher volatility of capital flows, exchange rate appreciation in periods of risk aversion or the need to secure liquidity supply lines on a global scale (ECB (2019c)). In other jurisdictions, a GSC can hinder the control of international capital flows that might be prejudicial to the implementation of monetary policy (IMF (2021)).

78. For example, if the GSC reserve invests in crypto-assets, the funds would most likely be held on a crypto exchange and not withdrawn from the crypto ecosystem.

79. For example, the proliferation of GSC referring to the US dollar is sometimes mentioned as a possible defense of the international role of the dollar. This contrasts with the approach in other jurisdictions that are more advanced in the process of issuing a central bank digital currency, as in the case of China (Catalini and Massari (2021)).

GSC pegged to one currency or a basket of currencies of foreign jurisdictions

The emergence of GSC referring to one currency or a basket of currencies of foreign jurisdictions may weaken the transmission of monetary policy in the domestic jurisdiction and, ultimately, lead to a loss of monetary sovereignty. The underlying monetary substitution diminishes the sphere of influence of monetary policy, since it limits the components of monetary liquidity over which the monetary authorities have direct control and it reduces the stability of money demand (He (2021)). The volume of issuance of the GSC and the associated fees or interest rates will not necessarily be determined by public policy concerns, namely related to macroeconomic stabilisation. Monetary policy ability to weather shocks will depend on whether the business cycle is synchronised with that of the GSC arrangement (IMF (2020)).

4.2.2. Financial stability.

GSC can adversely impact financial stability through different channels, especially if used as a means of payment and/or a store of value. In addition to these channels, the characteristics of each arrangement, in particular those related to the management of reserve assets, may reinforce the interlinkages with the traditional financial system with potentially negative effects on financial stability. There is broad consensus about the financial stability risks raised by GSC (G7 Working Group on stablecoins (2019), FSB (2020) and ECB (2020a)), although with different perspectives in terms of the probability underlying the scenarios that might trigger or enhance those risks.

If a GSC becomes a widely used means of payment, any operational disruption in the GSC arrangement may ultimately harm the financial and economic activities given the constraints that could arise in making payments, investments and other economic transactions. Like any other payment system, if liquidity, settlement, operational and cyber risks are not properly managed, the functioning of a GSC may be jeopardised leading to the potential materialisation of systemic risks. The severity of the impact would depend on the GSC uptake and on the extent to which other payment systems may replace the GSC. Additionally, the easy access to a GSC would facilitate and speed up the transfer of funds out of the traditional financial system, thus eventually exacerbating bank runs in times of stress.[80]

If a GSC becomes widely used as a store of value, it could impact financial stability through different channels. Firstly, GSC value fluctuations would have an impact on users' wealth and on their spending decisions. Secondly, to the extent

80. This effect may be attenuated if economic agents continue to assess stablecoins as a safe asset in these circumstances.

that a GSC could be perceived as a safe asset, it may be used as a substitute to bank deposits. Commercial banks' reaction to the decline in deposits may entail risks, having an impact on banks' (i) funding cost and composition, (ii) liquidity risk profile, (iii) lending volumes and rates, (iv) profitability, (v) ability to generate capital and (vi) capacity to collect information about their clients, which is key for risk assessment. However, there is also the possibility that part of the funds drained from the traditional banking system would revert to banks if bank deposits are part of the GSC reserve. Thirdly, the type of GSC underlying assets is also relevant to assess the financial stability risks at stake. The stability of GSC valuation is crucial for being considered as a store of value and, in this perspective, GSC will tend to have a wider share of safe assets. A significant demand for safe assets might cause a shortage of high-quality assets and/or influence their prices. Furthermore, an investment in foreign assets/currencies could entail a capital flow out of the country.

In addition to the aforementioned risks, a negative confidence effect in a GSC could undermine public confidence in payments and savings in general, and thus in the financial system as a whole. These confidence effects may derive from fragilities associated to the characteristics of the GSC arrangements.[81]

GSC' exposure to liquidity runs, that could be triggered by a loss in confidence or by significant shifts in the GSC value, may represent another source of financial stability risk, exacerbated by the absence of insurance schemes similar to deposit insurance or a lender of last resort that support the "traditional" banking sector. The swift liquidation of reserve assets to cover those redemptions could have, in turn, negative contagion effects on the financial system. Tradable assets' markets (e.g. short-term government debt market) could be affected by significant price (and yields) volatility, similar to that brought about by "fire sales". Furthermore, banks could also be impacted by a sudden deposit withdrawal if the GSC had a significant investment in these assets.

The interconnectedness with the "traditional" financial system may be heightened by the role stablecoins play in DeFi (Banco de Portugal (2022)). DeFi lending is usually done by depositing unbacked crypto-assets as collateral for taking out a loan denominated in a stablecoin. The growth in DeFi may thus lead to a growth in stablecoins' market. As stablecoins can be backed by fiat currency, bank deposits, sovereign debt and other liquid financial assets, the growth in stablecoins may result in increased holdings of these assets and a significant influence on its price.

81. In particular, (i) if the mechanism used to stabilise the value of the GSC does not adequately manage the financial risk associated with the reserve assets, (ii) if the GSC issuer lacks credibility or is perceived as not having sufficient loss-absorbing capacity to ensure GSC redemption requests or (iii) if the supporting infrastructure is not able to handle high transaction volumes according to users' expectations. In addition, the confidence of economic agents on GSC might be affected by potential failure or distress of issuers of the reserve assets.

While the interconnectedness with the traditional financial system is most direct in the case of stablecoins collateralised by liquid financial assets, a shock in the crypto market can spread to the stablecoins' market and into the traditional financial system.

For the time being, financial stability risks from GSC are limited, due to their relatively small scale and limited use cases, mainly around facilitating trading in other crypto-assets and with no material use as payments or store of value. Additionally, considering the reputational and confidence issues usually associated with crypto-assets, a scenario where a GSC is widely used as a store of value, alternative to bank deposits, may be considered less plausible (ECB (2020a)). However, we cannot ignore the significant increase in the relevance of these assets (in market capitalisation and turnover as presented in section 3) and, consequently, the financial stability risks should not be disregarded. To address this matter, the FSB issued 10 high level recommendations to address the risks that GSC can represent to financial stability (FSB (2020)).

4.2.3. The use of euro banknotes.

The more a GSC replicates some key features of cash, the more it might replace banknotes and coins in payment transactions. However, it is very unlikely that it will fully replace cash as a payment instrument. Instead of cash, it is more likely that a GSC will primarily compete with other electronic means of payment.

Although cash is clearly the dominant means of payment within the euro area, including in Portugal, its usage has experienced a slight decrease in recent years,[82] showing that consumers' payment behaviour is changing gradually.

The unique features of cash ensure that it will remain relevant in the future. Cash is the only form of money that people can keep without involving a third party or access to equipment, internet or electricity, it cannot be refused, it ensures consumer privacy and also guarantees non-traceability of transactions. Cash also provides payment and saving options for people with limited or no access to digital money or means of payment, contributing to financial inclusion, it has proven to be secure in terms of cybercrime, fraud and counterfeiting and, as central bank money, cash does not entail financial risks for either the payer or the payee.

A GSC may compete with cash, but only up to a certain limit. A GSC may in fact be easy to use, serve payment use cases and user segments that are typically underserved by existing solutions (e.g. cross-border payments) and, at the same time, appear to mitigate some relevant risks (e.g. loss of funds, fraud). However, like digital means of payment, it does not suit everyone. Therefore, only GSC that

82. ECB (2020b) shows that in terms of number and value in 2019, 73% of daily payments in the euro area (considering point-of-sale and person-to-person transactions) were made using banknotes and coins (79% in 2016). This proportion increases in Portugal to more than 80% (81% in 2016).

offer high levels of price stability,[83] credible redemption policies and more attractive remuneration rates (as possible those sponsored by reputable institutions), may lead their users to replace (part of) their cash reserves by such GSC.

When compared to a GSC, cash is more than just a payment instrument as it allows people to hold money for saving purposes without default risk and has proved to be resilient to existing alternatives as a store of value.[84]

Even in a scenario where a GSC satisfies the demand for storing value, it will likely coexist with, and not replace, euro banknotes as it is hardly imaginable that people would store their last resort assets in a digital form.[85]

In case a significant decline in the use of cash as a means of payment occurs, it would imply increasing dependence on private forms of money and private payment solutions. This could endanger (in an extreme scenario) the sustainability of the cash infrastructure and hamper the provision of adequate cash service in the future, although only up to a certain point, due to its function as a store of value. Additionally, a decrease in the demand for cash could also have impact on seigniorage income generated by central banks.

4.2.4. The international role of the euro.

Promoting a stronger international role of the euro is an important way of fostering "open strategic autonomy", a key objective of the EU. This would bring important benefits to the European economy, including lower transaction and hedging costs for companies and households, lower funding costs, improved access to capital and increased resilience to legal actions taken by other jurisdictions. A stronger role of the euro would also support a shift towards a more diversified system of global currencies, further strengthening global financial stability.

The widespread uptake of a GSC may impact the international role of the euro, even if the global appeal of currencies is more determined by fundamental economic forces, such as the size of the issuing economy in terms of global trade and finance, the soundness of economic policies, financial market depth and liquidity, and inertia in international currency use (ECB (2021b)).

The extent to which the international role of the euro may be affected by the emergence of a GSC depends on the GSC characteristics, in particular the currency or basket of currencies to which it is pegged.

---

83. Price stability in a GSC can only be guaranteed if safe assets (like physical cash or a CBDC) are held as collateral.

84. Since 2002, the number and value of euro banknotes in circulation have been rising, generally at a faster pace than economic growth and it continued to growth throughout 2020, mainly owing to higher uncertainty and a general impulse to hoard banknotes in crises. In fact, as with other crises, the increase in cash demand during the COVID-19 pandemic has been driven by precautionary motives, although this demand has come mainly from inside the euro area (ECB (2021a)).

85. A study (ECB (2021c)) suggests that the share of euro banknotes in circulation outside the euro area is between 30% and 50% of the total value of euro banknote circulation. The study presents evidence that these banknotes are used for both store-of-value and transaction purposes.

As already explained in section 4.2.1, a GSC pegged to the euro will increase the demand for safe assets denominated in euro and lead to a stronger international role of the euro. The circulation of this GSC within the euro area might even be encouraged by the absence of exchange rate risk, although users are likely to face higher credit, market and liquidity risks (Panetta (2020)).

Similarly, a GSC backed by assets denominated in a foreign currency would promote that currency's international use, possibly weakening the international role of the euro. However, widespread diffusion of a non-euro denominated GSC within the euro area seems unlikely, although its use for cross-border payments may gain some traction owing to low transaction costs, bundling effects and a large base of users.

The rise of GSC may be hampered, however, by the emergence of CBDC. Several central banks are currently considering the issuance of CBDC,[86] which, pending on their design, might support the internationalisation of their currencies by improving accessibility or helping them achieve reserve currency status (IMF (2020)).

5. Conclusions

In this paper we have explored the concept of stablecoin and "global stablecoin". We have made a stocktaking on the stablecoins' market and analysed the current (lack of) regulatory framework applicable to stablecoins and related activities/actors, both at national and international level. Finally, we have reflected on some of the major risks of stablecoins, namely: legal risks; the risk of affecting the smooth operation of payment systems; ML/FT related risks; consumer and investor protection risks and also risks that can mostly arise in global stablecoins, such as those related to monetary policy transmission and financial stability, among others.

We conclude that to manage the risks associated with the emergence and growing adoption of stablecoins in Europe, it is essential to create a common regulatory framework with a supervisory model applicable to stablecoins and its issuers within the EU.

As referred in the MiCA Proposal, "The crypto-asset market is still modest in size and does not yet pose a threat to financial stability. It is, however, possible that a subset of crypto-assets which aim to stabilise their price in relation to a specific asset or a basket of assets could be widely adopted by retail holders".

Aligned with this view, several authorities expressed concern on stablecoins and crypto-assets in general, and the various channels through which they may impact on financial stability. The BIS recently stated that "the growth of crypto-assets and related services has the potential to raise financial stability concerns and increase

86. For instance, the Eurosystem is currently exploring the possibility of issuing a digital euro that would complement cash, providing citizens with access to a safe form of money in the fast-changing digital world (ECB (2020a)).

risks faced by banks".[87] The president of the ECB and chair of the ESRB, Christine Lagarde, also declared in a recent speech that "systemic risk could easily arise from increasing interlinkages between the crypto ecosystem and the traditional financial system".[88] Fabio Panetta, member of the executive board of the ECB, stresses in a recent speech that "the recent crypto crash has highlighted that – without sound regulation – stablecoins are stable in name only".[89] For these reasons, financial stability risks, as other risks related to stablecoins, should not be disregarded.

Considering the specific nature of stablecoins and the risks presented, creating a common regulatory framework with a supervisory model applicable to stablecoins within the EU would help to ensure legal certainty, instil appropriate levels of consumer and investor protection, support innovation and guarantee market integrity and financial stability in the EU market, as pursued by the MiCA Proposal.

As is the case for most innovative issues, the analysis of stablecoins made in this paper is subject to change. Banco de Portugal should continue to monitor the stablecoins' markets and players, in particular in the regulatory field. The MiCA entrance into force may likely be one main driver of changes in the analysis and conclusions presented in this paper.

87. Second consultation on the prudential treatment of cryptoasset exposures, June 2022.

88. Welcome remarks by Christine Lagarde, President of the ECB and Chair of the European Systemic Risk Board, at the sixth annual conference of the ESRB, 8 December 2022.

89. Crypto dominos: the bursting crypto bubbles and the destiny of digital finance, 7 December 2022.

References

Adrian, Tobias and Tommaso Mancini-Griffoli (2019). "The rise of digital money." *IMF FinTech Notes No. 1*.

Banco de Portugal (2022). "Relatório de Estabilidade Financeira JUN.2022."

Banco de Portugal working group on crypto-assets (2020). "Occasional Paper on Crypto-Assets." *Banco de Portugal Occasional Paper No. 4*.

Bindseil, Ulrich, Patrick Papsdorf, and Jürgen Schaaf (2022). "The encrypted threat: Bitcoin's social cost and regulatory responses." *SUERF Policy Note No. 262*.

BIS (2020). "Central bank digital currencies: foundational principles and core features."

BIS (2021a). "CBDCs: an opportunity for the monetary system."

BIS (2021b). "Ready, steady, go? Results of the third BIS survey on central bank digital currency."

BIS (2022a). "Application of the Principles for Financial Market Infrastructures to stablecoin arrangements."

BIS (2022b). "Banking in the shadow of Bitcoin? The institutional adoption of cryptocurrencies."

BIS (2022c). "Gaining momentum Results of the 2021 BIS survey on central bank digital currencies."

Buocz, T, T Ehrke-Rabel, E Hödl, and I Eisenberger (2019). "Bitcoin and the GDPR: Allocating Responsibility in Distributed Networks."

Carney, Mark (2018). "The future of Money."

Catalini, Christian and Jai Massari (2021). "Stablecoins and the Future of Money." *Harvard Business Review August 2021*.

Chainalysis (2021). "The 2021 Geography of Cryptocurrency Report."

ECB (2019a). "Crypto-Assets: Implications for financial stability, monetary policy, and payments and market infrastructures."

ECB (2019b). "In search for stability in crypto-assets: are stablecoins the solution?"

ECB (2019c). "The international role of the euro."

ECB (2020a). "Stablecoins: Implications for monetary policy, financial stability, market infrastructure and payments, and banking supervision in the euro area."

ECB (2020b). "Study on the payment attitudes of consumers in the euro area (SPACE)."

ECB (2021a). "The expanding functions and uses of stablecoins."

ECB (2021b). "The international role of the euro."

ECB (2021c). "The paradox of banknotes: Understanding the demand for cash beyond transactional use."

ECB (2022a). "A deep dive into crypto financial risks: stablecoins, DeFi and climate transition risk."

ECB (2022b). "Stablecoins role in crypto and beyond: functions, risks and policy."

European Parliament (2018). "Virtual Currencies." *Monetary Dialogue July 2018*.

European Parliament (2019). "Blockchain and the General Data Protection Regulation: Can distributed ledgers be squared with European data protection law?"

FATF (2020). "FATF Report to the G20 Finance Ministers and Central Bank Governors on So-called Stablecoins."

FATF (2022). "International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation."

FSB (2020). "Regulation, Supervision and Oversight of "Global Stablecoin" Arrangements."

FSB (2022). "Assessment of Risks to Financial Stability from Crypto-assets."

G7 Working Group on stablecoins (2019). "Investigating the impact of global stablecoins."

He, Dong (2021). "Monetary Effects of Global Stablecoins." *Cato Journal Spring/Summer*.

HM Treasury (2021). "UK regulatory approach to crypto-assets and stablecoins: Consultation and call for evidence."

HM Treasury (2022). "UK regulatory approach to crypto-assets, stablecoins, and distributed ledger technology in financial markets: Response to the consultation and call for evidence."

IMF (2020). "Digital money across borders: macro-financial implications." *Policy Paper No. 50*.

IMF (2021). "The Crypto Ecosystem and Financial Stability Challenges."

Liao, Gordon Y. and John Caramichael (2022). "Stablecoins: Growth Potential and Impact on Banking." International finance discussion papers no. 1334, Board of Governors of the Federal Reserve System.

Lowe, David and Matthew Malloy (2021). "Global Stablecoins: Monetary Policy Implementation Considerations from the U.S. Perspective." Finance and economics discussion series no. 20, Board of Governors of the Federal Reserve System.

Nagas, Takeshi, Tomoyuki Tanak, and Takato Fukui (2021). "Blockchain & Cryptocurrency Laws and Regulations Japan."

OECD (2022). "Decentralised Finance ('DeFi'): why it matters and policy implications."

Panetta, Fabio (2020). "From the payments revolution to the reinvention of money."

President's Working Group on Financial Markets (2020). "Statement on key regulatory and supervisory issues relevant to certain stablecoins."

President's Working Group on Financial Markets (2021). "Report on stablecoins."

Occasional Papers

2020

1|20 Banco de Portugal TARGET balance: evolution and main drivers
Rita Soares | Joana Sousa-Leite | João Filipe | Nuno Nóbrega

2|20 Imputation of the Portuguese Household Finance and Consumption Survey
Luís Martins

3|20 The short-term impact of the COVID-19 pandemic on portuguese companies
Cristina Manteu | Nuno Monteiro Ana Sequeira

4|20 Occasional paper on crypto-assets
Banco de Portugal working group on crypto-assets

2021

1|21 Assessment of the exposure of the portuguese banking system to non-financial corporations sensitive to climate transition risks
Ricardo Marques | Ana Margarida Carvalho

2022

1|22 Climate change and the economy: an introduction
Bernardino Adão | António Antunes | Miguel Gouveia | Nuno Lourenço | João Valle e Azevedo

2|22 Um Indicador Compósito de Competitividade das Empresas
Mário Lourenço | Cloé Magalhães | Ana Martins | Fernando Martins | Eva Pereira Manuel Pereira | Rita Ponte | Hugo Reis

3|22 Modelling the financial situation of Portuguese firms using micro-data: a simulation for the COVID-19 pandemic
Carla Marques | Francisco Augusto | Ricardo Martinho

4|22 An economic estimate of capital stock at the firm level for Portugal
Ana Fontoura Gouveia | Manuel Coutinho Pereira

5|22 The Banco de Portugal balance sheet expansion during the last two decades: a monetary policy perspective
Joana Sousa-Leite | Diana Correia | Cristina Coutinho | Carmen Camacho

2023

1|23 Occasional paper on Stablecoins

Banco de Portugal working group on crypto-assets