Money and Collateral

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Abstract

The establishment of secured financing transactions as a main funding conduit for systemic financial institutions after the 2008 financial crisis brought professional attention to the study of the behavior of collateral and so-called shadow banks. At the same time, the existing monetary theory left a theoretical blank for the analysis of these principal subjects, therefore requiring the institution of a new perspective. This independent research adopts a more modern view of money that was developed during the last decade, extends the money supply by introducing a measure that helps to efficiently position monetary products on a hierarchy and orderly presents a collection of key topics surrounding collateral with the goal of being a valuable educational material and providing an alternative monetary perspective to the devoted finance practitioner.

Keywords: money supply; collateral; rehypothecation; repo,liquidity; shadow banking

Motivation for this research

This was an accepted research proposal during my time as an exchange student in Strasbourg, however my semester abroad was canceled because of COVID-19. During the summer of 2020 and the following 6 months, I decided to thoroughly study the existing bibliography around shadow money and banking and realized that it was highly fragmented, making it difficult for a student to get a good idea of the topic. This fact, along with the valuable research experience I would get and my belief that researching money, collateral, shadow banks, etc. will help me get a broader understanding of the 2008 financial crisis, were my main motivations for doing this project.

1 What is money?

Understanding the nature of money surely has been the occupation of many scientists and philosophers throughout history. From Plato and Aristotle to Fisher and Keynes, we observe that in most historical periods there will be attempts to examine the money, its mechanics, and the socioeconomic consequences of its behavior. Each author's and monetary scientist's take on money is one more building block that contributes to the uncovering of the full picture.

However, because the world is a dynamic ever-changing place, so is this picture. This is where these and many other important scientists find common ground: Money is not static. Before it is used by someone to create value, it must be "moved" in the first place. That means, to be provided by someone, to come into existence. If this does not happen, how can someone produce something valuable if they do not have access to the means that allow them

to produce? To make it clearer that money and therefor the monetary system is dynamic, one can observe a period characterized by quantitative and qualitative monetary expansion at a rate never seen before. That period is none other than the sixties and the seventies. Concerning this period, Dufey and Giddy (1981) provide remarkable insight to the driving forces behind it. After referring to previous working papers on the subject, they argue that during the said decades the reasons for the appearance of new financial processes are the circumvention of regulations in a certain jurisdiction and the changes in risk factors that open room for profit. In addition, another stated reason is financial globalization: In a multinational business environment, banks must tailor financial institutions' services to meet the needs of international clientele[1].

Another interesting fact about this period is that because financial innovation happens at such a rate, it is difficult to keep track of it, even many years after. Alan Greenspan's words at the FOMC 's meeting in June 2000 could not describe this any better[2]:

"The problem is that we cannot extract from our statistical database what is true money conceptually, either in the transactions mode or the store-of-value mode. One of the reasons, obviously, is that the proliferation of products has been so extraordinary that the true underlying mix of money in our money and near money data is continuously changing. As a consequence, while of necessity it must be the case at the end of the day that inflation has to be a monetary phenomenon, a decision to base policy on measures of money presupposes that we can locate money. And that has become an increasingly dubious proposition."

This is proof that even policymakers are encountering difficulties in capturing the entirety of the monetary system. A plausible explanation for this is that the "changes in the way of doing business" pave the way for more efficient monetary processes that unfortunately may not be captured because regulators and authorities do not participate directly in money dealing nor the innovative process. The primary actors in the "money business" are banks and other newer types of financial institutions. The rest are re-actors to changes in this non-constant space.

1.1 Relation to the repo market and collateral

It is these changes in the dynamic monetary space that deem it necessary to constantly monitor the financial processes and re-evaluate previous assumptions. Therefore, the reason for introducing a topic such as the repo market with a general subject such as the concept of money is firstly that the repo market itself is a biproduct of financial innovation. But most importantly, an attempt is made to form a perspective that will hopefully help the reader better understand its functioning. It is supported that the key to comprehending these parts of the modern monetary framework lies in giving a reliable (though always subject to change) answer to the question "What is money?" by adopting a modern view in the following paragraphs.

1.2 Giving perspective

Before transitioning to repo and collateral, it is helpful to conceptualize money by explaining its simplest form: The cash that people use every day. A dollar bill is nothing more than a debt certificate (IOU). It represents a liability of the Federal Reserve to its holder. However, the promise of the central bank to pay an amount of dollars is called a dollar itself and, in this occasion, this creates confusion. In reality, what people call a "dollar" (dollar bills, banknotes) isn't a dollar but only a promise by the Federal Reserve to pay the sum which is shown on it denominated in dollars in the future. This syllogism raises questions about its nature. If this

[1]The subject of financial innovation is covered by both spaces of academia as well as regulatory institutions. For more reading, see "Recent Innovations in international Banking", Bank for International Settlements, April 1986, "The Euro-Dollar Market: Some First Principles" by Milton Friedman (1971) as well as Erik Townsend and Jeff Snider's "Eurodollar University".

[2]https://www.federalreserve.gov/monetarypolicy/files/FOMC20000628meeting.pdf, page 82.

view holds, then what is a dollar? Following Mitchell-Innes (1914), this research adopts the opinion that the dollar does not exist, and it is only an idea, a symbol. The dollar's role is the one of a unit of account. Mitchell-Innes argues: *"The eye has never seen, nor the hand touched a dollar. All that we can touch or see is a promise to pay or satisfy a debt due for an amount called a dollar."*[3]

The previously introduced concept lays the foundation for what is called the "Money View". Being guided by Steffen Murau's working paper "Offshore Dollar Creation and the Emergence of the post-2008 International Monetary System", this research supports that money is nothing but circulating debt certificates and that the monetary system is a sum of payments that are realized through tradable IOU which are transferred between the participants' ledger balances[4] All transactions follow the rules of double-entry bookkeeping since there are two participants in each transaction (transactions with more participants can be broken into two-participant transactions). Therefore, balance sheet mechanics are used in order to analyze these processes.

One of these processes is money creation, which is (as it will be shown) simple yet misunderstood. As a result of the compliance to double entry bookkeeping, the Money View explains money creation as a mere balance sheet operation. According to Steffen Murau:

"The money creation process follows a structure which manifests itself in different contexts—that of a 'swap of IOUs'. Money creation takes place when financial institutions, in exchange for a long-term IOU owed to them, create a short-term IOU that can be traded on secondary markets against commodities, services or other financial instruments. The most common example is when banks issue loans by creating deposits as credit money. The loan constitutes an asset of the bank, as it is a long-term IOU owed to the bank; the deposit, as a short-term IOU owed by the bank, is the bank's liability. In terms of balance sheet mechanics, when a bank hands out a loan, it expands its balance sheet on both sides and swaps IOUs of different maturities. The short-term IOUs, if they are tradable on a secondary market, function as money that can be used by the receiver of the loan. Conceptually, money creation thus literally occurs out of nothing, it is merely an exchange of two promises to pay."

To simply demonstrate money creation, commercial bank loan issuance will be described.

⇒ A customer enters the bank's branch and speaks to an employee at one of the desks. His goal is to have a loan approved by the bank so that he can expand the operations of his retail clothing business.

⇒ The bank is given the data it needs to determine if the customer's business can "support" a loan of the demanded size. Then, the customer and the bank negotiate the lending terms.

⇒ Assuming that the business is deemed eligible for the loan being asked, then, as Mr. Murau mentioned, the bank's balance sheet is expanded on both sides. The loan has the same effect on the "imaginary" balance sheet of the customer.

⇒ The bank's balance sheet has the loan on the asset side and the money creation happens on the liability side: The bank "makes" the agreed amount of money available to the customer in the form of a deposit.

⇒ This deposit is now an asset for the customer, since it is money that can be used to fund the expansion of the business. At the same time, the customer holds a liability to pay this amount of money plus the agreed interest over a period[5]

[3] Mitchell-Innes 1914: 155

[4] https://publications.iass-potsdam.de/rest/items/item$_3$259914$_4$/*component*/*file*$_3$259926/*content*, *page*8

[5] Evidently, the commercial bank must also consider the existing reserve/liquidity requirements. However, the intent of this research is to focus on the essence of money creation and not on compliance.

This process may not be fully comprehended with a simple read. In fact, Mehrling (2017) writes: *"This process apparently offends common sense understanding of what it means to make a loan – I can only lend you a bicycle if I already possess a bicycle. Even more, it seems to go against a fundamental principle of elementary economics that 'there ain't no such thing as a free lunch'"*

The first and second sentences have a special meaning because lending is interpreted as the action of giving something that is already in one's possession with the expectation that it will be returned at a determined point in the future. The money creation process would be better interpreted as the action of providing access to some means; and this is where there's space for constructing a different view of money. As mentioned above, it is contradictory to our nature to have a process that gives out "free lunch". However, in our case, this is true only if someone considers money as "free lunch", or in other words, a form of wealth that is given for free. If someone does not think of money as a form of wealth but as a tool that is animated in order to be created, then the above balance sheet process makes sense.

Banks are businesses like any other: They allocate their available funds to maximize returns, which are a quantitative proxy for wealth creation. Simultaneously, they strive to minimize the cost of doing business (funding cost, liability side)[6]. What makes the banking business special is that they maximize returns by choosing the best potential wealth creators while showing their creditors (the lenders of the bank's funds) that they can perform this process in a profitable manner. Therefore, money (a.k.a. the tool used to create wealth) allocation is done as efficiently as possible, which leads to a simple fact. Banks choose who produces based on what value they can offer and they provide the tools (money) to act.

What can be derived from the above is that money is not necessarily "free lunch", because it will not always be abundant. At certain times, banks may believe that the risks of expanding their balance sheets are more than the opportunities they are offered. The result is a tight money economic environment. The cost of extending money to an unproductive activity is mostly economic in its nature, meaning opportunity cost: This money could be allocated in a more productive activity (or if these don't exist, not allocated at all since it's not worth the risk). The asset that is now capturing balance sheet space (which is limited due to risk factors and regulations) is restraining the bank from seizing other wealth creation opportunities that it may find in the future. This makes the bank less profitable and if this process continues it will result in larger funding costs (or no funding at all), which further worsens the course of business.

1.3 What defines the moneyness of a credit claim?

"Everyone can create money; the problem is to get it accepted'[7]

It is apparent that new credit forms make their appearance as time passes. As previously mentioned, the phenomenon of financial innovation can be attributed to different factors such as advances in technology and regulatory arbitrage. Notably, while he was attempting to answer our question in "Treatise of Money", Keynes indirectly implies that financial innovation is a result of "the pressures in capitalism for new promises to pay that can delay settlement in money proper"(Gabor and Vestergaard 2016). Also, in "Prices and Production and Other Works", Friedrich Hayek completes Keynes's claim by writing the following[8]:

"In particular, it is necessary to take account of certain forms of credit not connected with banks which help, as is commonly said, to economize money, or to do the work for which, if they did not exist, money in the narrower sense of the word would be required. The criterion by which we may distinguish these circulating credits from other forms of credit which do not act

[6]The idea of cheap funding is important in understanding why the repo market exists and it will be further discussed in the next section

[7]Minsky, 1986: 228, mentioned in Gabor and Vestergaard (2016)

[8]Page 270 of the book.

as substitutes for money is that they give to somebody the means of purchasing goods without at the same time diminishing the money-spending power of somebody else"
Most importantly, he further mentions:

"But it is important not to overlook the fact that these forms of credits owe their existence largely to the expectation that it will be possible to exchange them at the banks against other forms of money when necessary, and that, accordingly, they might never come into existence if people did not expect that the banks would in the future extend credit against them"

To put it differently, Keynes and Hayek both argue that new credit forms emerge from the financial system's motives (increasing leverage) to "delay payments[9]". These credit forms are accepted by counterparties only if they perceive them as easily convertible to "money proper". However, it is necessary to make a remark at this point. Although it may sound contradictory with the previous sentence, convertibility itself is not the main principle for accepting a form of credit. It is rather the perception/the confidence that the issuer of the credit form will have access to so-called "money-proper" if he is ever called to do so. If this confidence does not exist, then these credit forms are considered of no value (emphasis on the last sentence of Keynes's quote).

Therefore, the key principle is not convertibility, but the belief of the existence of the ability to convert to a higher form of credit if the circumstances ever deem it necessary.[10]

To better grasp these ideas, they are applied to cash (the "narrower sense of the word") and bank deposits.

In today's world, cash (fiat currency) is a liability of the central bank to its holder. For some fiat currencies, its nature is clearly stated: In Bank of England's Pounds, if someone looks closely at the top of its front side he will find the following sentence: " I promise to pay the bearer of demand the promise of [x] pounds". However, as it was mentioned in previous paragraphs, the liability to pay the sum of pounds is the pounds themselves, which is not true. Pounds are only a symbol; they do not really exist. Therefore, one can argue that they are not convertible because the "thing" that they are supposed to be converted into does not exist. This is where the idea of legal tender comes into place. Legal tender is any form of money that is required by law to be accepted for the settlement of any debt. Therefore, if someone goes to a grocery store and pays in BoE's pound bills, the store owner is legally required to accept it as a means of payment. This law ensures the demand for cash as well as the "supply" (the person who pays) because of the knowledge that it will be accepted.

As for bank deposits, they are a promise of a depository institution to pay the deposit equivalent in cash whenever it is demanded. As long as the public is confident that it can convert these deposits into cash, they are a money equivalent. If for any reason the public loses its confidence in a specific bank and many people withdraw their deposits simultaneously, the perception of convertibility of the bank deposits has been lost and it is possible that the bank will not be able to fulfill its promise to its depositors. This is a textbook bank run and backstops such as deposit state guarantees are put in place so that the above scenario can be avoided.

One can also think that the process of lending to a customer the following imaginary dialogue takes place:

- Candidate Borrower: I want 1000 dollars.
- Bank: I am willing to lend but "I don't have" 1000 dollars. Will you accept my liability to pay you 1000 dollars in the future (a deposit of 1000 dollars)?
- Candidate Borrower: I am confident that given our modern financial system, others will accept your liability as a means of payment because you are considered as a credible

[9]This idea will be further analyzed in the context of the repo market. Economization is not limited to money. It also extends to the notion of balance sheet space as well as borrowing costs.

[10]"A Brief History of 'Money"; Part 3, Jeffrey Snider.

institution by "the market". I do not need real dollars to operate, I only need a convertible, credible promise that they will be given by someone in the future.

Dollars are a purely theoretical concept. Our financial system is structured like this in the name of efficiency: A financial system that transacts virtually in all sorts of IOUs does not face any physical boundaries. The principal boundary in this mechanism is how an economic agent perceives risk and how this risk affects his balance sheet (his "asset portfolio" and the ways he funds it).

It comes as a logical conclusion that, given this view on convertibility, we can organize different credit forms in a hierarchy that shows their monetary status. Their place in the pyramid reflects the ease of convertibility. In fact, Hayek (in Gabor and Vestergaard (2016)) himself described an inverse pyramid of credit "that had cash at its base, followed by central bank credit, credits of commercial banks, and business credits outside banks". Gabor and Vestergaard (2016) graph this concept and show a stylized form of the modern hierarchy of money: the top two parts of the pyramid are captured by the two most liquid forms of money while the third part,≪sovereign and private securities"- the "business credits" that Hayek is referring- can be defined as all of the privately created, liquid liabilities that are created by bank and non-bank institutions to fund their operations. What is included and often quoted as "shadow money" in modern literature in this space is usually short-term liabilities such as repo liabilities, Asset Backed Commercial Paper and Money Market Fund shares. More specifically, Pozsar, Adrian, Ashcraft, and Boesky (2010) define shadow banks as specialized institutions that engage in credit intermediation (meaning credit, maturity, and liquidity transformation), just like a traditional bank. However, what separates them from traditional banks is that they are not backstopped by any official guarantees[11] and that credit intermediation is not completed "under one roof": The process is fragmented into many steps and different types of specialized institutions/entities are active in one or some of them. The concept is the same, but the names and the means are different. This reference to shadow banking is being made because repurchase agreements consist a principal funding means of shadow bank operations and because it is important to understand the relation with traditional bank deposits: The liabilities being called "shadow money" have the same use for their issuers as well as their holders (as assets) with the one for the issuers of bank deposits (traditional banks) and their holders (the public). Again, Steffen Murau's paper shows the difference of assets and liabilities of various institutions in a comprehensive manner:

[11]This does not necessarily mean that they are different institutions. For example, banks like J.P. Morgan include both traditional and shadow banking in their business. The distinction is made only in the way of doing business

Assets	Liabilities
Loans and bonds (long-term IOUs)	Deposits (very short-term IOUs)

Assets	Liabilities
Asset Backed Securities (long-term IOUs)	ABCPs (short-term IOUs)

Assets	Liabilities
Term repos (long-term IOUs)	Overnight repos (short-term IOUs)

Assets	Liabilities
ABCPs and overnight repos (short-term IOUs)	MMF shares (very short-term IOUs)

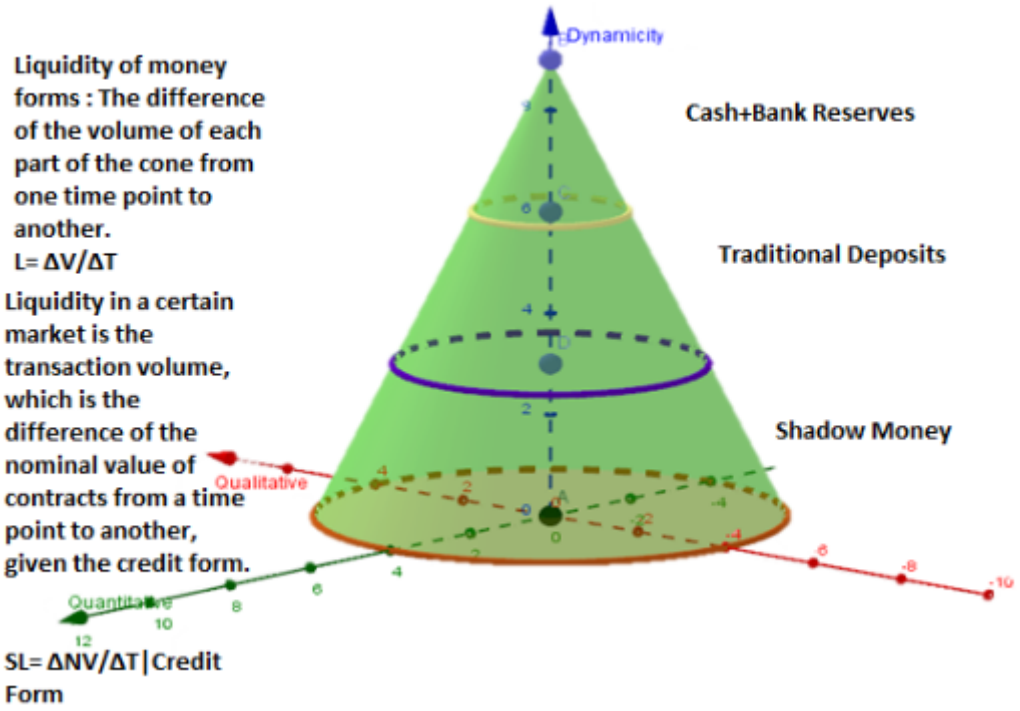
Figure 1: Different institutions back their liabilities with different assets, according to their purpose. Money takes different forms for different economic agents.

Finally, it must be noted that the third part (traditional deposits have an official backstop) of the pyramid is not static; in certain periods, some financial instruments may stop being accepted or others may appear to be covering a large portion of the money market. The dynamic nature of this part of the hierarchy is a direct result of what Mehrling (2017) refers as the inherent instability of credit: Promises for the future (all the liabilities above imply a monetary compensation in the future for the holders) are accepted today but uncertainty for what the future holds will surely lead to some failure (meaning loss of credibility of the issuers).

1.4 Expanding the hierarchy: A 3D graph of the money supply

Attempting to broaden the pyramid that was presented above, an abstract, hypothetical 3D model of the money supply is provided in the following image1. One can debrief the content of this graph by understanding what is behind each dimension:

- 1st dimension: Qualitative expansion. This dimension expresses the range of products being used in the money markets. The use of different credit products is a result of technological advance and efficiency.
- 2nd dimension: Quantitative expansion: Measures the "market size" of each credit product.
- 3rd dimension: Money Dynamicity: This is the most important dimension as it shows the preferences of the financial industry. Dynamicity is defined as the sum of the properties that make a credit product attractive to a financial institution. These properties are economization of balance sheet space, legal treatment and fungibility (meaning that its form allows for many uses).



Notes on the image

- The scale of the qualitative axis is not numerical because it should be mentioning the names of different credit forms. The scale of the quantitative axis is the nominal value of contracts issued denominated in dollars.The dynamicity axis is reversed. Shadow money forms are more dynamic than the forms in upper levels of the hierarchy. It is assumed that the concept of dynamicity cannot be quantified. However, an idea for measuring dynamicity is the calculation of the opportunity cost of using higher forms of credit to perform a function of a bank.

- From the following graph, one can extrapolate a cause-and-effect relation between the dimensions. If a credit form category is more dynamic than the other, then it is rational that more financial institutions will use this form. In a rationally behaving market that did not face a credit event that massively changed risk perceptions, this results in a larger market size for these product[12].

- The shape of the money supply is different in each time period, reflecting market conditions and risk appetite.

1.5 Take-away points

1. Money is not a form of wealth, but a tool to acquire and create it that takes many forms, according to the properties the holder needs it to have.

2. Money creation occurs out of thin air and is a simple balance sheet operation.

[12]This is explicitly mentioned to form a connection with 2008. After the Great Financial Crisis, ABCP issuance has greatly diminished while the size of the observable repo market has never recovered to pre-crisis levels. Additionally, the quantity of bank reserves has massively increased due to central banks' asset purchase programs.

3. The perception of convertibility is what makes any financial instrument money-like. A dominant perception that it can be easily converted is reflected upon and enhances market liquidity.

4. General definition of modern money: traditional and non-traditional liabilities whose creation is intended for various purposes such as asset financing, balance sheet management, leverage, and efficiency.[13]

1.6 Transitioning to repo

While reading the next parts, it is encouraged to keep in mind some previously mentioned notions as they will be reviewed through the lens of the repo market:

1. Liquidity Management: The repo market's value proposition is what makes it stand out from other markets.

2. Money hierarchy: A comparison will be made with collateral and it will be argued that collateral has a currency-like behavior.

3. Balance sheet operations: How repo substitutes deposits as a means of funding for certain economic agents.

2 The Repo Market: A Closer Look

2.1 A simple repurchase agreement

In a classic repo transaction, there are two participants. In this case, it will be assumed that they are two banks. On the trade date, Bank A agrees that on the settlement date it will sell securities to Bank B in exchange for cash. The agreement also makes it clear that on the termination date, Bank B will sell identical securities to Bank A at the previously agreed price, collecting interest on the cash it lent to Bank A. The cash proceeds of the collateral are no more than its market value, thus minimizing credit exposure (Choudhry 2005). In addition, the collateral is priced at its dirty price, which is the price including the security's accrued interest during the period of the transaction. This happens because legal title of the security does not change during the transaction(therefore in this case Bank A has the right to claim that interest) despite the fact that in most repo transactions the collateral recipient has the right to use the security for his own purposes. Apart from the interest collected, Bank B can also impose a haircut to Bank B, which means that Bank A borrows a lower nominal amount of cash from that of the pledged securities. Choudhry (2005) acknowledges 4 main reasons for the existence of haircuts:

- A sudden fall in the market value of the collateral
- Illiquidity of collateral
- Other sources of volatility of value (for example, approaching maturity)
- Counterparty risk

To better understand the above transaction, an example is provided (the numbers below are simplified for the sake of illustration and do not represent actual market conditions). /par Suppose Bank A holds 10,000,000$(face value) of 3-year government bond yielding 5% with a market price of 9,500,000$. The 30-day repo rate is 1%. In addition, the bond's day count

[13]Jeffrey Snider, Eurodollar University Season 1.

basis is 360 days/year, its coupon is annual, and Bank B sets a 2% haircut. Given the above, the transaction has these terms:

Settlement Date Principal (clean price) = 9,500,000$ Accrued interest = 10,000,000*15/360*0.05 = 20,833.33$ Amount of consideration for lending: 9,500,000 + 20,833.33 = 9,520,833.33$ To apply the haircut, the amount of the original loan will be 98% of the consideration, which is 9,330,416.6634$. This is rounded to 9,330,000.

Termination Date In the termination date, Bank A must pay back the principal plus the repo interest: 9,330,000 + 9,330,000*0.01 = 9,423,30$.
Bank B returns the securities to Bank A.
If the market value of the collateral falls then Bank B can call for extra collateral to cover the haircut. If the market value of collateral rises, then Bank A may ask for collateral to be given back. For example, in the transaction described above, if there is a sell-off in the bond market on the 10th day and the market value of the securities falls to 9,000,000$, Bank B can ask Bank A to post additional collateral so that its margin is covered.
The securities are now worth the sum of their market value and the accrued interest of 15+10 days: 9,000,000 + 10,000,000*25/360*0.05= 9,034,722.22$, which is rounded to 9,034,722$.
Evidently, the collateral's value is lower than the amount of the loan. To restore the initial margin(haircut), Bank B has the option to make a margin/collateral call to Bank A. The value of the additional collateral is calculated as follows:
(Original amount of consideration + accrued repo interest on the amount lent) *(1+ haircut) – new amount of consideration. (9,330,000 + 9,330,000*0.01*10/30) *(1.02) - 9,034,722 = 513,600$. This is the value of additional securities that need to be posted to Bank B.
If Bank A cannot repay Bank B on the termination date, Bank B gains ownership of the collateral and it can sell it to recover the cash it was not given. Bank B has a motive to hedge against market fluctuations because if the collateral is sold at a lower price than the one at the settlement date it might generate losses.
After showing what happens in case of volatility in the market of the security used for collateral, it is important to mention the characteristic that makes the repo market stand out from other markets. In this market, a repo liability is accepted by the lender only if he is confident that he can sell the collateralized securities at a price that covers his loan[14], or at least that there's a market for these securities (liquidity). Market participants use specialized methods of collateral valuation which are influenced by their risk perceptions (Gabor and Vestergaard 2016).
Interestingly, the above transaction is only the stereotypical type of repo. The next section will be dedicated to showing the diversity of the money markets by exploring other types of instruments where the idea of collateralized lending is the same.

2.2 Other instruments

As the repo market developed and became a major source of funding for different market participants, more complex instruments were innovated that can be used in such a way so that they serve the same economic function with repo but at the same time their form permits their usage by more types of institutions and for more reasons. Their difference with repo lies in their legal and balance sheet treatment as well as their mechanics.

Securities Lending Stock or securities lending is defined as the temporary transfer of securities in exchange for collateral (Choudhry 2002). Instead of imposing an interest rate, the lender seeks profit by charging a fixed fee (percentage of the market value of the securities being

[14]This is a direct implication of using mark-to-market accounting.

lent) on the counterparty. To cover credit risk, the counterparty is required to post collateral in the form of cash or other securities that the lender deems acceptable. Most contracts are on an open basis, meaning that there is no fixed term of the transaction. The two counterparties contact each other every business day to declare whether they want to continue the transaction or to terminate it.

Securities lending is a practice which is convenient for economic agents with large amounts of securities that are considered liquid by the money markets and that can be used as balance sheet tools for the borrowers. These agents are usually pension funds, insurance companies or fund managers with long term fixed income portfolios. Their goal is to enhance their returns and not have a large portion of idle securities on their balance sheet.

The Total Return Swap The total return swap is an interesting structure as it is economically identical to a repo, but it is not treated in the same way balance sheet-wise. This happens because, as a swap, the TRS transaction is overseen by the ISDA (International Swap and Derivative Association), which makes it possible to take it off balance sheet. Therefore, the TRS can be useful in quarter-end periods or before an external audit or other periods are window dressing (making final changes to their balance sheet composition before it is shown to external parties). The process of the TRS is the following:

1. A bond trader sells a security at the market price(this is why this security is removed from the balance sheet)

2. Then, he engages in a swap transaction for a fixed term with a counterparty, in which he "swaps" the total return on that security for a return on cash, which is usually slightly above LIBOR (or any other short-term benchmark rate). If the security rises in value, the cash lender counterparty pays the difference with the price on the settlement date. If it decreases in value, the bond trader pays the counterparty.

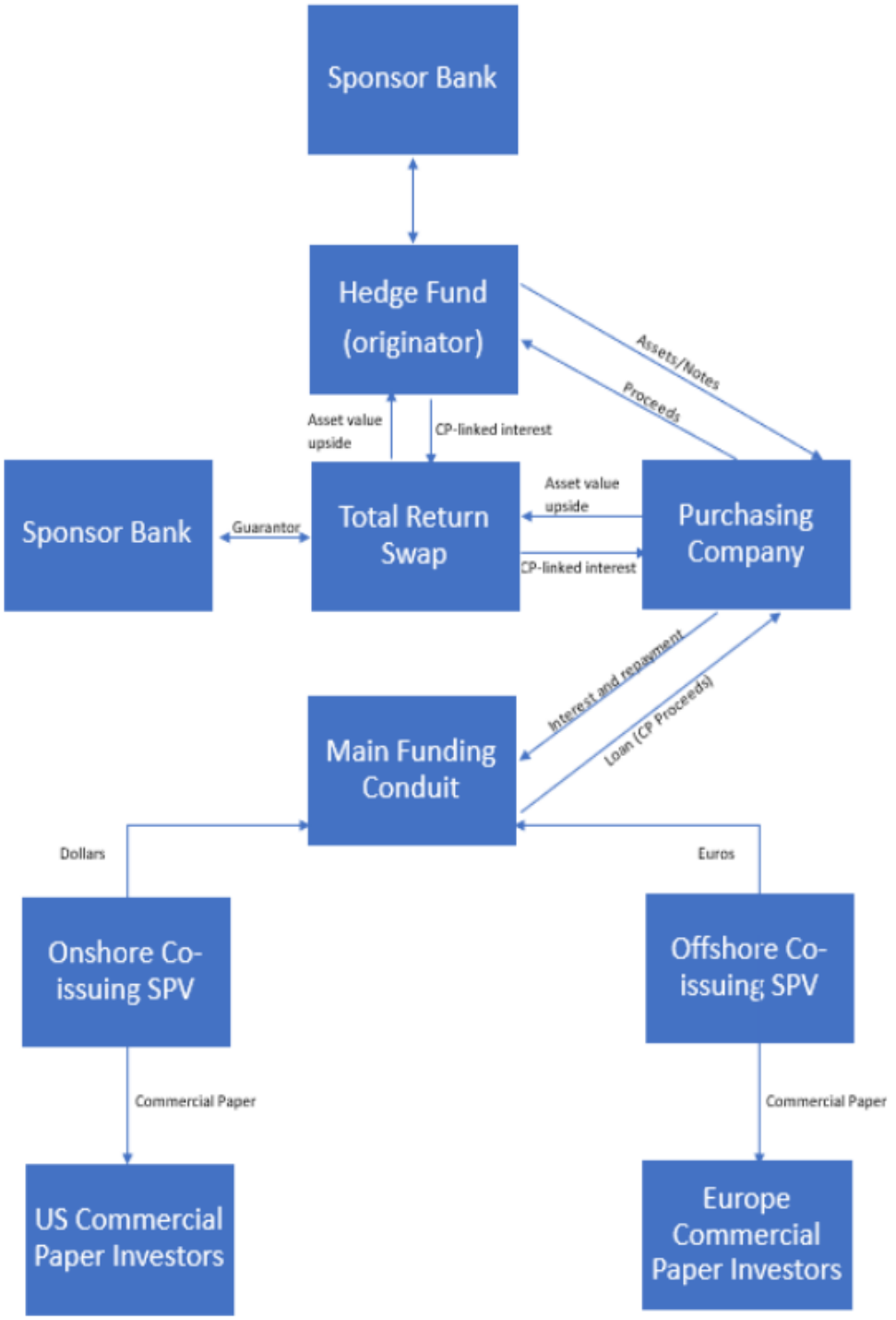
3. The counterparty holds legal title of the securities and it can sell them in the open market if it wants to. In addition, the bond trader has no obligation to repurchase the securities.

The Total Return Swap is used for financing a security position as well as for hedging. In the case of hedging, the bond trader profits if the security decreases in value while at the same time paying interest on cash.

Of course, this process can be broken and executed in parts with different counterparties. Nonetheless, as a total, it is still economically like a repo transaction with the main difference being that it may never be recorded on the balance sheet.

Synthetic Repo via The Total Return Swap As mentioned in the beginning of this paragraph, there are more synthetic funding instruments that combine many aspects of finance. Choudhry (2005) uses this transaction to show that evolutions in the derivatives space have made room for more complex ways of funding. In this case, it is a mix of total return swaps, commercial paper and note issuance, which is built on the use of a Special Purpose Vehicle[15] In addition, the economic effect of this funding structure is like a classic repo, however it is treated differently on the institution's books, therefore making it more dynamic than a classic repo. The next graph visualizes the synthetic repo:

[15]An SPV is a separate legal entity created by a "parent" company. The main motive behind its creation is that its legal treatment allows the isolation of financial risk, meaning that the parent company can use it to undertake riskier activities without affecting its own accounts and shareholders. At the same time, the parties affiliated with the SPV are not affected by the parent company's bankruptcy. This is why it is often characterized as bankruptcy-remote.



1. The Main Funding Conduit issues commercial paper via two other issuing SPVs, one in the US and one in Europe. The proceeds are both in dollars and euros (potentially a hedge for currency risk).

2. The proceeds from the CP issuance are loaned to the Purchasing Company, while the Purchasing Company- as a borrower- has the liability to pay back the amount lent. The loan terms are adjusted to the ones of the CP issue (the borrower pays CP interest and repayment).

3. The Purchasing Company uses the borrowed cash to buy assets from the Hedge Fund. The asset is transferred from the Hedge Fund's to the Purchasing Company's balance

sheet. These assets can be anything from equities to synthetic products. In this case, there is a variation in the asset acquisition: If the Hedge Fund desires to hold these assets to its balance sheet, it can issue a note that can be bought by the Purchasing Company so that it receives an interest in the asset.

4. The Purchasing Company engages in a TRS contract with the Hedge Fund, in which it pays the performance on the previously bought assets while receiving interest on the CP proceeds it used to buy those assets, which is used to pay off its loan from the Main Funding Conduit. If the value of those assets increases, the Purchasing Company gives the upside performance to the Hedge Fund. Through the TRS, the Hedge Fund maintains its economic interest on the assets it previously sold or for which it issued notes.

Notes and Observations

- As the commercial paper approaches maturity, it is repaid by being rolled over with new CP issuance and the interest received by the Purchasing Company via the TRS contract. If there is no market for rolling over the CP, the Main Funding Vehicle or the Purchasing Company will have to sell assets to cover the payment, or the sponsor bank must step in and repay the investors. Most significantly, if the asset's market is showing extreme volatility, the consequences follow the reverse course, as the institution with a long position exposure and not a necessary legal ownership of the assets is harmed via the TRS contract.

- The Sponsor Bank acting as a guarantor can be better described as the Bank "lending" its credit rating to the Hedge Fund so that it obtains funding at the lowest rate possible. Evidently, this service, either in the form providing guarantee or placing a liquidity backstop in case the rollover is not possible, is provided for a fee.

- It is important to note that although the above process is shown in steps, it is only done so for better comprehension. It is common practice that all the above steps realize simultaneously or at very short time periods between each other.

- The goal of this structure is for the originator to gain exposure to its preferred asset without having it on the balance sheet while funding it with borrowed money obtained at the lowest costs possible. The transaction is economically equivalent to a simple repurchase agreement, with the CP investors acting as the cash counterparty and the Hedge Fund acting as the leveraged investor.

- The market size of Asset Backed Commercial Paper today is negligent compared to its pre-crisis levels. This synthetic funding structure is demonstrated to show the level of complexity and interconnectedness of the financial system and the existing difficulties related to obtaining data for some transactions.

2.3 Who does repo and why?

To fully comprehend the systemic importance of the repo market, it is important to know the motive of the parties involved on both sides of the trade, as well as to connect their needs to their position in the market. It would be imprecise to divide the participants into borrowers and lenders, as it is not clear who they are in every trade. This happens because the main motive in a secured financing transaction may not be receiving cash, but the acquisition of collateral(especially in bilateral trades). Both questions mentioned in this chapter's title will be answered at the same time by categorizing the participating institutions and putting their individual needs into the context of secured financing.

Stylized Balance Sheet

Securities	Repo(IOU)

The first category of participants to be examined is hedge funds. Repo gives non-bank financial institutions access to a liquid short-term funding market in which they can acquire competitive rates for their cash. However, as mentioned above, the repo market is not one-sided. It is also a marketplace for acquiring collateral and funding bond or security positions. To better understand the notion of "funding a position" through repo, it is best to think of it not as a transaction where currency is transferred, but rather as the process chosen by the leveraged investor (e.g., hedge fund) to finance a portfolio of assets. If the hedge fund "does not have any equity left" or if its managers want to increase leverage to enhance its return on equity, it collateralizes one/a pool of assets to open a position on a desired security and "issues" a repo liability to the counterparty. At the same time, its counterparty (most likely a broker dealer) extends credit to the hedge fund's ledger balance, which is used to purchase the fund's position. The broker dealer can also take the collateralized asset and give the hedge fund the asset that it wanted to fund by using repo. This process is equivalent to an asset swap, whether that asset is cash or the fund's desired security. As shown in the balance sheet, the broker dealer has a claim on the hedge fund in which the former must return the collateralized securities and the latter must return cash + interest . Of course, hedge funds can also engage in a reverse repo (in which they receive securities), either to open or to cover short positions. This happens because a reverse repurchase agreement is economically equivalent to a sale and purchase of securities (under collateral terms).

Apart from hedge funds, an important player in repo and secured financing transactions in general is the asset manager complex, which is composed of insurance companies, pension funds, institutional investors, long-only funds etc. Because of their business models (especially insurance companies), these institutions manage their risk by holding a large amount of cash or cash equivalents (e.g., liquid securities). Instead of keeping them idle, they mobilize them through repo or securities lending to enhance their returns.

A crucial market participant in the repo market is financial institutions classified as dealer banks, who act as intermediaries between collateral sources and collateral demand. Their contribution to market liquidity is substantial, as they are responsible for collateral distribution and availability throughout the financial system. Primary dealers take on both sides of the repo market, being both pledgers and pledgees of collateral, thus acting as market makers profiting off the mismatch in funding terms. The willingness of primary dealers to expand short-term funding, as well as their creditor's perceptions for their own solvency, directly affects systemic liquidity.

3 Collateral: Role and Implications

3.1 Collateral as quasi-money and its role as reserves in the monetary system

After giving a brief description of repo transactions and (some of) their economic equivalents, an effort will be made to shed light on the significance of the collateral side of such transactions. In a financial environment where secured lending has taken over from unsecured lending, having liquid collateral is especially important for an FI. This part will show the role of collateral and "collateral reserves" [16] through an example, including a simplified version of an institution's balance sheet. In the end, two points will be argued:

[16]Source: Snider, "Collateral Reserves: What Is Behind Record Low and Negative Yields"

1. Bonds are not only seen as investments from the perspective of FI's, but also as balance sheet tools used for risk management. The use of certain bonds as collateral (and the simultaneous repudiation of volatile bonds or bonds that are perceived as illiquid or too risky by the market) well explains the existence of negative interest rates as well as the high demand of these bonds during volatile markets.

2. In accordance with existing research, collateral can be viewed as a quasi-currency for FIs, impacting systemic liquidity.

In our example, the protagonist is a securities house holding the assets in the matrix below. The example will be split into two scenarios: One in which the securities house does not have liquid securities on its balance sheet, and one in which it has. It intends to fund these assets using a basket repo, which is equivalent to a classic repo, except for the fact that an entire portfolio of assets is being repoed out and it is accounted as 1 trade. For the sake of simplicity, interest on cash is omitted and market values as well as credit ratings and haircuts don't reflect real market conditions. The repo term is overnight.

Asset Type	Credit Rating	Price	Market Value	Haircut	Finance Raised
MBS	A	100	300	5%	285
Emerging Market Bond	BB	100	300	10%	270
Corporate Bond	BBB	100	300	15%	265

As seen above, lower credit ratings for a security mean higher haircuts in the repo market. Our security house's stylized balance sheet is shown below:

Assets	Liabilities
Reserves 100 MBS 300 EM Bond 300 Corporate Bond 300	Equity 180 Basket Repo 820

A case of high volatility and downward price pressure is assumed for the corporate bond in the balance sheet. We assume a systemic event that elevates market participants' risk perceptions. As a result, they no longer accept these corporate bonds as collateral in the repo market (the case of higher haircuts is skipped intentionally, the consequences being less severe but equally serious for the securities house. A higher haircut means a margin/collateral call for the cash borrower). The secondary market for the Corporate Bond becomes illiquid, as there are significantly less agents willing to take the buying side of the trade. This results in its price tanking by 10%. Our protagonist's updated balance sheet looks like this:

Assets	Liabilities
Reserves 100 MBS 300 EM Bond 300 Corporate Bond 270	Equity 180 Basket Repo 555

From the above balance sheet, we infer that there is a funding gap, which occurs when some assets are not funded by any liabilities. The securities house is facing a problem because it must find an alternative to the now unavailable repo funding. At the same time, because the term is overnight (initially to reduce funding costs), time is against the FI, as it searches for alternative sources of funding. Normally, if our FI is not a non-bank financial institution (e.g. hedge fund), one alternative is unsecured borrowing through the discount window. However, it will be supposed that the market environment is turbulent, resulting in systemic illiquidity (crisis scenario). Thus, unsecured borrowing is not a good option for the house (high interest rates due to high demand because others are also experiencing funding problems). Assuming it finds no alternatives, the FI faces the same situation with Merrill Lynch, Bear Stearns and Lehman Brothers. The securities house is forced into a fire sale, making it book capital losses on its balance sheet and only realizing their newly reduced value of 270$. 270$ of deposits are credited to the security buyer, while total equity is reduced to 115$.The updated balance sheet is the following:

Assets	Liabilities	
Reserves 370 MBS 300 EM Bond 300	Equity 115 Deposits Basket Repo Capital Loss	 270 555 30

There are three main consequences due to the bond price's downward volatility. The first and most important one is worse balance sheet metrics and margins. If it is assumed that the FI's WACC is 0 and each security's returns are shown in the table below, then the asset side had a weighted return of 7.7%.

Name	Yield
Reserves	2%
MBS	5%
EM Bond	8%
Corporate Bond	12%

However, after the corporate bond's fire sale, the new asset side return is about 4.8%. The impact on the institution's fixed income is evident. Furthermore, the capital losses caused by the fire sale of the corporate bond will be shown in the income statement, giving out a negative signal to shareholders and potential investors. Finally, there are negative implications for the future funding conditions of the FI: In an environment where all counterparties are less trustworthy

because of a systemic reevaluation of risks, this institution, through its actions, has confirmed that it is troubled. This will trigger a vicious cycle in which the FI will face higher haircuts, higher rates and overall tighter funding conditions, which will only exacerbate its problem.

After the turbulent time passes, the institution wants to avoid being in this position in the future. It adds US Treasuries to its balance sheet, which is one of the best forms of collateral due to the depth of their market. Assuming, it obtains the UST's through a repo with no haircut, the new balance sheet is shown below:

Assets		Liabilities	
Reserves	100	Equity	180
MBS	300	Basket Repo	1120
EM Bond	300		
Corporate Bond	300		
US Treasuries	300		

If the previous scenario is repeated, the US Treasuries will most likely still be acceptable by the cash lender. Thus, the FI can rehypothecate them to maintain its repo funding until market volatility is reduced, and the Corporate Bond price can recover:

Assets		Liabilities	
Reserves	100	Equity	180
MBS	300	Basket Repo	855
EM Bond	300		
Corporate Bond	270		
US Treasuries	300		

Assets		Liabilities	
Reserves	100	Equity	180
MBS	300	Basket Repo	1120
EM Bond	300		
Corporate Bond	270		
(Temporary Impairment)	30		
US Treasuries	300		

As a result, the financial institution avoids all the previously mentioned consequences. However, this does not come without a cost: To always secure repo funding, financial institutions must have the best collateral on their balance sheet. That is, highly accredited governments' bonds with deep, developed markets. These bonds' markets are more liquid and less volatile, giving them the best characteristics in terms of collateral. As the FI is more certain about its funding, its net interest income is lowered because of these assets, as they yield lower than the rest of the FICC assets on its balance sheet. Therefore, this funding/liquidity insurance comes at a cost that is reflected on balance sheet space and balance sheet metrics.

Furthermore, it is important to point out that the securities belonging to the category of pristine collateral (UST's, UK Gilts, JGB's) have either extremely low or negative yields. It is clear that a fixed income security with a negative interest rate does not make sense from an investment perspective. On that account, it can be argued that the primary role of these bonds for FI's is to be balance sheet tools that act as "reserves" in a scenario of a funding shortfall, rather than investments. In addition, more can be inferred from the interest rates of these products: A low or negative interest rate reflects the high demand for these bonds, which is equivalent to elevated market risk perceptions and risk aversion, as it amounts to the hoarding of the safest assets. In other words, liquidity is systemically priced high.

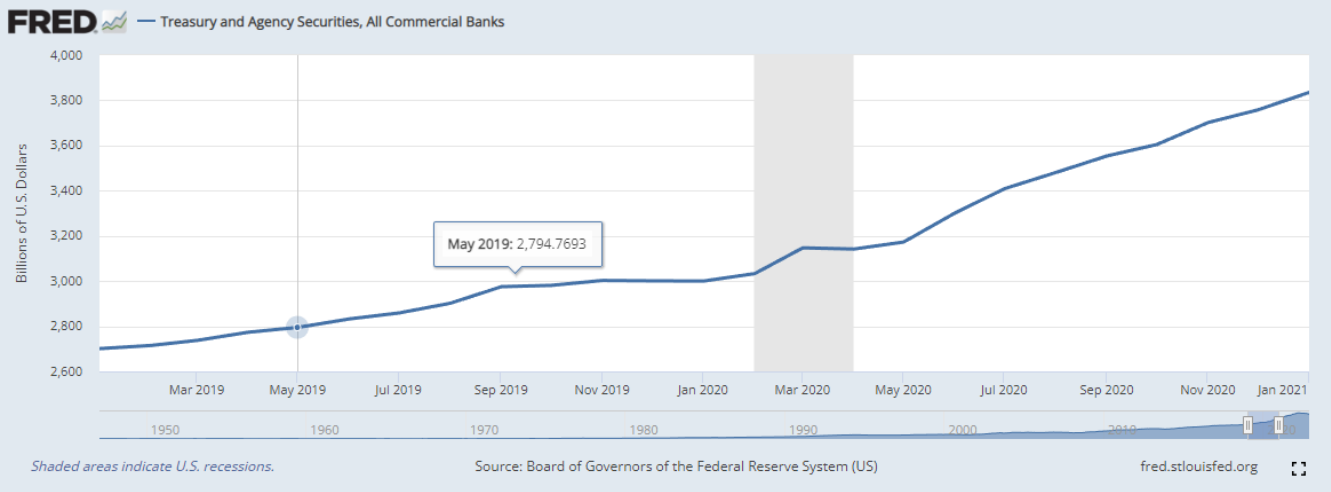


Figure 2: Increased demand of Treasury and Agency securities by US commercial banks. A significant increase realizes after March 2020, due to the illiquidity event caused by the uncertainty of COVID-19

Finally, it can be supported that collateral-or the securities being used as collateral- is money-like, in the sense that it enables the borrower to start or maintain a transaction that in its commencement was balance sheet expansionary. To put it differently, collateral is a privately issued means/method of acquiring two "goods": funding and leverage. From a systemic standpoint, because it is privately issued, its par value with instruments that are lower in the monetary hierarchy (i.e. deposits or bank reserves) is variable and subject to market conditions. This implies that in times of stress there appears to be a fragmentation of the market between what is perceived to be pristine collateral and other issues, which are more volatile. A reasonable characterization can also be made by using the terms introduced by Gorton (2012): The collateral market can be divided to information insensitive and information sensitive securities, the first having increased demand in stressed markets, when financial institutions want to replace collateral that is being repudiated with acceptable collateral. It is evident from the above that we can extract a "collateral supply", which shrinks/enlarges depending on systemic risk perceptions and combine it with "collateral velocity", as defined by Singh (2011), to obtain a more complete view of collateral's role in the financial system.

3.2 Collateral reuse and rehypothecation

This section will focus on one of collateral's attributes that further reinforces the argument for its monetary nature by giving a brief review of the existing legal regimes, explaining how reuse and its regulatory restrictions impact global liquidity, and finally providing an example of a collateral upgrade transaction and its effects on financial plumbing.

Definition Collateral reuse occurs when the collateral receiver in a secured transaction is legally entitled to use its counterparty/client's securities for its own purposes. These include maintaining funding for already open positions or raising finance for its own purposes. Rehypothecation is a special case of collateral reuse where it is only used for meeting the security requirements for an obligation.

Legal Overview Depending on the type of transaction and the jurisdiction, different rules apply to the securities being sourced. Securities dealers, as intermediaries/market makers in the

modern banking system, source collateral from different types of counterparties and a variety of transactions. These transactions are mostly repos, securities loans, collateralized derivatives transactions and prime brokerage or custody agreements. Although there are many other regimes for handling collateral around the world, it is important to focus on certain aspects of New York, UK and European law.

Beginning with New York law, the NY version of the 2016 ISDA Credit Support Annex, the concept of pledging is stated. Under such an agreement, the pledgor of the collateral remains the beneficial owner of the security, because title isn't transferred to the pledgee. The pledgee receives security interest, which gives him the right to repossess the security in case of default from the side of the pledgor. However, what makes this type of arrangement special and rather confusing is Paragraph 6(c), which sets the terms for using the posted collateral. Unless there are other specific contractual terms, the pledgee can sell, repledge, rehypothecate or invest the asset at will, without having any obligation to the pledgor. In addition, the pledgee can even register the posted collateral to its own name or its custodian's name. Interestingly, this can easily result in a scenario where the pledgor is entitled to the economic benefits of an asset that most probably isn't held anymore by the pledgee or has been used in some other type of arrangement for his own benefit. Thus, it can be inferred that, in this case, the pledgor becomes an unsecured creditor to the pledgee, as he can still claim the asset in case of the pledgee's insolvency.

Apart from the ISDA CSA, there are types of agreements that allow posting collateral by pledge, but the pledgee has no right to use it for its own purposes. Such an agreement is the 2018 pledge Global Masters Securities Lending Agreement. In contrast, the 2016 ISDA VM CSA, which is used in transactions subject to English law, is much simpler regarding ownership rights. Paragraph 5 clearly states that all right, title and interest is transferred to the collateral recipient, without the creation of security interest.

Regarding European law, Directive 2002/47/EC and its amending directives have the purpose of creating "a common frame of reference for collateralized transactions in the Euro Area". Its highlight lies in Article 2, where Paragraph 1b and 1c defines two types of arrangements: A "title transfer financial collateral arrangement", where full ownership is transferred to the collateral receiver, and "security financial collateral arrangement", where full ownership remains with the collateral provider and the collateral receiver has security interest over the asset.

Evidently, there are many other differences between legal frameworks, like the existence of SEC Rule 15c3-3 in the US (and the non-existence of an equivalent in the UK), which limits the amount of customer securities a broker dealer can use for its own financing. These differences make it difficult to promote the global harmonization of rehypothecation regimes, therefore allowing for regulatory arbitrage for financial institutions that operate globally.

Collateral Velocity, Monetary Nature and Regulation Collateral velocity as defined by Manmohan Singh (2011) is one proxy of shadow monetary expansion, which was the main means of credit growth in the pre-2008 world and still maintains its systemic relevance, despite being the root cause of the 2008 monetary breakdown. Cross border transactions that require collateral to be realized can be highly complex to decompose due to the lack of direct supranational data and their legal sophistication. To emphasize the latter, the legal topics mentioned above are not exclusive, not even for their own jurisdiction. For someone to gain a complete view of the legal underpinnings of secured financing transactions, intensive research by legal experts on a global level needs to take place. Nonetheless, it is worthy to focus on the economic meaning of collateral reuse. When an institution extends sourced collateral for the purpose of its own business (in lieu of cash or another security, selling the security, lending the security), it is basically "duplicating" this security within the financial system, thereby increasing liquidity and financial lubrication. What the primary source has done is lend an asset systemically perceived as liquid, while implying that it trusts its counterparty that when needed, it will be able to

return a security of equivalent "value", which in this case is determined by the liquidity of its market. This reuse of collateralized securities forms so-called "collateral chains", which if traced can provide an idea of the financial system's interconnectedness on a micro level. Ultimately, the entirety of this process is a modernized, more synthetic version of retail banking money creation through simple loans. The differences are the interbank nature of the credit expansion taking place and that the entire transaction relies on the existence, the quality, and the movement of collateral. To simplify the equivalence, a more traditional approach to monetary nature can be taken: Collateral is a means of "payment" because it is used for settling transactions in lieu of cash and a store of value because of the perceived parity with traditional money (e.g. deposits).

From a regulation standpoint, since the availability of collateral and its velocity are indicators of a modern, sophisticated form of liquidity, it is enticing to explore their impact. In particular, the focus lies on the Liquidity Capital Ratio (LCR) included in the Basel 3 regulatory framework. LCR's purpose, which is to motivate banks to construct and maintain a stock of high-quality liquid assets (HQLA) that can be liquidated in the next 30 operating days, in case of a (systemic) funding windfall. Gorton and Muir (2016) argue that this type of regulation makes collateral "immobile", while further observing a variety of data to quantify "collateral mobility" and compare the pre-crisis and the post-crisis environment. Certain collateral related articles give an idea of LCR's possible effects on collateral fluidity:

- Article 31 explicitly mentions that assets already included in the HQLA by the bank cannot be pledged for the usual transactions requiring securities pledging nor be used to cover operational costs. This restriction also applied for the inverse scenario, where securities are received via reverse repos or SFT's, as they cannot be repledged if they are to be committed to the HQLA.

- Adding to the requirements for assets received, Article 39 mentions that rehypothecated assets that can be contractually demanded by the bank's client in the next 30 days should not be included in the HQLA.

- Regarding collateralized derivatives transactions, unsegregated assets received as part of these activities which the bank can legally rehypothecate maybe included in the HQLA, provided that the bank addresses all of the liquidity needs arising from contract-specific terms or stressful market scenarios.

From the above, it is apparent that the very existence of a liquid asset stock may impede collateral velocity while increasing the most valued and safest collateral's demand, given that it is usually issued by treasury departments who do not consider systemic needs for collateral in their decision making.

Finally, since collateral itself can expand or contract to its reuse or the lack thereof, leading to balance sheet expansion/contraction and more/less financial entanglement, two questions come to mind: What happens at market disruptions and how can this be incorporated into the previous definition of the money supply?

As shown previously, collateral has quasi-money properties, leaving it in an implied, volatile position on the money hierarchy. Its "moneyness" is a reflection of market views for the specific asset. If the sum of all assets used as collateral is referred to as the "collateral pool", the previous balance sheet illustration proves that this pool is not monolithic, especially in times of market stress. The collateral market becomes fragmented, and some issues are more in demand while others are deemed non-acceptable in funding agreements, due to increased volatility among market participants.

With the novel definition of the money supply in mind, qualitative expansion in the case of collateral is the ensemble of new assets being collateralized, while quantitative expansion is the collateral velocity multiplied by the issued collateral.

3.3 Collateral Transformation: Shadow Money Intermediation and the Central Role of Primary Dealers

The following example of what is known as collateral transformation wraps the notions of rehypothecation and "moneyness" together, while emphasizing the paramount role of dealer banks in distributing liquidity globally.

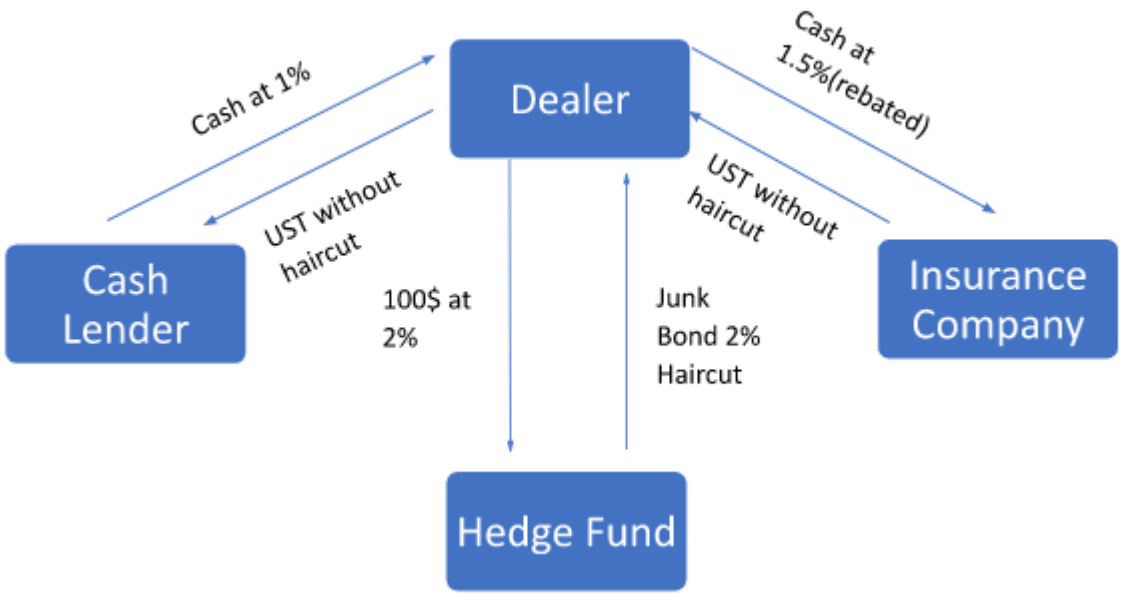


Figure 3: Increased demand of Treasury and Agency securities by US commercial banks. A significant increase realizes after March 2020, due to the illiquidity event caused by the uncertainty of COVID-19

In the figure above, the dealer is the hedge fund's creditor in the repo market, which receives a Junk Bond at 2% haircut and borrows at 2%. The dealer lends cash to an insurance company at 1.5% and receives a UST, which is then rehypothecated on the other side of the repo market to a cash lender, who lends to the dealer at 1%. Thus, the dealer finances its transaction with the hedge fund at good terms, which allows it to offer a more competitive rate for the hedge fund than the one it would receive if it went on the repo market without the dealer. Essentially, the primary dealer is being paid for going on the repo market for the hedge fund and securing better financing terms while running the risk of not being paid by the insurance company, of the cash lender not giving his collateral back, and of a devaluation of the hedge fund's junk bond. It is evident that rehypothecation plays a key role in the realization of this transaction. At the same time, an extremely volatile market period would affect the Junk Bond's price unfairly, possibly generating a loss that would have to be marked on the dealer's books. If the dealer stops receiving such collateral, the hedge fund will potentially face funding problems.

Citations for LaTeX

`\citet` → *2016 ISDA VM NY CSA* (n.d.) `\citet` → Alam and Singh (2017) `\citet` → Choudhry (2010) `\citet` → *Towards a Theory of Shadow Money* (2016) `\citet` → Dufey and Giddy (1981) `\citet` → *REPORT FROM THE COMMISSION TO THE COUNCIL AND THE*

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\citet → J. Snider (n.d.) \citet → Murau (2018)

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