

Economics and Business Review

Volume 10 (1) 2024

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<https://doi.org/10.18559/ebr.2024.1>

ISSN 2392-1641

e-ISSN 2450-0097

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Printed and bound in Poland by:
Poznań University of Economics and Business Print Shop

Circulation: 80 copies

Economics and Business Review

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The asset-backing risk of stablecoin trading: The case of Tether

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 Miguel Ángel Echarte Fernández²  Sergio Luis Náñez Alonso³

Abstract

This article aims to analyse the asset-backing risk of stablecoins, focusing on international accounting standards, classification criteria, and auditing standards and using Tether as a case study. It examines Tether's issuance, backing, controls, ratios, and regulations to assess risk transmission and mitigation. The results suggest a need for unified and strengthened accounting and auditing standards to enhance user confidence. Liquidity, solvency, and debt ratios were applied to Tether's balance sheets; while Tether has made efforts to increase its transparency, and although it possesses highly liquid assets, challenges remain regarding its liquidity, solvency, and debt. An independent auditors' valuation is crucial for investor confidence, demonstrating that more specific regulations are required for stablecoins. Future research should explore other stablecoins to comprehensively understand the accounting and auditing challenges in the field.

Keywords

- stablecoins
- auditing
- IFRS
- risk management
- volatility
- balance sheet

JEL codes: G15, M21, M41, M42, M48

Article received 23 December 2022, accepted 3 March 2024.

Funding: Research supported by project Finance for all (F4A), funded by the "Institución Gran Duque de Alba" and "Diputación provincial de Ávila" to Sergio Luis Náñez Alonso; under the grant 3364/2022.

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Suggested citation: Fernández, J. J., Fernández, M. Á. E., Alonso, S. L. N. (2024). The asset-backing risk of stablecoin trading: The case of Tether. *Economics and Business Review*, 10(1), 57–80. <https://doi.org/10.18559/ebr.2024.1.1211>



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Introduction

Stablecoins are defined as assets that attempt to replicate the behaviour of money issued by a central bank in order to stabilize their value (Giudici et al., 2022; Liao & Caramichael, 2022). Stablecoins have a strong correlation with Bitcoin (Elsayed et al., 2022; Nández Alonso et al., 2021; Yi et al., 2018) and act as a “haven” against the high volatility of the cryptocurrency asset market (Almeida & Gonçalves, 2022; Conrad et al., 2018; Łęć et al., 2023), addressing this shortcoming by linking their value to an underlying entity (Berentsen & Schär, 2019). To this end, stablecoins are backed fully or partially by legal tender (such as the dollar, pound, or euro) (Hoang & Baur, 2021); highly liquid reserves (such as government treasuries) (Benedetti & Smith, 2022; Chen, 2020; Lyons & Viswanath-Natraj, 2020); or commodities such as precious metals (Chowdhury, 2019). Stablecoins are also widely used to provide liquidity in decentralized exchanges (Catalini & Shah, 2021; Giudici et al., 2022) and they play an essential role as a peer or counterparty to many cryptocurrencies, allowing the investor to make a quick conversion from their wallet to a centralized exchange, from which users withdraw their funds as fiat currency (Catalini & Shah, 2021; Grobys et al., 2021; Jarno & Kołodziejczyk, 2021). In January 2024, the market capitalization of the three largest current stablecoins—Tether (hereafter USDT), USD Coin (hereafter USDC), and DAI—exceeded USD 125 billion, according to CoinMarketCap (2024). Stablecoins aim to offer investors price stability, either by being backed by specific assets or using algorithms to adjust their supply based on demand (Arslanian, 2022). Cryptocurrencies are normally used for speculative purposes (Auer & Tercero-Lucas, 2022), although they have also been adopted by some countries as legal tender (see the case of El Salvador) (Alonso et al., 2024). Stablecoins, on the other hand, are not an object of speculation but are used “to facilitate everyday transactional activities” (Arslanian, 2022; Barry, 2020). However, stablecoins also present several risks that all users (both individuals and companies) should be aware of (Arner et al., 2020). First, there is counterparty risk; by relying on a third party to print money and maintain a stable cryptocurrency, the currency used as backing could be fractionally reserved rather than fully backed (Arner et al., 2020; Mikhaylov, 2023). Second, there is a risk of centralization;

accounts can be misappropriated, locked, or accessed by unauthorized third parties (Mikhaylov, 2023), which are the same centralization risks as those faced by fiat currencies. Third, there is the risk of algorithm manipulations (Clements, 2021); as most decentralized stablecoins live inside smart contracts, in protocols such as Ethereum or Stellar, there is a risk that the algorithm that keeps the currency stable could be manipulated by a third party. In this research, given the current importance of stablecoins and their potential use by companies (Moura de Carvalho et al., 2022), we have focused on the stablecoin Tether (USDT) as a representative of the stablecoin sector in order to analyse these risks from an audit and accounting point of view. Currently, there is no consensus on how to treat assets stored in the blockchain that are part of the financial statements of an entity such as Tether (Alvarez-Pincay et al., 2018; Hsieh & Brennan, 2022).

The objective of this article is threefold. Firstly, this article analyses the accounting and auditing rules governing stablecoins. Secondly, this article analyses the evolution of risk support by studying Tether reserves using third-party audit reports. Thirdly, this article measures Tether's risk support in terms of its liquidity, solvency, and debt ratios.

This article is structured as follows: Section 1 examines stablecoins through the lens of international accounting and auditing standards such as the International Financial Reporting Standards (IFRSs), International Accounting Standards (IASs), Generally Accepted Accounting Principles (GAAPs), and Accounting Standards Codification (ASC). Section 2 provides a literature review of the accounting and auditing standards that are applicable to stablecoins. Section 3 shows the methodology of this research. Section 4 analyses the composition of Tether's assets and its liquidity, solvency, and debt ratios. The conclusions are presented in the last Section.

1. Accounting and auditing standards for stablecoins

This paper starts by analysing whether stablecoins should be treated as "money" or as a different asset class. The International Accounting Standards Board (IASB) is the regulatory body that creates and issues the International Financial Reporting Standards (IFRSs). These have been applied or adapted by individual countries and the EU. According to the EU regulation 1606/2002 (BOE, 2002), the IFRSs adopted by the EU are mandatory for the annual accounts of listed consolidated companies, including banks and insurance companies. However, member states of the EU have the right to implement these IFRSs as mandatory or optional elsewhere.

Regarding stablecoins, the EU has not expressly stated its position on the appropriate way to record and value cryptocurrencies. However, it has im-

plemented a regulation known as the “MiCA” (Market in Crypto-Assets). Moreover, under its umbrella, so-called electronic money tokens (EMT) or e-money tokens are considered a type of crypto asset and regulated with respect to the value of a fiat currency of legal tender in order to grant them a stable value. Although MiCA demands that crypto assets have a white-paper, authorization to operate, and a series of responsibilities and obligations to their providers (Sempere et al., 2021), it does not regulate their accounting or auditing. On the other hand, there is draft regulation called the “Cryptocurrency Holding”, dating from 2019, which includes cryptocurrencies, stablecoins, etc., and may register them in inventories in the form of a “stock”, as in the “stock of cryptocurrencies”. They may be recorded in inventories, in case they are held for sale in the ordinary course of business, as established in the International Accounting Standards (IAS) 2 (ICAC, 2023). In other cases, as they are intangible assets, according to IAS 38, that rules out the possibility of recording them as financial assets or cash, according to IAS 32 (ICAC, 2023). This is because, according to the IASB committee, “cryptocurrencies should not be recognized in the financial statements according to the provisions of IAS 32” (ICAC, 2023), as, due to their nature, they do not comply with any of the definitions of financial assets, which are, according to the IAS, “(a) cash; (b) an equity instrument of another entity; (c) a contractual right to receive cash or another financial asset from another entity; (d) a contractual right to exchange financial assets or financial liabilities with another entity under specified conditions; or (e) a specific contract that will or may be settled using the entity’s equity instruments” (IASB, 2019; 2021). Uniquely, stablecoins meet two of these definitions: in some cases, they behave as a contractual right to receive cash or another financial asset from another entity (Baker et al., 2023; Procházka, 2018; Torchelli & Símaro, 2021); in other cases, they are a contractual right to exchange financial assets or liabilities with another entity under specific conditions (Baker et al., 2023; Liao & Caramichael, 2022). It follows from the operation of Tether and other stablecoins that a token (USDT), once issued, becomes the user’s property, giving the user an immediate settlement right for the principal payment minus fees. On the other hand, the company expects to earn economic returns through the interest it earns using the capital received in exchange for the issuance of these tokens, and not through the token itself (Torchelli & Símaro, 2021). In other words, the company does not sell USDTs; it simply issues them in exchange for collateral in trust (Murialdo & Belof, 2022).

Regarding their valuation using IAS 2—Inventories, as stated in the IASB report (IASB, 2019), cryptocurrencies have characteristics that are compatible with inventories, as, although they do not meet all the conditions of an inventory, they can be held for sale in the entity’s ordinary course of business. Therefore, when stablecoins are controlled by an entity and held for sale, they are initially recognized as having a lower cost (acquisition or transformation

cost) and net realizable value. Upon subsequent measurement, a net realizable value model should be applied. In addition, IAS 2 (ICAC, 2023) allows for the assigning of their value using the retail method, the specific identification of their costs, and the First in, First Out (FIFO) approach. Finally, before their derecognition as inventories, impairments and reversals are to be recorded where applicable.

Regarding IAS 38—Intangible Assets (IASB, 2021), the IASB determines that, in cases where IAS 2 does not apply due to the lack of a “held for sale in the ordinary course” status, stablecoins should be recognized as an intangible asset following IAS 38 (IASB, 2019). The IASs state that intangible assets should be initially recognized at cost. Upon subsequent measurement, an entity can choose between cost and revaluation models. The IASB defines the disclosure of certain financial information as necessary to properly understand the entity’s financial statements. In this respect, it delineates the following points: If stablecoins are valued as inventories, the disclosures indicated in IAS 2, paragraphs 36 to 39, must be made (IASB, 2019). If stablecoins are measured as an intangible asset, the disclosures indicated in IAS 38, paragraphs 118–128 (IASB 2019), shall be required. The IASB indicates, contrary to the valuation methods suggested in its report, that disclosures should be made if the asset is measured at a fair value, and that the disclosures required in paragraphs 91 to 99 of IFRS 13 should be made (IASB, 2019).

In the United States, accounting standards derive from the Financial Accounting Standards Board (hereinafter the FASB), recognized by the American Institute of Certified Public Accountants (hereinafter the AICPA). This work consists of developing financial and accounting reporting standards, which the FASB decrees in the form of regulations known as Generally Accepted Accounting Principles (GAAPs). The FASB has not explicitly applied GAAPs to cryptocurrencies, stablecoins, etc. However, the AICPA expressed its opinion on the correct treatment of cryptocurrencies, stablecoins, etc., in the US in the Audit Evidence—Specific Considerations for Selected Items (AICPA, 2019, 2020). According to this report, cryptocurrencies should be recognized as intangible assets and, therefore, they must be recognized in line with FASB standards for accounting purposes. Specifically, the Accounting Standards Codification (ASC) 350 on intangible assets, goodwill, and others should be followed. According to this standard, intangible assets should be recognized at cost on initial recognition, and subsequent measurements should consider whether the asset has a specified useful life, in which case it should be amortized, or whether its useful life cannot be reliably determined. In this case, no depreciation should be recognized. With regard to the recognition of impairment, FASB ASC 350-35-15 states that impairment should be recognized when appropriate, but, unlike the IFRSs, it prohibits the reversal of impairment. The AICPA also disallows the treatment of cryptocurrencies as cash or cash-equivalent items because they are not backed by government agencies

and because of the volatile nature of their prices (AICPA, 2019, 2020). They also may not be defined as financial assets, as they do not involve a contractual right that guarantees the owner a receipt of cash or other financial assets. In addition, in the US, these assets may not be considered inventory, because of their intangible nature, even if the sole purpose of holding them is for sale in the ordinary course of business. In the case of exchanges involving cryptocurrencies, the company must treat the receipt of cryptocurrencies in accordance with ASC 606: Revenue from contracts with customers, according to which the price of the cryptocurrencies received is measured at market value on the agreed date of the transaction. In their subsequent valuation, the cryptocurrencies will not be amortized, as they will be recognized as intangible assets with an indefinite useful life. However, they will be subject to depreciation if their market value is lower than the carrying amount, and the difference between these values will be recognized as a depreciation expense. The difference will be the new carrying amount of the asset, without the possibility of reversal. When an entity holds cryptocurrencies, stablecoins, etc., through a third-party custodian, the recognition of these cryptocurrencies may be made in the financial statements of the third party or of the entity. The control of the assets is the parameter that will indicate which statements they should appear in.

The fair value of a cryptocurrency should be determined by considering the value available in its principal market or, if it does not have a principal market, the most profitable market. Because cryptocurrencies are traded in multiple markets, an entity needs to assess the volume and reliability of their information to consider one market as the principal market. Moreover, because cryptocurrency markets are not typically closing markets, a closing price is not available and other means of establishing the closing time must be used. These can be the closing time of the entity, the usual closing time of local markets, etc. (AICPA, 2019, 2020). These standards are set out in Table 1.

The auditing standards applicable to stablecoins depend on how they are classified. In the European Union, the standards that define an entity's audit responsibilities for inventories are the ISA 501 (Audit Evidence-Specific Considerations for Certain Areas) and ISA 505 (External Confirmations). Stablecoins held by EU companies may also be classified as intangible assets, in which case ISA 540 (Audit of accounting estimates and related disclosures) applies. Assuming that the stablecoin reserves held by the company have been accounted for as intangible assets, the auditor should consider whether the company prepares IFRS financial statements at an early stage and whether management has decided to do so. The auditor should also validate the impairments and reversals of impairments made by the entity.

In the United States, the Audit Evidence—Specific Considerations for Selected Items (AICPA, 2019) applies. In this case, it is recommended that stablecoins and cryptocurrencies should only be classified and presented in

Table 1. Accounting classifications of stablecoins according to IFRS-EU and US-GAAP

Classification	Period	IFRS-EU	US-GAAP
Inventory/ stocks	initial assessment	the lower value of the cost (cost of acquisition or processing) and the net realizable value	not applicable
	subsequent valuation	net realizable value	not applicable
	impairment and reversal	yes	not applicable
Intangible assets	initial valuation	cost	cost
	subsequent valuation	cost model, or revaluation model	amortized cost, if depreciation applies, otherwise at cost
	impairment and reversal	yes	yes, but no reversal is applied

Source: author’s work based on IAS 2, IAS 38 (IASB, 2019), and ASC 350 (AICPA, 2019).

the financial statements of US companies as intangible assets. The US auditing standard particularly relevant for an auditor’s work, in terms of verifying and obtaining evidence of intangible assets, is AU-C 540—Auditing Accounting Estimates and Related Disclosures.

Concerning EU audits, since stablecoins are not a physical component in practice, ISA 501 is not applicable to this type of asset audit. However, in its application guidance and other explanatory notes, there is a reference to another standard, specifically in paragraph A15, which refers to ISA 505 on external confirmations. According to this, as long as the stablecoins are held in a wallet, the auditor may request confirmation from the manager of the wallet. Again, this is a matter of confirming the existence and status of the stablecoins held by the audited client.

2. Literature review on the accounting and auditing of stablecoins

Ultimately, stablecoins have proven challenging for many regulators, as they represent the difficult task of balancing financial stability with innovation (Ferreira, 2021; Giudici et al., 2022; Hsieh & Brennan, 2022; Nájuez Alonso, 2019).

Various authors have pointed out the need to improve accounting and auditing procedures, such as Moura de Carvalho et al. (2022), who indicated that “we identify the need to adapt current auditing procedures and create new ones”. The same position is defended by Kampakis (2022), who, in his article auditing a project based on stablecoins, concludes that “the audit of stablecoins is still a new area and there is no established set of methods to carry it out” in such a way that risk can be minimized. In addition, Melo et al. (2022); Náñez Alonso (2019); Sanz-Bas et al. (2021) or Vučinić & Luburić (2022) argue that regulation is necessary, but that national and international collaboration is key for it to have the desired effects. Ultimately, as pointed out by Almeida & Gonçalves (2022), this regulation can ensure that these assets are seen as safe places. Therefore, regulators must take a broader, long-term view of stablecoins beyond their perceived risks and accept their advantages as well (Ferreira, 2021; Vučinić & Luburić, 2022). However, one should not lose sight of what is indicated by Náñez Alonso (2019) or Travkina et al. (2022); these currencies can be used to avoid international sanctions or restrictions. In addition, another risk is that stablecoins’ regulation is very changeable, so it is possible that these issues will be resolved in the medium term and that a stable, reliable, and unified framework for the accounting and auditing regulation of stablecoins will be generated.

The large-scale use of global stablecoins can have an impact on both large and small open economies, with a greater impact on the sovereign monetary system of small economies (Li & Shen, 2021; Liao & Caramichael, 2022). To address these potential impacts and risks, Li and Shen (2021) propose strengthening judicial investigations and planning global cooperation and coordination arrangements. There are some academic studies on the regulatory need for stablecoins. Arner et al. (2020) focus on financial regulation and conclude that it would be best to integrate supervisory requirements into the stablecoin systems themselves, which would allow for “integrated supervision”. Sood et al. (2023) identify the lack of a clear regulatory framework as the second biggest risk and difficulty for the acceptance of stablecoins and their use. The same conclusion is reached by Andryushin & Kochergin (2022) and Bullmann et al. (2019), who indicate that the integration of stablecoins into a modern monetary and payment system can only occur if there is an adequate and coordinated regulation of them by all monetary authorities. Briola et al. (2023) argue that the lack of adequate regulation and collateral, inadequate decentralised financial frameworks, and a dependence on liquidity providers are valuable lessons from the collapse of USDTs. Sidorenko (2019) points to the need for a clear financial regulatory framework to reduce volatility and risk. Meanwhile, Kozhan and Viswanath-Natraj (2021) analyse risk based on the case of the Maker DAO DAI stablecoin and conclude that the introduction of secure collateral has increased parity stability. Regarding accounting and auditing procedures, several authors such as Moura de Carvalho et al. (2022)

have pointed out the need to adapt current auditing procedures and create new ones. Additionally, Kampakis (2022) indicates that “the audit of stablecoins is still a new area and there is no established set of methods to perform it” so that risk can be minimised. Melo et al. (2022), Nández Alonso (2019) and Sanz-Bas et al. (2021) argue that accounting regulations are necessary, but national and international collaboration is key for them to have the desired effects. Ultimately, as noted by Almeida and Gonçalves (2022), such regulations can ensure that these assets are considered safe havens. However, despite various studies, it is not yet clear how best to regulate these assets, given their global reach (Klages-Mundt et al., 2020). There are several studies that have dealt with stablecoins and the regulation and management of their risk from an accounting and auditing point of view. Thus we can cite the study by Eichengreen et al. (2023), where the risk of the devaluation of Tether is analysed, indicating that “The average probability of devaluation during a year is 60 basis points, increasing to 200 basis points during the cryptocurrency crashes in March 2020 and March 2022”; thus, it is necessary to develop risk management models from an accounting point of view, as proposed by Klages-Mundt et al. (2020), and from an audit point of view (Liu et al., 2020) using the Mover system. These authors, joined by Kampakis (2022), agree on the need to develop a three-step risk assessment framework to investigate stablecoin arrangements and quantitatively assess their risks. To all this, Catalini & Shah (2021) and Smith (2023) propose that “stablecoin issuers comply with the capital and liquidity standards codified in the Basel accords and maintain adequate capital and liquidity buffers”.

3. Data and methodology

3.1. Data

To analyse the evolution of Tether’s assets, information has been extracted from all the audits available at the date of this study. These audit reports and their dates are listed in Table 2.

Table 2. Tether audit reports

Audit report by	Date
Audit by Friedman LLP	September 15, 2017
Audit by Freeh, Sporkin & Sullivan LLP	June 1, 2018

Audit report by	Date
Audit by MOORE	February 28, 2021
Audit by MOORE	March 31, 2021
Audit by MOORE	June 30, 2021
Audit by MOORE	September 30, 2021
Audit by Mha CAYMAN	December 31, 2021
Audit by Mha CAYMAN	March 31, 2022
Audit by BDO	June 30, 2022
Audit by BDO	September 30, 2022
Audit by BDO	December 31, 2022
Audit by BDO	March 31, 2023
Audit by BDO	June 30, 2023
Audit by BDO	September 30, 2023

Source: own work, data from (Tether, 2023).

3.2. Methodology

A qualitative analysis of Tether is conducted using the IFRS methodology, consistent with previous assessments of other assets (Ramos, 2021; Smith, 2023; Tache, 2020). This analysis utilizes information extracted from the audits available before the date of the study, as detailed in the data section. This qualitative analysis examines the impact of Tether, a stablecoin, on accounting and auditing procedures, employing the IFRS methodological perspective (Coccaro, 2021; Hsieh & Brennan, 2022; Kampakis, 2022; Smith, 2023). In addition, other queries were raised with the bodies that interpret and promulgate the accounting standards mentioned in the regulatory review above. Given the novelty of stablecoins, the support of these consultations is crucial to understanding their nature and, therefore, their place in the financial statements of both the issuers and companies that use cryptocurrencies or tokens for other purposes (Liao & Caramichael, 2022; Moura de Carvalho et al., 2022). Accurately classifying stablecoins and executing their audits will mitigate their risks and decrease financial stress for firms (Echarte Fernández et al., 2022; Kaczmarek et al., 2021; Moura de Carvalho et al., 2022; Smith, 2023). Proper classification and auditing will ensure their precise placement within financial statements, including the position of USDTs on Tether's balance sheet, further reducing their potential risks (Echarte Fernández et al., 2022; Kaczmarek et al., 2021; Moura de Carvalho et al., 2022; Smith, 2023).

Firstly, audit risk, which is the risk of expressing an inadequate opinion, can be defined as follows (Schultz et al., 2010; Smith, 2023):

$$\text{Audit Risk} = \text{Risk of material misstatement} + \text{Risk of detection}$$

Audit risk is composed of two other risks. First, the detection risk reflects the uncertainty of whether errors are detected during the audit. The risk of material misstatement is the likelihood of misstating financial statements before an audit engagement (Zaiceanu et al., 2015). The risk of misstatement is expressed by the formula:

$$\text{Risk of material misstatement} = \text{Inherent Risk} + \text{Control Risk}$$

Inherent risk is the susceptibility that an assertion about an item or another disclosure has been made before controls are performed. This assertion contains a misstatement that may be material (Schultz et al., 2010; Zaiceanu et al., 2015). On the other hand, control risk is identified as the likelihood that a misstatement is not prevented, detected, or corrected by the audited entity's internal control system (Schultz et al., 2010).

In the case of Tether, as the most representative stablecoin, scholars have analysed whether its reserves and backing have been sufficient to avoid transmitting these risks to the companies that have Tether on their balance sheets, which in turn could lead to them passing on this risk to their customers and other companies that operate with stablecoins (Kaczmarek et al., 2021; Kampakis, 2022; Moura de Carvalho et al., 2022).

Figure 1 illustrates the steps in the risk analysis of stablecoins from their use until they reach the end consumer. This is due to the existence, or not, of sufficient backing from the initial phase (issuance) and throughout the process of stablecoins being accounted for and audited.

In order to complete the above methodology, we have applied liquidity, solvency, and debt ratios to the data extracted from Tether's balance sheets. The

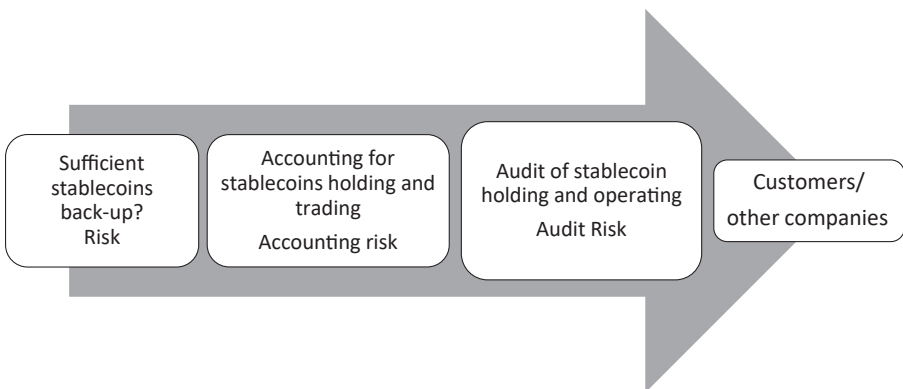


Figure 1. Applied methodology

Source: own work.

objective is to answer the question of whether Tether is sufficiently backed. This methodology has been previously applied in other sectors by authors such as Lessambo (2018, 2022), Lin et al. (2011), Xu et al. (2014), and Husna & Satria (2019).

Firstly, we applied two liquidity ratios, following Lessambo (2018, 2022); a liquidity ratio (short-term solvency), which measures a firm's ability to meet its short-term debt payments through its operating cycle, i.e. with all its current assets, and a cash ratio, which measures a company's ability to pay its short-term debts using only its cash on hand and cash receivable from customers or other debtors (realisable).

Then, we applied a solvency ratio, following Lessambo (2018, 2022) and Lin et al. (2011), which measures the firm's ability to pay all its debts through all its assets (the solvency and bankruptcy risk of the firm). We also applied a debt quality ratio, following Lessambo (2018, 2022), Xu et al. (2014) and Husna and Satria (2019), which measures the ratio of current liabilities to total liabilities. The results obtained are shown in Table 3.

4. Results and discussion

Tether is the largest stablecoin, with a market capitalization on November 1, 2023 of close to USD 100 billion, as shown in Figure 2.

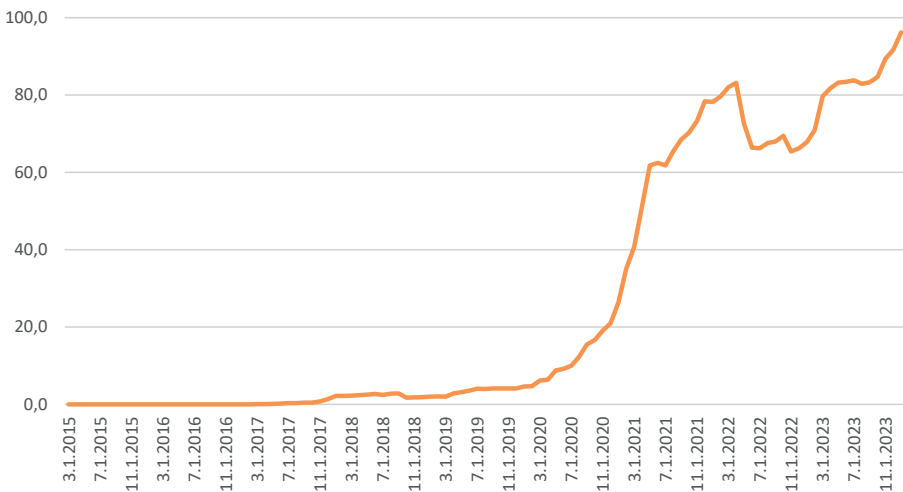


Figure 2. Market capitalization of Tether (billion USD)

Source: based on data extracted from (CoinMarketCap, 2024).

One of the elements that make up a company is its assets (which can be physical or intangible). Therefore, it is important to consider them as one of the aspects that provide a constant economic income. Tether is a stablecoin backed by US dollars, and its value remains stable at around USD 1 (Berentsen & Schär, 2019; Hoang & Baur, 2021). Additionally, stablecoins serve a crucial function in decentralized cryptocurrency exchanges, acting as a reliable counterpart to various cryptocurrencies and thus facilitating liquidity provision (Catalini & Shah, 2021). They enable investors to move their assets swiftly from their digital wallets to centralized exchanges, enabling an easy withdrawal to fiat currency (Catalini & Shah, 2021; Grobys et al., 2021; Jarno & Kołodziejczyk, 2021).

Therefore, knowledge of the assets of issuing entities is essential for stablecoin users, and they must be well registered (Almeida & Gonçalves, 2022), follow accounting regulations, and be audited appropriately to avoid some bankruptcies, such as the one that affected TerraUSD and Luna (Baker et al., 2023).

Concerning the audit of Tether conducted by Friedman LLP, it should be noted that the audit firm did not conduct an exhaustive review of Tether's contracts with the banks in which it deposits its funds. This raises substantial concerns about the singularities that these agreements may contain: Does Tether have immediate access to these funds? Among the risks of this practice is the possibility that the accounts may not be solely owned by Tether and may be shared with other entities in the group, giving them license to use the funds for purposes other than their original purpose.

FSS was appointed to review Tether's reserves; however, unlike the previous firm (FLLP), it is not subject to AICPA standards and does not base its opinion on them. Although its procedures do not differ from those performed by FLLP, there is a major problem: the lack of the independence of the auditor. As FSS is not subject to AICPA standards and, consequently, to those of its auditors, it is not bound by independence laws. Therefore, it is possible that FSS's opinion could be motivated by economic interests contrary to the presentation of reliable and true information. This is far from the objective of auditing, which is to offer a service to the recipients of the report, the clients, or those interested in knowing the state of the company's reserves. Figure 3 shows the composition and evolution of Tether Ltd.'s assets, validated using the audit reports indicated in the data section.

As of Moore Global's June 2021 audit, more detail has been presented on Tether's assets than in previous audits. Tether's assets are reflected in Figure 4. The ISAE 300 (revised) implies that this is distinct from an audit or review of historical financial information that is covered by the International Standards on Auditing (ISAs). Thus, both Tether and Moore Global are subject to the "Code of Ethics for Professional Accountants". Both entities are also subject to IAS 1: Quality Controls for Firms Engaged in Audit and Review of Financial Statements and Other Assurance Engagements and Related Services.

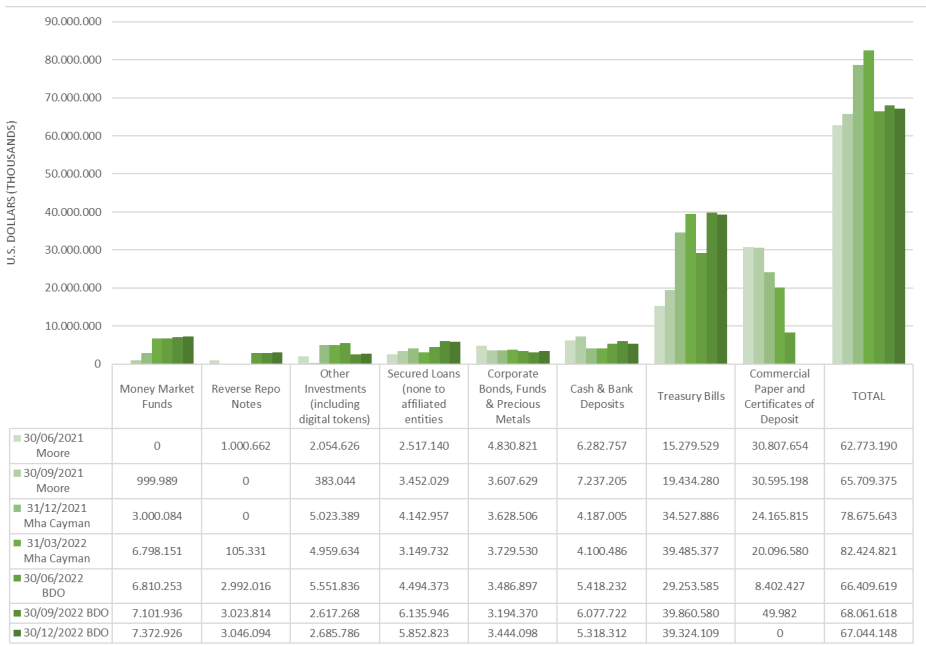


Figure 3. Composition of Tether Ltd's assets as validated in audit reports

Source: based on data extracted from Tether audits (2023).

This implies that the engagement partner is responsible for the overall quality of the audit.

MHA CAYMAN and BDO's audits have a scope of reporting and applicable regulatory framework that are similar to those of the Moore Global reports. In this regard, the same limitations of scope are also found; the engagement only covers the period from 30 June to 30 September 2022, with no review of previous or subsequent events that might allow for the identification of significant capital transfers or unusual events. This generates the possibility that Tether repeats the strategy it used in the audits conducted by Friedman LP. On the other hand, one of the most striking assessments we have made is a comparison of the data issued in the reserves report reviewed by BDO and all previous reports, in order to detect significant variations between the different periods. Although the materiality and, therefore, the significance criterion applied is unknown, it is noted that no mention is made of any of these changes, even though Tether's reserves were reduced by approximately 25% in less than three months, from USD 82.4 billion on 31 March 2022 to USD 66.4 billion on 30 June 2022. This change, irrespective of the criterion chosen, is significant given the magnitude of the numbers discussed. The reduction in Tether's reserves is mainly explained by a decline in their short-term notes and certificates of deposit, as shown in Figure 3. This component, and their

treasury bills, represent the two largest assets on the balance sheet, and the ones that fluctuate the most. The remaining components are fairly balanced and far smaller the two mentioned above. This is shown in Figure 4, which presents the average composition of the Tether issuers' assets.

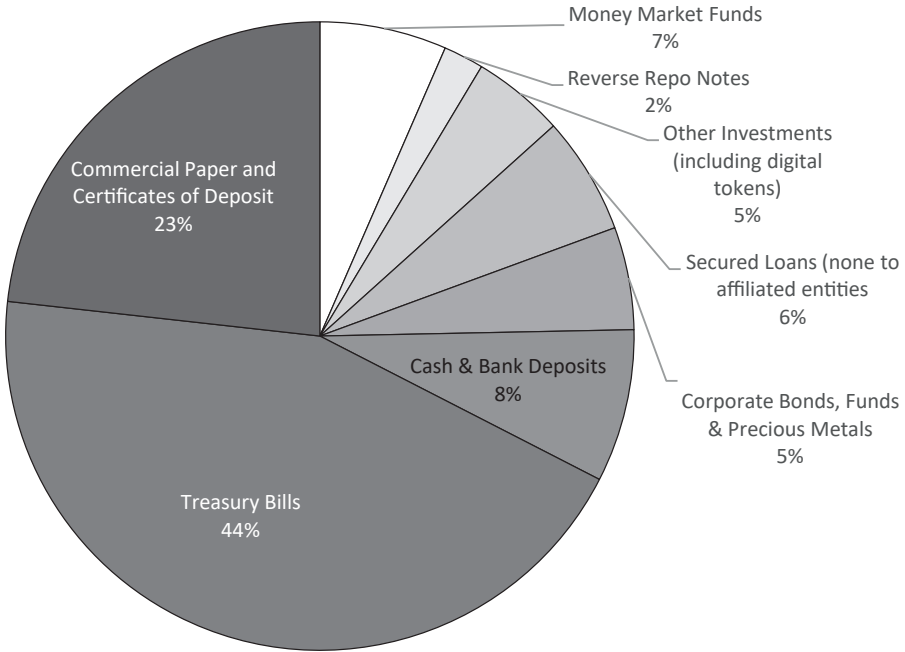


Figure 4. Historical average asset composition of Tether Ltd. as validated in its audit reports

Source: based on data extracted from Tether's audits (2023).

These assets are highly liquid and can reasonably ensure users' backing, reducing the risks associated with these digital assets. However, the risk of treasury bonds is significantly higher than that of other assets because of the materiality involved and because interest rate hikes by the Federal Reserve reduced the price of these financial assets. In the most recent period, the treasury bonds in Tether's portfolio represent more than 50% of its balance sheet. In the event of a massive withdrawal of deposits, the bank would be forced to realize these investments at a loss due to rising interest rates, which would pose a high solvency risk for the bank.

These ratios, with their optimum levels defined, act as beacons to guide prudent financial decision making. The liquidity ratio parameter provides a clear view of whether the company has sufficient liquid assets to cover its short-term financial obligations. A level between 1.5 and 2 indicates a healthy financial position, providing the company with the necessary peace of mind to

Table 3. Measurement of Tether's backing in terms of liquidity, solvency, and debt ratios

Ratio	Liquidity ratio	Cash ratio	Solvency ratio	Debt quality ratio
Formula	current as- sets/current liabilities	cash/ current liabilities	total assets/ total liabili- ties	current li- abilities/total liabilities
optimum level	1.5-2	0.8-1.0	1.5-2	0-0.5
Auditing 15 September 2017	1.001	1.001	1.001	1.000
Auditing 1 June 2018	1.003	1.003	1.003	1.000
Auditing 28 February 2021	1.005	1.005	1.003	1.001
Auditing 31 March 2021	1.004	1.004	1.004	1.000
Auditing 30 June 2021	1.003	1.003	1.002	1.000
Auditing 30 September 2021	1.002	1.002	1.002	1.000
Auditing 31 December 2021	1.002	1.002	1.002	1.001
Auditing 31 March 2022	1.003	1.003	1.002	1.001
Auditing 30 June 2022	1.003	1.003	1.003	1.000
Auditing 30 September 2022	1.001	1.001	1.004	1.000
Auditing 31 December 2022	1.014	1.014	1.015	1.000
Auditing 31 March 2023	1.026	1.026	1.031	0.996
Auditing 30 June 2023	1.039	1.039	1.040	1.000
Auditing 30 September 2023	1.011	1.011	1.039	1.000

Source: based on data extracted from Tether's audits (2023).

face immediate commitments to solvency (Lessambo, 2018, 2022). The cash ratio, which focuses on the availability of liquid funds to cover current liabilities, should be maintained between 80% and 120% to ensure an adequate cash reserve to provide financial guarantees in times of need (Lessambo, 2018, 2022). The solvency ratio examines the proportion of total assets and total liabilities. A range between 1.5 and 2 reflects an adequate balance between debt and equity, reducing the risk of insolvency and strengthening the company's long-term financial position (Husna & Satria, 2019; Lin et al., 2011; Xu et al., 2014). Finally, the debt quality ratio evaluates the proportion of short-term debt in relation to the company's total debt. A range between 0 and 0.5 indicates a balanced debt structure, reducing the risk of the company facing refinancing problems and ensuring more stable financial management (Husna & Satria, 2019; Xu et al., 2014).

Tether's liquidity ratio has remained consistently below the optimal range of 1.5 to 2 throughout the audited period. This persistent weakness suggests that Tether may have difficulty covering its short-term obligations with its liquid assets. Tether's cash ratio has remained consistently above the optimal range of 0.8 to 1.0 throughout the audited period, suggesting that Tether has a significant amount of cash relative to its short-term obligations, and thus a healthy ability to cover short-term obligations solely with cash. Tether's solvency ratio, based on the data provided, remains consistently below the optimal range of 1.5 to 2 in all audits. This may raise concerns about its ability to cover its long-term financial obligations. Tether's debt quality ratio has remained consistently above the acceptable range of 0 to 0.5 throughout the audit period, ranging from 0.996 to 1.001. Tether has had a relatively high ratio of current liabilities to its total liabilities. This suggests a lower quality of its debt.

Although the use of stablecoins is growing steadily (Włosik et al., 2022), stablecoin trading and use are not without risks (Echarte Fernández et al., 2022; Moura de Carvalho et al., 2022; Vučinić, 2020). These risks can be summarized into three categories: counterparty risks (Arner et al., 2020; Mikhaylov, 2023); centralization risks (Mikhaylov, 2023); and the risk of algorithm manipulations (Clements, 2021). These are risks that could be transmitted between the issuer, the operator, and the customer in the chain of relationships (Ferreira, 2021; Vučinić, 2020).

Users and companies that issue, hold, and operate stablecoins on their balance sheets can take several steps to mitigate risks. The first step is to ensure that the operator of the digital currency has sufficient backing (Baughman & Flemming, 2023). Another measure to reduce risk may be to increase the transparency of company balance sheets (Liao & Caramichael, 2022; Sobański et al., 2023). While stablecoins face regulatory hurdles arising from banking, financial monitoring, and security laws (Clark et al., 2020), in some cases because these regulations do not apply to stablecoins, other authors indicate that nine of the eleven fiat-backed stablecoins meet the objective requirements for cash equivalents and could be reported as such under the IFRSs (Hampl & Gyönyörová, 2021; Muhetaer, 2022).

Previous studies have addressed the accounting and characteristics of the mathematical modelling of stablecoins (Tarasova et al., 2020); others have analysed audited stablecoin companies to demonstrate the challenges in establishing their accounting (Moura de Carvalho et al., 2022; Smith, 2023). There are also studies that propose general principles that can be followed when performing a tokenomic audit (Kampakis, 2022), and others that defend the need for the existence of smart contract auditors to avoid situations such as TerraUSD (Bhambhwani & Huang, 2023). Our research seeks to close an existing gap in the scientific literature on the accounting and auditing of stablecoins. Using Tether as a case study, we analysed the issuance and backing of

the stablecoin, studying Tether reserves through third-party audit reports. Not only that, but we also performed a measurement of Tether's backing through its liquidity, solvency, and debt ratios.

As a limitation of this research, it should be noted that only one type of stablecoin (trust-asset-backed) has been considered. As a future line of research, we propose extending our analysis to other stablecoins with high market capitalization.

Conclusions

This research approached stablecoin accounting and auditing regulations analytically, from an economic regulatory perspective. To do so, it analysed the issuance and backing of Tether, the different phases of its accounting and auditing, and the controls and regulations in place for the end consumer or business customer. As becomes clear throughout this article, despite the various efforts made by accounting regulators, there is still a need for more precise and specific regulations that are applicable to stablecoins. Current accounting and auditing regulations mitigate, but do not prevent, the transmission of risks.

From our research, we conclude that Tether has made great efforts to increase the transparency of its reserves. In addition, its assets are highly liquid, which gives us reasonable confidence that it will have sufficient backing to cover its USDT issues in dollars. However, it also has a high number of treasury bonds, which, in a situation of a loss of confidence and possible deposit withdrawals, may lead to a discount sale of these securities, especially in a rising interest rate environment. Taken together, these findings show that while Tether has maintained a healthy ability to cover its short-term obligations with cash, it faces challenges related to its liquidity, solvency, and debt levels. In addition, the quality of its debt is also an aspect that should be considered as part of its overall financial health, which is reflected in our ratio analysis.

Tether's liquidity ratio has been consistently below the optimal range of 1.5 to 2. This suggests that the company may face difficulties covering its short-term obligations with its liquid assets. Nevertheless, Tether's cash ratio has consistently remained above the optimal range of 0.8 to 1.0, which indicates that Tether has a significant amount of cash relative to its short-term obligations, reflecting a healthy ability to cover these obligations solely with cash. Tether's solvency ratio has consistently remained below the optimal range of 1.5 to 2 in all audits, which raises some concerns about its ability to cover financial obligations. In turn, Tether's debt quality ratio has been consistently above the acceptable range of 0 to 0.5, suggesting an elevated risk.

It is also concluded that valuation by independent auditors is essential in a market that generates a lot of uncertainty among investors. For this reason, an external auditor must certify the composition of assets of these entities. It is also necessary to develop more specific and updated regulations for stablecoins and, consequently, unify and strengthen accounting and auditing regulations to generate more confidence among stablecoin users. As a limitation of this research, we point out that our study only focuses on Tether, the stablecoin with the largest market capitalization. Thus, the lack of an analysis of other stablecoins with high market capitalization suggests the need for future research for a more complete understanding of the accounting and auditing challenges in the stablecoin ecosystem.

Acknowledgements: We wish to express our thanks to Universidad Católica de Ávila and Institución Gran Duque de Alba for their support.

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