Repurchase Agreements and the Paradox of Risk

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Abstract

This paper examines how repurchase agreements (repos, in short) can give rise to the Paradox of Risk. Repos are financial contracts in which one party sells a security with the concomitant agreement to repurchase it at a certain price in a future date. In practice, they work as collateralized loans, being a source of liquidity for one party, and a substitute for bank deposits for the other. Our central argument is that while repos appear to be safe investments for lenders at the micro level, they contribute to greater financial fragility at the macro level. Our theoretical approach is the Monetary Circuit Theory. After a discussion of repos' main elements, such as haircuts, margining and market segmentation, we build a stylized monetary circuit to discuss repo's role as a catalyst of financial interconnectedness, facilitating the propagation of risk through the financial system even for agents not directly exposed to risky assets.

Keywords: Monetary Circuit Theory; Repurchase Agreements; Paradox of Risk; Post-Keynesian Economics; Financial Fragility.

JEL Codes: E12, E44, G23.

1. Introduction

Post-Keynesian macroeconomics is rich in paradoxes, where behavior that appears rational at the microeconomic level leads to unintended and often irrational outcomes when viewed in the aggregate, at the macroeconomic level. Two of the most famous are the paradox of thrift and the paradox of costs. The first, proposed by Keynes (1936), states that, while a higher saving rate increases an individual's savings, it reduces the aggregate savings of the economy if all agents do so, since the reduced propensity to consume (the counterparty to the increased propensity to save) reduces consumption, employment, output and the aggregate income. The second, proposed by Kalecki (1969), argues that a reduction in wages will increase the profits of a single firm, but will reduce overall profits if all firms adopt this policy, because lower wages translate into lower consumption, production and output.

There are also paradoxes tied to the financial system, such as the paradox of debt (Fisher, 1933) and the paradox of tranquility (Minsky, 1975). In the former, efforts to deleverage end up

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increasing leverage: from a single agent perspective, selling assets to reduce leverage is a sensible option, but if many agents follow this strategy, assets' prices fall, reducing the net worth and increasing leverage. The later states that the longer an economy remains stable, the lower is the perceived risk, leading agents to increase their risk taking and thus leading to instability.

Lesser discussed is the paradox of risk[2]. It was first proposed by Wojnilower (1980), in the context of financial futures. Lavoie (2022, p. 23) gives the following description of the paradox:

> Financial innovations designed to reduce risk at the microeconomic level, by spreading it over a larger number of financial institutions - as is the case with securitization, collaterized debt obligations, credit default swaps, equity default swaps, interest rate swaps, and the whole gamut of financial futures and financial derivatives - end up creating a larger amount of macroeconomic or systemic risk.

In this paper, we aim to deepen the discussion on the paradox of risk, which has been overlooked by the post-Keynesian literature, by analyzing the intricacies of repurchase agreements (repos, in short). Repos are financial contracts in which one party sells a security with the concomitant agreement to repurchase it at a certain price in a future date (and the other party, conversely, agrees to buy the security and re-sell it in the future). In practice, they work as collateralized loans, being a source of liquidity for one party, and a substitute for bank deposits for the other. While they are safe from the microeconomic point of view, due to the securities collateralizing the loan, the increased interconnectedness of balance sheets that they foster end up increasing systemic fragility, thus constituting a manifestation of the paradox of risk. In order to analyze this increased interconnectedness and the financial fragility that repos bring about, we will employ the Monetary Circuit Theory (MCT). The MCT is a useful framework to study financial flows in a monetary economy of production, since it tracks money from its creation (in the initial finance stage) to its destruction (in the final finance stage).

The paper is organized as follows. After this introduction, we briefly discuss the main ideas of the MCT and how shadow banks have been incorporated into it. In the third section, we discuss how repurchase agreements work, the main agents involved in its negotiation, the market segmentation and a brief historical discussion. In the fourth section, we use a monetary circuit to assess how repurchase agreements give rise to the paradox of risk The last section offers a synthesis of our findings and concluding remarks.

2. The Monetary Circuit, Financialization, and Shadow Banks

The Monetary Circuit Theory (MCT) analyzes the functioning of a monetary economy of production by describing how money is created, how it circulates through the main macroeconomic sectors, and how it is destroyed. In the original formulations of Alain Parguez (1975) and Augusto Graziani (1984), the Circuit is opened when banks extend credit to firms,

[2] For a long list of post-Keynesian macroeconomic paradoxes, see Lavoie (2022, p. 18-24).

endogenously creating money in the process; this is the so-called "initial finance". Firms then use the money to purchase labor from households, who, in turn, spend part of the money on consumption goods and save another part. The financial market collects this saving and redistribute it to firms, closing the Circuit in the so-called "final finance". This original formulation of the MCT has been used to analyze a number of issues. For example, Bougrine and Seccareccia (2002) analyze taxes, public spending, and the state. Bellofiore (2003) analyses Marx's labor theory of value. Godley (2003) and Lavoie (2003) use it as the basis of Stock-Flow Consistent models. Lunghini and Bianchi (2003) studies income distribution.

In the past decades, however, two developments challenged this original formulation of the MCT. One is the increase in household indebtedness, creating the possibility that the Circuit is opened with a loan not to a firm start its production process, but to a household purchase a house, a durable good, or simply acquire consumption goods. The second is the advent of Financialization. This term has many definitions. A classical one is given by Epstein (2005, p. 3), in which he defines it as "the increasing importance of financial markets, financial motives and financial institutions, and financial elites in the operation of the economy and its governing institutions". Krippner (2005, p.) defines it "as a pattern of accumulation in which profits accrue primarily through financial channels rather than through trade and commodity production". Stockhammer (2004, p. 720) defines it as "the increased activity of non-financial businesses on financial markets", arguing that "the process of financialisation is linked to changes in the internal power structure of the firm".

One particular aspect of financialization that received great attention from MCT scholars is the Shadow Banking system. Just like financialization, this term has been defined in various forms. As early as 1993, D'Arista and Schlesinger (1993) were warning about the emergence of a parallel banking system. The authors described what came to be known as the "shadow banking system" after McCulley (2007)'s famous speech, in which he defines shadow banks as "the whole alphabet soup of levered up non-bank investment conduits, vehicles, and structures". One of the most cited works on shadow banks is Poszar et al (2010, p. 1), which affirms that "shadow banks are financial intermediaries that conduct maturity, credit, and liquidity transformation without access to central bank liquidity or public sector credit guarantees". The Financial Stability Board (2016, p. 1) defines shadow banking as "credit intermediation involving entities and activities (fully or partially) outside the regular banking system"[3].

Several MCT works attempted to incorporate financialization and the shadow banking system on the Circuit. For instance, Seccareccia (2012) describes the different circuits of the "prefinancialization era", in which banks' main function was to finance the productive sphere of the economy, and the "hyperfinancialized era", when banks are at the center of profit-making transactions related to the financialization. Passarella (2014) contrasts the traditional monetary circuit with an amended version aimed at describing the "money manager capitalism". The author

[3] It is interesting to note that, in 2019, the FSB changed its terminology, replacing "shadow banking" with "non-bank financial intermediation" in its communications and reports (FSB, 2019).

then complements the circuit with matrices inspired by the Stock-Flow Consistent approach to discuss capital asset inflation, profits and income distribution.

Botta, Carvezasi and Tori (2015) develop an extended monetary circuit populated with investment banks, broker-dealers, insurance companies, institutional investors, money market funds, special purpose vehicles, and the many financial instruments used by them, such as bonds, commercial papers, repos, credit default swaps, asset-backed securities, and asset-backed commercial papers. They propose two interconnected circuits, one for the real side of the economy and another for the financial side. They also offer an interesting definition of financialization: "In a monetary theory of production, financialization can be conceived, and could be defined, as a shift of the main channel of money creation from real production to financial speculation" (ibid., p. 222).

Michell (2017) employs the MCT to assess if shadow banks can create money. After a thorough discussion of shadow banks in a financialized economy, he concludes that they are unable to do so, being dependent on traditional banks in this regard. His description of the monetary circuit is worth quoting at length:

> In the shadow banking era, the majority of money and credit claims are created when banks lend to households. When this money is spent it ends up either in the hands of wealthy individuals or as corporate profit. Such wealthy individuals or corporations, in turn use the money to buy the liabilities of money market funds or other financial intermediaries. From here, money is passed along the links of the chain until it is used to simultaneously remove a loan from the balance sheet of a bank, and extinguish a deposit. In this way, the monetary circuit has escaped the constraints of real output (Ibid., p. 375).

More recently, Canelli, Fontana and Realfonzo (2022) use the MCT to interpret the nature and role of shadow banks. They develop an extended monetary circuit using the economic function, activity-based approach of the Financial Stability Board to organize the shadow banking system into five economic functions, typified by money market funds, finance companies, broker-dealers, credit insurance companies and structured finance vehicles. With this extended circuit, they discuss the concepts of initial and final finance and how they are still relevant despite the enormous evolution of the financial system.

This update attempt by MCT scholars has not come without criticisms. Lysandrou (2020), for instance, argues that the MCT is unable to deal with a financialized economy. He claims that the fundamental relationship in Graziani's framework is the firm-bank-household, and that this is at odds with a financialized economy. On the opposite direction, Michell (2017, p. 360), while agreeing that "the theory of the monetary circuit needs to be updated to accurately reflect the institutional realities of modern financial systems", aptly argues that the MCT's fundamental relationship is the triad borrower-bank-lender, showing that the framework is flexible enough to deal with the evolving nature of capitalism. That flexibility is clearly demonstrated by the works mentioned in the previous paragraphs. Our aim in this paper is to further demonstrate the flexibility of MCT by applying it to the analysis of a specific financial instrument – repurchase agreements – and evaluating their macroeconomic implications.

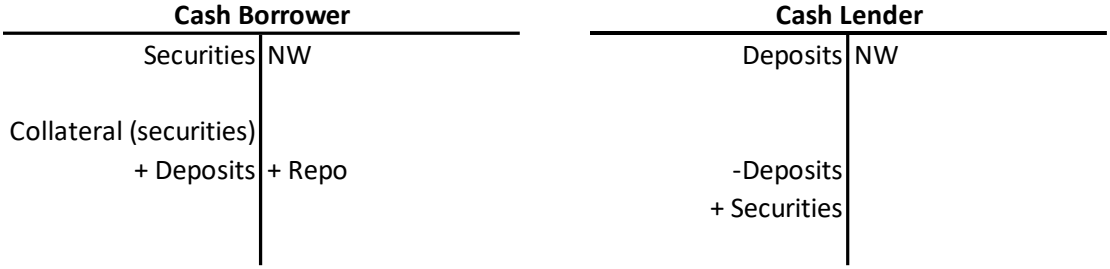
3. Repurchase Agreements

In this section, we will explain several details of repurchase agreements. We begin with its basic mechanics, such as accounting treatment, haircuts, mark-to-marketing and collateral calls. We then describe the main participants and their motivations to enter into a repurchase agreement. In the third subsection, we explore the market segmentation. Finally, we give a brief historical overview of recent developments in the market.

3.1 Basic mechanics

A repurchase agreement (or repo, in short) is the sale of a security with the concomitant agreement to repurchase it at a certain price on a future date. The opposite side of a repo is a reverse repo: the purchase of a security with the concomitant agreement to resell it at a certain price on a future date. In practice, a repo is a secured loan, using the security as collateral. Figure 1 presents a repo using balance sheets[4]. The left balance represents a cash borrower: an entity which owns securities and wants (or needs) liquidity. The right balance presents a cash lender: another entity which has large deposits and wants to invest them in a safe, short-term operation. The first row in each balance sheet represents the starting positions: securities for the cash borrower and bank deposits for the cash lender.

Figure 1 – A repurchase agreement



Source: author's own elaboration.

For the cash borrower, the second row presents a reclassification of its securities, which is now defined as "Collateral". The repo appears on the liability side, since it is a commitment to repurchase the securities. As for the cash lender, we simply compute a change in its assets: deposits are substituted for the securities. The reason for this accounting treatment is to make explicit the increased leverage of the borrower. As the International Capital Market Association (2019, p. 46-47, our emphasis) states:

[4] The lefthand side of a balance sheet represents assets, while the righthand side represents liabilities. Entries with a "+" sign represent acquisition of assets or issuance of liabilities. Entries with a "–" sign represent reductions in either assets or liabilities. Entries without a signal stand for assets or liabilities inherited from a previous period.

> The collateral remains on the balance sheet of the seller, even though he has sold legal title to the collateral to the buyer. The logic of this accounting treatment is confirmed by the consequence that, because the cash paid for the collateral is added as an asset to the seller's balance sheet (balanced on the liability side by the repayment due to the buyer at maturity), this will expand, thereby signalling that that seller has increased his leverage by borrowing. In order to make it clear to the reader of a balance sheet which assets have been sold in repos, the International Financial Reporting Standards (IFRS) require that securities out on repo are reclassified on the balance sheet from 'investments' to 'collateral' and are balanced by a specific 'collateralised borrowing' liability.

Repo contracts are asymmetrically designed to protect the lenders (Sissoko, 2019). Besides the presence of collateral, there are many other safety mechanisms in a repo contract that ensure lenders' safety. Among those, the most important are haircuts, mark-to-market accounting and margining. A haircut is a discount that lenders apply to the securities' market value when accepting them as collateral at the start of the repo, this discount being expressed as a percentage. For example, if a lender applies a 5% haircut to a certain security, then a borrower can obtain $95 for each $100 of securities it posts as collateral. The mark-to-market accounting is the practice of calculating the collateral's market value on a real-time basis. If the securities fall in value, then the lender makes a collateral call: it asks the borrower to post more securities in order to maintain the same amount loaned at the beginning of the repo, i.e., it will roll over the repo only if the borrower gives more securities as collateral. If the borrower fails to do so, the lender will sell the securities it has obtained in the opening leg of the repo, thus terminating the contract.

3.2 Main participants

There are three main types of participants in the repo market: cash lenders, cash borrowers and dealers. Borrowers of cash utilize repos to obtain liquidity without selling its securities, to leverage their portfolio using the securities as collateral or to simply fund its asset positions. Typical borrowers in repo markets are hedge funds, which seek to increase their leverage. Figure 2 exemplifies how this is done, and the limits that haircuts impose on this practice, using a hedge fund as an example. The fund begins by issuing $100 worth of shares, the proceeds of which are used to buy securities. On a second stage, the securities are used as collateral in a repo, guaranteeing $95 of deposits after the haircut. These $95 are used to buy more securities (third row), which are also used as collateral on another repo (fourth row), raising $90,25 in deposits. This is used again to buy more securities (fifth row), which will be collateral in a third repo, and so on.

Figure 2 – Leverage via repos

Hedge fund	
Securities: $100	Shares: $100
Collateral (securities) (1): $100 + Deposits: $95	Shares: $100 + Repo: $95
Collateral (securities) (1): $100 - Deposits: $95 + Securities: $95	Shares: $100 Repo (1): $95
Collateral (securities) (1): $100 Collateral (securities) (2): $95 + Deposits: $90.25	Shares: $100 Repo (1): $95 + Repo (2): $90.25
Collateral (securities) (1): $100 Collateral (securities) (2): $95 -Deposits: $90.25 + Securities: $90.25	Shares: $100 Repo (1): $95 Repo (2): $90.25

Source: author's own elaboration.

A basic but important fact about leverage is that the greater the leverage, the smaller the fall in security prices required to create insolvency[5]. If, for example, a hedge fund has $95,000 in liabilities and $5,000 in equity, with the concomitant $100,000 in assets, a 5% decline in the assets' prices is sufficient to wipe out all the equity of this fund. This has important implications for our argument, which will be discussed in the next section.

Cash lenders, by their turn, look for safe short-term investments, and/or to a safe place to "park" their funds, since their deposits are frequently above the maximum level eligible for deposit insurance (Pozsar, 2014). Institutions that act as lenders are money market mutual funds, corporate treasuries, securities' lenders[6] and foreign central banks.

Finally, we have repo dealers, which act as intermediaries between cash lenders and cash borrowers. Dealers offer slightly different prices to enter a repo or a reverse repo, in the so-called "bid-ask spread"[7].

3.3 Market segmentation

[5] On the other hand, and the reason why it is such a popular strategy, leverage increases the return on equity. Using the example's numbers, assuming that the assets' return net of the liabilities cost is as small as 2%, this means a $2,000 return. Over the $5,000 in equity, this means a 40% return, a non-trivial yield.

[6] Examples of securities lenders are buy-and-hold asset managers, such as pension and insurance funds. These entities lend their securities to earn additional income on their long-term portfolios. They receive cash as collateral for the securities lent, and use the repo market as a way to earn further interest income.

[7] For a thorough discussion of dealers in repo markets, see Hempel et al (2024).

The US repo market is, in fact, split into four different markets, each of them responsible for a combination of characteristics along two dimensions: cleared versus uncleared transactions, and bilateral versus tri-party settlement (Kahn and Olson, 2021).

The clearing dimension refers to the existence (or not) of a Central Counterparty (CCP). A CCP guarantees the settlement of all transactions by becoming the counterparty to every trade. Therefore, the CCP is the buyer of every seller and the seller to every buyer. This does not happen in transactions without a CCP. For example, if entities A and B enter in a repo with a CCP, A will be lending cash to the CCP, and B will be borrowing cash from the CCP; conversely, if the transaction does not have a CCP, A will be lending directly to B. Currently, this role is performed by the Fixed Income Clearing Corporation (FICC).

As for the settlement dimension, there are two alternatives: bilateral repos and the triparty repos. In the former, the counterparties meet directly. In the latter, there is a bank acting as a third party, offering custody and settlement services to both counterparties. Currently, the Bank of New York Mellon (BNYM) is the only bank to offer this service; J. P. Morgan was another tri-party bank until 2019. According to Baklanova, Copeland and McCaughrin (2015), there are four differences between these two segments. The first is the timing of settlement: for the bilateral segment, the trades occur in the morning, at 11am; for the triparty, the trades usually occur later in the day. The second difference is the settlement risk protection: for bilateral repos, the cash lenders receive full control of the securities posted as collateral, allowing for their rehypothecation; this is not possible in the triparty repo, since the clearing banks hold the securities for the duration of the agreement. Third, the costs of clearing and settlement: for bilateral repos, the operational costs are higher than for the triparty segment, since the last one offers services of custody and settlement. Finally, the last difference regards the type of securities used as collateral: for bilateral repos, the same security used in the opening leg must be returned in the closing leg; triparty repos, by their turn, are usually "general collateral" repos, in the sense that any security within an asset class can be used to close the repo[8].

Figure 3 – Repo markets in the US

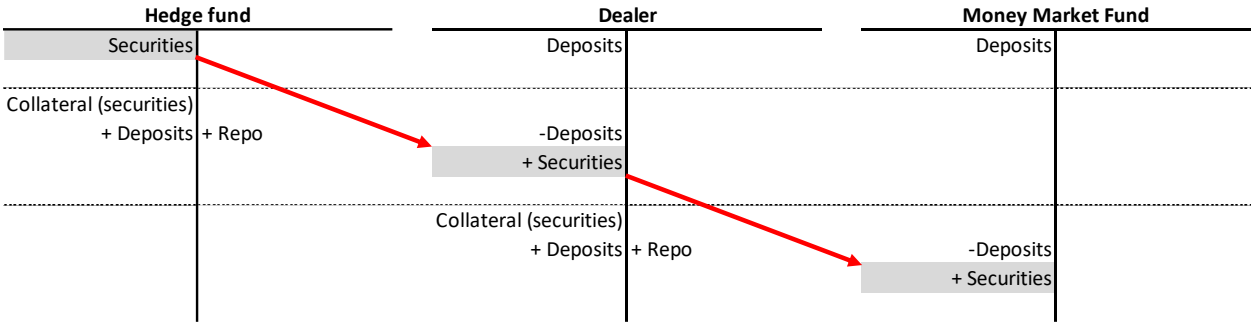
		Transactions' clearing	
		Uncleared	**Cleared**
Settlement	**Bilateral**	Uncleared Bilateral Market	FICC DVP
	Tri-Party	BNYM Tri-Party	FICC GCF

[8] For example, the cash borrower can post as collateral a Treasury security maturing in one month, and the cash lender can return a Treasury security of a longer maturity when the repo closes.

Source: author's own elaboration.

Figure 3 represents the four possible combinations of settlement and clearing options for a repo. In the uncleared bilateral market[9], repos occur on an over-the-counter basis. This market is the primary source of cash borrowing for hedge funds and, conversely, the main source of securities for repo dealers. Securities obtained by dealers in this market can be rehypothecated (or repledged), meaning that dealers can use them as collateral to obtain cash for themselves. This possibility means that a single security can sustain more than one repo. Figure 4 exemplifies such a case. The example starts with a hedge fund (or other cash borrower) entering a repo with a dealer (first and second rows): it pledges securities as collateral to receive deposits. The securities go to the dealer balance sheet (first arrow). The dealer, then, uses these securities as the collateral for its own repo, this time with a money market fund (or other cash lender), who now holds the securities (second arrow).

Figure 4 – A security rehypothecation



Source: author's own elaboration.

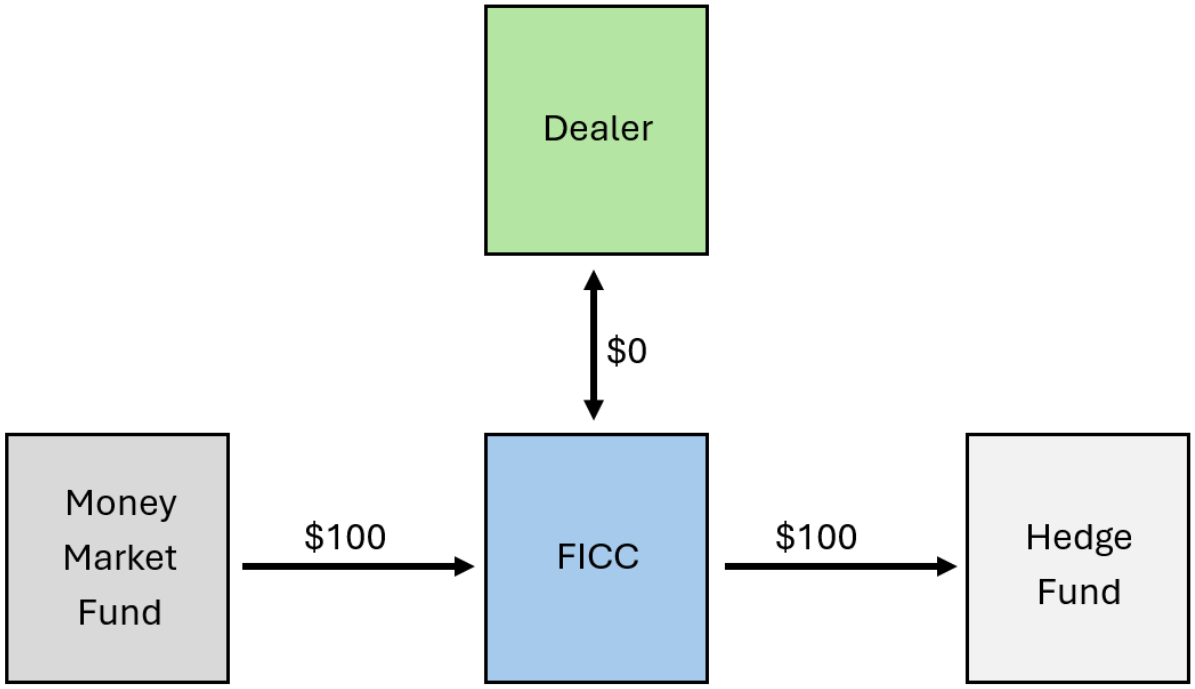
The uncleared tri-party market is simply known as tri-party repo. This market is the preferred one by money market funds to lend their cash to dealers. The securities pledged as collateral are managed by the BNYM, who holds them in custody for the duration of the repo contract. Moreover, they are posted on a "general collateral" basis[10].

The FICC Delivery Versus Payment (DVP) service is the cleared bilateral market. Repos in this market only uses Treasuries and agency MBS as collateral, securities that can be transferred through Fedwire, a settlement system operated by the Federal Reserve. Both counterparties agree on a specific security to serve as collateral, thus allowing for rehypothecation. The DVP is mainly a dealer-to-dealer market, except for its sponsored segment. In this case, a FICC member (which are mainly dealers) sponsors an institution (such as a hedge fund or a money market fund) to allow access to the DVP market. The rationale for this is that a dealer that lends to and borrows from the same counterparty at the same maturity can net out these exposures for regulatory capital purposes. Therefore, a dealer which sponsors a money market fund and a hedge fund to the DVP service can

[9] For a deeper discussion of this market, see Hempel et al (2023).
[10] See Paddrik, Ramirez and McCormick (2021) for a discussion of the tri-party repo market.

net out the cash it borrows from the former with the cash it lends to the later, since the FICC acts as a CCP. Figure 5 helps to understand this case. Remembering that a CCP becomes the counterparty to all transactions it clears, we have that the cash lent from the money market fund to the dealer is actually a lending from the fund to the FICC and then from the FICC to the dealer. Likewise, the cash lent from the dealer to the hedge fund has the FICC in the middle of the trade. Therefore, the dealer is both borrowing $100 from and lending $100 to the FICC, which can be netted to zero for its regulatory capital assessments.

Figure 5 – Netting transactions in the FICC DVP sponsored repo service



Source: adapted from Afonso et al (2020, figure 5b).

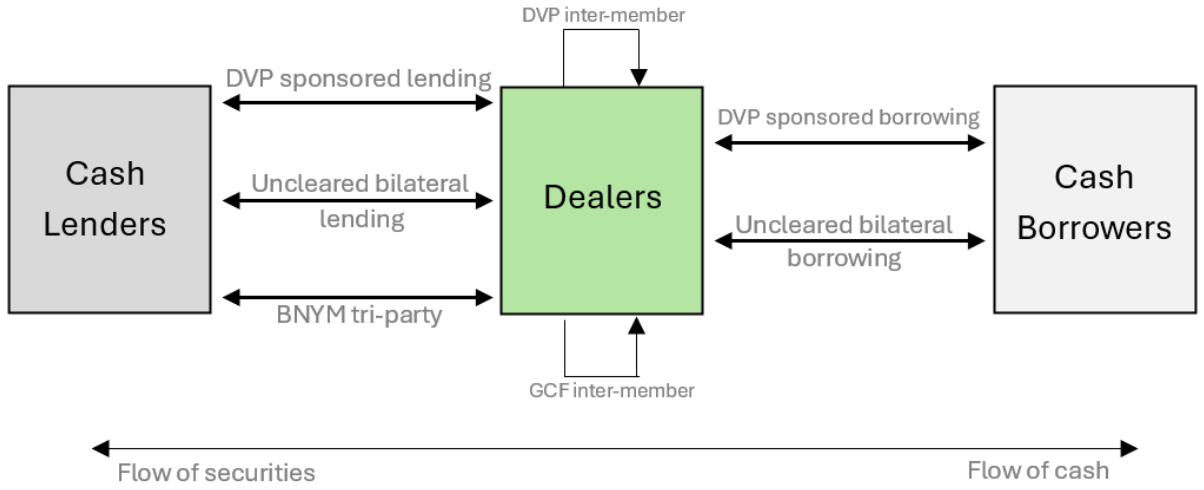
Finally, there is the FICC General Collateral Financing (GCF)[11], which is another interdealer market. In this case, repos are cleared by FICC and settled with the BNYM. Like the DVP market, it only uses securities that can be transferred through Fedwire. The identities of lenders and borrowers are anonymized, and there is transparent information about rates. Contrary to the DVP market, the GCF uses general collateral, thus not allowing for rehypothecation.

Figure 6 summarizes the flows of the four repo markets. Cash lenders, such as money market funds, lend cash to dealers through BNYM tri-party, the uncleared bilateral and the DVP sponsored market. Dealers lend and borrow among themselves using either the DVP or the GCF markets. Finally, cash borrowers, such as hedge funds, borrow cash from dealers using the uncleared

[11] Agueci et al (2014) analyze this market.

bilateral market or the DVP sponsored market. The bottom part of the figure shows that cash flows from left to right, and securities flow in the opposite direction.

Figure 6 – Flows in the repo markets



Source: adapted from Kahn and Olson (2021, figure 1).

3.4 Brief overview of recent history

By providing protection for the lender via haircuts, mark-to-market and margining, and by allowing greater returns for the borrowers via leverage, it is no wonder that repos spread throughout the world. Gabor (2016, p. 970) argues that this happened in the 1980s, a period when several states faced increased competition to attract international investors. To became competitive, they "embarked on a project of creating modern government bond markets, with modernity understood to mean the structural features of the US government bond market: regular auctions, market-making based on primary dealers and a free repo market".

Repos were an important conduit of the subprime crisis from the troubled mortgage-backed securities to the broader financial system. Gorton and Metrick (2012) show evidence of a run on repo in the bilateral segments during the subprime crisis, manifested in increased haircuts and interest rates. They also show that the uncertainty with subprime-related assets led to a contagion on other assets, which also experienced an increase in haircuts and interest rates. Krishnamurthy, Nagel and Orlov (2014), by their turn, analyze the tri-party segments, with particular focus on cash flows from money market funds and securities lenders to dealers. They also find that haircuts and interest rates increased in this segment, though to a lesser extent than in bilateral repos. Moreover, they also document a complete cessation in repos using private-label Asset-Backed Securities (ABS) as collateral. This led to liquidity problems for dealers which relied heavily on these operations, leading to the eventual collapse of some of them, such as Bear Sterns and Lehman Brothers.

On mid-September 2019, repo markets were at the center of a market stress event. The federal funds rate broke the ceiling of the target range set by the Federal Reserve, and repo rates measured by the Secured Overnight Financing Rate (SOFR)[12] rose from 2% to 5% in just two days. Several simultaneous shocks explain this event. First of all, the quarterly corporate tax payment and the settlement of a Treasury auction happened on September 16, leading to a reduction in liquidity both in the federal funds market and in the repo markets. Also, a significant portion of money market funds had withdrawn from the FICC DVP sponsored repo market. Finally, some large banks were experiencing a scarcity of bank reserves due to regulatory reasons (Afonso et al., 2020; Copeland, Duffle and Yang, 2025).

Given the centrality of the repo markets, the Federal Reserve was obliged to intervene in it. It entered into the repo market lending against Treasury and agency collateral. It did the same in March 2020 in the wake of the Covid-19 pandemic. These two experiences later developed into the Standing Repo Facility (SRF), a standing facility in which the Fed directly lends cash to repo market participants. The SFR works in the opposite direction of another facility, the Overnight Reverse Repo Program (ON RRP), created in 2013, in which the Fed borrows cash from repo market participants (Ennis and Huther, 2021).

4. Repurchase Agreements in the monetary circuit: the emergence of the paradox of risk

In this section, we use the MCT as our analytical framework to explain how repos serve as a trigger to the paradox of risk. Our central argument is that while repos appear to be safe investments for lenders at the micro level, they contribute to greater financial fragility at the macro level. This occurs because repos increase the interconnectedness of the financial system, indirectly exposing even those who do not directly hold risky assets to potential financial instability. Furthermore, their procyclical nature and their role on leverage amplifies this tendency.

To demonstrate repos' systemic risk aspects, we first locate them in an extended monetary circuit. Figure 7 below provides a simplified view of the financial system[13], highlighting repo operations with red arrows. Some flows of the traditional circuit are present in our figure: banks extend loans

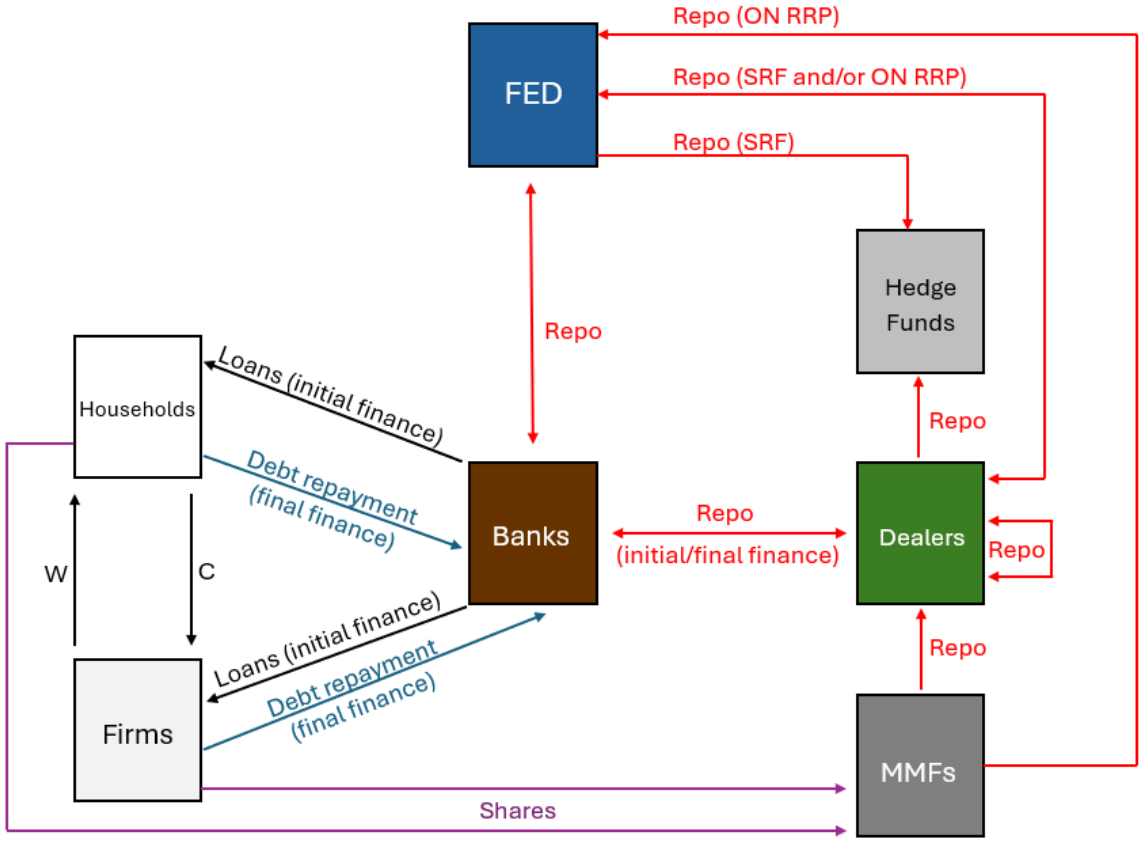
[12] The Federal Reserve Bank of New York calculates three benchmark interest rates for repos, all of them using data for . The first is the Tri-Party General Collateral Rate (TGCR), which is an average rate of the overnight repos collateralized with Treasury securities conducted in the BNYM tri-party market. The second benchmark rate is the Broad General Collateral Rate (BGCR), which uses the same transactions of the TGCR rate plus the repo transactions of the FICC GCF market. Finally, the SOFR contemplates all transactions under the BGCR rate plus the repo transactions of the FICC DVP market.

[13] For more complex representations of the financial system in a monetary circuit, see Botta, Carvezasi and Tori (2015) and Canelli, Fontana and Realfonzo (2022).

to firms in the initial finance stage; firms use these funds to pay wages; households then use part of the wages to purchase consumption goods; and firms repay their loans in the final finance stage.

For clarity, we simplified away some elements of the traditional circuit. For instance, households' savings directed to the "financial system" are simplified as shares in MMFs, and we have omitted an arrow from the "financial system" or any of its components back to firms to maintain a cleaner figure. This simplification does not compromise our analytical capacity, as our primary focus is on repos. Conversely, we added some complexity to this part of the circuit by including loans from banks to households, as well as debt repayments, highlighting that this is also a source of initial finance to the circuit. Additionally, we include an arrow from firms to MMFs, reflecting that some large firms park their deposits in these funds.

Figure 7 – A monetary circuit with repurchase agreements



Source: author's own elaboration.

As for the repos, we have the usual flows from MMFs to dealers, and from them to hedge funds. There is an arrow to represent interdealer repos. Banks conduct repos or reverse repos with dealers, represented by a double-headed arrow. Finally, there is the Federal Reserve and its two repo facilities: the Standing Repo Facility (SRF), in which it directly lends cash to repo market participants (simplified here as hedge funds) and the Overnight Reverse Repo Program (ON RRP),

in which it borrows cash from repo market participants (simplified here as MMFs). The Fed can either borrow or lend cash to dealers.

Two repo flows demand a longer discussion: the ones from the Fed to banks, MMFs and hedge funds, and those from the banks to dealers. The special nature of these repos is due to the fact that repos with the central bank create or destroy reserves, while repos with banks create or destroy deposits.

When banks enter into a repo with the central bank, there will be either a creation of bank reserves, or a destruction of it. Figure 8 helps to understand this case. At the top, we have the Federal Reserve with securities as assets and bank reserves as liabilities; the bank has reserves on the asset side and net worth on the liabilities. When the Fed repo the securities, it should receive "cash", or "money"; but the "cash" here is its own liabilities (the reserves). Since it is impossible to issue a liability against itself, what happens is that reserves are destroyed. For the Fed, the end result is a change in its liabilities' composition, the same happening for the commercial bank's assets. The bottom part of figure 8 presents an opposite case: the central bank conducts a reverse repo with the banks, taking securities in exchange for "cash", which in this case means newly created reserves. In a monetary policy context, both cases are known as "temporary open market operations", in contrast with "outright open market operations", in which a central bank buys or sells a security without any commitment over its repurchase or resell. In the first example, the Fed withdraws liquidity from the banking system, and injects it in the second (Bindseil, 2014).

As explained in the previous section, the Fed also transacts with non-bank financial entities, such as MMFs and hedge funds. Reserves will also be created and/or destroyed in this case, since these entities must have an account in a correspondent bank. If the Fed, for example, lends cash to a hedge fund through the SRF, reserves will be created to the fund's correspondent bank. Conversely, if the Fed borrows cash from an MMF with the ON RRP, reserves will be destroyed at the fund's bank.

Figure 8 – The central bank in a repo and in a reverse repo

Fed	
Securities	Reserves
Collateral (securities)	- Reserves
	+ Repo

Bank	
Reserves	Net worth
- Reserves	
+ Securities	

Fed	
+ Securities	+ Reserves

Bank	
Securities	Net Worth
Collateral (securities)	
+ Reserves	+ Repo

Source: author's own elaboration.

Another special kind of repos present in our monetary circuit are those from banks to dealers. In this case, there is either creation or destruction of bank deposits. Figure 9 illustrates banks conducting a repo (upper part) and a reverse repo (bottom part). Similar to the previous case, when banks enter into a repo, they exchange securities (reclassified as "collateral") for deposits; the bank cannot have a liability against itself, since it issued the deposits it is "receiving". In practical terms, what happens is that the bank reclassifies its liabilities, changing deposits for repo. If, in turn, a bank enters on a reverse repo, it will be creating deposits to exchange for the securities.

Figure 9 – Commercial banks in repo and in reverse repo

Bank	
Securities	Deposits
Collateral (securities)	- Deposits
	+ repo

Dealer	
Deposits	Net worth
- Deposits	
+ Securities	

Bank	
+ Securities	+ Deposits

Dealer	
Securities	Net Worth
Collateral (securities)	
+ Deposits	+ Repo

Source: author's own elaboration.

It is important to highlight that, when commercial banks are one of the counterparties of a repo, there is money creation or destruction. From an MCT perspective, this has implications for the concepts of initial and final finance. Besides the creation of money via banks' loans to firms, as emphasized in the traditional MCT formulations, there is also the possibility that money enters the circuit via repos with the financial system. Moreover, money can go from the "initial" to the "final"

finance stages without passing through the real side of the economy, circulating only in an "inner-finance circuit", as highlighted by Botta, Carvezasi and Tori (2015). The concepts of initial and final finance are also useful in debates of whether shadow banks can create money. As is well-summarized by Michell (2017, p. 375), "Graziani's assertion that initial finance must precede final finance remains valid: the accumulation of claims in the shadow banking sector logically relies on the prior creation of money claims by the 'traditional' banking sector".

So far, nothing has been said about the securities behind these repos. The main provider of safe securities for the repo market is the government, via its treasury bills, bonds and notes issuances. Another important source of repoable assets are commercial banks, via Mortgage-Backed Securities (MBS) and Asset-Backed Securities (ABS)[14]. Entities such as Special Purpose Vehicles (SPVs) and Structured Investiment Vehicles (SIVs)[15] generate shorter-term securities based on MBS and ABS. Firms, by their turn, issue Commercial Papers (CPs). In a sense, we can speak of an "initial collateral" stage, similar to the "initial finance" of the traditional MCT. This initial collateral stage is the moment in which a security enters the financial circuit, being able to serve as collateral in multiple operations via repos, rehypothecations and securitizations. In our current financialized economies, this flow of securities is as vital for the financial system as the flow of money. When the securities mature, we have the "final collateral" stage, in which they are withdrawn from the circuit.

One essential aspect of our stylized monetary circuit is how repurchase agreements increase the interconnectedness of the financial system. This tendency is further exacerbated by the procyclical nature of repos. In the boom phase, assets' prices increase, thus augmenting the net worth and reducing the leverage of financial market participants. This leads to adjustments in the leverage ratios, meaning that agents can take on more repos to buy more securities. This increased demand further inflates their prices. Moreover, haircuts are also procyclical, allowing agents to raise more funds with the same collateral as time passes (Gorton and Metrick, 2012). On the opposite direction, when prices fall, lenders on the repo market will make collateral calls. If they are not met, lenders will sell the securities they received, putting more pressure on the falling prices. Haircuts, once again, act procyclically, meaning that the same collateral renders less and less resources in a repo.

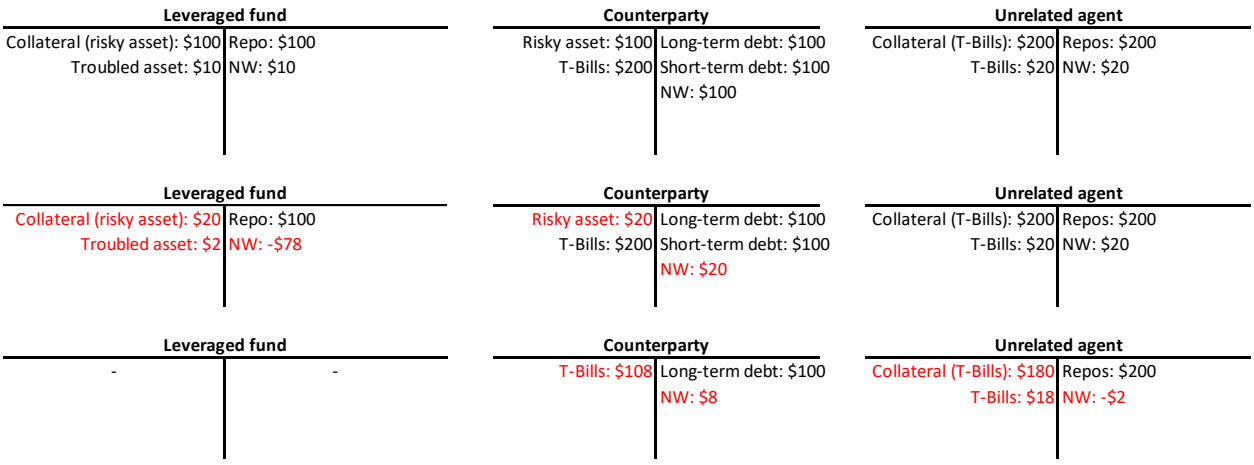
Leverage plays a critical role in how systemically dangerous the downward phase will be. Remember that the greater the leverage, the smaller the fall in security prices required to create insolvency. If a specific asset has problems (say, a sovereign defaults on its debt, subprime tranches default, etc.), it will impose losses on its holders. They will likely receive collateral calls from their repo counterparties and, if in an insolvent position, will not be able to pay all that is due (that is, will not have enough funds to repurchase the securities). The counterparties, by their turn, will face losses, as they now hold devalued collateral worth less than the loaned amount. This can push

[14] This is the well-known securitization process.
[15] SIVs basically ceased to exist after the subprime crisis.

them toward insolvency or, at the very least, create liquidity shortages, as they had relied on the repurchase of securities to maintain cash flow. In an attempt to raise liquidity, they may sell unrelated assets, putting downward pressure on broader market prices. As a result, distress in a single asset class can cascade through the financial system, amplifying instability through the interconnectedness facilitated by repos.

An example of this dynamic is given in figure 10, which presents three agents: (i) a leveraged fund, which has pledged $100 as collateral of a risky asset (for example, subprime MBS or sovereign debt with a lower credit rating); (ii) the counterparty of this fund, which is currently holding the $100 of that asset, plus $200 in US-Treasury bills, with $100 in long-term debt, another $100 in short-term debt and $100 in net worth; and (iii), an agent unexposed to the risky asset and not directly related to the other balance sheets. These initial positions are shown in the first row of the figure. The second row shows what happens when the risky asset faces a setback, such as increasing delinquency rates in underlying mortgages of a MBS, or the default of the sovereign. Due to this, the risky asset loses 80% in value. The leveraged fund is now highly insolvent and unable to meet the collateral calls on its repos. Its counterparty, while not insolvent, is facing a liquidity problem: it was counting on the repurchase of the risky asset to have funds to pay for its own $100 short-term debt. To acquire the necessary funds, it sells some of its T-bills. With many agents doing the same throughout the financial system, T-bills' prices drop by 10%. In the third row, the counterparty has finally paid out its short-term debt, with only $8 in net worth after the losses with the risky asset and the T-bills' price decline induced by the fire sale. The unrelated agent, which was unaffected when the risky asset lost value, is now insolvent due to the T-bills devaluation.

Figure 10 – Hidden exposures to a risky asset



Source: author's own elaboration.

As figure 10 makes clear, agents that do not hold a risky asset still have exposure to it, since their assets might lose value in a spiral of collateral calls triggered by price drops in a specific asset that

force leveraged players to unwind their positions. As Sissoko (2019, p. 325) summarized, “Repo contracts convert price declines into liquidity events”.

Scholars outside the post-Keynesian school have offered similar descriptions of the dynamic outlined above. For instance, Praet and Herzberg (2008, p.23) affirm that “asset liquidity may no longer depend on the characteristics of the asset itself but rather on whether vulnerable counterparts have substantial positions that need liquidating”. Sissoko (2019, p. 318) goes on a similar vein when stating that “instability can be triggered by the failure of a single financial market participant with a large balance sheet”. Specifically about repos, the author affirms that (ibid., p. 326) “the modern markets system is […] characterized by repo-based leverage that generates an environment where liquidity events are accompanied by forced selling, the expectation of forced selling, and repo borrowers who realize losses”. In conclusion, she summarizes her view by saying that (ibid., p.335) “safety for the individual is a trap for the economy”.

The monetary circuit depicted in figure 7 is also useful for understanding the broader economic implications of the paradox of risk. On the one hand, a financialized economy is characterized by what can be called a “financial circuit”, a self-referential subset of the monetary circuit that can exist detached from the real economy. Botta, Carvezasi and Tori (2015), when explaining the connection between repos and ABSs, state that:

> Such an inner-finance circuit takes place when commercial banks stretch liquidity to brokers and dealers through REPOs, which in turn use these funds to purchase ABSs. This is a self-feeding circular process. On the one hand, commercial banks indirectly “produce” and supply ABSs to be sold to investment banks. On the other hand, commercial banks may provide investment banks with the required money to buy ABSs, hence stimulating ABS demand (ibid, p. 219).

Therefore, many consequences of the paradox of risk are circumscribed to this “financial circuit”, or “inner-finance circuit”. For instance, a risky asset default such as the one exemplified in figure 10 will close some leveraged investment funds, bankrupt some institutions and wipe-out large fractions of financial wealth. The consequences for the real economy are mitigated by the fact that these losses afflict wealthy individuals and corporations with low propensities to consume or invest, thus resulting in a modest decline in output and employment.

On the other hand, there are still important connections between the “inner-finance circuit” and the “traditional” circuit which makes the paradox of risk an important threat for the economy as a whole. For instance, some of the investment funds that close during a downturn phase are pension funds, with repercussions on the income of the pensionists and macroeconomic implications over aggregate consumption. Other funds might have collected the cash deposits of large firms, leading to reductions in investment. During the subprime crisis, a large part of the “initial finance” went to mortgage lending, incentivizing real estate construction and the consequent positive impacts on employment and output. When the “inner-finance circuit” broke, the construction sector stalled, leading to a surge in unemployment.

In short, repos are safe from the individual perspective due to haircuts, mark-to-market and margining. However, their procyclical nature and the increased interconnectedness that they foster reduce safety at the aggregate level. Even in a financialized economy, these "inner-finance" instruments still have a dangerous influence on the real economy.

Concluding remarks

The Monetary Circuit Theory is a useful tool to study the functioning of a monetary economy of production. In the past decade or so, many authors have contributed to this strand of the literature by extending the traditional framework (focused on the relationships between banks, firms and households) to deal with several aspects of a financialized economy, such as shadow banks, securitization and the increased importance of the financial system. In this paper, we offered another contribution by presenting a detailed analysis of the functioning of repurchase agreements.

Repos are, in practice, collateralized loans. Repo contracts are asymmetrically designed to protect lenders, offering safety with haircuts, mark-to-market accounting and margining. There are three main agents in the repo markets: (i) cash lenders, such as MMFs, who seek safe, liquid short-term applications; (ii) cash borrowers, such as hedge funds, pursuing increased leverage; and (iii) dealers, who stand between these two groups. The market is segmented into four parts, each fulfilling a specific role. Broadly speaking, the uncleared bilateral market is where hedge funds get cash and dealers get securities that can be rehypothecated to the other markets. The BNYM tri-party market, in its turn, is where MMFs lend cash to dealers. The FICC GCF is an interdealer market operating in a general collateral framework. Finally, the FICC DVP is another interdealer market where repos have a specific collateral, thus allowing for rehypothecation, and with a sponsored segment that allows dealers to net out some transactions to alleviate regulatory capital measures.

We developed a stylized monetary circuit to analyze the role of repos in the emergence of the paradox of risk. This less-studied post-Keynesian macroeconomic paradox states that individual risk cover leads to more risk overall. Using the MCT as our framework, we have shown that repos fit precisely into this definition: its design elements ensure safety from an individual, or microeconomic, perspective; however, at the macroeconomic level, it increases the interconnectedness of the financial system, heightens assets' prices procyclicality, creates hidden exposures to risky assets and augments financial fragility. While these dangers can be limited to the financial system, or the "inner-finance" circuit, we have argued that many transmission channels can transform a financial event in a real economy crisis.

Our paper demonstrates the importance of the MCT in financial system studies. Though many works have contributed to this direction, we believe that there are many instances where the MCT can be successfully employed. We also contributed to the analysis of an overlooked post-Keynesian macroeconomic paradox. We hope that this paper will foster interest in this topic.

References

Afonso, G., Cipriani, M., Copeland, A., Kovner, A., La Spada, G., & Martin, A. 2020. 'The Market Events of Mid-September 2019.' *Federal Reserve Bank of New York, Staff Report* (918).

Agueci, P., Alkan, L., Copeland, A., Davis, I., Martin, A., Pingitore, K., Prugar, C., & Rivas, T. 2014. 'A Primer on the GCF Repo Service.' *Federal Reserve Bank of New York, Staff Report* (671).

Baklanova, V., Copeland, A. M., & McCaughrin, R. 2015. 'Reference Guide to US Repo and Securities Lending Markets.' *Office of Financial Research Working Paper* (15-17).

Bellofiore, R. 2004. 'As If Its Body Were by Love Possessed: Abstract Labour and the Monetary Circuit: A Macro-Social Reading of Marx's Labour Theory of Value.' In *Money, Credit and the Role of the State: Essays in Honour of Augusto Graziani*, edited by R. Arena and N. Salvadori. Aldershot: Edward Elgar.

Bindseil, U. 2014. *Monetary Policy Operations and the Financial System.* Oxford: OUP Oxford.

Botta, A., Caverzasi, E., & Tori, D. 2015. 'Financial–Real-Side Interactions in an Extended Monetary Circuit with Shadow Banking: Loving or Dangerous Hugs?' *International Journal of Political Economy* 44 (3): 196–227.

Bougrine, H., & Seccareccia, M. 2002. 'Money, Taxes, Public Spending, and the State within a Circuitist Perspective.' *International Journal of Political Economy* 32 (3): 58–79.

Canelli, R., Fontana, G., & Realfonzo, R. 2022. 'A Monetary Circuitist Interpretation of the Nature and Role of the Shadow Banking System in Modern Economies.' Paper presented at *26th FMM Conference: Post-Keynesian Economics and Global Challenges.*

Copeland, A., Duffie, D., & Yang, Y. 2025. 'Reserves Were Not So Ample After All.' *The Quarterly Journal of Economics* 140 (1): 239–281.

D'Arista, J. W., & Schlesinger, T. 1993. 'The Parallel Banking System.' *Briefing Paper 37, Economic Policy Institute, Washington D.C.*

Ennis, H. M., & Huther, J. 2021. 'The Fed's Evolving Involvement in the Repo Markets.' *Federal Reserve Bank of Richmond Economic Brief* (21-31).

Epstein, G. A. 2005. *Financialization and the World Economy.* Cheltenham: Edward Elgar.

Financial Stability Board. 2016. *Global Shadow Banking Monitoring Report 2016.* Basel, Switzerland: Financial Stability Board.

Financial Stability Board. 2019. *Global Monitoring Report on Non-Bank Financial Intermediation 2018.* Basel, Switzerland: Financial Stability Board.

Fisher, I. 1933. ‘The Debt-Deflation Theory of Great Depressions.’ *Econometrica* 1 (4) (October): 337–357.

Gabor, D. 2016. ‘The (Impossible) Repo Trinity: The Political Economy of Repo Markets.’ *Review of International Political Economy* 23 (6): 967–1000.

Godley, W. ‘Weaving Cloth from Graziani’s Thread: Endogenous Money in a Simple (but Complete) Keynesian Model.’ In *Money, Credit and the Role of the State: Essays in Honour of Augusto Graziani*, edited by R. Arena and N. Salvadori. Aldershot: Edward Elgar.

Gorton, G., & Metrick, A. 2012. ‘Securitized Banking and the Run on Repo.’ *Journal of Financial Economics* 104 (3): 425–451.

Graziani, A. 1984. ‘Moneta senza crisi.’ *Studi Economici* 39: 3–37.

Hempel, S., Kahn, R. J., Mann, R., & Paddrik, M. 2023. ‘Why Is So Much Repo Not Centrally Cleared?’ *Office of Financial Research, Brief* (23-01).

Hempel, S., Kahn, R. J., Mann, R., & Paddrik, M. 2024. ‘Repo Market Intermediation: Dealer Cash and Collateral Flow Management Across the U.S. Repo Market.’ *Office of Financial Research, Brief* (24-07).

International Capital Market Association. 2019. ‘Frequently Asked Questions on Repo.’ *ICMA*. Accessed January 2019. https://bit.ly/3BTZjUy.

Kahn, R. J., & Olson, L. 2021. ‘Who Participates in Cleared Repo?’ *Office of Financial Research Working Paper* (21-01).

Kalecki, M. 1969. *Studies in the Theory of Business Cycles 1933–1939.* Oxford: Basil Blackwell.

Keynes, J. M. 1936. *The General Theory of Employment, Interest, and Money.* London: Macmillan.

Krippner, G. R. 2005. ‘The Financialization of the American Economy.’ *Socio-Economic Review* 3 (2): 173–208.

Krishnamurthy, A., Nagel, S., & Orlov, D. 2014. ‘Sizing Up Repo.’ *The Journal of Finance* 69 (6): 2381–2417.

Lavoie, M. 2004. ‘Circuit and Coherent Stock-Flow Accounting.’ In *Money, Credit and the Role of the State: Essays in Honour of Augusto Graziani*, edited by R. Arena and N. Salvadori. Aldershot: Edward Elgar.

Lavoie, M. 2022. *Post-Keynesian Economics: New Foundations.* Cheltenham: Edward Elgar.

Lunghini, G., & Bianchi, C. 2004. ‘The Monetary Circuit and Income Distribution: Bankers as Landlords?’ In *Money, Credit and the Role of the State: Essays in Honour of Augusto Graziani*, edited by R. Arena and N. Salvadori. Aldershot: Edward Elgar.

Lysandrou, P. 2020. ‘Financialisation and the Limits of Circuit Theory.’ *Finance and Society* 6 (1): 1–18.

McCulley, P. 2007. ‘Teton Reflections.’ *Global Central Bank Focus* 2, PIMCO, California.

Michell, J. 2017. ‘Do Shadow Banks Create Money? “Financialisation” and the Monetary Circuit.’ *Metroeconomica* 68 (2): 354–377.

Minsky, H. P. 1975. *John Maynard Keynes.* New York: Columbia University Press.

Paddrik, M. E., Ramírez, C. A., & McCormick, M. J. 2021. ‘The Dynamics of the U.S. Overnight Triparty Repo Market.’ *Office of Financial Research, Brief* (21-02).

Parguez, A. 1975. *Monnaie et Macroéconomie.* Paris: Economica.

Passarella, M. V. 2014. ‘Financialization and the Monetary Circuit: A Macro-Accounting Approach.’ *Review of Political Economy* 26 (1): 128–148.

Pozsar, Z. 2014. ‘Shadow Banking: The Money View.’ *Office of Financial Research Working Paper* (14-04).

Pozsar, Z., Adrian, T., Ashcraft, A., & Boesky, H. 2010. ‘Shadow Banking.’ *Federal Reserve Bank of New York, Staff Report* (458).

Seccareccia, M. 2012. ‘Financialization and the Transformation of Commercial Banking: Understanding the Recent Canadian Experience Before and During the International Financial Crisis.’ *Journal of Post Keynesian Economics* 35 (2): 277–300.

Stockhammer, E. 2004. ‘Financialization and the Slowdown of Accumulation.’ *Cambridge Journal of Economics* 28 (5): 719–741.

Wojnilower, A. M. 1980. ‘The Central Role of Credit Crunches in Recent Financial History.’ *Brookings Papers on Economic Activity* (2): 277–326.