Deposit Insurance for Digital Financial Products and Services

A worldwide overview of fintech offerings from a deposit insurance perspective to identify potential needs for policy design actions

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About the sponsor of this paper

esisuisse is the deposit insurance scheme that guarantees client money held with Swiss branches of banks and securities firms up to CHF 100’000 per bank and per client. As a member of the International Association of Deposit Insurers IADI it strives to develop answers what challenges fintech offerings might pose for deposit insurers.
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1 Key Findings

1.1 Objective

Digital financial services provide payments, credit, savings, investment and remittances services that are rendered by digital channels. These innovations have the potential to enhance the efficiency of the financial system by lowering the costs of transactions and enhancing tailored financial services and thereby increase economic growth. This paper evaluates risks and challenges of new types of services for the financial system: it provides a worldwide overview on stability risk of fintech offerings (products, business processes, legal, technical set-ups) from a deposit insurance perspective to identify potential need for policy design actions.

1.2 Deposit Insurance for the Fintech Ecosystem

Fintech innovations are primarily technically changing the execution of the financial industry functions. Therefore, regulators pursuing a principle-based and technology-neutral approach can build on the existing principles of regulation and deposit insurance. To secure a level playing field and the stability of the financial system in the digital area, fintech offerings qualifying as deposits have to comply with same regulations and deposits insurance scheme as traditional financial service providers.

1.3 Digital Financial Instruments, Service and Deposit Insurance

1.3.1 Qualifying Characteristics of Digital Deposits

Providers of digital financial instruments use many different structures that are often complex and lack transparency. Therefore, it is hard for investors to understand validity of the offering, especially the involved risks. Up to now, three types of digital financial instruments have emerged. (1) Crypto-assets, which are of intrinsic nature and have no backing and are representing a virtual value only (e.g. Bitcoin), and (2) crypto-assets which are asset backed such (e.g.Stablecoins which are collateralised by the value of underlying assets). A third type of crypto-assets are Central Bank Digital Currencies (CBDC), however they are not discussed in this paper, because these would not need deposit insurance.

Stablecoins aim to mimic traditional, stable currencies such as fiat money. However, they vary in the way of their underlying assets, (1) Stablecoins can be denominated in a sovereign currency's unit of account such as US Dollar, Euro or Swiss Franc. Users have a direct claim on the issuer or the underlying fiat money and the provider pledges to redeem stablecoins at par in the same sovereign currency that was used to purchase the coins; (2) Commodity stablecoins are backed by a precious metal such as gold or resources such as oil and are pegged to sovereign currency. They are redeemable at the conversion rate for real underlyings. (3) Stablecoins can also be backed by a portfolio of all kinds of assets, even cryptocurrencies. For (2) and (3) the pegging mechanism becomes crucial to ensure a stable value with respect to a sovereign currency, and whether a stablecoin provider pledges to secure the redemption at a predetermined fix valuation; (4) Stablecoins can use algorithms and/or interventions to secure public's trust in the stability of coin's value. However, the use of algorithms and/or interventions could also work against the public's trust and provide instability of the coin's value . Therefore, algorithmic stablecoins lacking any backing cannot qualify as deposits. The market participants' level of trust on the issuers' ability and willingness to uphold the peg rate becomes crucial for stability of the stablecoins' value.

A key qualifying characteristic of any kind of digital deposit is that it represents a claim on an identifiable issuer and its assets. To ensure the accuracy of public perception of a safe medium of exchange "substitute for cash" and as store of wealth a digital deposit it must have the following characteristics:

(1) it is backed (a) by sovereign currency or assets held by the issuer (i) on his own accounts or (ii) segregated on the books of a custodian on behalf of a stablecoin issuer.
(2) a fix peg to a sovereign currency prevails.
(3) the issuer must ensure/guarantee to redeem the requested amounts directly in sovereign currency in full to the holder of the digital deposit account (i) at least at face value and (ii) including promised fixed returns (iii) at clients' requested time according to the contractual agreements.
(4) clients can be offered the opportunity to trade their digital deposits on exchanges or directly peer-to-peer between users

1.3.2 Cryptoassets

Considering the qualifying characteristics of digital deposits, it follows that digital tokens representing an investor's stake in the company or project, representing risky investment by design and cryptocurrencies, lacking asset backing as well as an obligation of a fixed conversion to central bank money, cannot be classified as digital deposits

1.3.3 Stablecoins

On the other hand, stablecoins may be a deposit like claim, i.e., they represent a cash-like financial product similar to traditional checking and saving accounts of traditional financial service providers. However, their design differs from the traditional deposit definition:

(1) The client identification is currently debated, i.e., especially whether a personal identification is required or whether it is sufficient that a client can prove its entitlement by a code.
(2) Every unit represented by stablecoins is a direct claim on the issuer over the funds it received from users, so the outstanding volume is demand driven. Holders of stablecoins can at any time request redemption in cash. That requires that the issuer must adjust the volume of outstanding coins accordingly.
(3) The leading stablecoins are based on fiat money or exchange traded commodities. Consequently, the sustainability of an offering is driven by the market risk of the underlying and not the risk of illiquidity of the coin issuer. It is not in the scope of deposit insurance to cover the market risk.[1]
(4) Stablecoins are offered based on underlyings, so runs on one stablecoin cannot by design create a contagion risk emerging from banks being interconnected by reciprocal liabilities.
(5) Unlike traditional deposits, stablecoins are traded on exchanges. Empirical evidence shows that stablecoins are not stable in the strict sense, and often fail to meet the Bank of International Settlement's defined stability requirement: "The difference in value (i.e., absolute difference stablecoin and underlying traditional asset value) must not exceed 10bp of the value of the underlying traditional asset more than three times over a one-year period."[2] This definition does implicitly define a band of 10bp around the peg rate similar to the fixed exchange rate systems. However, the potential loss due to undervaluation is often overcompensated by the low transaction cost, so that stablecoins provide higher net purchasing power compared with traditional service provider offerings.
(6) To be conforming with the traditional centralised ledger set-up, stablecoins would have to be recorded on permissioned distributed ledgers, where the involved parties can be identified.[3]

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[1] The experience of Tether Limited shows the need for and importance of a clear regulatory framework enforcing transparency. Tether claimed that each token it issued was backed 1:1 by U.S. dollars. But, the New York Attorney found that Tether sometimes held no reserves to back its cryptocurrency's dollar peg, but have granted loans, changing the risk profile of Tether tokens, transforming them into a hybrid instrument of debt. Various lawsuits filed were settled by Tether agreeing to report on the assets backing the coin and to offer more transparency on its reserves and paying $18.5m.

[2] Bank of International Settlement, Prudential Treatment of Cryptoasset Exposures, Consultative Document, 2021, p.4.

[3] `` Zandersone Laura Initial Appraisal of a European Commission Impact Assessment, Updating the Crypto Assets Regulation and Establishing A Pilot Regime for Distributed Ledger Technology, European Parliamentary Research Service, 2021.

The rapid growth of stablecoin offerings and their success as means of payment has launched the debate about whether or not central banks should launch digital currencies too, and some countries, especially China, move more aggressively to pilot digital versions of their currencies. Federal Reserve Chair Jerome Powell testified on 14. July 2021 in House Financial Services Committee "We have a pretty strong regulatory framework around bank deposits… (but this) doesn't exist currently for stablecoins, and if they're going to be a significant part of the payments universe - which we don't think crypto assets will be but stablecoins might be - then we need an appropriate regulatory framework."
Since multiple digital currency options will fragment the payment system and reduce the central banks' policy impact on the money supply, as well as the potential for seigniorage, Powell agreed to the statement that having a digital currency issued by the Fed would be a more viable alternative than having multiple stablecoins emerging in the payment system. The U.S. central bank plans to take an active role in developing standards as more countries research and develop central bank digital currencies, to ensure "safe central bank money". Powell concluded, "that, in particular, you wouldn't need stablecoins, you wouldn't need cryptocurrencies if you had a digital U.S. currency".
On May 21, 2021, Federal Reserve Governor Lael Brainard said "A guiding principle for any payments innovation is that it should improve upon the existing payments system, … if stablecoins were to be widely adopted and serve as the basis of an alternative payment system oriented around new private forms of money, there's a real risk that you could see fragmentation of the payment system," and concluded that policymakers would also need to develop a digital currency that does not encourage a run on traditional banks and also strikes a balance between offering privacy without encouraging illicit use. Therefore, the success of stablecoin business models hinges on the market entry of the central banks launching their own digital currencies.

Conclusion

To establish a sound financial safety network for security backed stablecoins, the offerings and issuers must be regulated. As stablecoins represent direct claims on issuers as well as the underlyings, they can be regarded as exchange traded fund-like structures and therefore have to be regulated accordingly. They cannot be classified as digital deposit, due to their design and the risk regarding the sustainability of the business models in view of the likely launch of central bank digital currency.[4] Insuring stablecoins like traditional deposits would crucially undermine the central bank's ability to control the money supply, because issuing insured stablecoins would create an almost perfect substitute for fiat money and possible central bank digital currency.

1.4 Digital Payment Services

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Digital Payment services store value electronically on a system or device, e.g., internet, cards, mobile phones, that can be used for making payments and transfers to entities and persons. Non-banks, especially telecom providers, offer digital payment services (generally referred to as "mobile money") partnering with digital service providers, in addition to their deposit accounts, i.e., savings and checking accounts. Authorised non-bank institutions are often restricted to payment and storage services only. Most established regulatory approaches require that non-banks maintain liquid assets equal to the amount outstanding of electronic money and other measures to ensure redemption of issued electronic money. Some regulatory approaches require that total value of the customer funds collected are held with a regulated bank to secure them in case of a bankruptcy of the digital service provider.

Conclusion

Three deposit insurance approaches have been implemented, based on the consideration regarding the importance balances held for the clients and by classifying digital payment as transaction accounts and not as deposit accounts:
(1) exclusion approach is applied if digital payments accounts are regarded as temporary value storage to make

[4] Swiss Financial Markets Authority (FINMA), Supplement to the Guidelines for Enquiries Regarding the Regulatory Framework for Initial Coin Offerings (ICOs), 2019; Somoza Luciano, Terracciano Tammaro, Stabilising Stablecoins: A Pragmatic Regulatory Approach, 2019.
The same approach could be applied to all other cryptocurrencies as well, asset tokens could be classified as traditional financial assets.

payments (2) direct approach is applied if non-banks digital payment providers' deposits are insured, (3) pass-through approach, requires that clients' account of a digital payment provider be held with a regulated financial service provider that is already a member of the deposit insurance system.

1.5 Fintech Investment Services

The fintech investment services business case emerged from clients' demand for affordable, easy to grasp information for intuitive financial planning - investment decision making and low-cost financial products having the potential to fulfil their goals. Digital technologies allow fintechs to meet this demand and deliver investment services in cheaper and more comprehensible ways. Robo advice and social trading offerings allow private investors to evaluate the risk/return potential of financial products and portfolios and to invest. Crowd investing providers platforms allow start-ups, small and midsize companies as well as private individuals to raise funds for their projects from investors, which in turn can efficiently select their exposure to build up their credit portfolios

1.5.1 Robo Advisors

Robo advisers interact with their customers over the internet, collecting investment specific information from their clients through an online survey and then using computer algorithm to automatically match that information to appropriate standard portfolios being compiled to match the specific needs' profile of investor clusters.

Conclusion

As robo advisors use regulated financial service providers as bookkeeping place, clients' deposits are covered by the traditional deposit insurance scheme. However, this is not true in all jurisdictions, for example, in the United States.

1.5.2 Social Trading

Social trading providers offer platforms that bring together so called signal providers [5]managing their porfolios and share their performance with the public enabling followers to co-invest with successful signal providers – i.e., to copy their tradings. To follow the trades of a signal provider, customers have to link to their own portfolio with those reference portfolios of the signal provider who is, in the customer's view, the most promising. The accounts of the signal provider and following investors are held by a custodian bank. The trading decisions made by the corresponding trader are then executed in an automated manner or by consent by the following customers. The social trading platform acting as the intermediary, usually remunerates signal providers depending on their portfolio performance, the number of their followers and trading turnover.

Conclusion

Due to the fact that social trading is limited to copy investment portfolios of signal providers by its followers, social trading is not within the scope of deposit insurance schemes.

1.5.3 Crowd Investing

Fintechs revived the idea of pooling money from a large number of people willing to fund projects or ventures, by building digital market platforms. The fintech acts as a market maker that promotes placed projects, publishes information on loans and securities, manages the closing as well as organises the exchange of funds.

Conclusion

The temporary transfer of funds between investors and project owners are generally not regarded as deposits. Because crowd investment platforms business is limited to mediate credits between investors and project owners, this service is not in the focus of deposit insurance schemes.

[5] Signal providers are usually persons, who offer their expertise in portfolio investing to followers,

2 Considerations on Deposit Insurance Definition for Digital Financial Products and Services

Fintechs have launched deposit-like financial instruments and offer novel services for payment and investing. But despite the close similarities of use for clients and potential future relevance for the financial system, the digital financial instruments do not fit in the traditional deposit insurance definition, as defined by the International Association of Deposit Insurers:

"Any credit balance which derives from normal banking transactions and which a bank must repay at par under the legal and contractual conditions applicable; any debt evidenced by a certificate issued by a bank; and any other funds or obligations defined or recognised as deposits by the law establishing the deposit insurance system."[6]

Client Protection

In the clients' view, digital financial instruments such as stablecoins and fix return asset tokens are at least close substitutes for traditional banking retail deposits.
Low risk, fixed return asset tokens, for example qualifying for PRIPPs[7] risk class 1 with an annual Value-at-Risk-equivalent volatility between 0-0.5%, are from a suitability perspective, very similar to traditional saving accounts. The regulatory requirement that asset tokens have to share information like exchange-traded funds enables clients to take informed decisions. One key aspect for an involvement of a deposit insurer is, whether users hold a substantial amount of their wealth in a single token or not. However, it is difficult to define this crucial distinction: What is the adequate threshold for "substantial amount of their wealth" because it depends on jurisdiction, economic and political situation. A key aspect of deposit insurance is that deposits are safe from a retail client perspective as they represent a substantial amount of their wealth. However tokens are intended for investors with at least some financial literacy. For this reason deposit insurance for stable-coins is not a necessity as long as ordinary retail depositors do not use them as an alternative to holding deposits at banks

Stablecoins designed as cash-substitutes can provide users with a more efficient means of exchange than traditional banking retail deposits. The regulatory proposal for stablecoins defines a 10bp band around the peg rate.[8] However, the leading stablecoin Tether, would not qualify for this condition. From a user perspective, only the stablecoins' value net of cost counts. Taking into account transaction costs stablecoins are a close substitute to traditional payment deposit accounts.

Provider Level Playing Field

Fintechs offering the financial instruments having similar characteristics as deposits for the clients should comply with the same regulation and be supervised as well as become member of a deposit insurance scheme.

Insurance Scheme

At the time when the deposit insurance for traditional banks was designed and introduced, it was possible to draw on the experience of many years of business activity. In contrast, fintechs have a much shorter track record.

So, the validity of the fintech business model is far from a given. Especially, the potential launch of central bank digital currencies threatens the business case of stablecoins. If privately issued stablecoins should become systemically relevant for the payment system, a collapse could have significantly disruptive effects on an economy. Providers may then have to become members of the deposit insurance schemes. To secure a level

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6 International Association of Deposit Insurers (IADI), Core Principles for Effective Deposit Insurance Systems, 2014.

7 PRIPP: Packaged Retail- and Insurance-based Investment Products according to EU regulation 1286/2014 and amendment draft

8 Bank of International Settlement, Prudential Treatment of Cryptoasset Exposures, Consultative Document, 2021.

playing field for stablecoin providers, they could be offered the option to get voluntarily insured on the basis of a suitable regulation. Furthermore, due to the short track record of stablecoin offerings, an appropriate insurance fee system is indicated to avoid moral hazard.

Monetary Policy

Deposit insurance has the obligation to stabilise the supply of inside money. But only 1:1 backed stablecoins are inside money. All other commodity, portfolio backed, or algorithmic (seigniorage) stablecoins, being pegged to fiat currency, form a fixed currency-like area. To offer deposit insurance for these types of stablecoins would establish an undesired currency competition between central banks and stablecoin providers.

Based on these considerations, the following definition of digital deposits may be established:

"Any stablecoin representing "inside money" [9], which a provider must repay at par; any fix-return token with a sufficiently stable market valuation that serves as a store of wealth for clients to a significant amount of their wealth; being compliant with relevant exchange traded funds regulations, qualifies as (digital) deposit."

[9] At the focal point of the monetary system resides the central bank providing the private sector with fiat money (out-side money: bank notes and holding of banks with the central bank). Banks raise funds offering liquid deposits, i.e., all retail deposits, sight and time deposits, - thereby creating inside money, and investing them in illiquid loans. Banks get compensated for these transformation services by the difference between the lending rates they charge to their credit customers and the returns they have to pay-out to the depositors.
The amount of inside money banks create is limited by the following circumstances: (1) market conditions, i.e. profitability of loans restricts the credit volume offered by banks; (2) behaviour of depositors, i.e. their supply of funds given offered interest rates, their payment habits, saving/withdrawals from their accounts; (3) risk appetite and processing costs of banks; (4) bank regulations; (5) the monetary policy, i.e. central bank interest rates shifting market rates and thereby the demanded credit volume and deposit supply.
The stability of inside money depends on the public's confidence in banks' business; a loss of trust by depositors is at the origin for financial crises or even business cycles. Therefore, to stabilise inside money supply by safeguarding the confidence in per-se solvent banks is the key task of deposit insurers.
Gurley John G., Shaw Edward S., Money in a Theory of Finance. Brookings Institution, Washington, D.C., 1960; Tobin James, Commercial Banks as Creators of Money, Cowles Foundation Discussion Papers No. 159, 1963; McLeay Michael, Radia Amar, Ryland Thomas, Money Creation in the Modern Economy, Bank of England, Quarterly Bulletin, 2014, pp. 14-27.

3 Digital Deposit Definition

3.1 Regulation and Deposit Insurance

The financial safety net rests on three pillars; regulation, deposit insurance and the central bank as a lender of last resort. The goal to enhance financial stability relies on an efficient combination of regulations and crisis interventions. Deposit insurance systems' effectiveness not only depend on its own design but also builds on regulation and supervision, the legal and judicial framework, governments' and central banks' efforts to stabilise the financial system. In order to enhance financial stability, there must be a comprehensive framework in place between financial safety-net participants that ensures coordinated activities and information sharing within a jurisdiction as well as between deposit insurers in different countries.[10] Due to differences in the environment, set-up of financial service providers, the design of deposit instruments, as well as regulations and the role of the lender of last resort, the necessity of deposit-like products to be insured by deposit insurance will vary too.

Regulation is the first line of defence. Its key function is to secure sound business behaviour in the financial industry, by setting standards for investment and credit business and requirements for financial intermediaries' balance sheets such as capital, leverage and liquidity constraints. Prudential regulation and supervision ensures that a financial product and service providers' weaknesses are timely identified and corrected and moral hazard risk that may arise from a deposit insurance scheme are mitigated.[11]
Crisis Intervention is the second line of defence. The role of deposit insurance schemes and lender of last resort is to intervene and advert a breakdown of a financial system in the event of an emerging financial crisis.

3.2 Financial System Stability and Deposit Insurance

By construction, deposits are the Achilles' heel of financial service providers' balance sheet transformation function of channelling funds from savers to borrowers, i.e., process of originating deposits that can be withdrawn at face value in the short term and transforming these funds in less liquid, riskier, long term, lumpier exposures. Asymmetry of information and reaction options on bad news is imminent to the financial service business and constitutes a short-run risk even for long-run stable institutions.

Deposit insurance is a widely adopted policy within the financial safety-net to promote stability in the financial service system. The main rationale for the existence of financial system safety nets are possible negative externalities arising from a deficient functioning or break down. The doctrine behind deposit insurance as well as the central banks' lender of last resort function is that "illiquid but solvent" financial service providers should receive funds to prevent runs in the event of a (potential) distress to prevent costly break downs and spill-overs to the economy as a whole. It is a well-established fact by empirical research that deposit insurance prevents bank runs, i.e., it stops contagion through interbank lending within the financial service system causing multiple banks to fail as well as ripple effects by the customers holding accounts.

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10 International Association of Deposit Insurers (IADI), IADI Core Principles for Effective Deposit Insurance Systems, 2014; International Association of Deposit Insurers (IADI), A Handbook for the Assessment of Compliance with the Core Principles for Effective Deposit Insurance Systems, 2016.

11 Basel Committee on Banking Supervision, International Association of Deposit Insurers Core Principles for Effective Deposit Insurance Systems, 2009; International Association of Deposit Insurers (IADI), IADI Core Principles for Effective Deposit Insurance Systems, 2014; International Association of Deposit Insurers (IADI), Integrated Protection Schemes, IADI Research Paper, 2015; International Association of Deposit Insurers (IADI), Evaluation of Differential Premium Systems for Deposit Insurance, IADI Research Paper 2020; Adema Joop, Hainz Christa, Rhode, Carla, Deposit Insurance: System Design and Implementation Across Countries, ifo DICE Report, ifo Institut, 2019, pp. 42-51.

However, since financial safety nets are a form of insurance, the provision of a safety net causes moral hazard similarly to any other form of insurance provision, encouraging covered financial service providers to take on excessive risk.[12]

Deposit insurance levels the playing field and enhances competition between larger and smaller banks. Risk-averse depositors are inclined to hold their funds with safer banks. Generally, larger banks of systemic relevance are more likely to benefit from implicit too-big-to-fail interventions by the government or the lender of last resort; so, a deposit insurance system makes deposit accounts of small and large banks equally risky, therefore both bank categories are equally positioned to attract deposits. The same holds true for the competition between private banks competing against state-owned banks, which typically benefit from government guarantees.[13]

"Deposit insurance is the only known effective measure to prevent runs." [14] If depositors can have good reasons to believe that they will under any circumstances get their funds back they have no incentives to run to the bank to withdraw their money. In this situation, the economic cost of insurance is small. As all deposit insurance schemes do not hold reserves to fully cover all potential losses, depositors must be sure that the government and/or the lender of last resort will provide a backstop in a crisis. Otherwise, it becomes rational for investors to be the first in line to withdraw their deposits and runs will happen.

The empirical evidence shows that poorly designed schemes can increase the likelihood of financial instability. Determining the optimal coverage for deposit insurance is difficult. On the one hand, the amounts covered must be high enough to prevent runs, but on the other hand, too extensive a coverage can reduce effective market discipline. Empirical research suggests that more generous deposit insurance schemes in terms of coverage are more likely to suffer from excessive risk taking and therefore instability, the smaller the disciplinary forces of market. Charging financial risk-adjusted premiums force insured institutions to internalise the costs of the risks that they take on and can help curb excessive risk-taking behaviour. Although risk-adjusted deposit insurance provide a way to internalize banks' risk taking, it is challenging to determine the premium that should be charged to the banks. Another way to correct the incentive distortions caused by deposit insurance is to complement it with robust supervision and regulation of the banking system. More generous deposit insurance schemes are associated with lower capital buffers, making banks more fragile to shocks.[15]

Deposit insurance schemes reduce the illiquidity risk of covered financial institutions, creating incentives for banks to neglect these risks in their asset allocation. Therefore, bank regulation has been designed to counteract those incentives to insure stability. Consequently, the goals of prudential supervision and deposit insurance are closely aligned, and their measures are complementary to a significant extent. Deposit insurance programs, to a certain degree, increase the need for governments to supervise and regulate banks. Therefore, any efficient financial safety net combines measures that optimally reduce the risk of financial break downs by

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12 International Association of Deposit Insurers (IADI), Core Principles for Effective Deposit Insurance Systems, 2014; Demirgüç-Kunt Asli, Kane Edward J., Deposit Insurance around the Globe: Where Does It Work? National Bureau of Economic Research, Working Paper 8493, 2001; Demirgüç-Kunt Asli, Kane Edward J., Laeven Luc, Deposit Insurance Design and Implementation: Policy Lessons from Research and Practice, World Bank Policy Research Working Paper 3969, 2006; Anginer Deniz, Demirgüç -Kunt Asli, Bank Capital and Systemic Stability, World Bank, Policy Research Working Paper No. 6948, 2014; Scheubel Beatrice, Stracca Livio, What do we know about the Global Financial Safety Net? Rationale, Data and Possible Evolution, European Central Bank, Occasional Paper Series, No 177, 2016.

13 Anginer Deniz, Demirgüç-Kunt Asli, Zhu Min, How does Competition affect Bank Systemic Risk?, Journal of Financial Intermediation, 2014, pp. 1-26.

14 Diamond Douglas W., Dybvig Philip H., Bank Runs, Deposit Insurance, and Liquidity, Journal of Political Economy, 1983, pp. 401-419; Diamond Douglas W., Dybvig Philip H., Banking Theory, Deposit Insurance, and Bank Regulation, Journal of Business, 1986, pp. 55-68, p. 67.

15 Nier Erlend, Baumann Ursel, Market Discipline, Disclosure and Moral Hazard in Banking, Journal of Financial Intermediation, 2006, pp. 332-361; Fonseca Ana Rosa, González Francisco, How Bank Capital Buffers vary across Countries: The Influence of Cost of Deposits, Market Power and Bank Regulation, Journal of Banking and Finance, 2010, pp. 892-902.

(1) governance, business and transparency guidelines for financial service providers' risk-taking and management and (2) stabilizing interventions in case of failure, through deposit insurance and central banks lender of last resort. Briefly, the regulations and interventions depend on each other.[16]

3.3 Definition

Defining an insured deposit (and consequently what kind of deposits are not insured) is a fundamental starting point. However, how to define a deposit is a basic, but not the easiest question, because the answer impacts the kind of products that have to be covered by a deposit insurer, and which financial service providers have to be regulated and become members of the deposit insurance scheme. The International Association of Deposit Insurers defines deposits as follows:

International Association of Deposit Insurers

"Any credit balance which derives from normal banking transactions and which a bank must repay at par under the legal and contractual conditions applicable; any debt evidenced by a certificate issued by a bank; and any other funds or obligations defined or recognised as deposits by the law establishing the deposit insurance system."[17]

The European Union

"A 'deposit' means a credit balance which results from funds left in an account or from temporary situations deriving from normal banking transactions and which a credit institution is required to repay under the legal and contractual conditions applicable, including a fixed-term deposit and a savings deposit", where the principal is repayable at par.[18]

The definition potentially drives the scope of deposits to be insured and the types of institutions that will be within the deposit insurance protection. Therefore, the definition not only affects the funding of scheme or insurance premiums, but also the market functioning, i.e., level playing field between the financial service providersand enhances client protection. [19]

3.4 Characteristics of Financial Instruments Qualifying as Deposits

Whether or not a financial instrument can be considered as a deposit depends on determinative characteristics of the offerings, i.e., the contractual claims or property rights regarding the involved parties[20]: The following characteristics can serve to qualify a financial product as a deposit:

Contractual and Informational Arrangements

Deposits must be based on contractual agreement between an identifiable provider and identifiable users. The financial instrument must be underpinned by sound contractual framework that defines and governs material aspects of how the underlying technical arrangements are utilised by parties.

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16 Calomiris Charles W., Jaremski Matthew, Deposit Insurance: Theories and Facts, National Bureau of Economic Research, Working Paper 22223, 2016; Anginer Deniz, Demirguc-Kunt Asli, Bank Runs and Moral Hazard, A Review of Deposit Insurance, World Bank, Policy Research Working Paper 8589, 2018.

17 International Association of Deposit Insurers (IADI), Core Principles for Effective Deposit Insurance Systems, 2014.

18 EU, the European Parliament and the Council, Directive 2014/49, On Deposit Guarantee Schemes, 2014, Article 2 (3).

19 Basel Committee on Banking Supervision Sound Practices Implications of Fintech Developments for Banks and Bank Supervisors, 2018; Restoy Fernando, Fintech Regulation: How to Achieve a Level Playing Field, Financial Stability Institute, Occasional Paper, No 17, 2021.

20 G7 Working Group on Stablecoins, Investigating the Impact of Global Stablecoins, 2019.

Financial Instrument Scope and Attributes

Deposits are offered to the public as personal store of wealth instrument and/or medium exchange account with fixed value or returns having no direct link to financial service providers' investments and liquidity reserves backing them. [21] A key risk feature of deposits for the stability of the financial systems is that owners have the right and possibility to withdraw funds at face value in sovereign cash from their accounts of the financial service provider on demand or on an agreed notice period.
This feature of deposits is the origin of the traditional providers' liquidity risk, because due to maturity transformation of the banking business a mismatch in available liquidity may occur if customers unexpectedly require in a significant amount the redemption of their funds.

Customers

The client must be identifiable – according to generally accepted KYC rules (know-your-customer rules) applicable in the financial services industry. . These financial products are in scope of a deposit insuring scheme if for "average" customers' the loss of funds has a relevant impact on their wealth (different national limits exist regarding the amount representing significant share wealth). Any news about a potential collapse of a financial service provider will switch customers' perception from "safe as cash" to "at risk" that may trigger a run.

Provider - Valuation, Transfer and Ledger

The maturity and risk transformation business of traditional financial service providers creates a failure risk if customers unexpectedly require redemption of their funds in excess of the banks' liquidity reserves. Regulators address this risk by (a) licensing requirements and (b) by enforcing a prudential conduct of business, capitalisation and liquidity restrictions enabling financial service providers to absorb adverse shocks, as well as governance and disclosure rules.

To become a relevant risk for the financial system, a provider must be either systemically important and/or the spill overs from a failure are expected to create relevant chain reactions or contagion due to network effects resulting from financial services providers interconnected funding by reciprocal liabilities.[22]

Valuation, Transfer and Ledger

Traditional financial service providers have a centralised ledger and hold cash in their vaults. By contrast, digital financial instruments are set-up in a more complex way. Bookings may be recorded on a distributed ledger, transactions could be executed on exchanges or peer-to-peer, or the funds could be held with a custodian and the issuer has put in place stabilising mechanisms to uphold the stated peg rate.

So, the core aspects of an operationally resilient transfer system of digital financial instrument requires an agreement on the valuation, a transfer protocol, operator(s) that ensure the soundness of transaction and a reliable ledger infrastructure.

The underlying assets of digital deposits must be recorded on a safe and accurate ledger, which is directly linked to the outstanding digital financial instrument.[23] [24]

An issuer must provide customers

(1) with means to enable them to access their accounts. This does not exclude that third parties may offer that service on behalf and obligation of the issuer.

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[21] International Association of Deposit Insurers (IADI), Core Principles for Effective Deposit Insurance Systems, 2014; Izaguirre ByJuan Carlos, McGuire Claire, Grace Dave Three Questions for Determining if a New Product is a Deposit, CGAP, 2015.

[22] Restoy Fernando, Fintech Regulation: How to Achieve a Level Playing Field, Bank of International Settlements, Financial Stability Institute, Occasional Paper, No. 17, 2021

[23] Bank of International Settlements, Committee on Payments and Market Infrastructures Distributed Ledger Technology in Payment, Clearing and Settlement, An Analytical Framework, 2017.

[24] For a legal analysis see: Zellweger-Gutknecht Corinne, Seiler Benedikt, The Law of Crypto Assets Country Report Switzerland, University of Basel, 2021.

(2) A designated digital ledger, which allows holders (i) to proof their exclusive entitlement on their digital deposits and (ii) positions. This implies that the ledger must permit users to securely initiate, validate and record state changes (or updates) of all digital deposit transactions.[25] [26]
(3) and ensure that their claim for redemption in fiat currency can be fulfilled at any point in time.

Governance and Regulation

Processes and technologies are subject to operational risks. The transfer of digital financial instruments involves a variety of entities, with specialised tasks and responsibilities depending on each other. However, they are not necessarily falling within a single regulatory perimeter.
Therefore, a sound and efficient governance is key to ensure (a) the safekeeping of reserve asset of the issuer to prevent misuse of the funds by the issuer, and (b) policies and controls that safeguard the reliability of system access, the ledger system, data protection as well as transaction stability and efficiency. If business and technological standards adopted by different operators and issuers competing in the market get harmonised, interoperability of the distributed ledger technology using smart contracts will foster competition. If multiple initiatives emerge that compete for the market, the financial system gets fragmented and more fragile.[27]

Digital financial instruments can pose significant risks to financial integrity by creating new opportunities for illicit financing activities as well as to the financial system stability overall. To mitigate these risks, providers and other entities of the digital finance ecosystems should comply with the relevant regulatory standards preventing money laundering or criminal financing. Transparency, i.e., sound, sufficient and understandable information, and disclosures about the nature of the stablecoins, the rights associated with them and the risks they present are essential for users to make informed decisions. Therefore, regulatory (as well as legal) clarity is needed to protect consumers and investors and it must be ensured that sufficient information and disclosures are available.

Insurability

To be legally insurable by a deposit insurance scheme the issuer must hold a licence in the same jurisdiction as the deposit insurer. Deposit insurance schemes are designed to cope with runs - as a result of temporary illiquidity of some of their members – but it does not address bank solvency issues. For the establishment of a level playing field, deposit insurers must have sufficient data to estimate the loss distribution of its members, i.e., the likelihood of runs, potential loss volume (how well prepared a financial service provider is to absorb unexpected redemptions requests of its customers by its own funds, their availability (ring fencing)), and the contagion risk.

3.5 How Fintechs Change the Technology of Financial Systems

Fintechs use innovative technologies to offer financial services and products to customers on digital platforms. Fintech is first and foremost a technical innovation, i.e., the combination of IT-technologies (web, platforms, blockchains, distributed ledgers) and quantitative methods (artificial intelligence, machine learning) to execute financial system functions and to compile digital financial instruments. Fintechs digitalise the financial product landscape and how financial service providers operate by fundamentally disrupting customer journeys by new, more efficient and less costly business models as well as offering novel customer centric value-added services and extending their availability to new client segments.

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[25] Bank of International Settlements, Committee on Payments and Market Infrastructures Distributed Ledger Technology in Payment, Clearing and Settlement, An Analytical Framework, 2017; Negre Alice, William Cook, Interoperability in Digital Financial Services: Emerging Guidance for Funders, CGAP Technical Note, 2021.

[26] For a legal analysis see: Zellweger-Gutknecht Corinne, Seiler Benedikt, The Law of Crypto Assets Country Report Switzerland, University of Basel, 2021.

[27] Bullmann Dirk, Klemm Jonas, Pinna Andrea, In Search for Stability in Crypto-Assets: Are Stablecoins the Solution?, European Central Bank Occasional Paper, No. 230, 2019.

For these reasons regulators and deposit insurers face the challenge to review and update their regulatory frameworks where necessary to optimally balance benefits of fintech innovations with the potential risks for the financial system stability and market integrity.
These updates have been centred on (1) ensuring of fintech technology stability, (2) reconsider and apply transparency requirements for digital financial instruments and service provisioning, (3) evaluate the potential effects of financial inclusion on the financial system stability.[28]

3.6 Same Business - Same Rules Principle

Fintech innovations are primarily technical, such as the digitalisation of financial services and products. Existing functions of the financial industry are not altered per se. Therefore, the prevailing principles of regulation and deposit insurance should keep their relevance:
Focussing on the economic impacts that fintech offerings have on the financial system and its stability is evaluated using the principles of "substance over form" as well as "same business same rule". Noted that, the current rules and regulations aiming to secure the stability of the financial system are a valid starting point approach to address fintech offerings.

The key innovation of fintech offerings is that it is designed to fulfil the needs and requirements of users belonging to digital networks and/or platforms, whose ranges do not coincide with country borders. This potential mismatch of service and product ranges and efficient regulatory and monetary policies for a specific country must be considered to optimally update the rules and policies to a digital financial system.

- But due to country specifics of financial systems and laws, regulators will have to (a) impose different rules and restrictions to ensure the stability of their country's financial systems; (b) establish international standards to prevent looming systemic risks.
- Digital money challenges the stability of global financial system and the effectiveness of monetary policies by offering novel ways to pay, store wealth and even create new units of account. The stability risks emerge from (a) the design of digital money, especially the backing of the currency and process-set up; (b) the failure of issuers to preserve the stability of the currency, and altering convertibility commitments; (c) the international competition between private as well as public (digital) money providers;[29] (d) technical risk due to the nature of digital money, such as cyber-risks, IT-operational risks and information security risks.

The key question is whether or not the digital financial instruments and services have novel designs and functions that are not covered by the current regulatory and deposit insurance frameworks.

[28] Claessens Stijn, Frost Jon, Turner Grant, Zhu Feng, Fintech Credit Markets around the World: Size, Drivers and Policy Issues, Bank of International Settlements, BIS Quarterly Review, September, 2018, pp. 29–49; Wadsworth Amber, Decrypting the Role of Distributed Ledger Technology in Payments Processes, Reserve Bank of New Zealand, Bulletin, 2018; Ehrentraud Johannes, Garcia Ocampo Denise, Quevedo Vega Camila, Regulating Fintech Financing: Digital Banks and Fintech Platforms, Financial Stability Institute, FSI Insights on Policy Implementation No 27, 2020.

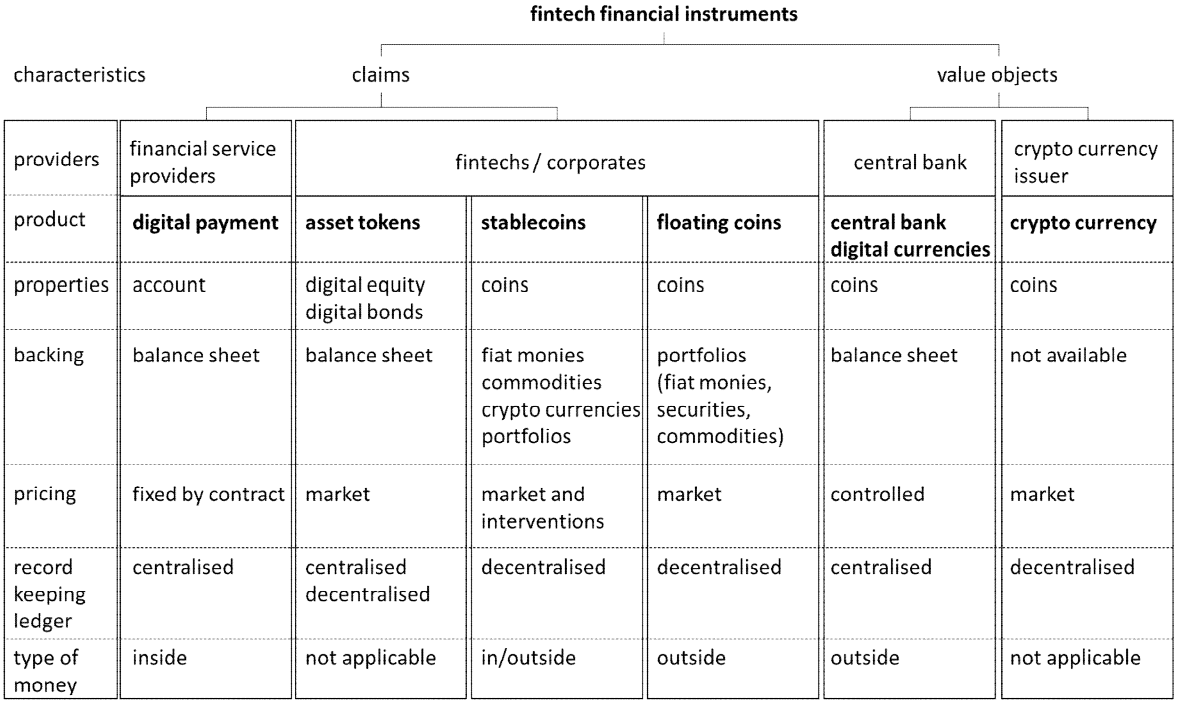
[29] Mundell Robert A., A Theory of Optimum Currency Area, American Economic Review, 1961, pp. 657-665; Fama Eugene F., Banking in the Theory of Finance, Journal of Monetary Economics, 1980, pp. 39-57; Fama Eugene F., What's Different about Banks? Journal of Monetary Economics, 1985, pp. 29-39; Greenfield Robert L., Yeager Leland B., A Laissez-Faire Approach to Monetary Stability, Journal of Money, Credit and Banking 1983, pp. 302-315; Basel Committee on Banking Supervision, Sound Practices Implications of Fintech Developments for Banks and Bank Supervisors, 2018.

4 Digital Financial Instruments

Digital financial instruments that represent claims are offered as an add-on to current banking accounts to facilitate digital payments, tokenise traditional asset (equity, bonds), or digital store of wealth and means of exchange, and floating coins offer a private central bank money. Digital value objects represent a value by themselves. They are issued by central banks (central bank digital currencies CBDC) or by crypto currency issuers in the form coins with no underlying assets.[30]

Digital financial instruments can be classified into two major categories: Those that (1) represent a contractual claim against a counterparty, i.e., an issuer and its assets (2) constitute a value by themselves (value objects).

Figure 1: Digital Financial Instruments



providers	financial service providers	fintechs / corporates			central bank	crypto currency issuer
product	**digital payment**	**asset tokens**	**stablecoins**	**floating coins**	**central bank digital currencies**	**crypto currency**
properties	account	digital equity digital bonds	coins	coins	coins	coins
backing	balance sheet	balance sheet	fiat monies commodities crypto currencies portfolios	portfolios (fiat monies, securities, commodities)	balance sheet	not available
pricing	fixed by contract	market	market and interventions	market	controlled	market
record keeping ledger	centralised	centralised decentralised	decentralised	decentralised	centralised	decentralised
type of money	inside	not applicable	in/outside	outside	outside	not applicable

Fintech financial instruments representing a claim are a digital replication of cash, deposits, equities, bonds. So far, they share the same characteristics and valuation principles as their underlyings. However some digital financial instruments may share the same characteristics and valuation principles as their underlyings, and still have certain risks (such as losing their pegs) to which they could not fully replicate cash, deposits, equities, and bonds. On the other hand central bank digital currency is equivalent to fiat money.

4.1 Distributed Ledgers

Distributed ledgers radically change how assets are stored on a ledger, transactions and payments are executed. They allow for multilateral trading, clearing and settlement of asset transactions. Distributed ledger technology enables participants to consensually share and synchronize transactions recordings on a network accessible to

[30] Moin Amani, Gun Sirer Emin, Sekniqi Kevin, A Classication Framework for Stablecoin Designs, Cornell University and AVA Labs, 2019; Adrian Tobias, Mancini-Griffoli Tommaso, The Rise of Digital Money, Fintech Notes, International Monetary Fund, Note 19/01, 2019; Allen Jason G., Rauchs Michel, Blandin Apolline, Bear Keith, Legal and Regulatory Considerations for Digital Assets, Center for Alternative Finance, Cambridge University, 2020.

multiple participants, each participant at each (transaction) node holding the records of the entire transaction history. Distributed ledger technology is regarded to have the potential to replace traditional financial infrastructures using centralised ledgers.[31]

The blockchain – the first version digital ledger system - is a permissionless system without a central owner controlling the network so anyone can join to execute transactions or validate blocks. Blockchain systems often use open source software and are freely available to anyone who wishes to use it. With respect to permissionless distributed ledgers, regulators pursuing a principle-based and technology-neutral approach have their reservations, such as the legal ownership of the ledger, who is licensed and who ensures compliance with regulations, the identification and verification of network members, which is especially important for deposit insurance schemes. As it is likely the industry will develop multiple ledger models that will fragmentise the financial industry, a need for uniform business standards and high levels of technical interoperability between different ledgers is indicated to maintain the efficiency and competition.[32]

4.1.1 Organisation of a Permissioned Distributed Ledger

In permissioned distributed ledgers the owner or an administrator of the ledger who controls network access and sets the rules of the ledger selects members necessary for a sound processing. The working of a ledger requires activities by several entities:

System Administrator Node

This role involves deciding who can access the network, maintaining and administering dispute resolution rules and performing notary functions. This role is not required in a permissionless distributed ledger.

Issuer Node

The nodes playing this role are responsible for issuing new coins used in the network, and if asked to, redeem them as agreed. Stablecoins issuer are obliged to maintain the peg rate.

Proposer Node

This role involves proposing new transactions for inclusion in the ledger.

Validator Node

Validators run the consensus mechanism of a distributed ledger, i.e., the process by which the members of a network agree on a common state of the ledger. This process typically relies on cryptographic tools, a set of rules or procedures reflected in the protocol. This role involves validating requests for addition of transactions in the ledger. Each validator identifies state changes according to the rules of the arrangement, i.e., checks the availability of assets of the initiating party and whether the beneficiary is entitled to exchange the assets. In order to do so, each validator analyses a record of previous states.

Auditor node

Allowed to view the ledger but not allowed to make changes. This could be used for performing audits and also be used by regulators and supervisors.

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[31] European Parliament and of the Council, Article 4/(19) Directive 2014/65/EU of the European Parliament and of the Council, 15 May 2014, European Securities and Markets Authority (ESMA), MiFID II Review Report on the Functioning of Organised Trading Facilities (OTF), 2021; Swiss Financial Markets Authority (FINMA Circular 2018/1, Organised Trading Facilities, Duties of Operators of Organised Trading Facilities (OTFs), 2017); International Bank for Reconstruction and Development Technology (DLT) and Blockchain, FinTech Note No. 1 2017; Bullmann Dirk, Klemm Jonas, Pinna Andrea, In Search for Stability in Crypto-Assets: Are Stablecoins the Solution? European Central Bank, ECB Occasional Paper No. 230, 2019.

[32] The legal requirements and regulations vary from country to country, making an international digital ledger complex to implement.

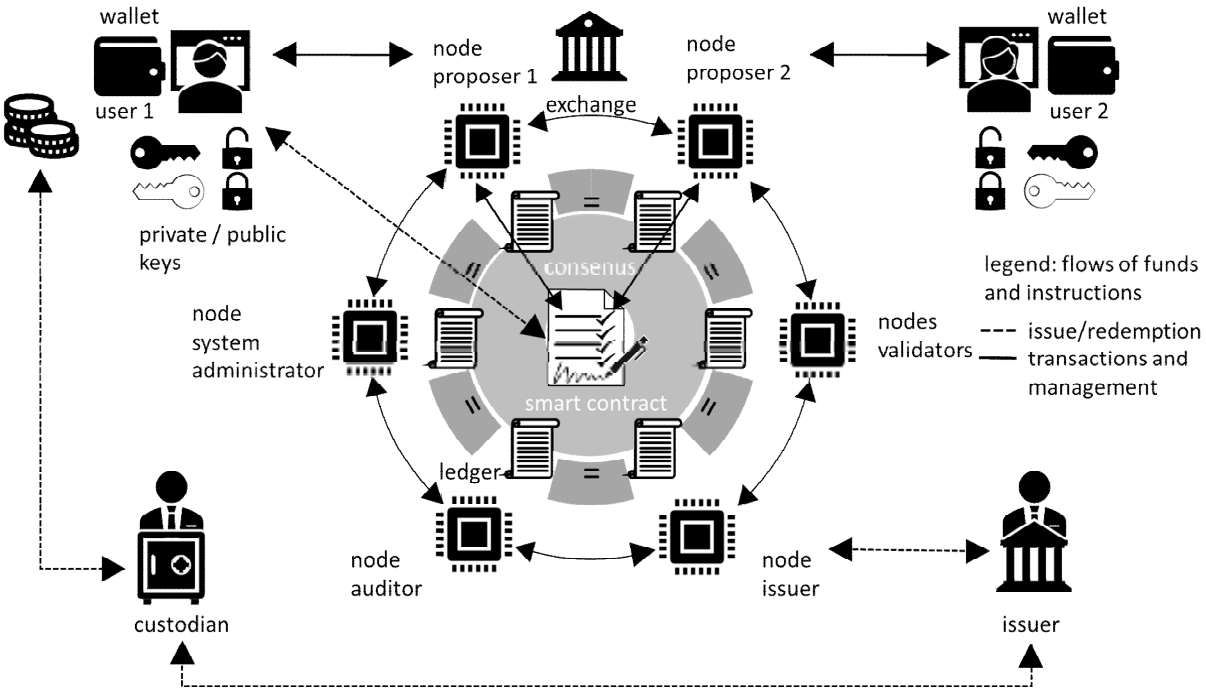
Custodian

On a permissioned distributed ledger the issuer can partner with a custodian holding the funds received by clients. This set-up enhances the security that coins are redeemable according to the terms of service communicated to users.

Exchange

Enables participants to trade stablecoins, cryptocurrencies, as well as asset tokens

Figure 2: Distributed Ledger Set-up



Digital Wallets, Private and Public Keys

Users hold funds in digital wallets. A digital wallet is an electronic device, online service, or software program that allows one party to make electronic transactions with another party trading digital currencies and stablecoins or buy goods and services. Money can be deposited in the digital wallet prior to any transactions or, in other cases an individual's bank account can be linked to the digital wallet. Wallets combine two components of information: (1) a cryptographic software program (private/public key), allowing users to securely execute transaction with other parties and (2) user specific information. There are three types of wallets. Hot wallets are always connected to the Internet, cold wallets are hardware devices that keep the cryptocurrencies away from any internet and warm wallets are connected to the internet but keep most funds in cold storage to prevent security breaches. Generally, digital wallets are stored on the client side. A thin wallet replicates the data on provider side's servers.

Each wallet comes with a cryptographic tool, i.e., private and public keys. The private key is used for signing digital messages and is only known by the individual user. The public key is public knowledge and is used for validating the identity of the sender by the network participants and especially the receiver.[33]

[33] By design a peer-to-peer electronic exchange systems do not require trusted third parties, banks or other organisations to verify transactions. Due to the substantial growth of the crypto market risk of criminal abuse is rising. Regulators therefore request Know Your Customer (KYC) procedures. Having a crypto wallet means the crypto exchange knows your public key and can connect transactions to your identity. And, if requested, they could provide this information to law enforcement or government officials. The European Union propose new AML regulations, applying also to crypto wallets, including requirements that "all transfers of crypto-assets will have to include information on the source of the asset and its beneficiary,

Smart Contracts

The objectives of smart contracts are the reduction of intermediation, arbitration and enforcement costs. Smart Contracts are computer programs or transaction protocols, which automatically execute contract agreements. On a digital ledger, smart contracts being automatically executed by computers strictly enforce the transfer of funds, without the possibility of manipulation, and store transaction data. The actual execution of contracts is validated and audited by the distributed ledger.

Consensus

To reach a consensus regarding the validity added, data entries on distributed ledgers systems follow a set of rules specified in an algorithm. Permissioned blockchains typically use the "proof of stake" approach. To ensure the integrity of the validation process, entities are allowed to validate transactions up to the amount o[34]f coins they hold, i.e., their stake protects the transaction they approve to be sound. Because the remuneration for their validation efforts and the higher chance to get selected depends on the amount of their stake held on the network validators are incentivised to held a (higher) stake in the network. A selected validator proposes a block, and if other validators agree, the block is added to the network. Despite the fact that the proof-of-stake approach to validate transactions is a relatively new consensus technology, it has gained prominence among distributed ledgers. [35]

4.1.2 Transaction on the Digital Ledger

To obtain digital funds, i.e. stablecoins, a user deposits funds to the account an issuer holds with a custodian. Upon confirmation of the receipt by the custodian, the issuer creates, i.e., "mints", and allocates a corresponding number of coins through the smart contract it maintains in the user's wallet. The process of redeeming units of tokenised funds works in reverse. A user sends the units of tokenised funds to be redeemed to the issuer's network address to withdraw them from circulation, i.e., "burn" them, and the custodian is instructed to transfer funds back to the user. This process ensures that the circulating digital funds maintain the pledged backing the at all time.

The initiating user A enters the transaction information to user B in the protocol of the smart contract of the digital ledger, and locks it by digitally signing it with its private key, i.e., by adding a unique "hash" that is shared with the entire network.[36] The single transactions are packaged in blocks. These are strictly connected to their predecessors forming a chain using algorithmic methods. To ensure the integrity of the chain an independent entity not involved in transactions validates the blocks. Upon receiving the transfer protocol, a validator will authenticate user A's digital identity by checking the cryptographic credentials and the availability of funds to execute the transaction. Only after validation all participants add the new block to their respective ledgers. In a permissioned distributed ledger, the entities managing the distributed ledger hold identical copies of the entire ledger at any point in time, so that the record cannot be changed without the consent of all participants securing the ledger integrity.[37] After the update is accepted, the records get modified in such way that all future transactions regarding the transferred funds must be linked to cryptographic credentials of user B.

information that is to be made available to the competent authorities." The proposal includes crypto wallets. https://finance.ec.europa.eu/financial-crime/eu-context-anti-money-laundering-and-countering-financing-terrorism_en

34 "burn" means that the issuer reduces the outstanding amount of its stablecoins

35 Bitcoin blockchain use the "proof of work" protocol.

36 International Securities Services Association, ISSA Distributed Ledger Technology, Principles for Industry-Wide Acceptance, 2018; Rauchs Michel, Glidden Andrew, Gordon Brian, Pieters Gina, Recanatini Martino, Rostand François, Vagneur Kathryn, Zhang Bryan Distributed Ledger, Technology Systems, A Conceptual Framework, Cambridge Centre for Alternative Finance, University of Cambridge, 2018.

37 The complex technical aspects of digital ledgers are discussed in: G7 Working Group on Stablecoins, Investigating the Impact of Global Stablecoins, 2019.

4.1.3 Implication for the Financial System

Distributed Ledgers may have broader market implications due to numerous interlinkages within the financial system, especially due to the emergence of multiple store of wealth and payments systems across jurisdictional boundaries. One key challenge will be the technical interoperability, i.e., the development of standards that facilitate the connectivity between different distributed ledgers to prevent the fragmentation of the financial system, which could also create network scale efficiencies. The potential disintermediation effects of distributed ledgers may affect the competitive balance in financial markets, especially if big tech companies were to launch their own platforms.

4.2 Digital Payments

Digital payment services mainly provide "electronic money" (e-money) that is essentially cash stored in electronic form, i.e., on mobile devices, cards etc.[38] It is the most common form of money to execute transfer of funds used on electronic banking systems. The launch of fintech digital payment services using mobile phones and computers is a paradigm shift, allowing for peer-to-peer transactions, fulfilling the customer demand for faster (instantaneous), cheaper, easily accessible and reliable payment making. Empirical evidence clearly shows that this technical innovation had a positive impact on economic development by lowering the cost of payments and allowing direct access to payment services through mobile/computer devices resulting in the financial inclusion and opening up users' access to additional financial services, credit, savings, insurance, and investment.

Both banks and nonbanks (mobile network operators, electronic money issuers) cooperate to render digital payment services. In 2020, 60 countries had digital payment solutions, and others are planning to go live. 14.5% of all the global non-cash transactions were made in the form of e-money and instant payments compared to 85.5% in the form of checks, direct debits, credit transactions and cards (2016: 8.8% and 91.2%). The rapid spread of digital payments solutions indicates that they are likely to become the dominant payment infrastructure in the future; retailers switch to online platforms and thereby new modes of payment interfaces, customer demand shifts to more payment convenience, 24/7, real-time peer-to-peer transfers at low cost. The expanding payment networks fostered by interoperability facilitate both individual and corporate use cases.[39]

4.2.1 Set-Up

Regulators in different countries allow three institutional set-ups:

Bank / Limited Bank Digital Payment Services

Regulation only allows licensed banks or limited banks that are restricted to deposits taking solely for transaction purposes, to offer digital payment services. The advantages of this approach result from banks being already licensed and supervised by a financial authority, and limited banks profit from lower minimum capital requirements. However, being focused on banking clients using traditional services, incumbents may be reluctant to expand their business cases to the currently not included (underbanked?) client segments.

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[38] European Parliament and Council, Directive 2009/110/EC, On the Taking up, Pursuit and Prudential Supervision of the Business of Electronic Money, 2009: Article 2(1) "electronic money" means "electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of funds for the purpose of making payment transactions (…), and which is accepted by a natural or legal person other than the electronic money issuer".

[39] Bill & Melinda Gates Foundation, Inclusive Digital Financial Services a Reference Guide for Regulators, 2019; International Bank for Reconstruction and Development, World Bank, Fast Payment Systems, Preliminary Analysis of Global Developments, High-Level Draft For Public Consultation, 2020; CapGemini, World Payments Report, 2020 and 2021; Adrian Tobias, Mancini-Griffoli Tommaso, The Rise of Digital Money Fintech Notes, NOTE/19/01, 2019; McKinsey, The 2020 McKinsey Global Payments Report, 2020.

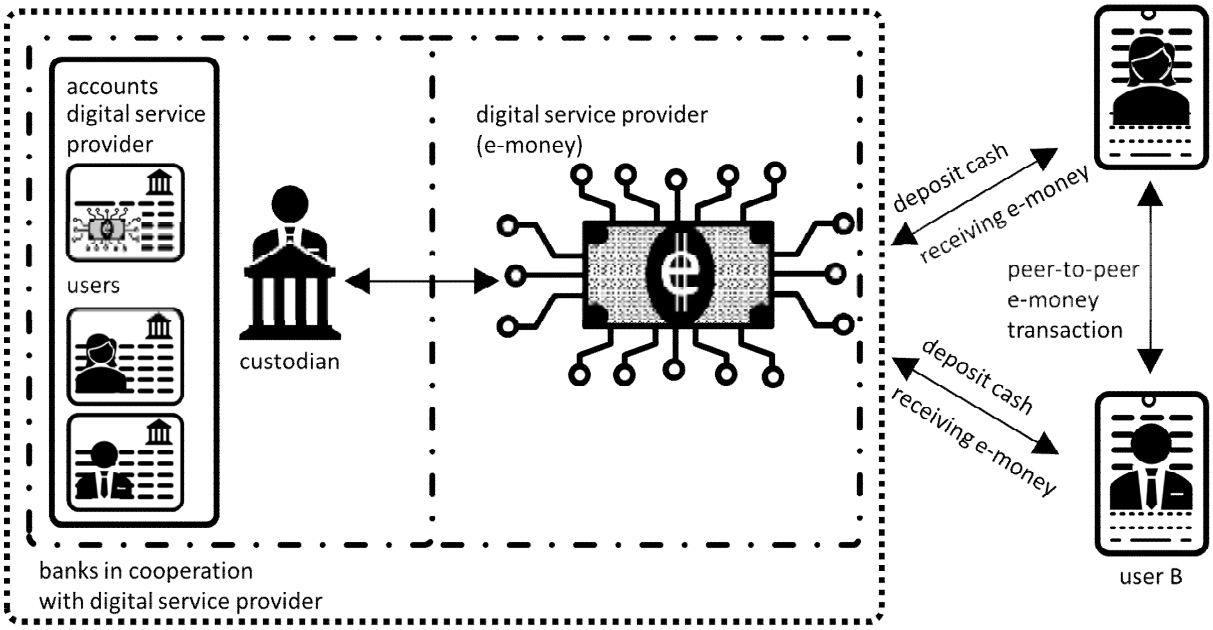
Bank – Digital Payment Service Provider Partnership

The user interfaces are supplied by digital payment service providers and the banks holds the accounts and areresponsible for back-office tasks. The combination of licenced and supervised banks with a digital payment service provider brings together the benefit of two worlds, i.e., the safety of fund keeping and the innovations provided by digital payment platforms. The flip side of this approach is that the digital service provider is obliged to get the banks approval for new products and services, changes to account limits, etc. Also the partnership of digital service providers with banks involves third-party risks for the client and requires clear due diligence of the engagements and Service Level Agreements between the partners.

Digital Payment Service Provider

A digital payment service provider is licensed to perform all payment steps. It is the most common approach in markets where digital payment has become a dominant means of funds transfer to directly regulate digital payment providers, because licenced digital payment providers telecom and Bigtech companies (Facebook, Amazon, Apple, Google) can establish their own business approach profiting from their experience to render services to the mass market. From a regulatory perspective, financial and telco-regulators must coordinate their efforts to secure a stable execution of payments. Often the mobile network operators establish, or are required to set-up, a subsidiary specifically for digital payment services to be licensed by the financial authority.

Figure 3: Set-Up



bank-only/limited bank offering

Users can deposit money on a personalised digital payment service account either with an authorised agent and/or link it with a bank account. Once money has been loaded onto their mobile devices, users can transfer funds peer-2-peer using QR codes, SMS etc.

4.2.2 Regulatory Approaches

In many countries the offerings of digital payment services are regulated and providers must be licenced[40]. In countries with high volumes of holdings and/or larger numbers of users, a disruption of digital payment system constitutes a systemic risk. Regulators' key focus is to ensure stability of the payment system and to secure the users funds. Depending on the digital payment services set-ups, regulators around the world have established different requirements and supervise the involved entities offerings:

[40] For example in Canada, UK, European Union, Japan, Singapore, Switzerland, see J.Ehrentraud et.al. "Fintech and payments: regulating digital payment services and e-money" BIS-FSI Insights No 33 (July 5, 2021)

Capital and Liquidity Requirements

Initial minimum capital requirements aim to ensure that new entrants have sufficient capital to build a sustainable business. To mitigate key risks such as unexpected losses, capital buffer must be increased as the business grows.

To secure sufficient liquidity, digital service providers are requested to set aside funds in safe, liquid investments equal to 100% of outstanding balances in licensed banks. Financial institutions may also be required to have access to lines of credits, as part of their liquidity requirements.

Provider Insolvency

To protect clients' funds in the case of a digital service provider insolvency, clients' funds must be ring-fenced, i.e., held in separate trust and only to be used to repay clients, and should be protected against credit claims in event of issuer's insolvency.

Bank Insolvency

Regulated banks have to comply with capital and liquidity regulations and are members of the deposit insurance schemes. Providers of digital payments services could hold their balances at multiple banks to benefit from distribution effects in the case of a collapse of one bank. Digital service providers partnering with banks could benefit from deposit insurance holding a custodial account where the funds are held on behalf of the underlying identifiable customers. They may benefit up to the deposit insurance amount, and depending on how the custodial accounts are structured.

4.2.3 Deposit Insurance

At present, countries with deposit insurance have adopted one of three approaches to digital "deposit-like" products based on their market structure, legal and regulatory frameworks and their assessment of risks associated with the widespread adoption of these products. [41]

Exclusion Approach

This means that these accounts are explicitly not covered by the deposit insurance system due to digital payment services accounts being regarded as primarily instruments of temporary value storage to make payments or transfers.

Direct approach: Bank / Narrow Bank Digital Payment Services

In some countries, digital deposit-like products are defined as insured deposits, where providers of such products are prudentially regulated financial institutions, which however may not have a full banking licence. These would then be members of the deposit insurance system. Colombia and Mexico have adopted this approach. They have not only permitted banks to offer deposit-like products, but also have created new specialized categories of prudentially regulated financial institutions which are allowed to offer deposit-like products that will be insured.[42]

Indirect Approach

Deposit insurance covers indirectly digital deposit-like products if the "float" collected by providers of digital payment services is placed in pooled custodial accounts with an insured depository institution. Under the indirect approach the coverage limit for individual accounts is "passed through" to each owner of the funds making up the float held in the custodial account. However, the indirect approach only protects e-money customers should the bank holding the funds fail, but not necessarily protect against e-money institution failure.

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41 Izaguirre Juan Carlos, Dias Denise, Kerse Mehmet, Deposit Insurance Treatment of E-Money, An Analysis of Policy Choices, Technical Note, CGAP/World Bank, 2019.

42 Izaguirre Juan Carlos, Claire McGuire, Dave Grace, Deposit Insurance for Digital Financial Products. 3 Approaches, Blog July 16, 2015, CGAP, https://www.cgap.org/blog/deposit-insurance-digital-financial-products-3-approaches

Because of the different business set-ups, i.e., specific types of involved entities and the characteristics and use of products offered, the legal system, the regulatory and supervisory framework, determines the effectiveness of these approaches. So, there is no “one-size-fits-all” approach to cover digital payments.

4.3 Asset-backed crypto-assets in the form ofTokens

Asset-backed tokens can be means of investment representing digital claims on almost any security or financial assets: fixed income, equities, real estate; commodities: precious metals (gold, silver, platinum), agricultural products, energy; manufactured products: automobiles, equipment; art objects: fine art, virtual collectables, intangible assets (intellectual properties), patents, copyrights, licenses, trademarks. They share by design the price dynamics of the underlying assets. Asset-backed security tokens provide secure, fast exchange opportunities at minimal trading costs compared to conventional assets while increasing liquidity for traditional securities. Asset-backed tokens are mainly used for assets which have been traditionally difficult to find investors for, due to expensive fundraising campaigns, listing and trading costs of traditional exchanges. The small denomination of asset tokens creates investment opportunities for retail investors who have a relatively modest amount of capital and are currently unable to develop a diversified portfolio by stock picking. On the other hand, companies get new ways to raise money more efficiently and can reach out to new investor segments.

Regulators are eyeing asset-backed and security tokens with caution because these instruments address a new segment of investors and the technical set-up required for holding and trading differs from existing instruments. The U.S. Securities and Exchange Commission (SEC), the EU (European Securities and Market Authority, European Banking Authority, Markets in Financial Instruments Directive) and Switzerland (FINMA) have already issued regulations. China’s regulatory authorities have completely banned asset-backed tokens from being issued.

4.4 Asset-backed crypto-assets in the form of Stablecoins

Stablecoins mimic or digitally replicate the functions of fiat currencies as means of payment and store of wealth. They offer holders of stablecoins the advantage of inexpensive and easily accessible (digital) networks for near instant transfer of money.[43] Every unit of tokenised funds represents a users’ claim on the issuer for the received funds. The issuer either holds the funds itself or passes them on to a custodian, requiring that the issuer is identifiable and an accountable entity able to fulfil the role of a custodian. The issuer ensures tokenised funds are redeemable according to the terms of service communicated to the users.

Stablecoins efficiency rests on two pillars. (1) the stabilising mechanisms and (2) the distributed ledger technology providing a transparent and traceable international payment system that processes stablecoin transactions fast and at low cost.
These benefits allow issuers to provide services to unbanked or underserved people as well as to increase efficiency of the established financial system. In countries with an unstable currency, stablecoins can evolve to a preferred means of payment over the legal national currency. Depending on the scale of the stablecoin, the established financial and monetary system faces fundamental changes and disruptions due to more efficient payment and store of wealth services as well as by creating private outside money dominating existing offerings especially when substituting fiat-currency monetary sovereignty, monetary policy and financial stability could be impacted.

[43] European Central Bank, ECB Crypto-Assets Task Force, Stablecoins: Implications for Monetary Policy, Financial Stability, Market Infrastructure and Payments, and Banking Supervision in the Euro Area, Occasional Paper Series, No 247 / September 2020.Bullmann Dirk, Klemm Jonas, Pinna Andrea, In Search for Stability in Crypto-Assets: Are Stablecoins the Solution?, European Central Bank Occasional Paper, No. 230, 2019.

The multiple stablecoin options could lead to a fragmentation of the payment system and create financial stability risks. As stablecoins' designs vary greatly in economic, technical, and legal terms, regulatory and oversight risks will arise: the legal categorisation of stablecoins is relatively ambiguous. Depending on the stablecoin characteristics and the legal framework in different jurisdictions, stablecoins may be considered as money, a contractual claim, a security or a financial instrument. To establish a sound regulatory framework for stablecoins without legal certainty complicates user protection regarding adequate information and disclosures and deposit insurance – especially due to the potential of stablecoins to substitute central bank money and inside money offerings.

4.4.1 Set-Up On-Off-Chain-Collateralised Stablecoins

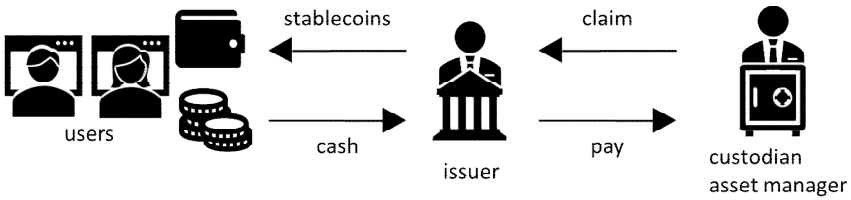
Stablecoins issuers "guarantee" redemption at face value, i.e., at a fix peg between the stable coins and a fiat currency. To ensure the peg rate (1) a 1:1 coverage of the stablecoin with the fiat money or (2) a well-structured backing portfolio and specific legal structures is required. Otherwise, stablecoins are subject to run-risk.

Users buying stablecoins get a claim on the issuers as well as the underlying assets. As a replication the backing assets stablecoins are subject to the same volatility and risk associated with their underlying. Therefore, the risk profile of stablecoins emerges from: (1) fluctuating market valuations and foreign exchange rates, unless the stablecoin is not fully backed with the asset it is pegged to; (2) the pledge to meet the redemption request at any time, which creates liquidity risk to meet obligation due to (a) the lack of marketability of backing investments or (b) to having to sell assets suffering significant losses; (3) default of the issuer; (4) operational risk. All these risks potentially undermine the stability of stablecoins.

To optimise exposure to these risks and thus the stablecoins value stability in relation to the guaranteed peg, issuers can put in place the following measures: (1) to secure a prudent management and legal protection of assets available for redemption, client funds may be transferred to a custodian. This segregates client funds from the balance sheets of stablecoin issuers. (2) issuers offer their stablecoins at a premium to build up reserves or necessary funds to absorb these risks (3) issuers held own capital.

Off-chain collateralised stablecoins are backed by units of one or more assets having the unique characteristic that their reference value is given by the underlying. The assets backing up stablecoins must have sufficient reserves - being over-collateralised - allowing to absorb value shock without an impact on the peg value of the stablecoin and/or a mechanism that automatically executes stabilising interventions by buying and selling stablecoins at the peg value. Generally, the issuer must ensure that funds turned in by users are stored securely with a custodian, so they are available to be paid out at the users' request.

Figure 4: Stablecoin Set-Up



On-chain stablecoins are often over-collateralised by other cryptocurrencies and transactions are executed entirely based on a distributed ledger technology. The set-up structure of on-chain collateralised corresponds to on -chain collateralised stablecoins. But the custodians' tasks are performed by the network of the stablecoin users on the distributed ledger. However, on-chain stablecoins, although are often over-collateralized by other cryptocurrencies, may be one of the stablecoins with the most risks.

4.4.2 Stablecoin Ecosystem

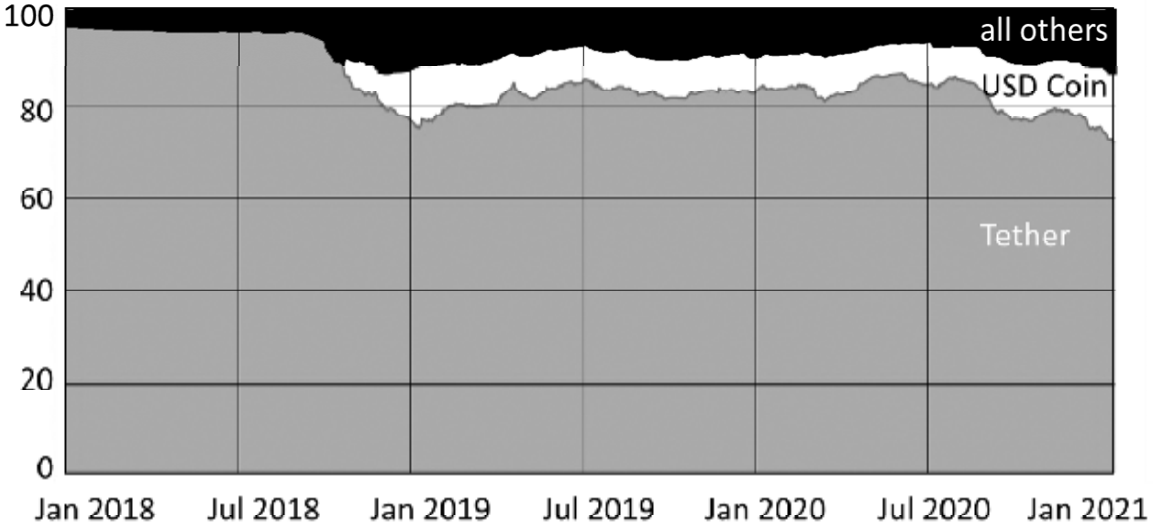
A stablecoin value is determined by its backing assets. The provider or the digital network must be able to demonstrate how the backing is designed: (1) that the backing is sufficient for securing the stability of its value with regard to its users' currency or reference, and (2) the backing allows to absorb unexpected redemption requests by users at the predetermined conversion value. A possible way to ensure stability is to regulate the eligible asset universe and composition of the backing portfolio.

4.4.2.1 1:1 Fiat Money Stablecoins

1:1 fiat money stablecoins, for example USD Tether (USDT) , Binance (BUSD), TrueUSD (TUSD), USD Coin (USDC), are directly linked to backing currency that is generally deposited with a third-party regulated financial entity holding funds of stablecoin providers on separate off-balance sheet accounts. By design 1:1 stablecoins share the same inflation/deflation risk as the underlying currency – i.e., they do not stabilise the purchasing power as such.

Tether dominates the global stablecoin supply. However like other fiat money stablecoins there appeared inherent risks in such stablecoins such as market manipulation and temporarily not fully backed situations. US Department of Justice's investigations regarding Tether's potential market manipulation as well as the New York Attorney General's inquiry into an apparent misuse of Tether cash reserves was settled by a 18.5m fine. This turmoil fostered the market entry of new fiat-collateralised stablecoins, reducing the market share of USDT from 75% market share in January 2021 to 45% in December 2021, while its largest rival USDC rose to 26% in the same two years.

Figure 5: Stablecoin Market



Source: CBInsights[44]

4.4.2.2 Commodity Stablecoins

Commodity-backed stablecoins are linked to tangible assets, such as precious metals, i.e., gold, silver or oil etc., and redeemable in value of the physical amount of commodity a token represents. Examples are, Digix Gold Tokens (1 DGX represents 1 gram of gold, stored in a vault in Singapore being audited every 3 months to ensure a 1:1 backing as well as transparency for the holders), Novem Gold, Tiberius Coin (TCX is backed by a portfolio of 7 precious metals commonly used in technology), SwissRealCoin (SRC is backed by a portfolio of Swiss real estate). Therefore, holders of commodity-backed stablecoins essentially own a digital representation of the physical asset having the potential to appreciate or depreciate in cash value over time.

4.4.2.3 Cryptocurrency Stablecoins

The design and technical implementation of cryptocurrency-backed stablecoins are the most complex form of stablecoins, i.e., more complex and varied than that of fiat-collateralized stablecoins. Conceptually similar to fiat-backed stablecoins, cryptocurrency backed stablecoins are collateralised with cryptocurrencies. The significant difference between the two designs is that while fiat collateralisation typically is off distributed ledger

[44] CB Insights, What Are Stablecoins?, Report, 2021.

technology and using custodians that are subject to regulation, the cryptocurrency or crypto asset used to back the crypto stablecoins is done on unregulated blockchains.

Cryptocurrency stablecoins issuers are significantly challenged in maintaining the defined peg rates due to the value volatility of underlying cryptocurrencies. Issuers address this challenge by over-collateralising the outstanding tokens, i.e., building up buffers that can absorb price fluctuations in the collateral. Dai, which is backed by Ether and locked up in smart contracts, is pegged to USD. Dai is the most popular and promising example of a cryptocurrency stablecoin token. Because of the highly volatile cryptocurrency market prices, a significant collateral must be deposited by users. This is making this offering risky and expensive. The complexity of how the price is actually ensured may be difficult for users to understand and so may deter usage. Consequently, cryptocurrency stablecoins have not gained much traction yet.

4.4.2.4 Algorithmic (Seigniorage) Stablecoins

The algorithmic stablecoins commonly offer two types of digital financial instruments, i.e., stablecoins and digital shares as ownership of seigniorage. In principle, digital shares are used to increase the supply of coins when the price of a coin is above its intended peg. In addition, seigniorage-style stablecoins often issue a redeemable bond designed with an automatic incentive for holders to adjust their holdings depending on the actual market value of the outstanding tokens. Therefore, the total supply of an algorithmic stablecoin is variable and controlled by an automatic adjustment process: new coins are automatically minted and proportionally distributed to all accounts based on their balances if the price of an algorithmic stablecoin is higher than its peg; if the market value falls below the peg coins are proportionally burned. More precisely, when the price of algorithmic stablecoins rises above the peg new stablecoin tokens will be minted and distributed as a reward to current holders. Bond holders can redeem algorithmic stable coins with their bond at a 1:1 price. Both mechanisms increase the circulating quantity of stable coins counteracting the effects of increased demand, making the value to decrease. By dynamically in/decreasing supply, the price is expected not to fall too far from its peg.[45] However, there is a significant risk, that algorithmic stablecoins can loose their pegs. This happened in May 2022 to the popular TerraUSD algorithmic stalecoin, which was indirectly pegged to the US Dollar through the Luna cryptocurrency. During a general and continuous market-downturn (including massive value decreases of cryptocurrencies), TerraUSD lost 95% of its value and wiped out almost US$45 billion in market capitalisation within a week.

4.4.3 Valuation and Stabilisation Mechanisms

4.4.3.1 Valuation: Peg

The definition of a reference currency or asset of a stablecoin and the design of the convertibility rules and mechanisms are essential for the value stability of stablecoins. As the USD is the key transaction currency and is considered as a stable store of value around the world, USD is a preferred choice of stablecoin issuers that want to maximise the size of their potential market. For the same reason the Euro, the Japanese Yen, and the Swiss Franc serve as a reference currency; China has prohibited stablecoins to be pegged against the yuan. As a consequence, stablecoins follow the valuation of the underlying currency and are therefore also exposed to the risk of inflation. They do not represent a stable purchasing power. Other stablecoins may choose to peg to a portfolio or a bundle of currencies and/or commodities, allowing to insulate the stablecoin against the value fluctuations of a single instrument by a well-diversified portfolio; Facebook's failed Libra project (renamed Diem) planned to peg its currency to a basket of currencies and assets thereby establishing its own unit of account, however it was scaled back to a peg to the US$. Apparently without success as in January 2022 Diem's assets were sold to the bank holding company Silvergate .

[45] Zhao Wenqi, Li Hui, Yuan Yuming, Understand Volatility of Algorithmic Stablecoin: Modeling, Verification and Empirical Analysis, Huobi Research, 2020.

4.4.3.2 Stabilisation Mechanism

A stablecoin arrangement should have appropriate systems, controls and practices in place to address potential stability risks.[46] The Bank of International Settlement has set out requirements for the approval of stabilisation mechanisms: (1) stabilisation mechanisms must be "effective at all times" to minimise fluctuations in the market value with regard to the stipulated peg-value; (2) the issuers hold ownership rights of underlying assets and have to safely store them; (3) the exposures have to be appropriately managed; (4) evidence must be provided at significant deviations from the peg-rate of 10bp. This should occur not more than three times within a time horizon of one year; (5) in case of a violation of the threshold rule the issuer has to demonstrate that measures have been taken to eliminate the possibility of a breach of the threshold; (6) monitoring framework must function independently of the issuer. Consequently, stablecoins backed by cryptoassets or algorithm-based stablecoins that control their peg rate using algorithmic protocols to increase or decrease supply are not considered to fulfil the requirements of an effective stabilisation mechanism.

In order to maintain the peg builds on arbitrage mechanisms, the issuer guarantees convertibility to the underlying fiat currency, offers holders of stablecoins to turn them in to the issuer who will burn the stablecoin tokens, and pay-out the amount in fiat currency. As a result, the stablecoin token supply and reserves are at a constant peg ratio.
Regulators, for example New York State Regulators, apply banking laws to the stablecoin to ensure full collateralisation. The custodians have to control the creation and burning of tokens and to check for illegal activities on accounts. Inbuilt within the token smart contract's function that reflects the regulation of the stablecoin.
As stablecoins are tradeable on exchanges any deviation from the peg opens arbitrage opportunities. Whenever the price would fall below the peg rate, arbitrage traders will realise a risk-free profit by buying on the market and simultaneously asking for redemption. This will bring the stablecoin back to par. In case of a market price above par, arbitrageurs will pay in cash to obtain stablecoins and selling them instantly at the higher market price with profit. This in turn will increase the supply of the coins on the market and lower the coin price to parity.
Adding automated market makers to the stablecoin ecosystem enhances the stability of stablecoins' value. Automated market makers are robots providing liquidity and using smart contracts to quote a price between two assets according to a pricing algorithm. To create the market, automated market makers collect the necessary liquidity from holders of digital currencies. In turn, liquidity providers earn fees from the trades executed through automated market makers using their pool of funds. Automated market makers pool more liquidity and slippage will occur less likely in case of large transactions (orders). This contributes to the stabilisation of the value of stablecoins.[47]

4.4.3.3 Stability of Stablecoins

Stablecoins offer new technology and benefits to store wealth and execute payments. However as with any new technology, uncertainty prevails about its reliability and stability.[48]
To qualify a digital stablecoins as safe as cash, a fixed peg to its anchor currency must prevail at least within an "acceptable" band around it.[49] Value stability crucially depends on stablecoins' arrangements and design,

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46 U.S. President's Working Group on Financial Markets, Statement on Key Regulatory and Supervisory Issues Relevant to Certain Stablecoins, 2020; Financial Stability Board, Regulation, Supervision and Oversight of "Global Stablecoin" Arrangements, Final Report and High-Level Recommendations, 2020; Bank of International Settlement, Prudential Treatment of Cryptoasset Exposures, Consultative Document, 2021.

47 Adams Hayden, Zinsmeister Noah, Salem Moody, Keefer River, Robinson Dan, Uniswap v3 Core, 2021.

48 Lyons Richard K., Viswanath-Natraj Ganesh, What Keeps Stablecoins Stable? National Bureau of Economic Research Working Paper 27136, 2020; Arner Douglas, Auer Raphael, Frost Jon, Stablecoins: Risks, Potential and Regulation, Bank of International Settlement, Working Paper No. 905, 2020.

49 G7 Working Group on Stablecoins, Investigating the Impact of Global Stablecoins, 2019; Financial Stability Board (FSB), Regulation, Supervision and Oversight of "Global Stablecoin" Arrangements, 2020; Group of Thirty (G30), Digital Currencies and Stablecoins: Risks, Opportunities, and Challenges Ahead, 2020;

especially on how backing, management and market arbitrage mechanisms can secure a stable peg to the anchor currencies. Regulators and deposit insurers are fundamentally challenged with regard to their duty to secure the stability of the digital financial system.

Perfect value stability with regard to the anchor currencies requires a 100% liquid backing. In this case a stablecoin should simply reflect the anchors' properties. Unfortunately, full currency backing does not generate any profit, which is the key challenge of stablecoin issuers. To stay in business and make money, providers charge fees on withdrawals and deposits and/or establish fractional backing combining currency reserves and an investment portfolio, not much different from the traditional banks deposits offerings or a fund.[50] However, empirical research documents that stablecoins cannot secure the deposit requirement of value stability. Baumöhl and Výrost used high-frequency 1-minute data to find that stablecoins are not consistently and reliably stable at all times.[51] Jarno and Kolodziejczyk observe that for tokenised funds being operated like a currency board arrangement show the least volatility. But none of the existing implementations of stablecoins either backed by asset portfolios or by algorithmic rebalancing mechanisms work smoothly enough, as was experienced in the collapse of TerraUSB/Luna. Off-chain stablecoins display lower volatility than other designs.[52] Grobysa et. al. find similar result and find statistically unstable volatilities of stablecoins that contemporaneously respond to Bitcoin volatility.[53] Jeger and Jeger et. al., evaluated different stablecoin designs regarding the financial market turmoil in 2020 and find that USD pegged off-chain collateralized stablecoins performed best in terms of stability. However on-chain collateral design could not win a larger market share.[54]

Gloede and Moser show that sovereign-backed stablecoins do not all perform equally, and neither do asset-back on-chain stablecoins. This suggests that other design features than the type of collateral or the degree of decentralization matter as well. Evaluating different risk dimensions, their research establishes that stablecoins offer hedge potential against equity market risk and Bitcoin volatility. They did not find any evidence that either Tether, stablecoins backed by gold, or algorithmic stablecoins exhibit hedging or safe-haven properties. [55]

Corbet et. al. document that large cryptocurrencies acted as a store of value during the period of exceptional financial market stress in 2020. They conclude that investors held stablecoins to realise diversification benefits and use it as a safe haven digital currency similar to gold.[56] Hoang and Baur's findings from the evaluation of the six largest stablecoins show that none of them is absolutely stable (strict 1:1 relationship, i.e., zero volatility) and

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Bullmann Dirk, Klemm Jonas, Pinna Andrea, In Search for Stability in Crypto-Assets: Are Stablecoins the Solution? European Central Bank, ECB Occasional Paper No. 230, 2019; Härdle Wolfgang Karl, Harvey Campbell R., Reule Raphael C. G., Understanding Cryptocurrencies, Journal of Financial Econometrics, 2020, pp. 181–208.

50 From its inception on the leading stablecoin Tether considerable uncertainty prevailed about its US dollars backing; later revealing that Tether was only fractionally backed, but claiming that Tether does not need to hold $1 for every USDT issued.
De Nikhilesh, Tether Lawyer Admits Stablecoin Now 74% Backed by Cash and Equivalents. Coindesk, 2019, Berentsen Aleksander, Schär Fabian, Stablecoins: The Quest for a Low Volatility Cryptocurrency, in: Fatás, A. ed., The Economics of Fintech and Digital Currencies. CEPR Press, 2019, pp. 65- 71; Blockdata, Stablecoins: An Overview of the Current State of Stablecoins, 2019.

51 Baumöhl Eduard, Výrost Tomáš, Stablecoins as a Crypto Safe Haven? Not all of them! 2020.

52 Jarno Klaudia, Kołodziejczyk Hanna, Does the Design of Stablecoins Impact Their Volatility?, Journal of Risk and Financial Management, 2021, pp. 1-14.

53 Grobysa Klaus, Junttilab Juha, Kolaric James W., Sapkotad Niranjan, On the Stability of Stablecoins, SSRN Working Paper, 2021.

54 Jeger Clemens, Analysis of Stablecoins during the 2020 Global Financial Crisis, Working Paper Department of Informatics IfI, University of Zurich, 2020; Jeger Clemens, Rodrigues Bruno, Scheid Eder, Stiller Burkhard, Analysis of Stablecoins during the Global COVID-19 Pandemic, Working Paper Department of Informatics IfI, University of Zurich, 2020.

55 Gloede Oliver, Moser Thomas Crypto Havens: Are Stablecoins Safe Havens? Swiss National Bank Working Paper, 2021.

56 Corbet Shae, Hou Yang Greg, Hub Yang, Charles Larkin, Oxley Les, Any Port in a Storm: Cryptocurrency Safe-Havens during the COVID-19 Pandemic, Economic Letters, 2020, p. 1-7.

none shows less volatility than anchor currencies such as USD, EUR or gold. Despite evident value instability, stablecoins have become popular and are increasingly used as means of exchange and store of value.

Hoang and Baur argue that stablecoins' low trading costs compared with sovereign currencies compensate users for the value risk they have to incur using stablecoins. [57] From a user perspective the value stability of a stablecoin vis à vis a peg currency is only one side of the equation, because the convenience and cost of using a stablecoin to store wealth or as a medium of exchange has to be considered as well. Stablecoins will be strictly preferred if the net value after cost is higher than for traditional means, i.e., if the following inequality holds

Net-purchasing power of traditional money and stablecoins:

$$p_{TM} - c_{TM} \leq p_{StC} - c_{StC}$$

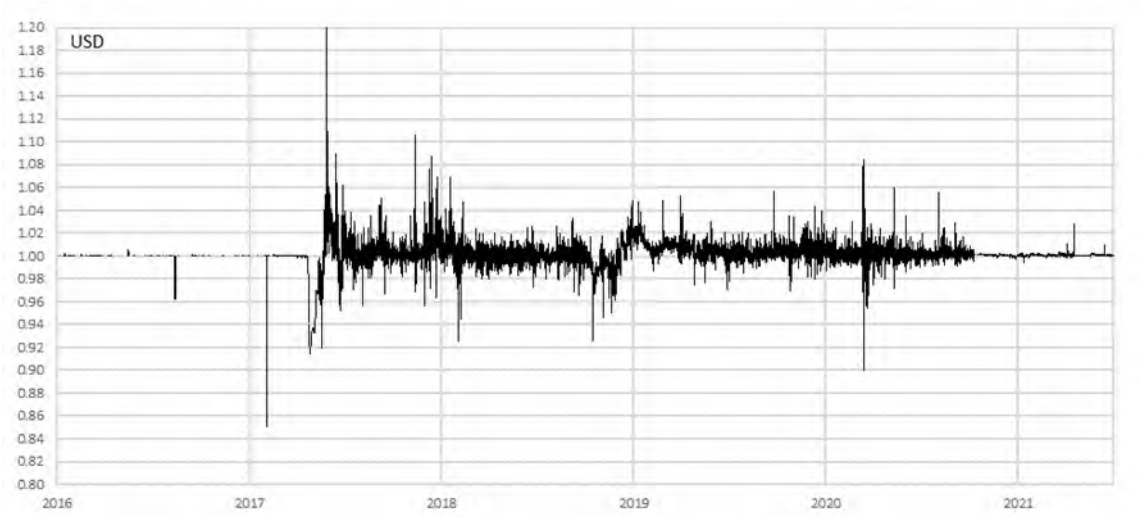
Where: market value and transaction costs p_{TM}, c_{TM} of traditional money, p_{StC}, c_{StC} of stablecoins

This equation states that if the net purchasing power of stablecoins is greater than that of traditional money, stablecoins will become the preferred means of exchange; many countries witness the launch of hundreds of low cost and easy accessible stablecoins that will rapidly attract users willing to substitute traditional means of payments with stablecoins. Therefore, stablecoins have the potential to replace traditional means of exchange or store of wealth financial instruments as well as increase financial inclusion.

The Bank of International Settlement has defined stability: "The difference in value (i.e., absolute difference stablecoin and underlying traditional asset value) must not exceed 10bp of the value of the underlying traditional asset more than three times over a one-year period."[58] This definition does implicitly define a band of 10bp around the peg rate similar to the procedure for fixed exchange rate systems, but in case of violations the issuer has taken measures that prevent such deviations.

Tether would not qualify as a stablecoin under the 10bp regulation guideline, given its valuation track record.

Figure 6: Tether and 10bp Band



	number of breaking the 10bp band per year			in line with 10bp rule
	downside	upside	total	
2016	21	1	22	94%
2017	246	39	285	22%

[57] Hoang Lai T. Baur Dirk G., How Stable are Stablecoins?, University of Western Australia, Working Paper, 2020.

[58] Bank of International Settlement, Prudential Treatment of Cryptoasset Exposures, Consultative Document, 2021, p.4.

2018	339	26	365	0%
2019	233	125	358	2%
2020	309	41	350	3%

4.5 Historical Note: Money Mining – Yap Island Stone Money

The private provision of means of exchange was launched in the Yap Islands about 500–600 years ago, where people mined stone money – like today stablecoins – to represent value. As today the blockchain captures the full transaction history, the involved parties recorded pass-on of ownership by engraving the holders name on these stones. Their use as currency built on a social agreement that owners' could trust that these stones represent future purchasing power the same way like today's digital currencies.

Yapese stone money or rai stones are one of many large monetary artifacts that were quarried and treasured by the native inhabitants of the Yap islands in Micronesia. The practice stopped in the early 20th century. A typical rai stone shaped as a disk with a hole in the centre were carved out of crystalline limestone. The diameter for rai stone ranges from 3.5 centimetres to 3.6 metres. The largest rai stone is weighing 4'000 kilograms.

Rai stones, as a form of money, are often used as an example to support the thesis that the value of some form of money can be assigned purely through shared belief in said value. The perceived value of a specific stone was based not only on its size and craftsmanship, but also its history. The value could depend, for instance, on whether a famous sailor brought it, or whether people died during its transport. Although the ownership of a particular stone might change, the stones were rarely moved due to their weight and risk of damage or loss. So, the physical location of a stone was often insignificant: ownership was established by shared agreement and could be transferred even without physical access to the stone. Each large stone had an oral history that included the names of previous owners. In one instance, a large rai being transported by canoe and outrigger was accidentally dropped and sank to the sea floor. Although it was never seen again, everyone agreed that the rai must still be there, so it continued to be transacted as any other stone.[59]

4.6 Regulate Digital Financial Instruments as Exchange Traded Funds

To establish an effective deposit insurance scheme a first line of defence by risk-based prudential regulation and supervision must be implemented to limit moral hazard. By design deposit-like digital financial products are in principle directly exchangeable funds traded on the issuers' platform.[60] Since stablecoins are designed like an exchange traded fund (ETF), they are valued like an ETF and traded like an ETF on the issuers' multilateral trading facilities, stablecoins can be probably viewed as ETF-like financial instrument. It therefore appears logical to use the same legislative instruments, as first line of defence, to classify stablecoins as exchange traded funds. In particular, all stablecoin issuers could be obliged to conduct due diligence and implement a sound governance structure and policies to reduce uncertainty around their business model and enhance transparency and thereby trust.

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[59] Gillilland Cora Lee C., The Stone Money of Yap, A Numismatic Survey, Smithsonian Institution Press Smithsonian Studies in History and Technology, No. 23, 1975, Friedman Milton, The Island of Stone Money, Stanford, California: Hoover Institution, Working Papers in Economics, E-91-3, 1991; Bryan Michael F., Island Money, Federal Reserve Bank of Cleveland, Economic Commentary, 2004.

[60] International Association of Deposit Insurers (IADI), Deposit Insurance and Financial Inclusion: Current Trends in Insuring Digital Stored-Value Products, 2020, p. 4, 10, 13; Somoza Luciano, Terracciano Tammaro, Stabilising Stablecoins: A Pragmatic Regulatory Approach, Working Paper, 2019; Adrian Tobias, Mancini-Griffoli Tommaso, The Rise of Digital Money, International Monetary Fund, IMF FinTech Note No. 19/01, 2019; Bullmann Dirk, Klemm Jonas, Pinna Andrea, In Search for Stability in Crypto-Assets: Are Stablecoins the Solution? European Central Bank, ECB Occasional Paper No. 230, 2019.

4.6.1 Redeemability at Predetermined Fixed Value

The provider must be able to demonstrate to regulators that the design (management rules and backing) of the deposit-like digital financial instrument (1) is sufficient for securing the stability of its value with regard to its users' currency or reference and (2) the backing allows to absorb unexpected redemption requests by users at the predetermined conversion value. A possible way to ensure stability is to regulate the eligible asset universe and composition of the backing portfolio.

4.6.2 Transparency of Financial Products

Consistent with fair and transparent financial services, digital deposit arrangements should provide enforceable direct claims by holders against the issuer or the reserve assets, as applicable, to exchange their stablecoin in a timely manner for the underlying sovereign currency at a ratio of 1:1 net of fees.
Stablecoin arrangements should clearly disclose the user's rights. The claims procedure should minimize counterparty risks to the stablecoin holder, by ensuring that the reserve assets are held in a bankruptcy-remote manner and protected from other creditors of the stablecoin arrangement participants. There should be clear disclosures to promote transparency and informed choices for the end-user. These disclosures should include the stablecoin arrangement's operational and governance structures by, for example, providing a description of the functions and activities within the arrangement and who is accountable for those functions and activities, detailed financial information supporting the backing of the stablecoin as well as any fees, foreign exchange risks, and potential conflicts of interest of entities involved in the arrangement. Stablecoin arrangements should offer clear processes around error resolution, protect users from unfair or deceptive acts or practices and protect user data.[61] [62]

4.7 Impact on the Financial System Stability and Monetary Policy

Fintechs' entry point were the unfulfilled digital demands of consumer and investors, which traditional financial industry did not want to fulfill, or were unable to occupy and which are now growing their businesses into the turf of the incumbent service providers.

4.7.1 Impact on Financial Service Providers

As fintech offerings are complementing traditional financial service offerings, there is room for cooperation. At the same time, as is currently observable, incumbent banks build up fintech offerings themselves by expanding services through adding robo advise and digital payment solutions to their current service portfolio. Moreover, fintechs may have in the future the opportunity to migrate to the banking business, given their cost advantages from digital technology, processes and the rising use of digital services by clients.

Digital deposit-like offerings increase the competition for existing bank retail deposit services and attract new clients. Incumbent banks can respond to this in three ways: (1) offering higher interest on deposits; (2) enhance

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[61] Izaguirre Juan Carlos, Dias Denise, Kerse Mehmet, Deposit Insurance Treatment of E-Money: An Analysis of Policy Choices, CGAP, 2019; Izaguirre Juan Carlos, Making Consumer Protection Regulation More Customer-Centric, CGAP Working Paper, 2020; Staschen Stefan, Meagher Patrick, Basic Regulatory Enablers for Digital Financial Services, CGAP Focus Note No. 109, 2018.

[62] Given that anonymous or pseudonymous transactions will attract illicit actors stablecoin arrangements must meet all applicable anti-money laundering (AML) /combating financing of terrorism (CFT) obligations, to insure market integrity as well as a level playing field. Therefore, all providers of stablecoins must like any other financial service providers be subject to AML/CFT and sanctions obligations, i.e. they must conduct identification and risk assessment of customers, monitoring of transactional activity, maintenance and reporting of suspicious activities to regulators and law enforcement agencies. A company transferring stablecoins for customer should be obliged to include their name, address, date of birth and account numer, and the name of the recipient.

digital deposit services; (3) reach out for new sources (money markets, bond capital, equity,) to fund their balance sheet business as demand for traditional bank retail deposit would shift to the more competitive deposit-like digital version. A subsequent transformation of bank funding could put incumbent banks into a temporary liquidity-stress situation, especially over a short time, forcing central banks to provide liquidity and deposit insurers to intervene.

4.7.2 Impact on Inside and Outside Money and Monetary Policy

Considering overall transaction and time costs in the payment process, stablecoins could potentially outperform the traditional payment systems, as users get real-time payments and better exchange rates especially for cross border transactions and it is less costly to execute payments.

Digital payment services allow users to efficiently execute peer-to-peer transactions. Due to their attractiveness as means of payment, they might have a significant impact on the functioning of the financial system by increasing competition and potentially establishing new currency areas. Network effects of business user communities, result in lower costs in cross border transactions as well as relative stability to national currencies (currency substitution).

The introduction of new digital means of exchange will change the working of the current monetary system, i.e., especially the role and importance of inside as well as outside money. Kiyotaki and Moore show that in economies with no bilateral commitment, only outside money circulates in economies. For low degrees of bilateral commitment, both outside and inside money are used in equilibrium, but if market participants are well positioned to make bilateral commitments only inside money circulates. The role of inside or outside money is omitted if market participants can trade perfectly.[63] Because the new technology allows creating trust by digital ledger technologies and making direct bilateral commitments redundant, Kiyotaki and Moore findings imply that for the emerging digital financial area of the industry, inside money provided by banks will become the dominant means of payment since the digital means of exchange have lower transaction cost, and therefore users will not demand any fiat cash to settle their transactions. This is supported by empirical evidence from the introduction of M-Pesa. The demand for cash fell, as well as the velocity of circulation, while the money multiplier increased, i.e., the financial inclusion of non-banked individuals displaced outside money and banked entities also switched to digital payment services.[64]

Stable digital means of payments allowing user to execute peer-to-peer transactions create user-defined "currency areas" that are not necessarily limited by national borders. The structure and technology underlying digital networks and trading platforms may invert the industrial organisation with its centre of financial services, to a trading/payment centred world, implying the national currencies may be replaced by global digital currencies.[65] As this risk has been acknowledged by central banks, it has increased the drive of central banks themselves to create digital versions of their currencies.

Digital currency areas are then established by the users' digital interconnectedness of digital network ecosystem. i.e., trading platforms, with their unique underlying network based on their specific digital payment systems. Network members share the same digital means of exchange, benefit from greater price transparency and the network size can realise economies of scale. National regulatory frameworks may obstruct the emergence of user centric global digital currency areas.

These user centric currency areas, which are used beyond jurisdictions challenge deposit insurance schemes, which today are bound to their respective jurisdiction. Insuring 1:1 backed stablecoins could create valid substitutes to central bank digital currencies. Covering stablecoins which are backed by commodities or

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63 Kiyotaki Nobuhiro, Moore John, Inside Money and Liquidity, Princeton University, Working Paper 2018.

64 Njuguna Ndung'u, The M-Pesa Technological Revolution for Financial Services in Kenya: A Platform for Financial Inclusion, in: LEE Kuo Chuen David, Deng Robert, eds., Handbook of Blockchain, Digital Finance, and Inclusion, Volume 1, Cryptocurrency, FinTech, InsurTech, and Regulation, Academic Press, 2018, pp. 37-56.

65 Brunnermeier Markus K, James Harold, Jean-Pierre Landau, The Digitalization of Money, Bank of International Settlements, BIS Working Papers, No 941, 2021.

portfolios, and pegged to fiat currency would undermine central banks control over fiat money supply; because guaranteeing liquidity of stablecoins, would increase the public trust in the sustainability of peg rate of stablecoins and thereby increase their attractiveness compared with central bank money.

These potential developments would have significant implications for monetary policy, significantly reducing the impact of monetary interventions. Central banks are therefore under pressure to launch their own digital currency to uphold the unit of account status and keep the control over money supply.[66]

As stablecoins are backed by fiat currency, assets, commodities and portfolios, there exist no balance sheet interlinkages of issuers of stablecoins and/or with traditional financial service providers. Therefore, an immediate contagion of other financial service providers resulting from a run or a breakdown of a stablecoin are not possible. However, the subsequent liquidation of the underlying assets of a stablecoin may have a negative impact the financial markets. In the case of banks holding stablecoins as liquidity reserves to execute transactions, a loss of liquidity reserves would be imminent, creating the risk of a potential bank run and contagion effects. This is why the Bank of International Settlement has initiated a consultation on how to address crypto asset exposures under the capital accord framework.[67]

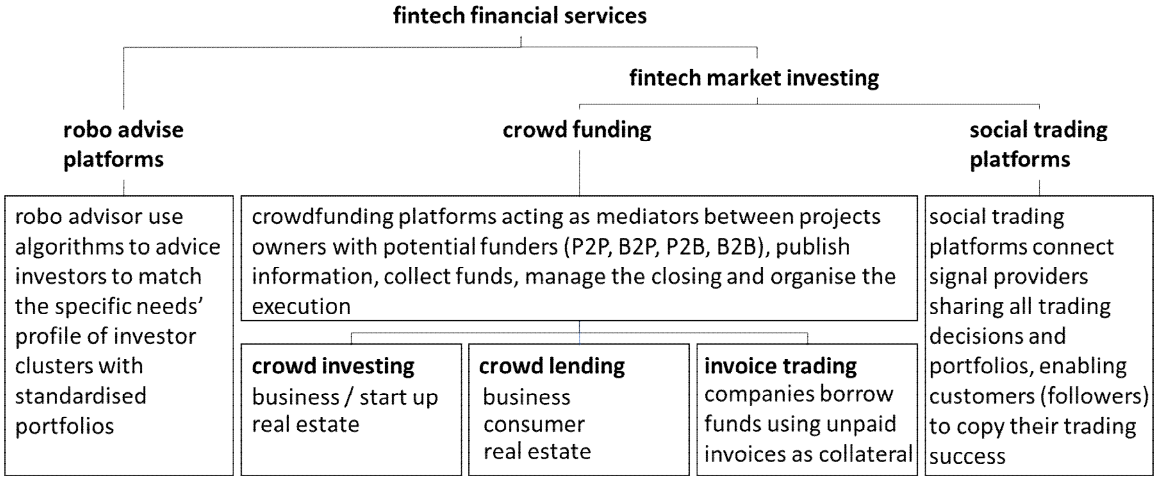
66 Chaum David, Grothoff Christian, Moser Thomas, How to Issue a Central Bank Digital Currency, Schweizerische National Bank, SNB Working Papers, 3/2021, 2021.

67 Basel Committee on Banking Supervision, Prudential Treatment of Cryptoasset Exposures, Consultative Document, 2021.

5 Fintech Financial Services

Fintech financial services, trading platforms, social trading, crowd investing and robo advice facilitate financial inclusion of (less wealthy) individuals to invest in risky portfolios and invest in risky projects as well as business and private individuals to obtain funding for their projects. **However, these fintech products and offerings generally have no impact on deposit insurance, as these products do not contain deposit-like features**. This chapter is therefore only for reference about which products and offerings in the fintech world are not insured by deposit insurers and very likely will not be insured in the near future by deposit insurers.

Figure 7: Fintech Financial Services



5.1 Robo Advice

The complexity and high cost of financial advice is the key hurdle for many investors.[68] Robo advisers fulfil investors' need for intuitive, easily accessible and low cost investment advice.

Robo advisers interact with their customers over the internet, obtaining customer information and then use computer algorithms to match that information to appropriate standard portfolios being compiled to match the specific needs' profile of investor clusters.[69]

5.1.1 Robo Advisors' Business Models

Two business models have emerged to service private investors: (1) independent robo advisors' business model is B2B2C (business-to-business-to-consumer) involving a partnership between a robo advisor and a financial institution, rendering financial products, custodian services as well as bringing in customers;[70] (2) to create their own digital sales channel, traditional financial service providers have launched their own robo advisor platforms to offer their services to additional customer segments.

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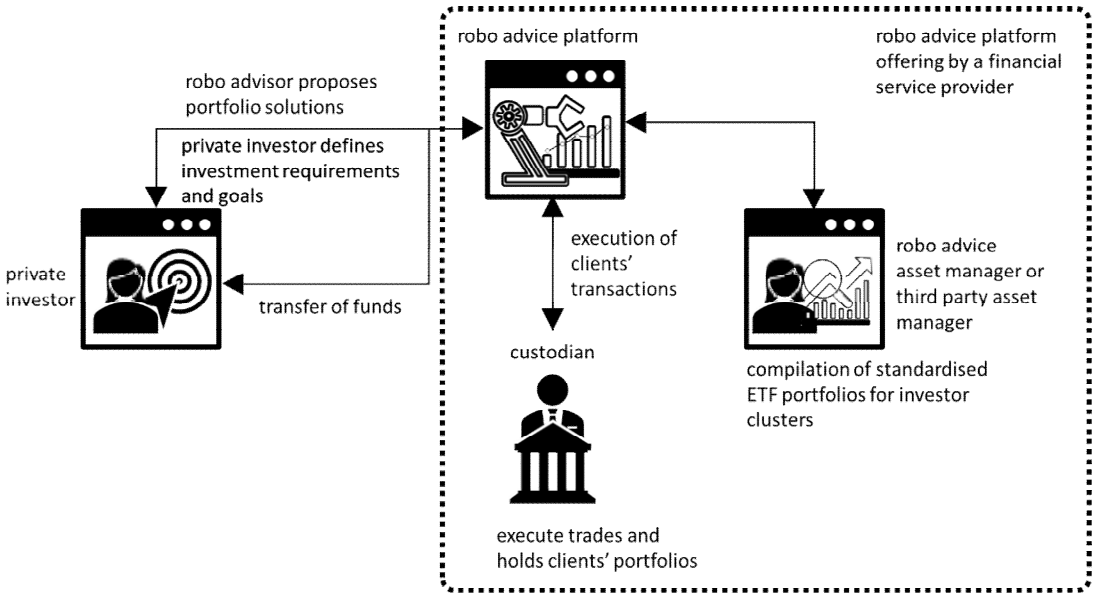
68 van Rooij Maarten, Lusardi Annamaria, Alessie Rob, Financial Literacy and Stock Market Participation, National Bureau of Economic Research, Working Paper 13565, 2007, Lusardi Annamaria, Mitchell Olivia S., The Economic Importance of Financial Literacy: Theory and Evidence, Journal of Economic Literature, 2014, Lusardi Annamaria, Michaud Pierre-Carl, Mitchell Olivia S., Optimal Financial Knowledge and Wealth Inequality, Journal of Political Economy, 2017, pp. 431-477

69 Finra, Report on Digital Investment Advice, 2016; Better Finance, Robo-Advice 5.0: Can Consumers Trust Robots? Research Report, 2020.

70 Robo advisors targeting the end customers directly (B2C) were confronted with prohibitively high acquisition costs.

Figure 8: Robo Advisors' Business Models



5.1.1.1 Advice Process and Offering

The key offerings of robo advisors are investment portfolios that are created as a fund of funds. To enable private investors to self-manage their financials, robo advisors provide self-explanatory investment information and tools that do not require a deep financial knowledge. These offerings are packaged as follows:

(1) Financial knowledge packages to get started

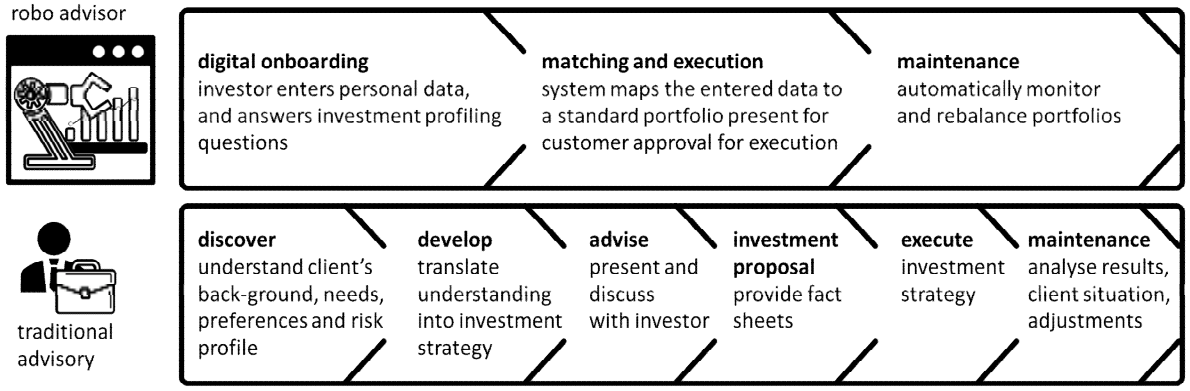
(2) Financial and retirement planning tools allow user to evaluate their financial needs and means over time to find out gaps and evaluate scenarios to design a long-term investment plan.

(3) Guiding tools to select investment solutions: In its simplest form robo advisors offer standardised investment solutions based on the clients' financial and personal situation. More complex solutions suggest a series of goals including the proposition of a target asset allocation to a financial safety net to cope with adverse financial situations, a retirement savings target and an investment portfolio matching the risk tolerance of the investor. Users can adjust the proposed allocation or add other portfolios.

(4) Deposit and cash accounts: Some robo advisors offer also deposit and cash account with a financial service provider, which is then covered by deposit insurance schemes. These accounts can be integrated with the chosen investment solution, so that excess balances are automatically invested and in the case of low balances the user can move funds back on them.

These building blocks allow robo advice to gain efficiency and have automated processes replacing the traditional advice work-flow.

Figure 9: Robo Advice versus Traditional Advice Work-Flows



5.1.1.2 Onboarding – Client Profile

Digital client onboarding is probably the most crucial step in robo advice. To identify the optimal strategy for an investor, a robo advisor uses multiple-choice questionnaires to capture individual investment preferences, financial goals, investment horizons and risk tolerance to set up an investment portfolio in a convenient and easy way. Empirical evidence shows that users' preferences change often as a reaction to short-term market movements. The focus of one-size-fits-all questionnaires are overly simple, the subjective responses of individuals may involve behavioural biases such as a response bias or overconfidence and other factors which mislead machines portfolio matching.[71]

5.1.1.3 Exchange Traded Funds and Standardised Portfolio Offerings

Almost all robo advisors use exchange-traded funds to compile their investment portfolio offerings, i.e., a passive and less expensive to run investment approach, reflecting the efficient market idea that the market is hard to outperform.[72] To implement a suitable investment strategy for a client, robo advisors match the findings derived from answers received through the survey in the onboarding phase with the performance of their standard exchange trade fund portfolios. Almost all robo advisory firms choose ETFs as their main investment instruments.

Robo advisors' asset managers usually select specific ETFs following a top-down approach and compile standardised portfolios for specific client segments and/or investment goals. To keep portfolios on target, threshold-based rebalancing prevails, i.e., if portfolios deviate from targeted outcomes by a predetermined percentage the asset manager rebalances the asset allocation of the portfolio. To maximise investors' after-tax returns, i.e., to minimise tax payments, robo advisors execute tax-loss harvesting transactions that offset capital gains with capital losses: by selling underperforming funds robo advisors realise losses and invest the proceeds in highly correlated alternatives. Having similar return developments as the funds sold the portfolio's risk-return profile remains unchanged.

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71 FCA "Many firms .. did not properly evaluate a client's knowledge and experience, investment objectives and capacity for loss in their suitability assessments", Nikolova Maria, FCA Review of Automated Advice Providers Finds Lack of KYC Focus, FCA, 2018; Linciano, de Palma André, Picard Nathalie, Evaluation of MiFID Questionnaires in France, Technical Report, Autorité des Marchés Financiers, 2010; Linciano N., Soccorso P., Assessing Investors' Risk Tolerance through a Questionnaire, Consob, Discussion Papers, 2012, Mazzoli Camilla, Marinellib Marinelli Nicoletta, Determinants Of Risk-Suitable Investment Portfolios: Evidence from a Sample of Italian Householders, Journal of Economic and Financial Studies, 2014, pp. 50-63; Oehler Andreas, Wendt Stefan, Good Consumer Information: the Information Paradigm at its (Dead) End?, Journal of Consumer Policy, 2017, pp. 179–191; Schroders, Global Investor Study under Pressure: Investors' Response to Crisis, 2020

72 Kaya Orçun, Robo Advice – A True Innovation in Asset Management, Deutsche Bank, 2017; Kaya Orçun, Deutsche Robo Advisors, Algorithmen als Turbo für die passive Geldanlage, Deutsche Bank, 2020.

5.1.2 Legal Considerations

Robo advice generally meets the regulatory definition of investment advice, i.e., providing personal recommendations on financial instruments based on an evaluation of the investor's personal circumstances or is presented as being suitable.[73]
Due to the fact that independent robo advisors are partnering with financial service providers holding their clients' accounts, they serve the clients of their partners and bring additional clients. But in fact, the services are rendered by the regulated "back office" of the financial service provider.

5.2 Digital Investing

"Crowdfunding" and "Social Trading" represent alternative ways to invest in many kinds of assets in a digital way, without using traditional banking services. Crowdfunding and social trading are not only accessible to wealthy people but are accessible to the part of the world population, which is online and has a propensity to invest in assets in addition to holding savings in the form of deposits.

5.2.1 Crowdfunding

5.2.1.1 Asymmetric Information and Funding Markets

Financial intermediation is an information business: The key challenge of financing a project is to overcome the asymmetric distribution of information between the owner and the funder of the project.[74] Diversification of investment by a financial intermediary is the key to understanding why there is a benefit from delegating monitoring of project owners to an intermediary which is not monitored by its depositors; diversification of financial intermediaries increases the probability that the intermediary has sufficient loan proceeds to repay depositors' fixed claims.
Financial intermediaries (1) realise efficiency gains by centralising information production, monitoring and management and are positioned to create well-diversified portfolios of investments; (2) stabilise their funding portfolio, by collecting funds from many depositors having different cash flow patterns over time, enable depositors to withdraw at any time and buffer firms from the investors' liquidity needs.
Consequently, financial intermediaries have a low probability of default despite a highly leveraged capital structure which is mainly debt (deposits).[75]

The information and transaction costs limit financial intermediaries' possibilities. As asymmetric information prevails between the funder and the project owner rationing occurs because the expected returns for a funder are not necessarily increasing in the return rate due to adverse selection or moral hazard problems. Financial intermediaries will have to trade-off the cost of information with the potential losses due to deficient

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[73] Better Finance, "Robot Advice" for Savings & Investments, A Misnomer with Real Potential Benefits Better Finance Research Report, 2016.

[74] A key investment principle states that positive net present value projects should be worth funding. The failure to produce reliable information about the validity of projects limits the efficiency of financing due to the well-established fact that projects offering higher returns also carry higher risks,; if markets are unable to distinguish high risk projects from low risk ones, financing might even not be feasible at an average interest rate since it will drive out below-average risky projects because asked interest rate is too high, while above average risky projects would profit.
Akerlof George A., The Market for "Lemons": Quality Uncertainty and the Market Mechanism, Quarterly Journal of Economics, 1970, pp. 488–500.

[75] Diamond Douglas W., Financial Intermediation and Delegated Monitoring, Review of Economic Studies, 1984, pp. 393-414; Diamond Douglas W., Dybvig Philip H., Banking Theory, Deposit Insurance, and Bank Regulation, Journal of Business, 1986, pp. 55-68; Bhattacharya Sudipto, Thakor Anjan V., Contemporary Banking Theory, Journal of Financial Intermediation, 1993, pp. 2-50.

information in relation to the returns. As a result, investment projects with vague information on future prospects requiring in-depth costly evaluation will not be funded. [76] [77]

The rationing of funding resulting from asymmetric information gets exacerbated due the fact that financial institutions face the challenge to maintain stable funding with deposits which typically grant short term withdrawal rights to depositors. Thus, the risk of 'bank runs' limits the risk taking of financial institutions to secure their funding deposits.[78]

The goal of Basel regulatory framework is to strengthen the stability of the banking industry by imposing regulations on the conduct of business and capital requirements. The flip side of the approach is that these regulations impose restrictions on banking business and also increase costs for banks and their customers. So, it is highly probable that Basel III will have inhibitory effects on banks' credit business by increasing loan rates and restricting origination.[79]

Consequently, incumbent financial service providers are limited to serve founding stage, small and medium enterprises and individuals due to (1) costs of gathering and analysing complex information on the viability of

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76 Coase Ronald H., The Nature of the Firm, Economica, 1937, pp. 386–405; Alchian Armen A., Demsetz Harold, Production, Information Costs, and Economic Organization, American Economic Review, 1972, pp. 777-795; Williamson Oliver E., Transaction-Cost Economics: The Governance of Contractual Relations, Journal of Law and Economics, 1979, pp. 233–261; Williamson Oliver E., Transaction Cost Economics: The Natural Progression, American Economic Review, 2010, pp. 673-690.

77 Project owners will benefit if the resulting gain is greater than the debt service costs, but they lose paid-in capital invested in the project when the projects return are low. For low-risk projects, the potential upside gains are smaller than for high- risk project. If low-risk projects are pooled with high-risk projects, low-risk projects will increasingly withdraw as rates rise. As a result the average risk of the projects to be financed remaining in the pool rises. That in turn increases the adverse selection premium and therefore the cost of funding because the interest rate must compensate for the default risk of an ever-worsening pool of borrowers. Paradoxically, the safest projects are not submitted for funding. Instead they voluntarily drop out of the market because the cost of being pooled with higher-risk borrowers is too great.
Stiglitz Joseph E., Weiss Andrew, Credit Rationing in Markets with Imperfect Information, American Economic Review, 1981, pp. 393-410; pp. 394-395.

78 Unregulated shadow banks finance themselves primarily with short-term debt of informed and concentrated lenders to originate long-term loans but use double equity capital as banks, having a substantially more dispersed leverage ratios than banks; in short, modern shadow bank capital structures resemble those of pre-deposit insurance banks, implying that the differences in capital structures are likely due to access insured deposits. Empirical research shows that deposit insurance mitigates the risk of a bank run and increases the risk taking of banks.
Calomiris Charles W., Jaremski Matthew S., Stealing Deposits: Deposit Insurance, Risk-Taking and the Removal of Market Discipline in Early 20th Century Banks, National Bureau of Economic Research, Working Paper No. 22692, 2016; Jiang Erica, Matvos Gregor, Piskorski Tomasz, Seru Amit, Banking without Deposits: Evidence from Shadow Bank Call Reports, National Bureau of Economic Research,Working Paper No. 26903, March 2020; Lambert Claudia, Noth Felix, Schüwer Ulrich, How do Insured Deposits Affect Bank Risk? Evidence from the 2008 Emergency Economic Stabilization Act, Goethe University Frankfurt, SAFE Working Paper No. 38, 2014.

79 Bhattacharya Sudipto, Boot Arnoud W. A., Thakor Anjan V., The Economics of Bank Regulation, Journal of Money, Credit and Banking, 1998, pp. 745-770; Bank for International Settlement, Basel Committee on Banking Supervision Results of the Comprehensive Quantitative Impact Study, 2010; Bank for International Settlement, Basel Committee on Banking Supervision Basel III: A Global Regulatory Framework for more Resilient Banks and Banking System, 2011; Bridges Jonathan, Gregory David, Nielsen Mette, Pezzini Silvia, Radia Amar, Spaltro Marco, The Impact of Capital Requirements on Bank Lending, Bank of England, Working Paper No. 486, 2014; Fender Ingo, Lewrick Ulf, Adding it all up: The Macroeconomic Impact of Basel III and Outstanding Reform Issues, Bank for International Settlement, Monetary and Economic Department, BIS Working Papers No 591, 2016; Naceur Sami Ben, Pépy Jérémy, Roulet Caroline, Basel III and Bank-Lending: Evidence from the United States and Europe, International Monetary Fund, Working Paper 17/245, 2017; Roulet Caroline, Basel III: Effects of Capital and Liquidity Regulations on European Bank Lending, Journal of Economics and Business, 2018, pp. 26-46.

projects, especially in the case of lacking track record; (2) transaction and operational costs; (3) their own funding constraints, (4) further restriction by regulatory requirements, and (5) small volumes asked for funding.

Fintech companies fill this market gap incumbent financial providers cannot serve profitably by digital marketplace platforms which directly connect funders to project owners, using big data analytics to overcome informational barriers.[80] Fintechs enable funders to compile their own diversified portfolios through the offering a variety of projects and providing reliable information on the prospects, terms and conditions.[81]

5.2.1.2 Crowdfunding Business Models

Fintechs have revived the idea of pooling money from a large number of people in order to fund projects or ventures, by building digital market coining the label crowd investing/funding. Crowdfunding platforms intermediators focus on the matching of project owners with potential funders. The fintechs acting as mediators promote the placed projects, publish information on loans and securities, transaction rules (minimum investment volumes, execution principles, i.e., all-or-nothing, keep-it-all, stretched goals schemes) and enable investors to make up by providing their research findings. Fintechs manage the closing as well as organise the exchange of funds to execute the transactions. I.e., the fintech as such acts as an end-to-end market maker. In return, the fintech will typically demand a fee.[82] [83]

Peer-to-peer intermediaries crowdfunding service providers offer the following services:

- online investment platform to enable borrowers to attract lenders and investors to identify and purchase loans that meet their investment criteria
- due diligence filtering out the unqualified projects and fund seekers, rating and pricing of loans
- processing payments between involved parties
- legal compliance and reporting
- search for new projects and marketing

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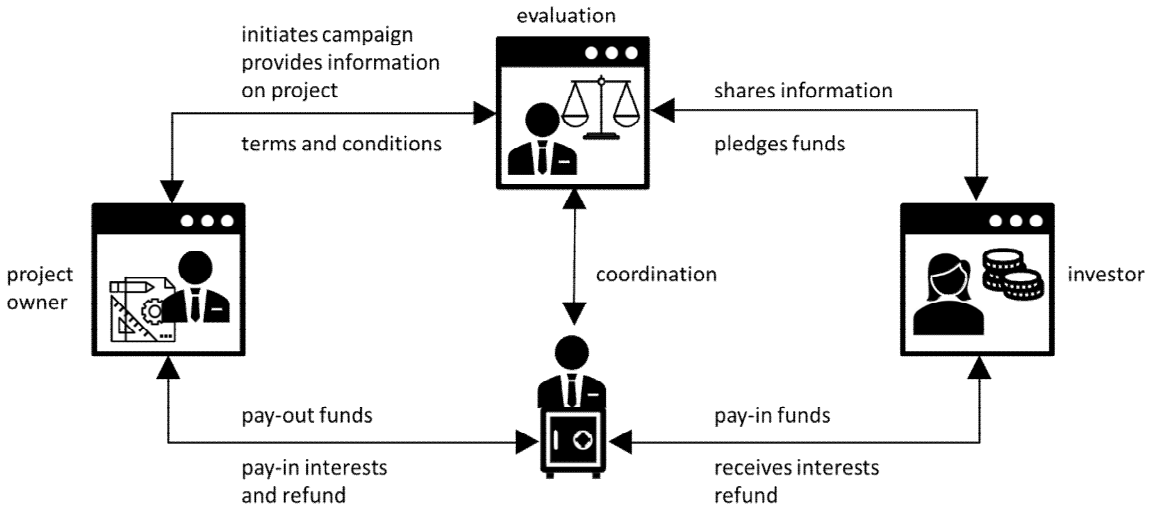
80 Jagtiani Julapa, Lemieux Catharine, Do Fintech Lenders Penetrate Areas, That Are Underserved by Traditional Banks?, Federal Reserve Bank of Philadelphia, Working Papers, WP 18-13, 2018; Wang J. Christina, Technology, the Nature of Information, and FinTech Marketplace Lending, Federal Reserve Bank of Boston, Current Policy Perspectives, No. 18–3, 2018; Bazarbash Majid, Beaton Kimberly, Filling the Gap: Digital Credit and Financial Inclusion, International Monetary Fund, Working Paper, WP/20/150, 2020.

81 Demirgüç-Kunt Asli, Klapper Leora, Singer Dorothe, Ansar Saniya, Hess Jake, The Global Findex Database, Measuring Financial Inclusion and the Fintech Revolution, World Bank, 2017; World Economic Forum, The Future of FinTech A Paradigm Shift in Small Business Finance, 2015; Delivorias Angelos, Crowdfunding in Europe, European Parliamentary Research Service, Briefing, 2017; Bazarbash Majid, Beaton Kimberly, Filling the Gap: Digital Credit and Financial Inclusion, International Monetary Fund, Working Paper 20/150, 2020.

82 Gierczak Michael M., Bretschneider Ulrich, Haas Philipp, Blohm Ivo, Leimeister Jan Marco, Crowdfunding: Outlining the New Era of Fundraising, in: Brüntje Dennis, Gajda Oliver, eds. crowdfunding in Europe, State of the Art in Theory and Practice, Springer, 2016, pp. 7-23; EU, The European Parliament and of the Council, Regulation 2020/1503, On European Crowdfunding Service Providers for Business, 2020; Financial Conduct Authority UK, Loan-based ('peer-to-peer') and Investment-Based Crowdfunding Platforms: Feedback on our Post-Implementation Review and Proposed Changes to the Regulatory Framework, Consultation Paper CP18/20, 2018; Financial Conduct Authority UK, Loan-based ('peer-to-peer') and investment-based crowdfunding platforms: Feedback to CP18/20 and final rules, 2019; U.S. Securities and Exchange Commission, Crowdfunding, 2013; Staff U.S. Securities and Exchange Commission Report to the Commission, Regulation Crowdfunding, 2019.

83 Crowdfunding platforms also support charitable or non-monetary reward receiving projects.

Figure 10: Business Model Crowdfunding[84]



The competitive advantages marketplace funding offers to companies are speed, availability and simplicity; lenders can earn higher returns compared to savings products offered by banks taking on the borrowers' default risk, while borrowers can borrow money at lower interest rates, due to the lower intermediation costs. [85]

Crowd Equity Investing

Equity crowd funding is the collective effort of individuals to support efforts of a business project in need of raising capital offering equities of an established or to be established company. Equity crowd funding is particularly suitable for start-ups and/or non-listed companies that need to reach out to a wider audience to secure funds for their business. In return, investors get entitled to participate in future profits. This quasi-public offering creates marketable equities.

Crowd Lending

Crowdlending is the dominating crowdfunding model in the world where investors provide funds in exchange for the right to have their money paid back with interest according to the repayment terms specified in a loan contract or debt security.

Peer-to-Peer (P2P) Consumer

This type of debt-based crowdfunding is characterised by individuals or institutional investors providing loans to individuals with consumption purpose, such as home loans, car loans, travel loans, student loans, pay-day loans and refinancing. The loans are usually only covered by a personal guarantee and assets and will typically have a wide range of interest rates, depending on purpose and backing. Pay-day loans are often the most expensive type of loan with the highest interest rates (and also carry the highest risk). In some instances, car loans can be fairly cheap with low interest rates and low risk, since the purpose involves a tangible asset.

P2P Business Lending

This type of debt-based crowdfunding is characterised by individuals or institutional investors providing secured or unsecured loans to a business. Borrowers are often small and medium-sized enterprises. These loans can be issued as mini-bonds paying regular interests, i.e., unsecured retail bonds that individuals or institutional investors purchase from companies to be held until they mature.

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[84] Branzov Todor, Maneva Nelly, Crowdfunding Business Models and Their Use in Software Product Development, International Scientific Conference Informatics In Scientific Knowledge, 2014; Haas Philipp, Blohm Ivo, Leimeister Jan Marco, An Empirical Taxonomy of Crowdfunding Intermediaries, University St. Gallen, Working Paper, Auckland 2014; Agrawal Ajay, Catalini Christian, Goldfarb Avi, Some Simple Economics of Crowdfunding, National Bureau of Economic Research, Working Paper 19133, 2013.

[85] Allen Jason G., Rauchs Michel, Blandin Apolline, Bear Keith, Legal and Regulatory Considerations for Digital Assets, Cambridge Centre for Alternative Finance, University of Cambridge, 2020.

P2P Real Estate

P2P real estate lending provides funds to either a consumer or a property business secured against a property. Funders get the benefit to hold an exposure on real estate by building a collateral backed portfolio. Investors face safety and time horizon trade-off due to long development horizons.

Balance Sheet Lending

A market platform offering balance sheet lending provides loans directly to a consumer or business protecting lending investors default losses by internalising the default risk. Like a bank – balance sheet lending platforms earn their income from net interest margins, the difference between the cost of capital and the interest rate charged to borrowers and therefore usually hold a banking license.

Invoice Financing/Invoice Trading

Invoice trading, invoice financing principle is simple: companies need cash and invoices are instruments to cash. The characterisation of invoice trading is that it is asset-backed lending: the asset is a debt and an invoice to be paid at a certain date in the future. There are two ways for companies to finance their outstanding invoices. The first and most basic is to sell invoices for immediate payment to increase directly the working capital of the company; or to use them as a collateral to secure a revolving line of credit. The benefit of immediate cash injection will impair net revenues, because invoices have to be offered at a discount to investors. However, there is always the risk that the customer will never pay the invoice, which would potentially result in an expensive and complicated process – depending on the structure of payment terms, the company that owes the money specified on the invoice, and the platform.

5.2.1.3 Efficiency of Market Platforms and the Digitalisation of Securities

To ensure success of the financial platform the provider has to produce reliable information reports about the offered projects, i.e., to conduct due diligence and risk assessments, so that investors are shielded from adverse selection and moral hazard problems. However, project owners are reluctant to publicly disclose the details of their products or ventures especially in early stages due to concerns about intellectual property theft, exposing themselves to the risk of copy by competitors. Solving this trade-off is the challenging task of the platform provider who acts as the mediator between funders and project owners.

It is also worth noting that platforms may face an existential trade-off between short-term growth/earnings and long run stability, especially if in the short run the platform's financial returns are directly related to the volume of transactions rather than to the quality of transactions paying out in the long run. However, empirical evaluations show that crowd investing documentations lack relevant information on the risks and opportunities of offered projects.[86]

The openness of market platforms allow project owners to address investors from around the world, to raise funds as well as to promote their business, retaining control of their operations, as voting rights are not conveyed to crowd investors.
Investors can allocate their wealth by choosing from many investment opportunities. Especially, market places offer the possibility for investors interested in socially and/or environment conscious investing to place their savings – even in small amounts - on projects they feel comfortable with and to create communities between funders and project owners that go beyond financial transactions.

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[86] Empirical evidence shows that borrowers better embedded in social networks are more likely to raise funds and realise lower interest rates; but they are more likely to pay late or default. Freedman Seth, Zhe Jin Ginger, The Information Value of Online Social Networks: Lessons from Peer-To-Peer Lending, International Journal of Industrial Organization, 2017, pp. 185-222;
Despite regulatory efforts, crowd funding information for investors are deficient on the risks and opportunities of the offered projects, especially on the financing of start-up companies, creating the illusion of being well informed.
Oehler Andreas, Abschlussbericht für die Studie zum Thema Infos für den Schwarm: Werden Crowdinvesting-Kleinanleger mit VIBs gut informiert? Eine empirische Untersuchung, Universität Bamberg, 2017.

Due to the increase in competition for funding, reduced search costs enabled by market place financing enhances the efficiency of the financial system. The low costs of intermediation create the opportunity for funders to realise more attractive returns and project owners to obtain funding at better terms.

Market platforms enable investors to take exposures in a variety of projects giving them the opportunity to compile highly diversified portfolios. Research shows that portfolios with equally allocated funds perform relatively efficiently over time.[87]

Market financing fills the gaps of underserved project owners and areas. It is becoming a substitute for incumbent financial service providers due to its advantageous terms and conditions. The tokenisation of crowd investing / funding as it is still in its infancy has the potential to revolutionise financial markets, because tokens enable crowd investors to trade their exposures – transforming illiquid equities and loans to perfectly liquid assets.[8889] However, tokenization of crowd investing/funding may have additional challenges due to the lack of a regulatory framework, possible cybersecurity risks, and the adoption of the technology.

5.2.1.4 Key Regulation Aspects in a Nutshell

To ensure fair market making on two-sided markets imposes challenges to regulators and policymakers, especially to overcome information asymmetries between participants in the market. The key aspects which regulators need to address are: Providers of crowd funding services – as market makers - have to be licenced and must ensure equal treatment to all investors and particularly prevent any preferential treatment or privileged access to information, especially equal conditions of investment. All information rendered to investors has to be fair, clear and not misleading. Key facts such as financial risks and fees that might occur, including risks regarding insolvency and project selection criteria must be accurately documented.[90]

5.2.2 Social Trading

5.2.2.1 Economic Rational

Rational investors will not incur the expenses to gather and analyse information unless they can expect to be rewarded by higher returns compared with the free alternative of following the market strategy, especially when prices do diverge from intrinsic values.[91] This fact has a crucial implication - (perfectly) informationally efficient markets are impossible because there are no profits from investment research, if prices perfectly

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87 Gigerenzer Gerd, Why Heuristics Work, Perspectives on Psychological Science, 2008, pp. 20-29; Maillard Sébastien, Roncalli, Thierry, Teiletche Jérôme, On the Properties of Equally-Weighted Risk Contributions Portfolios, 2009, DeMiguel Victor, Garlappi Lorenzo, Uppal Raman, Optimal Versus Naive Diversification: How Inefficient is the 1/N Portfolio Strategy?, Review of Financial Studies, 2009, pp. 1915-1953.

88 Jagtiani Julapa, Lemieux Catharine, Do Fintech Lenders Penetrate Areas that are Underserved by Traditional Banks?, Journal of Economics and Business, 2018, pp. 43–54; Jagtiani Julapa, Lemieux Catharine, The Roles of Alternative Data and Machine Learning in Fintech Lending: Evidence from the Lendingclub Consumer Platform, Financial management, 2019, p.1009-1029; Croux Christophe, Jagtiani Julapa ; Korivi Tarunsai, Vulanovic Milos, Important factors determining Fintech loan default: Evidence from a Lendingclub Consumer Platform, Journal of Economic Behavior & Organization, 2020, pp.270-296; De Roure Calebe, Pelizzon Loriana, Tasca Paolo, How Does P2P Lending Fit into the Consumer Credit Market, Deutsche Bundesbank Discussion Paper 30, 2016; Block Joern H., Groh Alexander, Hornuf Lars, Vanacker Tom, ismara Silvio, The Entrepreneurial Finance Markets of the Future: A Comparison of Crowdfunding and Initial Coin Offerings, Small Business Economics 2020, 2020/04/07.

89 https://p2pmarketdata.com/crowdfunding-statistics-worldwide/ provides up-to-date information on the volumes of crowdfunding around the world.

90 For example, European Union: European Parliament and Council of the EU, Regulation (EU) 2020/1503, European Crowdfunding Service Providers for Business, 2020; Switzerland: FINMA, Crowdfunding, 2020; USA: https://www.sec.gov/smallbusiness/exemptofferings/regcrowdfunding

91 Shiller Robert J., Speculative Asset Prices, American Economic Review 2014, pp. 1486–1517; Robert J. Shiller, Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?, American Economic Review, 1981, pp. 421-436.

reflect the costly obtained information to all market participants. Consequently, prices on financial market will only partially reveal the information to all market participants.[92]
So it is rational for uniformed investors to follow investors that are more efficient in processing information, i.e., having an informational advantage. This is the business case of social trading platforms allowing investors with limited knowledge and/or time to do their own investment research to copy the trading of expert traders, offering a low-cost alternative to traditional wealth managers.

5.2.2.2 Mechanism of Social Trading

Social trading providers act as platforms that bring together the signal provider and the followers. The operator of a signalling platform makes it possible for so-called signal providers or traders to share all trading decisions and (reference) portfolios, so that customers (followers) can observe their investment performance to make up their mind whether or not to co-invest with the signal provider – i.e., to copy their trading. To follow the trading of a signal provider customers have to link their own portfolio with those reference portfolios of trader(s) who are in the customer's view the most promising, by an agreement between the custodian bank, the social trading platform and the investor. Trading decisions made by the corresponding trader are then executed in an automated manner for the customer as well. Signal providers usually get remunerated by the social trading platform, which is acting as the intermediary, depending on the signal portfolios performance, the number of their followers and trading turnover.

In addition to the adoption of a trading strategy for one's own portfolio, there are other varieties of business models through which the follower is enabled to copy reference portfolios. Signal providers can securitise their portfolios in a separate security ("certificate"). These certificates are issued jointly with a bank and are tradable on stock exchanges. The follower then merely acquires the certificate and participates on the signal providers' investment performance. Such a model allows followers to save the transaction costs for individual investments, but at the same time also bears the issuer risk for the certificate. If, for example, the certificate defaults, e.g. as a result of the issuing bank's insolvency, the client may lose his investment in extreme cases.

Social trading platform exchange trading signals and execute of transactions as follows:

The signal providers manage their securities accounts and take trading decisions in public on the platform, and the customers (followers) can observe said accounts and decisions.[93]

The platform records the signal provider's decisions and passes them on to the followers. The follower gives the instruction to copy the signal provider's decisions (copy trading) either case by case or mirrors them automatically. The platform passes the orders to the financial service provider, where both the trader and the follower hold their accounts for execution.[94]

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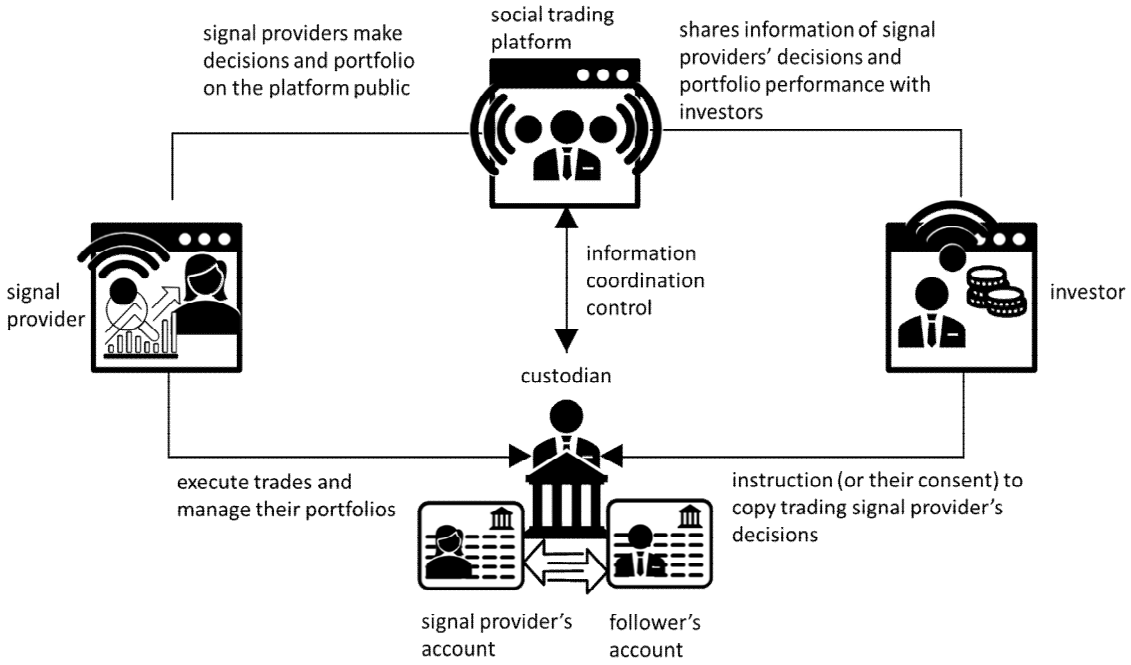
92 Grossman Sanford J.; Stiglitz Joseph E., On the Impossibility of Informationally Efficient Markets, American Economic Review, 1980, pp. 393–408.

93 If the platform holds temporarily cash of its clients, for the purposes of settlement of transactions, the relevant cash positions do not qualify as deposits by Swiss Law.

94 https://www.bafin.de/EN/Aufsicht/FinTech/Signalgebung/signalgebung_node_en.html

Figure 11: Social Trading



These benefits are challenged: because profiting from social trading requires that users can reliably single out those expert traders having a lasting trading record and outperforming a passive investment strategy. Investors following signal providers by simply copying their trade strategies based on accumulated returns are not successful; and signal providers do not outperform the market on average.[95] These findings are supported by empirical findings that professional analysts and asset managers that actively manage their portfolios cannot sustainably realise outperformance.[96]

[95] Oehler Andreas, Horn Matthias, Wendt Stefan, Benefits from Social Trading? Empirical Evidence for Certificates on wikifolios, International Review of Financial Analysis, 2016, pp. 202–210; Doering Philipp, Neumann Sascha, Paul Stephan,, A Primer on Social Trading Networks - Institutional Aspects and Empirical Evidence, University of Bochum, Working Paper, 2015; Pastor Lubos, Stambaugh Robert F., Taylor Lucian A., Scale and Skill in Active Management, Journal of Financial Economics, 2015, pp. 23–45; Wei Pan, Wei, Altshuler Yaniv, Pentland Alex Decoding Social Influence and the Wisdom of the Crowd in Financial Trading Network, MIT, DSpace@MIT, 2012; Dorfleitner Gregor, Hornuf Lars, Schmitt Matthias, Weber Martina, Economics and Finance To follow or not to Follow - An Empirical Analysis of the Returns of Actors on Social Trading Platforms, Quarterly Review of Economics and Finance, 2018, p. 160–171; Oehler Andreas, Wanger Hans Philipp, Household Portfolio Optimization with XTFs? An Empirical Study using the SHS-base, Research in International Business and Finance, 2020, pp. 101-103.

[96] Malkiel Burton G., The Efficient Market Hypothesis and Its Critics, Journal of Economic Perspectives, 2003, pp. 59-82; Shiller Robert J., Speculative Asset Prices, American Economic Review 2014, pp. 1486–1517; Fama Eugene F., French, Kenneth R., The Capital Asset Pricing Model: Theory and Evidence, Journal of Economic Perspectives, 2004, pp. 25-46; Ang Andrew, Bekaert Geert, Stock Return Predictability: Is it There?, Review of Financial Studies, 2007, pp. 651-707; Bonini Stefano, Zanetti Laura, Bianchini Roberto, Salvi Antonio, Target Price Accuracy in Equity Research, Bocconi University, Working Paper, 2010; Bradshaw Mark T., Analysts' Forecasts: What Do We Know After Decades of Work?, Boston College, Working Paper, 2011; Hilary Gilles, Hsu Charles, Analyst Forecast Consistency, Journal of Finance, 2013, pp. 271-296; Schlanger Todd, Philips Christopher B., Peterson LaBarge Karin The Search for Outperformance: Evaluating 'Active Share', Vanguard Investment Perspectives, 2012; Vanguard, Myth: Active Management Performs Better in Bear Markets, 2018; Liu Berlinda, Brzenk Phillip, S&P500 Dow Jones, Global Research & Design, Does Past Performance Matter? The Persistence Scorecard, 2020.

5.2.2.3 Legal Set-up

Depending on the business model the signal providers can be categorised as financial analysts, sharing only information on their investment decisions, or providers of funds if they offer certificates on their portfolios. Signal providers can be categorised as financial analysts and be regulated accordingly, if they share their general information and expectations regarding the development of certain financial instruments and thus no personalised investment advice is given. Copy trading can be regarded as information only, because signal providers act in their own name and own account and only consider their own interests and preferences neither having information about the preferences nor access to the portfolios held by the copying individuals. [97]

[97] https://www.fca.org.uk/firms/copy-trading; https://www.esma.europa.eu/press-news/esma-news/esma-highlights-risks-retail-investors-social-media-driven-share-trading